



# Foodgrain Warehouse Market in India 2025-2030



**PHD Chamber of Commerce and Industry**





# **Foodgrain Warehouse Market in India 2025-2030**

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## Foodgrain Warehouse Market in India 2025-2030

### PHD Chambers' Viewpoint



**Shri Rajeev Juneja**  
President, PHDCCI

India stands among the world's leading nation in terms of arable land and overall foodgrain output, driven by the strong agricultural performance of key states such as Uttar Pradesh, Madhya Pradesh, Punjab, Odisha, and Rajasthan. The sector has maintained a steady upward trajectory, achieving a historic production level of 332.3 million metric tonnes in 2023-24. The foodgrain production is projected to reach about 368 million metric tonnes by 2030-31. This creates host of opportunities for the warehousing system in India. Notably, rice and wheat remain the predominant contributors to the country's foodgrain basket. Strong post-harvest infrastructure—warehouses, cold chains, drying units—also gives farmers economic flexibility. These facilities also open the door to warehouse receipt financing, allowing farmers to use stored produce as collateral for short-term credit. In essence, good post-harvest systems protect both value and livelihoods.



**Shri Anil Gupta**  
Senior Vice President  
PHDCCI

In India, the journey of foodgrains from farm to plate is quite wide-ranging. It begins with procurement at minimum support prices, moves through milling, and then into temporary storage at Agricultural Produce Market Committee mandis. From there, much of the foodgrain travels across the country before finally reaching people through the Public Distribution System and Fair Price Shops. Even today, foodgrains are largely kept in traditional godowns. Therefore, a clear national push to modernize agriculture storage is much required. Today, we are witnessing a true technological shift in how foodgrains are stored and managed.



**Shri Sanjay Singhania**  
Vice President PHDCCI

India's approach to foodgrain storage has come a long way since the 1950s, with landmark laws—such as the Warehousing Corporations Act of 1962 and the Warehousing Development and Regulation Act of 2007, shaping a more structured and accountable system. The government has also encouraged wider participation through initiatives like the PEG scheme for private sector involvement, the Gramin Bhandaran Yojana for rural godowns, and major infrastructure programmes like the Agriculture Infrastructure Fund and various PPP-led silo projects.



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**Dr Ranjeet Mehta**  
CEO & Secretary  
General PHDCCI

India currently has about 87 million metric tonnes of foodgrain storage capacity, most of it located in the northern and western parts of the country. By 2030–31, India's foodgrain production is expected to rise to nearly 368 million metric tonnes. This is creating a scope to fulfill the expected storage shortfall of around 69 million metric tonnes—an unmistakable signal that the country needs substantial new investment in storage infrastructure. Looking ahead, the foodgrain storage market requires investment to the tune of about ₹43,953 crore by 2030–31. Therefore, for industry and investors, the opportunity here is both large and long-term.



**Mr Sanat Kumar**  
Chief Economist  
PHDCCI

Post-harvest management plays a critical role in India's food system. It not only strengthens food security but also has a direct impact on farmers' incomes and the overall efficiency of our agricultural markets. As one of the world's leading producers of foodgrains, fruits, and vegetables, India must handle its harvests carefully to maintain quality and reduce losses between the farm and the consumer.



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### ***Abbreviations***

AIF - Agriculture Infrastructure Fund

AMI - Agricultural Marketing Infrastructure Scheme

CWC - Central Warehousing Corporation

DCDC - District Cooperative Development Committee at District Level

FCI – Food Corporation of India

FPO - Farmer Producer Organization

FPS - Fair Price Shops

MIDH - Mission for Integrated Development of Horticulture



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MMT-Million Metric Ton

NABARD - National Bank for Agriculture and Rural Development

NAIFF - National Agriculture Infra Financing Facility under Department of Agriculture & Farmers Welfare

NCDC - National Cooperative Development Corporation

NLCC - National Level Coordination Committee

PACS - Primary Agricultural Credit Societies

PMFME - Pradhan Mantri Formalization of Micro Food Processing Enterprises Scheme

PMKSY - Pradhan Mantri Kisan Sampada Yojana

SCDC - State Cooperative Development Committee at State level

SMAM - Sub Mission on Agricultural Mechanization

SMAM - Sub Mission on Agricultural Mechanization

StCB – State Cooperative Banks

SWC – State Warehousing Corporation

VGF – Viability Gap Funding

WDRA – Warehousing Development and Regulatory Authority



## Executive Summary

Efficient post-harvest management, particularly scientific storage of food grains, is vital to India's food security, farmer incomes, and reduction of post-harvest losses, which can range from 6% to 10%. As one of the world's largest food grain producers, India faces significant challenges in storage and supply chain infrastructure, which impact the preservation, quality, and marketability of agricultural produce.

### Agricultural Sector and Foodgrain Production

India ranks highly globally in arable land and foodgrain production, with major contributions from states like Uttar Pradesh, Madhya Pradesh, Punjab, Odisha, and Rajasthan. Foodgrain production has shown consistent growth, reaching a record 332.3 million metric tonnes in 2023-24, projected to further increase to approximately 354 million metric tonnes by 2024-25. Rice and wheat constitute the majority of foodgrain production.

### Supply Chain and Storage Infrastructure

The food grain supply chain in India encompasses procurement at Minimum Support Price (MSP), milling (for rice), temporary storage in APMC Mandis, transportation mainly via Indian Railways, and final distribution through the Public Distribution System (PDS) via Fair Price Shops (FPS). However, the existing Agricultural Produce Market Committee (APMC) mandis have limitations—they serve only as aggregation points with little capacity for long-term storage.

Food grains are primarily stored in traditional godowns (covered warehouses), steel silos, and cover-and-plinth (CAP) open storage units. While godowns dominate existing capacity, there is a national drive towards modernizing and expanding silo storage—bulk handling infrastructure with mechanization, temperature, and moisture control.

### Policy Framework and Storage Schemes

India's foodgrain storage policy has evolved since the 1950s, with key legislation like the Warehousing Corporations Act (1962) and the Warehousing (Development and Regulation) Act (2007). Government schemes promote private participation (PEG scheme), rural godowns (Gramin Bhandaran Yojana), and modern infrastructure development (Agriculture Infrastructure Fund, Central Sector Schemes, PPP silo projects).

The hub-and-spoke model is a key strategy, linking large rail-connected storage hubs with smaller rural silos or godowns at procurement centers, aimed at reducing post-harvest losses and improving logistics efficiency.

### Technology and Innovation

Advanced technologies transforming foodgrain storage include:

- Modular steel silos for scalable and durable bulk storage.
- Warehouse automation with conveyors, elevators, pneumatic systems.
- Real-time monitoring using IoT sensors for temperature, humidity, and pest control.



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- Non-chemical fumigation methods such as controlled atmospheres, hermetic sealing, and infrared/microwave treatments.
- Automated quality labs with near-infrared analyzers and AI-based grading.
- Advanced data connectivity including blockchain and digital twins for traceability and operational optimization.

### Market Size and Forecast

The total scientific foodgrain storage capacity in India is around 87 million metric tonnes, primarily concentrated in the North and West zones, whereas production is projected to reach about 368 million metric tonnes by 2030-31. This generates a significant storage capacity deficit estimated at approximately 69 million metric tonnes by 2030, implying a large investment opportunity.

The foodgrain storage market size is projected to grow from roughly ₹37,336 crore in 2025-26 to ₹43,953 crore by 2030-31, with a CAGR of 3.3%, driven by expansions under PPP silo projects, PEG schemes, and government buffer stock requirements.

### Key Private Sector Players

The private sector is increasingly important in India's foodgrain storage, with major players like Adani Agri Logistics, Globus Warehousing, LT Foods, StarAgri, NCML, and Keventer Agro leading silo construction, warehousing, and collateral management, often in partnership with government agencies.

### Environmental, Social, and Governance (ESG) Considerations

A proposed ESG framework supports sustainability by promoting green infrastructure, energy efficiency, farmer inclusion, worker safety, transparency, and governance compliance. Incentives for solar-powered warehouses, electric logistics, gender equity, digital traceability, and third-party ESG audits are integral to the policy vision.

### Challenges and Recommendations

1. Restrictions on stacking heights limiting private sector efficiency.
2. Escalation clause disputes in contracts based on inflation indices.
3. Shortage of skilled manpower in scientific storage management.
4. Limited revenue diversification and seasonal underutilization.
5. Access to credit for private warehouses and complex financing for warehouse receipt systems.
6. Land acquisition hurdles and modernization needs.
7. High insurance premiums and GST credit issues affecting storage viability.

Recommendations focus on policy reforms to harmonize escalation clauses, skill development, promoting warehousing-as-a-service, raising awareness on financing options, incentivizing hermetic storage, enabling digital traceability, reviving PEG schemes, easing land acquisition, and improving insurance frameworks.



## Introduction

Post-harvest management in India holds immense importance in ensuring food security, improving farmer incomes, and reducing agricultural losses. Given that India is one of the world's largest producers of foodgrains, fruits, and vegetables, efficient post-harvest handling is crucial to preserve the quality, quantity, and marketability of produce between harvest and consumption.

A significant portion of India's agricultural output—particularly perishable crops like cereals, pulses, fruits, and vegetables—is lost after harvest due to improper storage, transportation, and handling. According to government estimates, post-harvest losses in foodgrains can range from **6% to 10%**. Proper management through scientific storage, cleaning, drying, grading, and packaging minimizes these losses and ensures more food reaches consumers.

Post-harvest infrastructure such as warehouses, cold storage, and drying facilities allows farmers to store produce and sell when prices are favourable, avoiding distress sales immediately after harvest when market prices are low. This also enables access to collateral-based loans via warehouse receipt systems.

Well-managed post-harvest systems integrate supply chains, ensuring faster, cleaner, and safer movement of produce from farms to markets. Efficient **sorting, grading, and packaging** improves price realization and quality standards, especially for exports.

Given the importance of post-harvest management of foodgrain produce in India, on the back drop of significance India's food security policy, the specific objectives of the report are as follows:

- I. To review growth in agriculture sector in India
- II. Analyse foodgrain warehousing market and policies in India
- III. Forecast future foodgrain storage capacity requirement for the period 2025-2030
- IV. Present new technologies in foodgrain storage
- V. Identify the factors that constrain the private sector participation in foodgrain storage in India
- VI. To make recommendations on ways to increase private investment in India



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## **Foodgrain Warehouse Market in India 2025-2030**

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The report is divided into following sections:

Section I: Agriculture Sector in India

Section II: Supply Chains of Key foodgrain states in India

Section III: Foodgrain Storage Policies and Schemes in India

Section IV: Foodgrain Storage Technology Paradigm

Section V: Foodgrain Storage Market in India

Section VI: Profile of Key Foodgrain storage Private Players in India

Section VII: ESG Framework for Foodgrain Storage

Section VIII: Constraints and Challenges

Section IX: Recommendation

# **Section I: Agriculture Sector in India**



## 1. Agriculture Sector in India

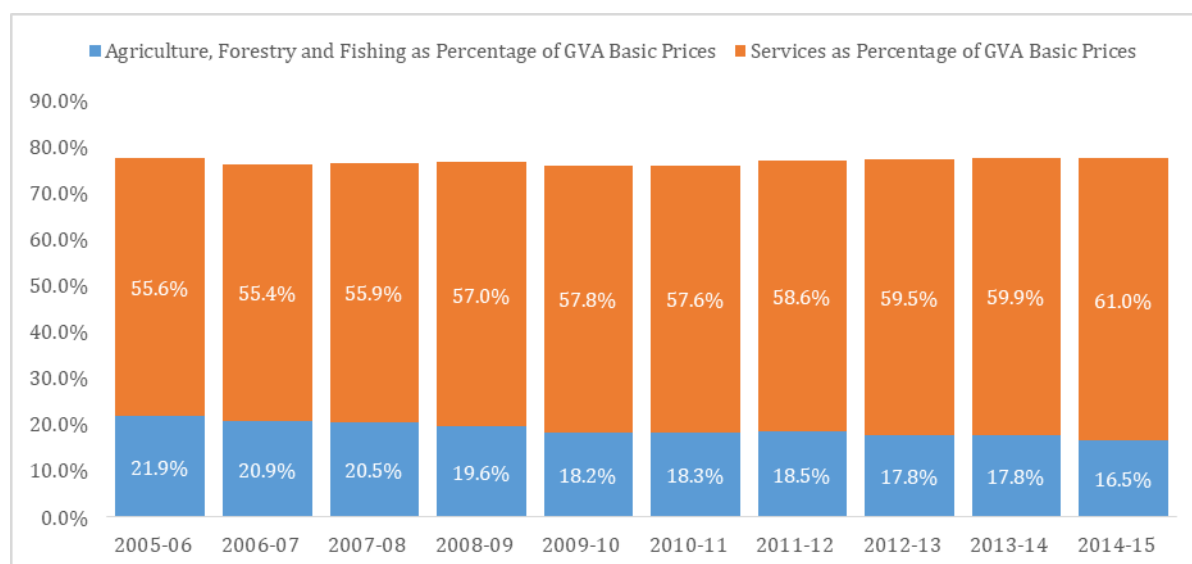
India ranks second worldwide in arable land (155.37 million hectares); third in production of cereals; and second in groundnut, fruits, vegetables, sugarcane, tea, and jute. In India Agriculture, Forestry and Fishing sector includes crops, livestock, forestry & logging and fishing & aquaculture.

Crops category includes both food and non-food crops. The food crops include cereals & millets, pulses, condiments & spices, fruits, vegetables, sugar, and other Food Crops. The non-food crops include oilseeds, fibres, drugs, narcotics and plantation crop, dyes & tanning materials, guar seed, oats, green manure crops, fodder crops and other Non-Food Crops.

Agriculture, Forestry and Fishing sector remain a cornerstone of India's economy though its share in Gross Value Added (GVA) has decreased from average 19 percent during FY2006 and FY2015 to average 15.2 percent in last 10-year period of FY2016 to FY2025 due to increase in share of Services sector from average 57.8 percent in 2005-06 to 2014-15 average share of 62.2% during 2015-16 to 2024-25.

Over time with improved technological interventions, these sectors have undergone significant change in terms of crop diversification, use of genetically modified crops and marketing strategies.

**Figure 1: Share of GVA from Agriculture, Forestry and Fishing and GVA from Services at Basic Prices FY2006 to FY2015 (2011-12 Constant Prices)**

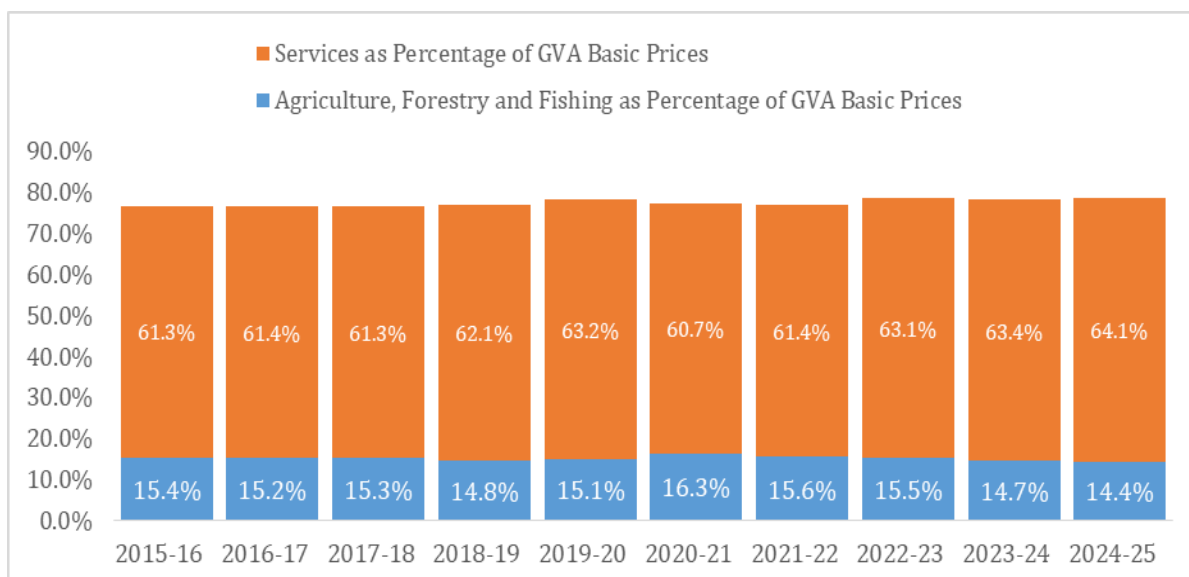


**Source:**

National Statistics Office (NSO), Ministry of Statistics and Programme Implementation (MoSPI), Government of India

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**Figure 2: Share of GVA from Agriculture, Forestry and Fishing and GVA from Services at Basic Prices FY2016 to FY2025 (2011-12 Constant Prices)**



**Source:** National Statistics Office (NSO)

**Notes:**

1. Data for 2021-22 are Third Revised Estimates for 2022-23 are Second Revised Estimates and for 2023-24 are First Revised Estimates.
2. Data for 2024-25 are Provisional Estimates.
3. For the years prior to 2004-05, the additivity of detailed estimates with the aggregates will not be maintained since estimates for that period at detailed and Aggregate levels have been compiled by adopting the splicing method.

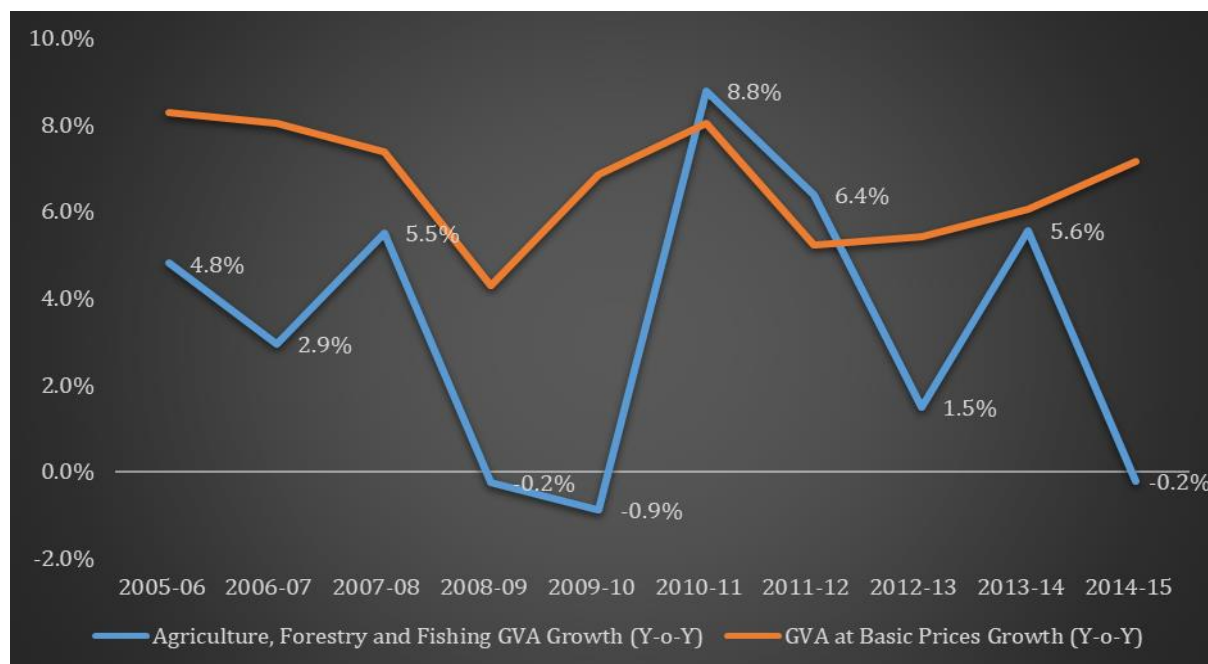
GVA from Agriculture, Forestry and Fishing sector has seen an average growth of 4.45 percent in last 10-year period FY2016 to FY2025 at constant prices while the average growth during FY2006-FY2015 was 3.42 percent.

Gross Value of Added (GVA) from the Agriculture, Forestry and Fishing sector at constant prices has shown steady growth from ₹1,208 thousand crore in FY2006 to ₹1,606 thousand crore in FY2015, while it increased from ₹1,616 thousand crore in FY2016 to ₹2,477 thousand crore in FY2025.

Gross Value Added (GVA) of Agriculture, Forestry and Fishing at current prices registered average growth of 13.99 percent during FY2006 and FY2015 increasing from ₹640 thousand crore in FY2006 to ₹2,094 thousand crore in FY2015. While it increased from ₹2,228 thousand crore in FY2016 to ₹5,385 thousand crores in FY2025.

## Foodgrain Warehouse Market in India 2025-2030

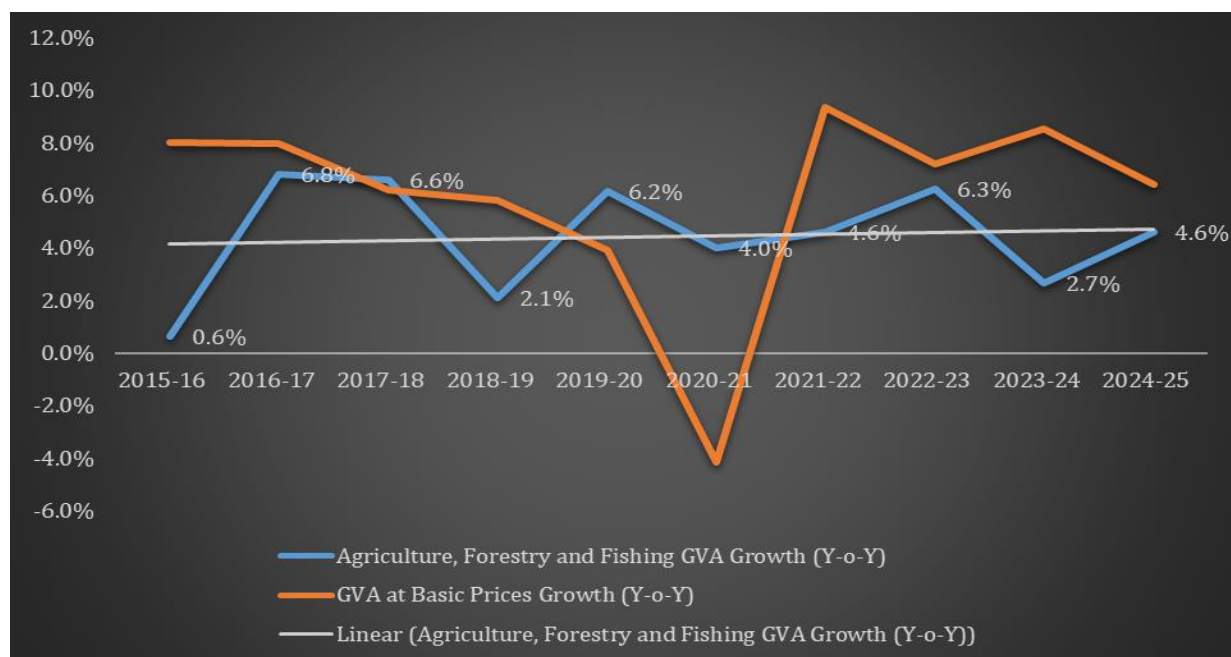
**Figure 3: GVA from Agriculture, Forestry and Fishing at Basic Prices and GVA at Basic Prices FY2006 to FY 2015 – (Constant Prices - 2011-12)**



**Source:**

National Statistics Office (NSO)

**Figure 4: GVA from Agriculture, Forestry and Fishing at Basic Prices and GVA at Basic Prices FY2016 to FY 2025 – (Constant Prices - 2011-12)**



**Source:**

National Statistics Office (NSO)

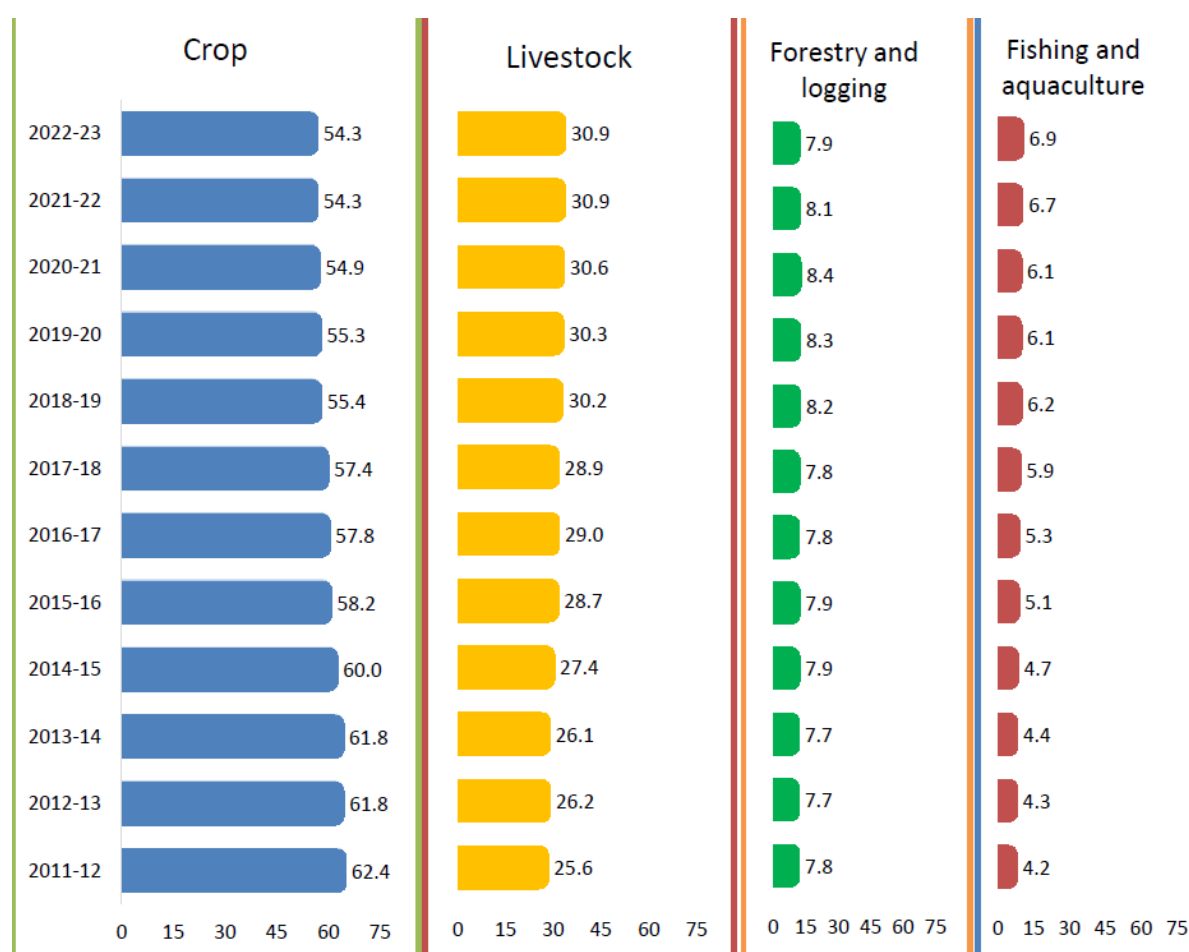
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### Notes:

1. Data for 2021-22 are Third Revised Estimates for 2022-23 are Second Revised Estimates and for 2023-24 are First Revised Estimates.
2. Data for 2024-25 are Provisional Estimates.
3. For the years prior to 2004-05, the additivity of detailed estimates with the aggregates will not be maintained since estimates for that period at detailed and Aggregate levels have been compiled by adopting the splicing method.

The share of different components within Gross Value of Output (GVO) from Agriculture, Forestry and Fishing are presented below:

**Figure 5: Shares (%) of agriculture, livestock, forestry and fishing in total GVO of Agriculture and allied sectors at constant prices**



### Source:

Statistical Report on Value of output from Agriculture and Allied Sectors (2011-12 to 2022-23) published by National Accounts Division, NSO, Ministry of Statistics and Programme Implementation, GOI

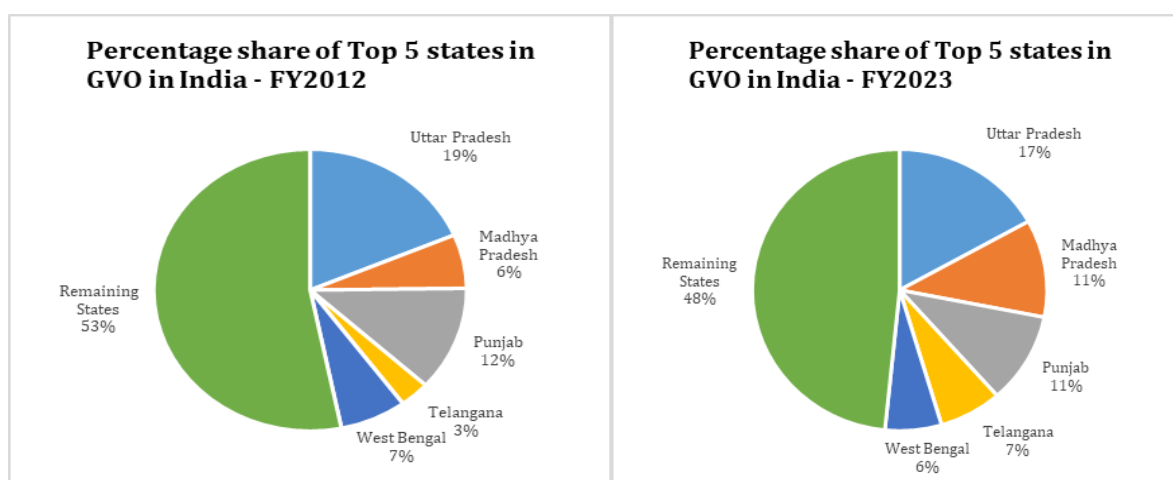
Uttar Pradesh recorded the highest output of cereals in all the years, although its share in all India output has marginally decreased from 18.6% in 2011-12 to 16.9% in 2022-23. The share of Madhya Pradesh has gone up considerably from 6.2% in 2011-12 to 11.2% in 2022-23. Substantial increase in cereal output has been observed over the period 2011-12 to 2022-23 and for the first time, it claimed the position in top-5 states

## Foodgrain Warehouse Market in India 2025-2030

in cereal production during 2022-23. Among the top five states as per the output of 2022-23, the four states namely, Uttar Pradesh, Punjab, West Bengal and Madhya Pradesh were also in the top five group in the year 2011-12.

Five States namely Uttar Pradesh, Madhya Pradesh, Punjab, Telangana and Haryana contributed nearly 53% of GVO (at constant prices) of cereals in 2022-23. With reduced share (18.6% in 2011-12 to 17.2% in 2023-24) Uttar Pradesh maintained the top most position. Following figure provide the shares for FY2012 and FY2023.

**Figure 6: Percentage share of Top 5 states in GVO in Cereals in India - FY2012 and FY2023**



**Source:**

Statistical Report on Value of output from Agriculture and Allied Sectors (2011-12 to 2022-23) published by National Accounts Division, NSO, Ministry of Statistics and Programme Implementation, GOI

### 1.1 Foodgrain production in India

India is the primary producers of foodgrains such as wheat and paddy with average percent share of total foodgrains for the period FY2016 to FY2025 being 40.76 percent and 35.04 percent respectively. India has two major seasonal cycles—Kharif (July-October) and Rabi (October-March). The following table provides foodgrain-wise sowing and harvesting Seasons in India.



## Foodgrain Warehouse Market in India 2025-2030

**Table 1: Foodgrain-wise sowing and harvesting Seasons in India**

| Crop                          | Kharif Season                       | Rabi Season                                     | Zaid (Summer) Season                                 |
|-------------------------------|-------------------------------------|-------------------------------------------------|------------------------------------------------------|
| <b>Rice (Paddy)</b>           | Sown: June–July<br>Harvest: Sep–Oct | —                                               | Sown: March–June<br>Harvest: Apr–July<br>(Boro rice) |
| <b>Wheat</b>                  | —                                   | Sown: Oct–Dec<br>Harvest: Feb–May               | —                                                    |
| <b>Maize (Corn)</b>           | Sown: June–July<br>Harvest: Sep–Oct | Sown: Oct–Nov<br>Harvest: Feb–Mar               | Sown: Jan–Feb<br>Harvest: Apr–May                    |
| <b>Jowar (Sorghum)</b>        | Sown: June–July<br>Harvest: Sep–Oct | Sown: Sep–Oct<br>Harvest: Dec–Jan               | Sown: Feb–Mar<br>Harvest: May–June<br>(limited)      |
| <b>Bajra (Pearl Millet)</b>   | Sown: June–July<br>Harvest: Sep–Oct | Rare in Rabi                                    | Rare in Zaid                                         |
| <b>Ragi (Finger Millet)</b>   | Sown: May–July<br>Harvest: Sep–Oct  | Sown: Sep–Oct<br>Harvest: Dec–Jan               | Sown: Dec–Jan<br>Harvest: May–June                   |
| <b>Barley</b>                 | —                                   | Sown: Oct–Nov<br>Harvest: Mar–Apr               | —                                                    |
| <b>Gram (Chana)</b>           | —                                   | Sown: Oct–Nov<br>Harvest: Feb–Mar               | —                                                    |
| <b>Lentil (Masoor)</b>        | —                                   | Sown: Oct–Nov<br>Harvest: Feb–Mar               | —                                                    |
| <b>Moong (Green Gram)</b>     | Sown: Jun–Jul<br>Harvest: Sep–Oct   | Sown: Feb–Mar (South India)<br>Harvest: Apr–May | Sown: Mar–Apr<br>Harvest: May–Jun                    |
| <b>Urad (Black Gram)</b>      | Sown: Jun–Jul<br>Harvest: Sep–Oct   | Sown: Feb–Mar (in some regions)<br>Harvest: May | Sown: Mar–Apr<br>Harvest: Jun–Jul                    |
| <b>Tur (Pigeon Pea/Arhar)</b> | Sown: Jun–Jul<br>Harvest: Nov–Jan   | —                                               | —                                                    |

**Source:** Agriculture Statistics Reports, 2023

India's food grain production has increased from 251.50 million metric tonne (MT) in 2015-16 to 332.30 million metric ton in 2023-24 (Final Estimate), registering an average growth of 3.16 percent during the period. The average growth rate during the



## Foodgrain Warehouse Market in India 2025-2030

period in cereals, and pulses were 3.08 percent and 4.88 percent respectively. The following table presents the production of cereals and pulse during the period between FY2016 to FY 2024.

**Table 2: Agriculture Production – Food grains (Value in Million Metric Ton)**

| Year           | Cereals |        |                | Total Cereals | Pulses | Total Foodgrains |
|----------------|---------|--------|----------------|---------------|--------|------------------|
|                | Rice    | Wheat  | Coarse Cereals |               |        | Cereals + Pulses |
| <b>2015-16</b> | 104.4   | 92.3   | 38.5           | 235.2         | 16.3   | <b>251.50</b>    |
| <b>2016-17</b> | 109.7   | 98.5   | 43.8           | 252           | 23.1   | <b>275.10</b>    |
| <b>2017-18</b> | 112.8   | 99.9   | 47             | 259.6         | 25.4   | <b>285.00</b>    |
| <b>2018-19</b> | 116.5   | 103.6  | 43.1           | 263.1         | 22.1   | <b>285.20</b>    |
| <b>2019-20</b> | 118.9   | 107.9  | 47.8           | 274.5         | 23.0   | <b>297.50</b>    |
| <b>2020-21</b> | 124.4   | 109.6  | 51.3           | 285.3         | 25.5   | <b>310.70</b>    |
| <b>2021-22</b> | 129.5   | 107.7  | 51.1           | 288.3         | 27.3   | <b>315.60</b>    |
| <b>2022-23</b> | 135.8   | 110.6  | 57.3           | 303.6         | 26.1   | <b>329.70</b>    |
| <b>2023-24</b> | 137.82  | 113.29 | 56.93          | 308.05        | 24.2   | <b>332.30</b>    |
| <b>2024-25</b> | 149.07  | 117.50 | 62.14          | 328.72        | 25.2   | <b>353.96</b>    |

**Source:**

1. For 2015-16 to 2022-23 are taken from RBI database on Indian Economy
2. For 2023-24 and 2024-25 are taken from <https://desagri.gov.in/statistics-type/advance-estimates/>

The upward momentum has continued into the 2024–25 crop year, with production surging to 353.96 million metric tonnes, an increase of over 6% year-on-year—the fastest pace of growth seen in nearly a decade, and a record high across all foodgrain categories. This expansion was driven by exceptional harvests of rice (up ~8%), wheat (up ~3.7%), maize (up ~7.8%), and nutri/coarse cereals (up ~9.1%).

Government policies such as the Minimum Support Price (MSP) provide farmers with a guaranteed price, protecting them from market price fluctuations and supporting their income stability.



## Foodgrain Warehouse Market in India 2025-2030

**Table 3: State wise production of food grains from year 2018-19 to 2023-24 (Value in Million Metric Ton)**

| S. No. | State                       | 2018-19 | 2019-20 | 2020-21 | 2021-22 | 2022-23 | 2023-24 |
|--------|-----------------------------|---------|---------|---------|---------|---------|---------|
| 1      | Andaman and Nicobar Islands | 0.01    | 0.02    | 0.01    | 0.01    | 0.01    |         |
| 2      | Andhra Pradesh              | 10.84   | 12.36   | 11.30   | 11.08   | 12.15   | 10.43   |
| 3      | Arunachal Pradesh           | 0.37    | 0.37    | 0.38    | 0.39    | 0.39    |         |
| 4      | Assam                       | 5.47    | 5.24    | 0.00    | 4.68    | 5.95    | 5.46    |
| 5      | Bihar                       | 15.60   | 14.23   | 15.38   | 17.02   | 18.34   | 20.04   |
| 6      | Chandigarh                  | 0.00    | 0.01    | 0.00    | 0.00    | 0.00    |         |
| 7      | Chhattisgarh                | 7.56    | 7.50    | 8.23    | 9.02    | 10.89   | 10.70   |
| 8      | Dadra and Nagar Haveli      | 0.04    | 0.04    | 0.03    | 0.03    | 0.04    |         |
| 9      | Daman and Diu               | 0.00    | 0.00    | 0.00    | 0.00    | 0.00    |         |
| 10     | Delhi                       | 0.11    | 0.11    | 0.11    | 0.11    | 0.11    |         |
| 11     | Goa                         | 0.11    | 0.09    | 0.09    | 0.09    | 0.09    |         |
| 12     | Gujarat                     | 6.80    | 8.15    | 8.97    | 10.13   | 9.88    | 10.08   |
| 13     | Haryana                     | 18.15   | 17.86   | 18.31   | 16.33   | 17.39   | 18.45   |
| 14     | Himachal Pradesh            | 1.50    | 1.53    | 1.54    | 1.61    | 1.48    | 1.55    |
| 15     | Jammu and Kashmir           | 1.89    | 1.67    | 1.60    | 1.68    | 1.76    |         |
| 16     | Jharkhand                   | 4.40    | 4.79    | 4.87    | 5.00    | 3.17    | 3.56    |
| 17     | Karnataka                   | 10.89   | 12.78   | 14.55   | 13.78   | 14.18   | 12.73   |
| 18     | Kerala                      | 0.58    | 0.61    | 0.64    | 0.49    | 0.60    | 0.70    |
| 19     | Ladakh                      | 0.00    | 0.00    | 0.01    | 0.03    | 0.03    |         |
| 20     | Madhya Pradesh              | 32.21   | 33.52   | 32.84   | 39.31   | 41.93   | 39.84   |
| 21     | Maharashtra                 | 10.30   | 12.82   | 15.77   | 16.66   | 16.73   | 14.53   |
| 22     | Manipur                     | 0.50    | 0.42    | 0.70    | 0.66    | 0.44    |         |
| 23     | Meghalaya                   | 0.26    | 0.36    | 0.35    | 0.36    | 0.34    |         |
| 24     | Mizoram                     | 0.08    | 0.08    | 0.08    | 0.08    | 0.06    |         |



## Foodgrain Warehouse Market in India 2025-2030

| S. No. | State            | 2018-19       | 2019-20       | 2020-21       | 2021-22       | 2022-23       | 2023-24       |
|--------|------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| 25     | Nagaland         | 0.56          | 0.57          | 0.57          | 0.25          | 0.51          |               |
| 26     | Odisha           | 8.32          | 9.03          | 9.52          | 10.13         | 9.07          | 11.00         |
| 27     | Puducherry       | 0.06          | 0.06          | 0.05          | 0.06          | 0.07          |               |
| 28     | Punjab           | 31.53         | 29.86         | 30.42         | 28.25         | 30.24         | 32.59         |
| 29     | Rajasthan        | 21.29         | 23.23         | 24.28         | 21.66         | 23.81         | 23.20         |
| 30     | Sikkim           | 0.09          | 0.09          | 0.09          | 0.09          | 0.08          |               |
| 31     | Tamil Nadu       | 10.39         | 11.27         | 10.82         | 12.00         | 11.68         | 9.27          |
| 32     | Telangana        | 9.28          | 11.13         | 12.75         | 15.35         | 19.38         | 19.84         |
| 33     | Tripura          | 0.84          | 0.85          | 0.87          | 0.87          | 0.84          |               |
| 34     | Uttar Pradesh    | 54.64         | 56.17         | 58.11         | 56.19         | 57.51         | 59.29         |
| 35     | Uttarakhand      | 1.88          | 1.89          | 2.00          | 1.92          | 1.77          | 1.73          |
| 36     | West Bengal      | 18.69         | 18.79         | 20.01         | 20.31         | 18.77         | 18.82         |
|        | Others           | 0.00          | 0.00          | 0.00          | 0.00          | 0.00          | 5.04          |
|        | <b>All India</b> | <b>285.21</b> | <b>297.50</b> | <b>310.74</b> | <b>315.62</b> | <b>329.69</b> | <b>328.85</b> |

**Source:**

<https://www.pib.gov.in/PressReleaselframePage.aspx?PRID=2039218>

**Note:**

1. Data for the year 2023-24 of 3rd Advance Estimate
2. Others include minor States/ UTs

# **Section II: Supply Chains of Key food grain states in India**





## 2. Supply Chains of Key food grain states in India

Supply chains are principally concerned with the flow of products and information between supply chain member organizations—procurement of materials, transformation of materials into finished products, and distribution of those products to end customers. The agricultural supply chain begins with crop or livestock production and extends to the eventual delivery of these products to consumers. End-to-end, this involves various processes and stakeholders.

The food grain supply chain in India at National level goes through following stages:

1. **Procurement:** Both the Food Corporation of India (FCI) and State Governments' Agencies (SGA) source food grains directly from farmers at a predetermined Minimum Support Price (MSP), which is decided by the central government on the recommendations of the Commission for Agricultural Costs and Prices (CACP), Government of India.

National Food Security Act, 2013, (NFSA) defines the joint responsibility of the Centre and State/UT Government of foodgrain procurement. This marks a paradigm shift in the approach to food security from *welfare to rights based approach*. The Act legally entitles upto 75% of the rural population and 50% of the urban population to receive subsidized foodgrains under Targeted Public Distribution System (Antyodaya Anna Yojana (AAY). While AAY households, which constitute poorest of the poor are entitled to 35 kg of foodgrains per family per month, priority households (PHH) are entitled to 5 kg per person per month.

Since the introduction of Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY) was launched by Indian government in April 2020, two food subsidy schemes have been subsumed. Launched by Indian government as a response to the COVID-19 pandemic in order to remove the financial burden of the poor beneficiaries and to ensure nationwide uniformity and effective implementation of the Act, had decided to provide food grains free of cost to NFSA beneficiaries i.e. AAY households and PHH beneficiaries. Prior to that, under NFSA, subsidized food grains were distributed at Rs 3 per kg for rice, Rs 2 per kg for wheat and at Rs 1 per kg for coarse grains to beneficiaries.

While rice is ultimately distributed to eligible beneficiaries, it is initially procured in its paddy form. The paddy procurement process begins in October each year and lasts for over six months. Approximately 50 percent of the paddy is procured within the first three months, and by the end of six months, this figure rises to between 80 and 90 percent.

Wheat procurement, on the other hand, starts in April and continues until June, with over 90 percent of wheat being sourced by the end of May. The procurement of wheat tends to be more concentrated in certain states.



## Foodgrain Warehouse Market in India 2025-2030

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2. **Milling (Rice):** After the procurement of paddy, it undergoes milling to be transformed into rice. Private millers conduct the milling process according to a specific standard operating procedure. Typically, from three kilograms of paddy, about two kilograms of rice is produced, while the remaining one kilogram serves as a byproduct that private millers keep to cover the milling fees. Once milling is complete, the rice is stored in warehouses operated by the Food Corporation of India (FCI) if it is a non- Decentralized Procurement (DCP) state. In Decentralized Procurement (DCP) states, the milled rice can be stored in either FCI or SGA warehouses.
3. **Storage:** After procurement from farmers, foodgrains in India are stored at multiple levels depending on the purpose (buffer stock, PDS distribution, or market sale). The immediate storage points near procurement centres after purchase include state Agricultural Produce Market Committee markets (APMC) mandis, rural procurement centres or temporary covered platforms. Mandis serves as first aggregation and transaction points where foodgrains are brought from farmers after harvest. Grain is temporarily held here for sorting, weighing, grading, and auctioning. Mandis help aggregate and grade produce, but do not maintain buffer stocks or distribution storage. These are holding area before foodgrains are transported to central warehouses.
4. **Transportation:** FCI is responsible for organizing and managing the transport of food grains from states with surplus to those with deficits. The Indian railways predominantly handle inter-state transport of these grains, working in tandem with the FCI. The central agency employs a periodic review policy to ensure stock replenishment and to maintain an adequate supply of food grains in states facing shortages.
5. **Distribution:** In each state, the Public Distribution System (PDS) is tasked with the final distribution of food grains to eligible beneficiaries via a network of Fair Price Shops (FPS) spread throughout the region. There are over half a million FPS involved in this distribution process. For DCP states, grain allocation primarily comes from the SGA, whereas non-DCP states receive their allocations from the FCI.

The Public Distribution System (PDS) was developed as a way to manage scarcity by distributing food grains at lower prices. It operates under the shared responsibility of both the Central and State/Union Territory (UT) Governments.

The Central Government, through the Food Corporation of India (FCI), is responsible for the procurement, storage, transportation, and large-scale distribution of food grains to the State Governments.

Meanwhile, the State Governments handle operational tasks such as allocation within the state, identifying eligible families, issuing Ration Cards, and overseeing the operations of Fair Price Shops (FPSs).

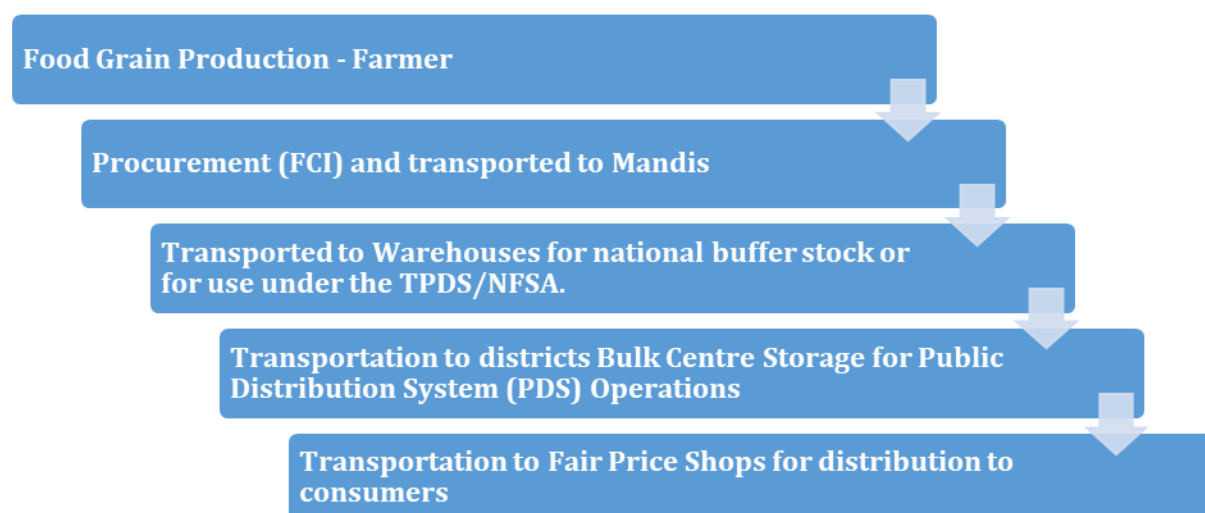
**Table 4: Role of APMC Mandis in Foodgrain Storage**

| Function                                       | Description                                                                                                                                                                                           |
|------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>1. Temporary Holding</b>                    | Mandis serve as <b>first aggregation and transaction points</b> where foodgrains are brought by farmers after harvest. Grain is temporarily held here for sorting, weighing, grading, and auctioning. |
| <b>2. Transition to Procurement Agencies</b>   | If the sale is made to a government agency (like FCI or a State Procurement Agency), grains are taken from the mandi to nearby <b>FCI godowns or storage hubs</b> .                                   |
| <b>3. Facilities at Mandis</b>                 | Some large APMC mandis (like in Punjab, Haryana) have <b>sheds, platforms, and covered godowns</b> for short-term grain storage (1–7 days). These are <b>not designed for long-term storage</b> .     |
| <b>4. Facilitate Market Access</b>             | By aggregating supply in one place, mandis enable smoother procurement and planning of <b>transport to formal warehouses</b> .                                                                        |
| <b>5. Limited Cold Storage for Perishables</b> | APMC mandis sometimes house <b>cold storage units or warehouses</b> , but these are more for fruits, vegetables, or perishables—not grains like wheat or rice.                                        |

## 2.1 Limitations of Agricultural Produce Market Committee markets (APMC) Mandis in Storage

1. No long-term storage: They are designed for trade, not warehousing
2. Inadequate infrastructure: Many mandis lack proper shelters, weighing machines, drying yards
3. Congestion during peak season: Leads to grain spillage, spoilage, and delayed procurement
4. No role in buffer stock: Long-term foodgrain storage is done by FCI, CWC, SWC—not APMCs

**Figure 7: Flow of food grains in supply chain of food grains in India**





## Foodgrain Warehouse Market in India 2025-2030

Source: PHD Research Bureau, PHDCCI

The following table provides overview of Foodgrain supply chain in India.

**Table 5: Foodgrain Supply Chain in India – Stage-wise Overview**

| Stage                     | Key Activities                                                                                                                                                                                         | Main Stakeholders                                          |
|---------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| <b>1. Production</b>      | Land preparation, sowing, irrigation, crop care, harvesting                                                                                                                                            | Farmers, agri-input dealers, agri-extension workers        |
| <b>2. Procurement</b>     | Purchase of grains at MSP or via private channels                                                                                                                                                      | FCI, State Procurement Agencies, FPOs, private traders     |
| <b>3. Storage</b>         | APMC Mandis/rural centres Handling and preservation of grains post-procurement or temporary covered platforms temporary store foodgrains<br><br>- Handling and preservation of grains post-procurement | FCI, CWC, SWCs, private warehouses, agri-logistics firms   |
| <b>4. Transportation</b>  | Movement from farms to mandis, storage, and distribution centres                                                                                                                                       | Indian Railways, truckers, logistics companies             |
| <b>5. Distribution</b>    | Delivery through PDS, open market sales, private retail                                                                                                                                                | FPS dealers, state civil supplies, private retailers, OMSS |
| <b>6. Consumption</b>     | End use by households, processors, institutions                                                                                                                                                        | Consumers, food processors, public institutions            |
| <b>7. Support Systems</b> | Digital platforms, storage modernization, policy and regulatory frameworks                                                                                                                             | eNAM, FPOs, agri-tech startups, NABARD, MoA&FW             |

Source: PHD Research Bureau, PHDCCI

Food Corporation of India, is the nodal agency which is responsible for the handling, procurement, storage, movement, transportation and distribution activities of food grains throughout the country.

One of the objectives of FCIs is to provide the food grains to needy peoples of the society at reasonable prices. Transportation cost is the major part of this process and to reduce this cost, it needs the effective and efficient movement of food grains from the producing states to consuming states. The movement of food grains is taking place between the producing states and consuming states.



## Foodgrain Warehouse Market in India 2025-2030

To understand the dynamics of food grain supply chain, the mapping has been conducted for top five the food grain production states of India as per the food grain production data for FY 2023. These include Uttar Pradesh (17.58%), Madhya Pradesh (13.71%), Punjab (9.25%), Odisha (8.02%) and Rajasthan (7.19%).

**Table 6: Distribution of the top states producing food grains in 2024-25**

| S. No. | State          | Percentage of Total India Foodgrain Production |
|--------|----------------|------------------------------------------------|
| 1      | Uttar Pradesh  | 17.58%                                         |
| 2      | Madhya Pradesh | 13.71%                                         |
| 3      | Punjab         | 9.25%                                          |
| 4      | Odisha         | 8.02%                                          |
| 5      | Rajasthan      | 7.19%                                          |
| 6      | Telangana      | 5.97%                                          |
| 7      | West Bengal    | 5.92%                                          |
| 8      | Haryana        | 5.49%                                          |
| 9      | Maharashtra    | 5.30%                                          |
| 10     | Bihar          | 5.07%                                          |

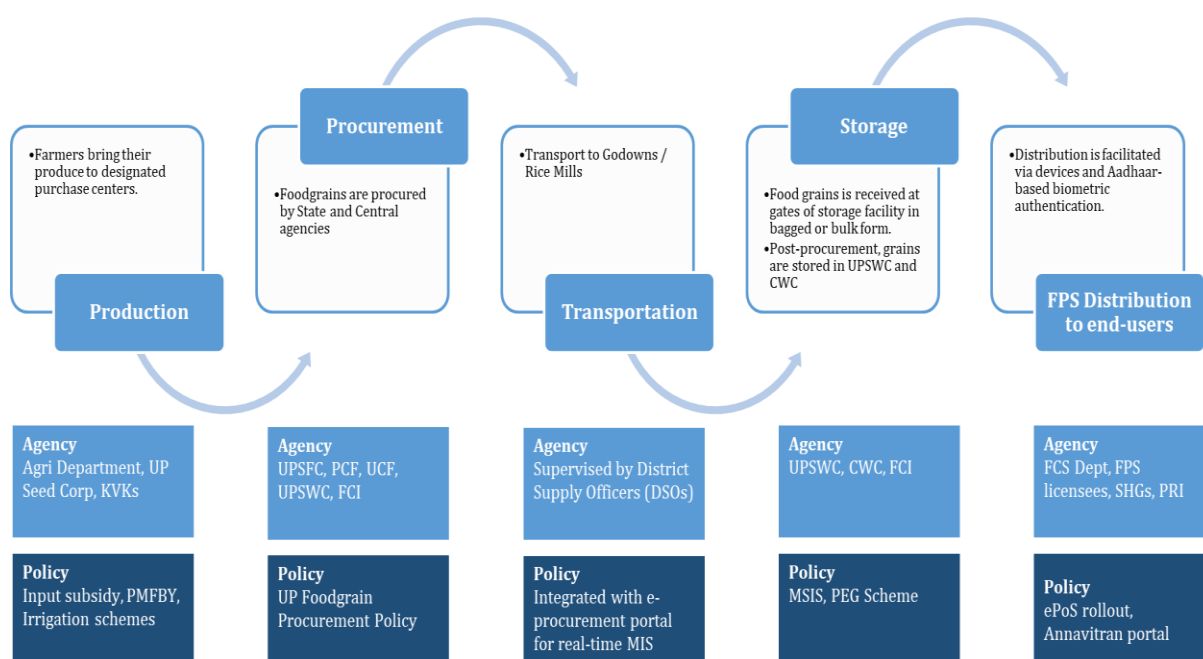
**Source:** Ministry of Agriculture and Farmer Welfare, Government of India

### 2.2. Supply Chain for Food grains in Uttar Pradesh

- The foodgrain supply chain in Uttar Pradesh is managed through a structured system involving various state agencies and policies from production to consumer delivery.
- At the production stage, the Department of Agriculture, UP Seed Corporation, and UP Agro Industries support farmers through subsidies, seed distribution, and irrigation initiatives under various schemes.
- Procurement of wheat and paddy is carried out by the Food and Civil Supplies Department, UP State Agro Industrial Corporation, and cooperative federations like PCF, using the e-procurement portal to register farmers and ensure MSP payments via Direct Benefit Transfer (DBT).
- Transport from procurement centers to godowns and rice mills is managed through contractors and digitally tracked.

- Storage is facilitated by the UP State Warehousing Corporation (UPSWC), CWC, and FCI through covered godowns and modern infrastructure.
- Allocation of foodgrains under the National Food Security Act (NFSA) is managed by the Food Department using the Annavitran Portal, targeting AAY and PHH beneficiaries.
- Final distribution is done through Aadhaar-enabled Fair Price Shops (FPS) equipped with ePoS devices, ensuring transparent and targeted delivery, with full integration into the One Nation One Ration Card (ONORC) system.

**Figure 8: End-to-End foodgrain supply chain in Uttar Pradesh**



**Source:** PHD Research Bureau, PHDCCI

### 2.3. Food grain supply chain in Madhya Pradesh

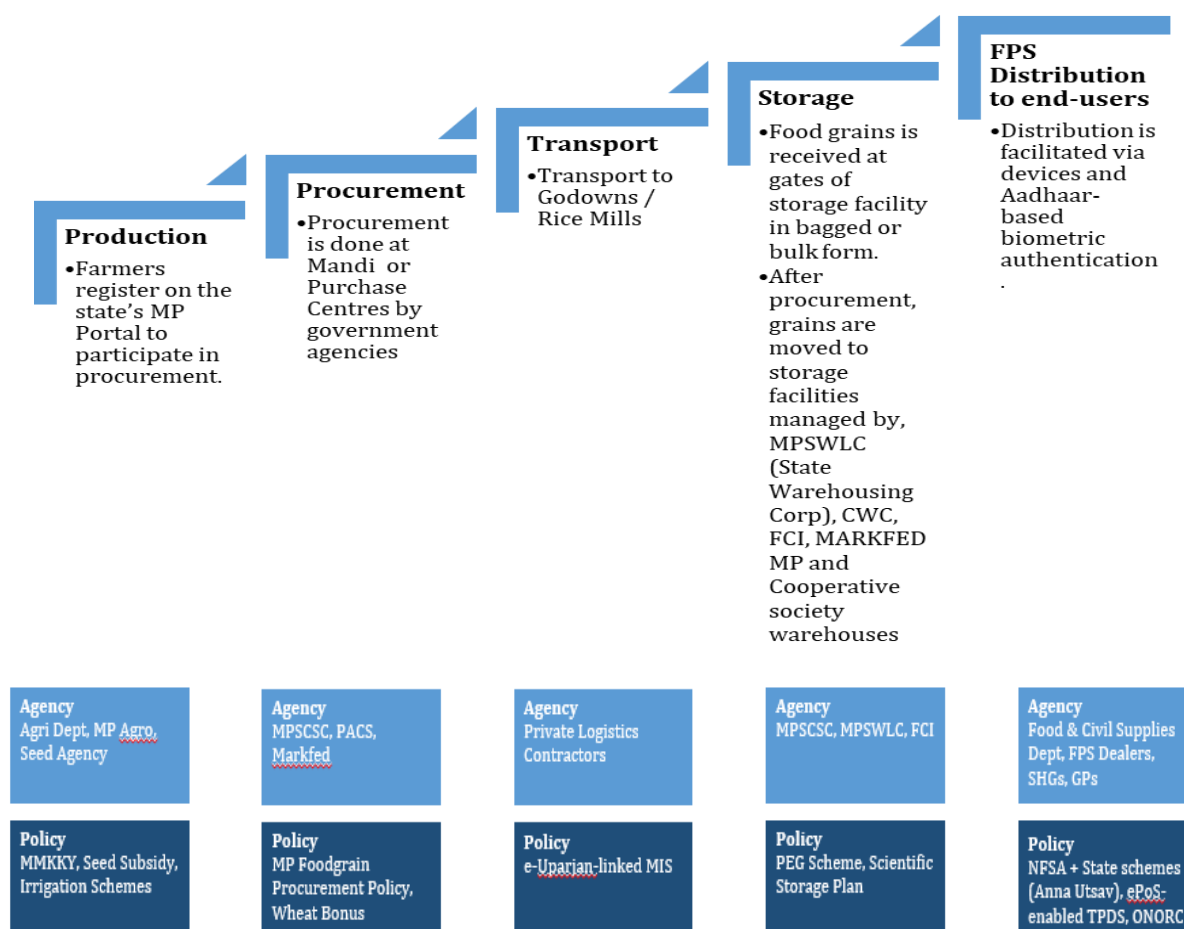
- The foodgrain supply chain in Madhya Pradesh is managed through the coordinated efforts of state agencies and various policy frameworks at each stage, starting from production to consumer distribution.
- At the production stage, the Department of Farmers Welfare and Agriculture Development, MP Agro Industries Corporation, and the MP State Seed Certification Agency assist farmers by providing subsidized inputs, irrigation support, and crop insurance through initiatives like the Mukhya Mantri Kisan Kalyan Yojana and PMFBY.
- The procurement of wheat and paddy is handled by the Madhya Pradesh State Civil Supplies Corporation (MPSCSC), PACS, and Markfed via the e-Uparjan

## Foodgrain Warehouse Market in India 2025-2030

portal, which ensures minimum support price (MSP) procurement and timely direct benefit transfers (DBT).

- Transportation from procurement sites to rice mills and storage facilities is managed by MPSCSC using contracted services that include digital tracking.
- Foodgrains are stored in facilities operated by MPSCSC, the MP State Warehousing and Logistics Corporation, and FCI, with support from the PEG scheme aimed at enhancing infrastructure.
- The allocation and distribution under the National Food Security Act (NFSA) are overseen by the Department of Food and Civil Supplies, with an online stock monitoring system through the e-Annavitaran portal.
- The final distribution to Antyodaya Anna Yojana (AAY) and Priority Household (PHH) beneficiaries is carried out through Aadhaar-enabled Fair Price Shops (FPS) equipped with ePoS devices, which are fully integrated with the One Nation One Ration Card (ONORC) system to ensure portability and transparency.

**Figure 9: End-to-End foodgrain supply chain in Madhya Pradesh**

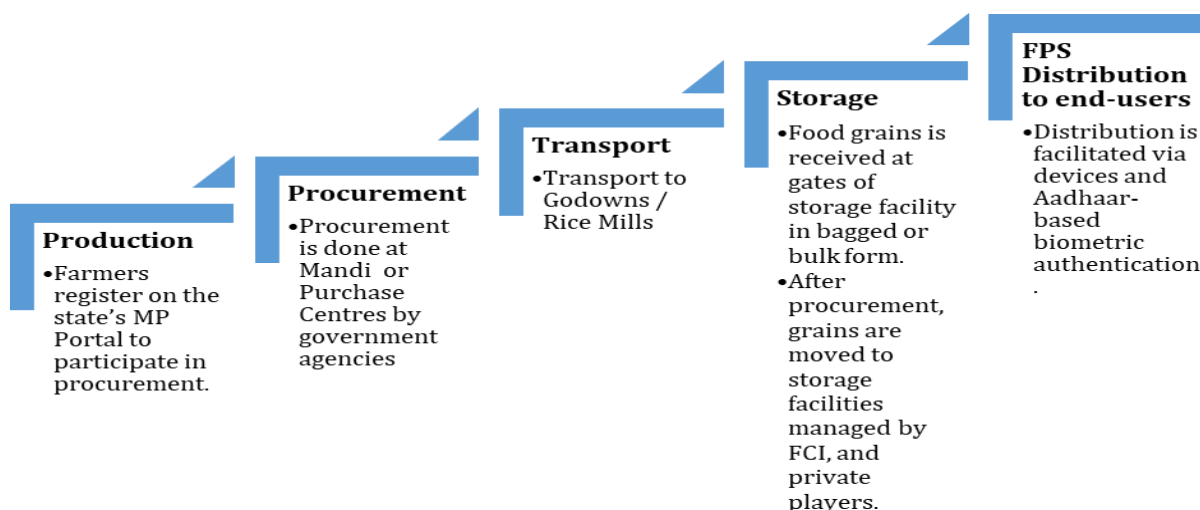


Source: PHD Research Bureau, PHDCCI

### 2.4. Food grain supply chain in Punjab

- The foodgrain supply chain in Punjab operates through a highly organized system involving multiple state agencies and policies at each stage.
- Procurement is centrally coordinated by agencies such as Punjab State Grains Procurement Corporation Ltd (PUNGRAIN), Punjab State Civil Supplies Corporation Ltd (PUNSUP), Punjab State Cooperative Supply and Marketing Federation Ltd (Markfed) and the Food Corporation of India (FCI) through notified mandis, with payments made to farmers via Direct Benefit Transfer (DBT) through the Anaaj Kharid portal.
- Transport from procurement centers to storage or rice mills is managed by contractor networks and monitored digitally.
- Grains are stored by Punjab State Warehousing Corporation (PSWC), CWC, and FCI using both conventional godowns and CAP storage.
- Allocation under NFSA and TPDS is managed by the Department of Food and Civil Supplies, which also administers schemes like the Atta-Dal Scheme.
- Finally, distribution is carried out through Aadhaar-enabled Fair Price Shops (FPS) facilitated using ePoS devices and smart ration cards, ensuring targeted delivery to AAY and PHH beneficiaries and full integration with One Nation One Ration Card (ONORC).

**Figure 10: End-to End foodgrain supply chain in Punjab**





## Foodgrain Warehouse Market in India 2025-2030

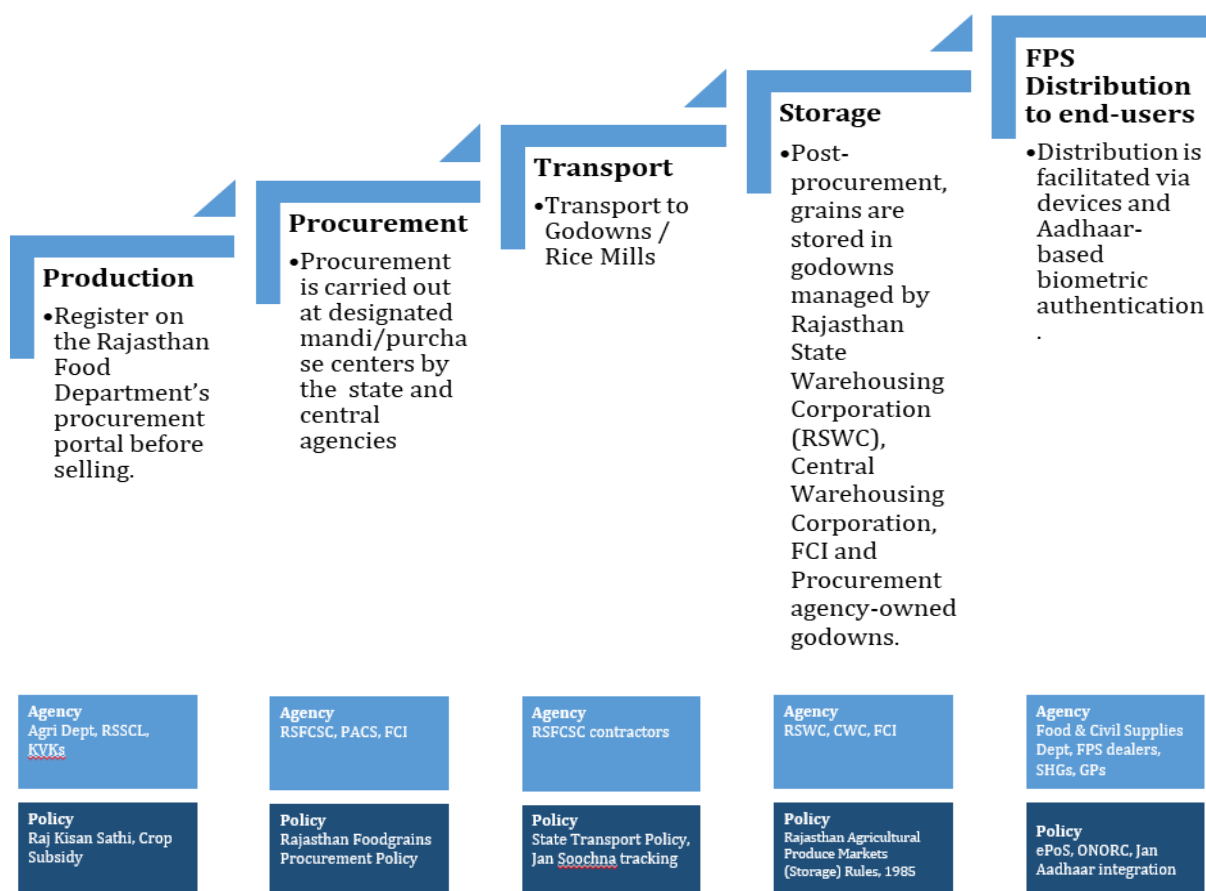
|                                                         |                                                               |                                                 |                                                                                        |                                                     |
|---------------------------------------------------------|---------------------------------------------------------------|-------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------|
| Agency<br>Agri Dept. PAU,<br>PUNSEED, PAIC              | Agency<br>PUNGRAIN, PUNSUP,<br>Markfed, PSWC                  | Agency<br>Agency-appointed<br>contractors       | Agency<br>PSWC, CWC, FCI,<br>Private Warehouses                                        | Agency<br>FPS Dealers, SHGs,<br>PRIs                |
| Policy<br>Punjab Farmer Policy,<br>Crop Diversification | Policy<br>Punjab Procurement<br>Policy, Anaaikharid<br>Portal | Policy<br>Punjab Transport &<br>Handling Policy | Policy<br>Punjab State-Specific<br>Integrated Logistics and<br>Warehousing Policy 2023 | Policy<br>ePoS System, ONORC,<br>Smart Ration Cards |

Source: PHD Research Bureau, PHDCCI

### 2.5. Food grain supply chain in Rajasthan

- The foodgrain supply chain in Rajasthan, from farmer to consumer, is coordinated through a network of state agencies and policies across all stages.
- At the production stage, the Department of Agriculture, RSSCL, and Agro Industries Corporation support farmers with inputs, irrigation, and crop schemes under Raj Kisan Sathi and other initiatives.
- Procurement is managed mainly by the Rajasthan State Food and Civil Supplies Corporation (RSFCSC), PACS, and FCI under the annual Foodgrain Procurement Policy, with MSP payments.
- Transport from mandis to storage or mills is overseen by RSFCSC through GPS-tracked contractors
- Storage is handled by RSWC, CWC, and FCI using both godowns and CAP facilities, with modernization efforts underway.
- Grain allocation for distribution under NFSA is managed by the Food and Civil Supplies Department, using digital platforms integrated with Jan Aadhaar and ePDS.
- Finally, foodgrains are distributed to consumers through ePoS-enabled Fair Price Shops, ensuring transparency and Aadhaar-authenticated delivery to AAY and PHH beneficiaries under NFSA, supplemented by schemes like Indira Rasoi.

**Figure 10: End-to-End foodgrain supply chain in Rajasthan**



Source: PHD Research Bureau, PHDCCI

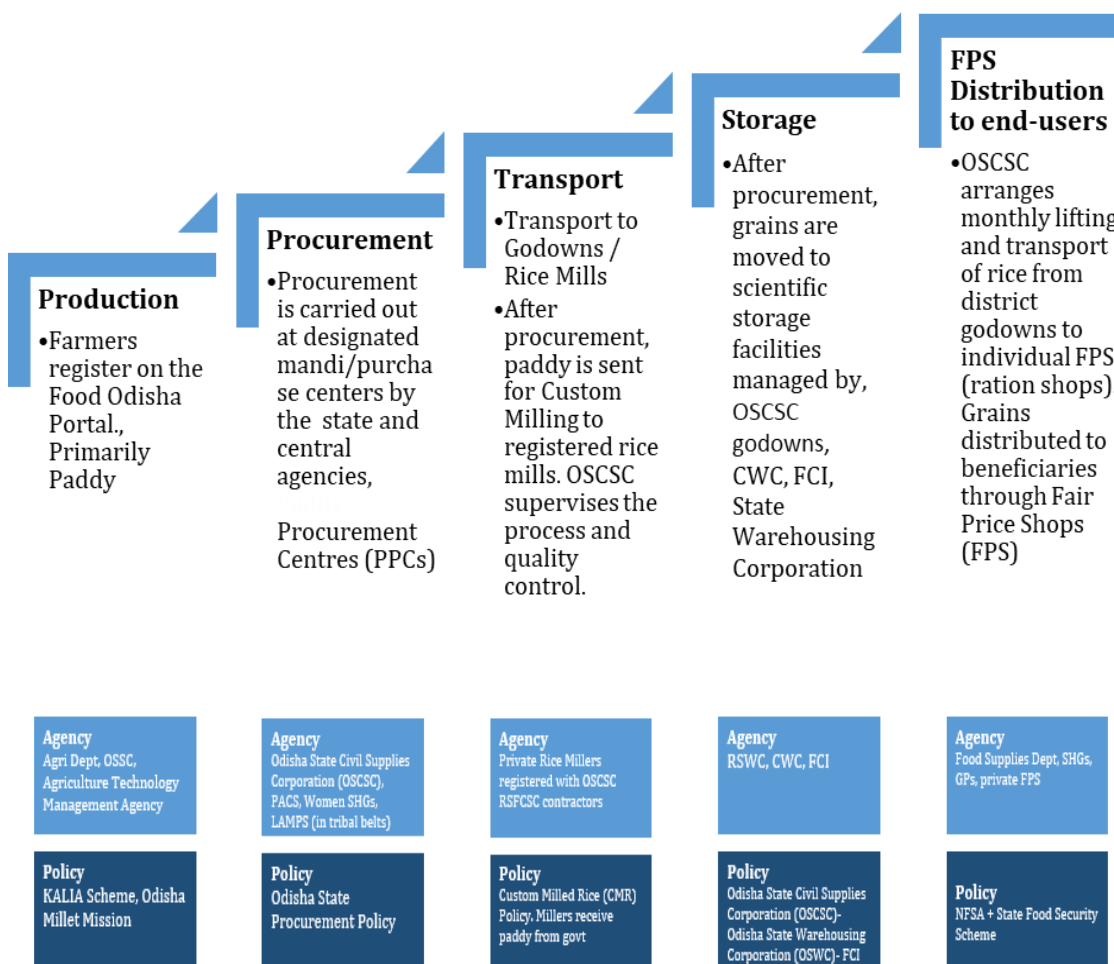
## 2.6. Food grain supply chain in Odisha

- The foodgrain supply chain in Odisha is managed through a well-defined system involving state agencies and policy mechanisms across each stage—from procurement to distribution.
- At the production level, the Department of Agriculture and Farmers' Empowerment supports paddy cultivation through input subsidies, irrigation, and schemes like PMFBY. Farmers sell paddy at designated procurement centers after registering on the Food Odisha Portal, and receive payment through Direct Benefit Transfer (DBT).
- Procurement is led by the Odisha State Civil Supplies Corporation (OSCSC), in coordination with Primary Agricultural Cooperative Societies (PACS), Women Self-Help Groups (SHGs), and LAMPS, under the state's annual procurement policy.
- The procured paddy is transported to registered rice mills for Custom Milling of Rice (CMR), with the resultant rice delivered back to OSCSC.

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- Storage is handled by OSCSC, Odisha State Warehousing Corporation (OSWC), and FCI, using a mix of covered godowns and CAP storage.
- Allocation under the National Food Security Act (NFSA) and the State Food Security Scheme (SFSS) is overseen by the Department of Food Supplies and Consumer Welfare, ensuring monthly allotments to districts.
- Final distribution is conducted via Fair Price Shops (FPS) managed by SHGs, Gram Panchayats, or private licensees, using ePoS devices and Aadhaar authentication to deliver subsidized or free rice to PHH and AAY beneficiaries.
- Odisha's digital initiatives, such as the Annavitran Portal and SMS alerts, enhance transparency and real-time tracking throughout the supply chain.

**Figure 11: End-to End foodgrain supply chain in Odisha**



Source: PHD Research Bureau, PHDCCI

# **Section III:**

## **Foodgrain Storage Policies and Schemes in India**



### 3. Foodgrain storage policies

The agriculture marketing system plays a vital role in transferring agricultural products from producers to consumers while also facilitating price discovery and transmission throughout the supply chain.

The evolution of agricultural warehousing policy in India began with the landmark All India Rural Credit Survey of 1954, which highlighted the acute shortage of scientific storage in rural areas and emphasized the need for organized warehousing to support rural credit and reduce post-harvest losses.

Acting on these recommendations, the Agricultural Produce (Development and Warehousing) Corporations Act was introduced in 1956. It led to the creation of the National Cooperative Development and Warehousing Board, the Central Warehousing Corporation, and State Warehousing Corporations.

This Act was later split into two separate acts in 1962; the National Cooperative Development Corporation Act and the Warehousing Corporations Act.

**Table 7: Tracing the policies and legislation on agricultural warehousing in India**

| Year/Period | Policy/Act                                                              | Key Features                                                                                                                                                   |
|-------------|-------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1954        | All India Rural Credit Survey                                           | Recommended warehousing for rural credit                                                                                                                       |
| 1956        | Agricultural Produce Warehousing Act                                    | Initiated warehousing development                                                                                                                              |
| 1957        | Central Warehousing Corporation (CWC)                                   | First public warehousing agency                                                                                                                                |
| 1962        | Warehousing Corporations Act                                            | Statutory basis for CWC & SWCs                                                                                                                                 |
| 1982        | NABARD Act                                                              | Refinance for rural infrastructure including storage                                                                                                           |
| 2000        | National Policy on Handling, Storage, and Transportation of Food Grains | To reduce storage and transit losses at farm and commercial levels, and to modernize the handling, storage, and transportation system of food grains in India. |
| 2001        | Gramin Bhandaran Yojana                                                 | Subsidy for rural godowns                                                                                                                                      |
| 2007        | The Warehousing (Development and Regulation) WDRA Act                   | Regulates warehouses, introduces Net Warehousing Receipt (NWRs)<br>It made the Warehousing Receipt negotiable.                                                 |
| 2016        | e-NAM Integration                                                       | Digital linkage of warehouses with markets                                                                                                                     |
| 2020        | Agriculture Infrastructure Fund                                         | Large-scale support for warehousing infra                                                                                                                      |

**Source:** PHD Research Bureau, PHDCCI

Provisions of this act suggested the government establish the Central Warehousing Corporation (CWC) in 1957, followed by the Warehousing Corporations Act of 1962,



## Foodgrain Warehouse Market in India 2025-2030

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which provided the legal framework for setting up CWC and State Warehousing Corporations (SWCs). These institutions were tasked with providing scientific storage for agricultural commodities and enabling farmers to access credit using warehouse receipts.

In 1982, the establishment of the National Bank for Agriculture and Rural Development (NABARD) gave further impetus to warehousing infrastructure, especially through refinance schemes under the Rural Infrastructure Development Fund (RIDF).

India's food grain storage policy is guided by the National Policy on Handling, Storage, and Transportation of Food Grains, 2000. The aim of the policy was to moderate the system of handling, storage and transportation of the food grains procured by the FCI and to attract resources through private sector involvement.

In 2001, the Gramin Bhandaran Yojana was launched to provide capital subsidies for constructing rural godowns, encouraging private and cooperative participation.

A major leap came with the Warehousing (Development and Regulation) Act of 2007, which established the Warehousing Development and Regulatory Authority (WDRA) and introduced the Negotiable Warehouse Receipt (NWR) system, enhancing farmers' access to credit.

Subsequent policies focused on integrating warehousing with digital platforms like the National Agriculture Market (e-NAM), and in 2020, the Agriculture Infrastructure Fund (AIF) was launched to provide ₹1 lakh crore in financing support for post-harvest infrastructure, including warehouses.

Over the decades, agricultural warehousing policy in India has evolved from state-led institutional models to market-oriented frameworks emphasizing private sector participation, digitization, and financial integration.

### 3.1 Foodgrain Storage Schemes in India

FCI continuously assesses and monitors the storage capacity and based on the storage gap assessment, storage capacities are created/hired through various schemes. The requirement of Storage capacity in FCI depends upon the level of procurement, requirement of buffer norms and PDS operations for Rice and Wheat mainly. FCI continuously assesses and monitors the storage capacity and based on the storage gap assessment, storage capacities are created/hired through the following schemes:

1. Construction of Silos under Public Private Partnership (PPP) mode
2. Private Entrepreneurs Guarantee (PEG) Scheme
3. Central Sector Scheme "Storage & Go
4. downs"
5. Hiring of godown from Central Warehousing Corporation (CWC)/ State Warehousing Corporations (SWCs)/State Agencies
6. Private Warehousing Scheme (PWS)
7. Creation of godowns under Asset Monetization



### 3.2 Effective measures being taken to increase storage facilities for developing efficient storage system

- I. **Silo:** In order to upgrade and modernize the storage facilities, Government of India approved Action Plan for construction of steel silos on PPP (Public Private Partnership) mode in the country. Under this plan Silos with capacity of 2.38 million MT at various locations throughout country was under implementation. Out of which a capacity of 1.63 million MT is completed and remaining 0.75 million MT were under various stages of development as on July 2024. Additionally, silo capacity in PPP mode was proposed under Hub & Spoke model to be implemented in 3 phases.
- II. **PEG Scheme:** Under the PEG Scheme, construction of conventional godowns has been undertaken in 24 States by attracting private investment. PEG Scheme was initiated in 2008 and is in its last phase. Total capacity sanctioned for godowns as on July 1, 2024 was 15.195 million MT. Out of this, 14.701 million MT has been completed.
- III. **Centre Sector Scheme:** Government of India through FCI has been constructing Food grain Storage Depots (FSDs) under Central Sector Scheme at hilly/difficult states where private investor do not come forward. A capacity of 78,770 MT was created at 16 locations from 2017 onwards.
- IV. **Asset Monetization:** Under asset monetization, godowns, particularly those owned by the Food Corporation of India (FCI) and Central Warehousing Corporation (CWC), are being considered for monetization. This involves leveraging the economic potential of these assets, often through leasing or other contractual arrangements, to generate revenue and potentially improve infrastructure. Under Asset Monetization, godowns will be constructed on FCI vacant land. 177 locations were identified upon which 1.747 million MT can be constructed as per July 2024. In principle approval was granted by Government of India, (Department of Food and Public Distribution (DFPD)).
- V. **Phasing out of Covered and Plinth (CAP):** Traditionally, wheat is also stored in CAP by State Agencies/FCI in procuring regions. However, a policy decision was taken by Government of India to phase out CAP.

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**Table 8: Major Foodgrain Storage Schemes in India**

| Scheme                                                     | Launched by                    | Objective                                                             | Key Features                                                                                         |
|------------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|
| <b>Gramin Bhandaran Yojana (Rural Godown Scheme)</b>       | Ministry of Agriculture (2001) | Encourage private and cooperative sector investment in rural storage  | Subsidy: 25%–33% on capital cost; Max capacity: 10,000 MT; For farmers, NGOs, SHGs, cooperatives     |
| <b>Construction of Steel Silos for Foodgrains</b>          | FCI & MoCAF&PD under PPP       | Build modern silos to store wheat and rice scientifically             | Mechanized loading/unloading; pest-free long-term storage; over 10 million MT planned under PPP mode |
| <b>Private Entrepreneurs Guarantee (PEG) Scheme</b>        | FCI & MoCAF&PD (2008)          | Attract private investment for godown construction for FCI use        | 10-year guaranteed rent to private investors for building storage infrastructure                     |
| <b>Integrated Scheme for Agricultural Marketing (ISAM)</b> | Ministry of Agriculture        | Support creation of marketing and storage infrastructure              | Provides financial support for cold storages, godowns, grading and sorting units                     |
| <b>Agricultural Infrastructure Fund (AIF)</b>              | Ministry of Agriculture (2020) | Financing support for post-harvest infrastructure including godowns   | 3% interest subvention & credit guarantee for loans up to ₹2 crore per project                       |
| <b>Negotiable Warehouse Receipt (NWR) System</b>           | WDRA (2007, revamped 2011)     | Allow farmers to store produce and get loans using warehouse receipts | Farmers can delay sale & access credit from banks using receipts from WDRA-registered warehouses     |
| <b>PM Kisan Sampada Yojana</b>                             | Ministry of Food Processing    | Develop infrastructure including storage and agro-processing clusters | Grants for storage, cold chains, silos, mega food parks, etc.                                        |
| <b>Viability Gap Funding for Silos (VGF Scheme)</b>        | MoCAF&PD                       | Support financial viability of private silo projects under PPP        | Provides viability gap funding for approved silo projects with railway sidings                       |
| <b>Rural Infrastructure Development Fund (RIDF)</b>        | NABARD                         | Fund rural infrastructure including godowns and storage for PACS      | Long-term low-cost financing to state governments and cooperatives for agri infrastructure           |
| <b>e-NAM Linked Warehousing</b>                            | Ministry of Agriculture        | Integrate digital mandi platform with warehousing and logistics       | Enables online trading linked with warehouse-based delivery and pledge financing                     |

Source: PHD Research Bureau, PHDCCI



### **3.3 Central Sector Scheme (CSS) “Storage & Godowns” (Focus on NE)**

The Central Sector Scheme for Construction of Storage Godowns is a key initiative of the Department of Food and Public Distribution (DFPD), Government of India, aimed at augmenting the food grain storage infrastructure, especially in North-Eastern Regions (NER) along with few other states.

Under this Scheme, funds are released directly to FCI in the form of equity for land acquisition and construction of storage godowns and infrastructure like railway sidings, electrification, installation of weighbridge, etc.

Funds are also released as grants-in-aid to the Governments of the North-Eastern States including Jammu & Kashmir for construction of intermediate storage godowns considering the storage gaps as well as difficult geographical & climatic conditions in these States.

The Department has been providing plan funds to Governments of the NE States including Jammu & Kashmir for construction of intermediate godowns, considering their difficult geographical conditions. This is necessary to improve the supply chain logistics for Targeted Public Distribution System.

Under this Scheme, funds are released directly to FCI in the form of equity for land acquisition and construction of storage godowns and infrastructure like railway sidings, electrification, installation of weighbridge, etc.

Funds are also released as grants-in-aid to the Governments of the North-Eastern States including Jammu & Kashmir for construction of intermediate storage godowns considering the storage gaps as well as difficult geographical & climatic conditions in these States. This scheme was extended for 8 years from April 1, 2017 to March 31, 2025.



## Foodgrain Warehouse Market in India 2025-2030

**Table 9: Completed Central Sector Scheme (from 2017-18 to 2024-25) - Status as on July 1, 2024**

| Year         | Zone (North East/other than NE) | State             | Locations       | Capacity - (MT) |
|--------------|---------------------------------|-------------------|-----------------|-----------------|
| FY 2017-18   | North East                      | Nagaland          | Kohima          | 4590            |
| FY 2017-18   | North East                      | Arunachal Pradesh | Bomdila         | 3340            |
| FY 2018-19   | North East                      | Manipur           | Thoubal         | 2500            |
| FY 2018-19   | North East                      | Manipur           | Imphal East     | 10000           |
| FY 2018-19   | North East                      | Manipur           | Bishnupur       | 4600            |
| FY 2019-20   | North East                      | Manipur           | Churachandpur   | 2500            |
| FY 2021-22   | North East                      | Assam             | Jonai (Dhemaji) | 20000           |
| FY 2022-23   | North East                      | Manipur           | Tamenglong      | 4730            |
| FY 2022-23   | North East                      | Arunachal Pradesh | Aalo            | 1670            |
| FY 2022-23   | North East                      | Meghalaya         | Baghmara        | 2500            |
| FY 2023-24   | North East                      | Arunachal Pradesh | Roing           | 1120            |
| FY 2018-19   | Other than NE                   | Kerala            | West Hill       | 10000           |
| FY 2018-19   | Other than NE                   | Kerala            | Angadipuram     | 5000            |
| FY 2022-23   | Other than NE                   | Himachal pradesh  | Kangra          | 3340            |
| FY 2022-23   | Other than NE                   | Himachal pradesh  | Palampur        | 2240            |
| FY 2023-24   | Other than NE                   | Himachal pradesh  | Recongpeo       | 640             |
| <b>Total</b> |                                 |                   |                 | <b>78,770</b>   |

Source: PHD Research Bureau, PHDCCI

### 3.4 Private Entrepreneurs Guarantee Scheme (PEG)

In order to provide food security to the nation, it is considered necessary that sufficient stock of wheat and rice is available in all States. PEG Scheme is a policy initiative launched by the Food Corporation of India (FCI) under the Ministry of Consumer Affairs, Food & Public Distribution, Government of India, aimed at enhancing storage capacity for foodgrains across the country.

PEG Scheme was introduced in 2008 to augment the foodgrain storage infrastructure in India by involving:



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1. Private entrepreneurs,
2. Central Warehousing Corporation (CWC), and
3. State Warehousing Corporations (SWCs)

It ensures the creation of additional storage capacity outside the existing FCI network, particularly in areas with foodgrain surplus.

FCI, in coordination with state governments, identifies locations based on foodgrain procurement trends, availability of land, and existing storage gaps. Priority is given to:

- Major procurement states (Punjab, Haryana, Madhya Pradesh, etc.)
- NE/Hilly/Tribal areas
- Remote districts lacking storage

Under the PEG Scheme, construction of conventional godowns has been undertaken in 24 States by attracting private investment. PEG Scheme was initiated in 2008 and subsequently in 2009 it was extended to include De-centralized Procurement States (DCP). Under the PEG scheme, as on December, 2024, a capacity of 15.20 million MT has been sanctioned. Out of this, 14.70 million MT has been completed. The scheme is in its last phase.

**Table 10: Key Features of Private Entrepreneurs Guarantee Scheme (PEG)**

| Feature                       | Details                                                                                                                               |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>Objective</b>              | Create modern storage infrastructure (mainly godowns and silos) through private investment or state agencies.                         |
| <b>Mode of Implementation</b> | Through <b>Private Entrepreneurs, CWC, and SWCs.</b>                                                                                  |
| <b>Guarantee</b>              | FCI provides a <b>10-year assured storage guarantee</b> (for godowns) and up to <b>30 years for silos</b> , with fixed rent payments. |
| <b>Ownership</b>              | Ownership remains with private players or the concerned agency, not FCI.                                                              |
| <b>Financing</b>              | Private investment or viability gap funding through state support; NABARD and other banks also provide financing.                     |
| <b>Storage Type</b>           | Traditional godowns (covered storage) and modern silos (for bulk grain handling).                                                     |

The government is now moving towards silo-based storage under a hub-and-spoke model, with bulk grain handling to reduce losses and improve logistics. PEG is seen as a precursor to modernizing India's food grain logistics.



### 3.5 Creation of godowns under Asset Monetization

Under India's Asset Monetization programme, the Food Corporation of India (FCI) is creating new godowns (warehouses) by utilizing vacant land it owns. This initiative aims to leverage existing assets to generate revenue and improve storage infrastructure. This approach aims to unlock the economic value of these assets, potentially through leasing or other revenue-generating models, while also improving storage capacity for food grains or other goods.

#### Key aspects of godown creation under asset monetization:

**National Monetization Pipeline (NMP):** The broader context of asset monetization includes the National Monetization Pipeline, which aims to monetize various public assets, including warehousing assets.

**Utilizing vacant land:** Asset monetization for godowns focuses on identifying and utilizing vacant land owned by organizations like the Food Corporation of India (FCI) for constructing new storage facilities.

**Revenue generation:** The primary goal is to generate revenue from the assets, either through lease payments or other monetization methods, while also improving storage infrastructure.

**Table 11: Phasing of monetization value – warehousing assets (Rs. Crore)**

| Asset Type                   | FY22        | FY23        | FY24        | FY25        | Total         |
|------------------------------|-------------|-------------|-------------|-------------|---------------|
| Storage Infrastructure - FCI | 3500        | 5250        | 5250        | 3500        | 17,500        |
| Storage Infrastructure - CWC | 2280        | 3420        | 3420        | 2280        | 11,400        |
| <b>Total</b>                 | <b>5780</b> | <b>8670</b> | <b>8670</b> | <b>5780</b> | <b>28,900</b> |

Source: NITI Aayog report, National Monetization Pipeline (NMP)

### 3.6 Agricultural Marketing Infrastructure (AMI) Scheme

According to the Department of Agriculture & Cooperation, Ministry of Agriculture's 'Operational Guidelines 2014'<sup>1</sup>, Agricultural Marketing Infrastructure (AMI), a sub-scheme of Integrated Scheme for Agricultural Marketing (ISAM) under which the existing schemes of Grameen Bhandaran Yojana (GBY) and Development/Strengthening of Agricultural Marketing Infrastructure, Grading and Standardization (AMIGS) has been merged in 2014.

For creation of agricultural marketing infrastructure, Grameen Bhandaran Yojana (GBY) is being implemented since April 1, 2001 and Scheme for Development/Strengthening

<sup>1</sup> [https://dmi.gov.in/Documents/final\\_guidelines\\_2014.pdf](https://dmi.gov.in/Documents/final_guidelines_2014.pdf)



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of Agricultural Marketing Infrastructure, Grading & Standardisation (AMIGS) is being implemented from October 20, 2004. In the Integrated Scheme for Agriculture Marketing (ISAM), these two viz GBY and AMIGS is subsumed into one sub scheme, which would henceforth be known as Agricultural Marketing Infrastructure (AMI).

The Marketing Division in the Department of Agriculture is the overall in charge of policy formulation for the agricultural marketing sector. The Directorate of Marketing & Inspection (DMI) an office under the Department will implement the three sub schemes viz. Agricultural Marketing Infrastructure (AMI), Marketing Research and Information Network (MRIN) and Strengthening of Agmark Grading Facilities (SAGF).

Under the scheme, assistance is provided for construction/ renovation of godowns/ warehouses in the rural areas in the States to enhance the storage capacity for agriculture produce.

Under the scheme, Government provides subsidy at the rate of 25% and 33.33% on capital cost of the project based on the category of eligible beneficiary. Assistance is available to Individuals, Farmers, Group of farmers/growers, Agripreneurs, Registered Farmer Produce Organizations (FPOs), Cooperatives, and state agencies etc.

The scheme is demand driven. Further, Agriculture Infrastructure Fund (AIF) scheme was launched in July 2020 with an objective to mobilize a medium - long-term debt financing facility for investment in viable projects for post-harvest management Infrastructure and community farming assets through incentives and financial support in order to improve agriculture infrastructure in India.

Under the scheme, Rs. 1 Lakh Crore is provided by banks and financial institutions as loans with interest subvention of 3% per annum and credit guarantee coverage under CGTMSE for loans up to Rs. 2 Crores. Under the AIF Scheme, a total number of 13,353 warehouses have been set up with the sanction of Rs 11,258 crore by Banks and other lending institutions as on July 18, 2024.

As per guidelines, the AIF Scheme has not earmarked special allocation for setting up storage facilities. As per the Impact Assessment study by Agro Economic Research (AER), Department of Agriculture and Farmers Welfare (DA&FW), the average storage capacity shall be 7000 MT per storage project.

### **Objectives of AMI scheme:**

- To develop agricultural marketing infrastructure for effectively managing marketable surplus of agriculture including horticulture and of allied sectors including dairy, poultry, fishery, livestock and minor forest produce.
- To promote innovative and latest technologies in agricultural marketing infrastructure.
- To promote competitive alternative agricultural marketing infrastructure by encouraging private and cooperative sector investments.



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- To promote direct marketing so as to increase market efficiency through reduction in intermediaries and handling channels thus enhancing farmers' income.
- To promote creation of scientific storage capacity for storing farm produce, processed farm produce and agricultural inputs etc. to reduce post-harvest and handling losses.
- To provide infrastructure facilities for grading, standardization and quality certification of agricultural produce with the objective of (a) ensuring a price to the farmers commensurate with the quality of the produce and (b) promoting pledge financing and marketing credit, negotiable warehousing receipt system and promotion of forward and future markets to increase farmers' income.
- To promote Integrated Value Chains (confined up to primary processing stage only) to provide vertical integration of farmers with primary processors. Primary processing means adding value to the produce without change in its form and may include washing, sorting, cleaning, grading, waxing, ripening, packaging, labelling etc.
- To create general awareness and provide training to farmers, entrepreneurs market functionaries and other stakeholders on various aspects of agricultural marketing including grading, standardization and quality certification.

### Eligible Marketing Infrastructure under AMI Scheme

Storage infrastructure like godowns including stand-alone silos for storage of food grains with necessary ancillary facilities like loading, unloading, bagging facility etc., excluding railway siding are eligible for subsidy.

Assistance for storage infrastructure will be available on capital cost of the project including cost of allied facilities like boundary wall, internal road, internal drainage system, weighing, grading, packing, quality testing & certification, firefighting equipment etc. which are functionally required to operate the project.

For silos overall ceiling for capacity creation will be kept at 25% of the overall target for storage capacity for the year or actual capacity sanctioned during the year whichever is lower.

The capacity created under silos and subsidy disbursement under the above 25% limit will be implemented and monitored by NABARD, HO and NCDC, HO in respect of projects sanctioned by them. Assistance for renovation will be restricted to storage infrastructure projects of cooperatives only.

### Eligible Beneficiaries under AMI Scheme

Assistance under the sub scheme will be available to:

1. Individuals, Group of farmers / growers, Registered Farmer Producer Organisations (FPOs);
2. Partnership/ Proprietary firms, Companies, Corporations;
3. Non-Government Organizations (NGOs), Self Help Groups (SHGs);



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4. Cooperatives, Cooperative Marketing Federations;
5. Autonomous Bodies of the Government, Local Bodies (excluding Municipal Corporations for storage infrastructure projects), Panchayats;
6. State agencies including State Government Departments and autonomous organization / State owned corporations such as Agricultural Produce Market Committees & Marketing Boards, State Warehousing Corporations, State Civil Supplies Corporations etc.

### Subsidy under the AMI scheme

Subsidy under the sub-scheme is linked to institutional credit and will be available to only such projects financed by

1. Commercial, Cooperative, Regional Rural Banks, Agricultural Development Finance Companies (ADFCs), State Cooperative Banks (SCBs), State Cooperative Agricultural and Rural Development Banks (SCARDBs), Scheduled Urban Cooperative Banks, Scheduled Primary Cooperative Banks (PCBs), North Eastern Development Financial Corporation (NEDFi), other institutions eligible for refinance by National Bank for Agriculture and Rural Development (NABARD) or any other financial institution such as State Financial Corporations (SFCs) approved by DAC.
2. NABARD co-financed and directly financed marketing infrastructure projects including storage infrastructure projects would be eligible for subsidy where the interest rates are commercial / market related.
3. State Government / State Government agency storage infrastructure projects financed by NABARD under Rural Infrastructure Development Fund (RIDF) / Warehousing Infrastructure Fund (WIF) / NABARD's own funds.
4. Projects promoted by cooperatives and financed by National Cooperative Development Corporation (NCDC) or cooperative banks recognized by NCDC in accordance with NCDC's eligibility guidelines.
5. State agencies have a choice of investing their own funds rather than going for institutional funding.

### Subsidy Pattern

The sub-scheme envisages back-ended capital subsidy for investment in eligible storage and marketing infrastructure projects as under:

**For storage infrastructure projects:** Capital cost of the project for the purpose of subsidy will be calculated on the project cost as appraised by financial institution or actual cost of eligible components as certified by a Chartered Accountant, whichever is lower subject to the subsidy ceiling per MT as well as overall ceiling given below:



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**Table 12: Subsidy Pattern under AMI Scheme**

| Category                                                                                                              | Rate of Subsidy (on capital cost) (%) | Up to 1000 MT in Rs./ MT | More than 1000MT and upto 30000 MT in Rs./ MT | Maximum ceiling (Rs. Lakhs) |
|-----------------------------------------------------------------------------------------------------------------------|---------------------------------------|--------------------------|-----------------------------------------------|-----------------------------|
| <b>A) North Eastern States, Sikkim, UTs of Andaman &amp; Nicobar and Lakshadweep Islands, hilly* areas</b>            | 33.33%                                | 1333.2                   | 1333.2                                        | 400                         |
| <b>B) In other Areas</b><br>1. For Registered FPOs, Panchayats, Women, SC/ST beneficiaries or their cooperatives/SHGs | 33.33%                                | 1166.55                  | 1000                                          | 300                         |
| B) In other Areas<br>2. For all Other categories of beneficiaries                                                     | 25%                                   | 875                      | 750                                           | 225                         |

**Source:**

Department of Agriculture and Farmers Welfare, Ministry of Agriculture & Farmers Welfare, Government of India

**Notes:**

\* Hilly area is a place at an altitude of more than 1,000 meters above mean sea level.

\*\* SC/ ST Cooperatives to be certified by the concerned officer of the State Government.

### Promoter's Contribution & Term Loan under the AMI scheme

1. Minimum promoter's contribution should be 20% of the project cost. Minimum Term loan (including subsidy) to be sanctioned by the Financial Institution (FI) should be 50% of the project cost.
2. However, Promoter's contribution for storage infrastructure projects of State Government and State Government agencies financed under Rural Infrastructure Development Fund (RIDF)/ Warehouse Infrastructure Fund (WIF) of NABARD may be relaxed as per their respective fund guidelines.
3. Promoter's Contribution in case of own funded State agency projects should be 75% / 66.67% of the project cost as the case may be.

For renovation of storage projects by cooperatives financed by NCDC and Cooperative banks subsidy will be 25% of the project cost as appraised by FI or actual cost whichever is lower subject to subsidy ceiling of Rs. 187.50 per MT of storage capacity. Cost norms for computing subsidy for silos will be same as for other storage infrastructure.

Since inception of the scheme on April 1, 2001 and up to June 30, 2024, a total of 48,512 storage infrastructure projects (Godowns), with storage capacity of 93.99 million MT have been sanctioned under the scheme and subsidy of Rs. 4,734.73 crore has been released.



## Foodgrain Warehouse Market in India 2025-2030

**Table 13: State-wise progress of Storage Infrastructure assisted under AMI as on June 30, 2024 since inception (April 1, 2021)**

| S. No. | State             | No. of Projects Sanctioned | Capacity Sanctioned Million (MT) | Subsidy Released - (Rs. Crore) |
|--------|-------------------|----------------------------|----------------------------------|--------------------------------|
| 1      | Andhra Pradesh    | 1543                       | 6.12                             | 317.59                         |
| 2      | Arunachal Pradesh | 1                          | 0.00                             | 0.06                           |
| 3      | Assam             | 367                        | 1.14                             | 71.83                          |
| 4      | Bihar             | 1234                       | 1.11                             | 53.74                          |
| 5      | Chhattisgarh      | 1396                       | 2.29                             | 89.14                          |
| 6      | Goa               | 1                          | 0.00                             | 0.01                           |
| 7      | Gujarat           | 12376                      | 5.99                             | 354.43                         |
| 8      | Haryana           | 2307                       | 7.68                             | 444.22                         |
| 9      | Himachal Pradesh  | 88                         | 0.03                             | 1.81                           |
| 10     | Jammu & Kashmir   | 17                         | 0.10                             | 8.01                           |
| 11     | Jharkhand         | 243                        | 0.22                             | 9.60                           |
| 12     | Karnataka         | 5062                       | 4.49                             | 216.17                         |
| 13     | Kerala            | 207                        | 0.11                             | 6.38                           |
| 14     | Madhya Pradesh    | 8324                       | 28.48                            | 1684.12                        |
| 15     | Maharashtra       | 4071                       | 8.10                             | 351.10                         |
| 16     | Meghalaya         | 17                         | 0.03                             | 2.53                           |
| 17     | Mizoram           | 4                          | 0.00                             | 0.06                           |
| 18     | Nagaland          | 36                         | 0.03                             | 3.54                           |
| 19     | Odisha            | 717                        | 1.07                             | 43.94                          |
| 20     | Punjab            | 1819                       | 7.06                             | 252.32                         |
| 21     | Rajasthan         | 1873                       | 3.76                             | 149.21                         |
| 22     | Tamilnadu         | 1233                       | 1.49                             | 53.79                          |
| 23     | Telangana         | 1330                       | 6.02                             | 320.00                         |
| 24     | Tripura           | 5                          | 0.03                             | 2.97                           |



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| S. No.       | State         | No. of Projects Sanctioned | Capacity Sanctioned Million (MT) | Subsidy Released - (Rs. Crore) |
|--------------|---------------|----------------------------|----------------------------------|--------------------------------|
| 25           | Uttar Pradesh | 1294                       | 6.04                             | 203.25                         |
| 26           | Uttarakhand   | 321                        | 0.88                             | 39.71                          |
| 27           | West Bengal   | 2626                       | 1.74                             | 55.21                          |
| <b>Total</b> |               | <b>48,512</b>              | <b>94.00</b>                     | <b>4734.73</b>                 |

Source: <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2037655>

### 3.7 Agriculture Infrastructure Fund

The Union Cabinet in July 2020 has approved a new pan India Central Sector Scheme called Agriculture Infrastructure Fund (National Agriculture Infra Financing Facility). The scheme shall provide a medium - long term debt financing facility for investment in viable projects for post-harvest management Infrastructure and community farming assets through interest subvention and financial support.

#### Objective of AIF

The objective of the fund is to establish Post-Harvest Management Projects Integrated Primary and secondary processing projects, Cold stores, Viable Farming Assets Warehousing, Silos, Assaying /Grading, packing units, ripening chambers /waxing plants, etc. Objectives for all the stakeholders in the agriculture eco-system are as under.

1. Farmers (including FPOs, PACS, Marketing Cooperative Societies, Multipurpose cooperative societies): Improved marketing infrastructure to allow farmers to sell directly to a larger base of consumers and hence, increase value realization for the farmers. This will improve the overall income of farmers.
2. Government will be able to direct priority sector lending in the currently unviable projects by supporting through interest subvention, incentive and credit guarantee. This will initiate the cycle of innovation and private sector investment in agriculture.  
Due to improvements in post-harvest infrastructure, government will further be able to reduce national food wastage percentage thereby enable agriculture sector to become competitive with current global levels.  
Central/State Government Agencies or local bodies will be able to structure viable PPP projects for attracting investment in agriculture infrastructure.
3. Agri-entrepreneurs and startups: With a dedicated source of funding, entrepreneurs will push for innovation in agriculture sector by leveraging new age technologies including IoT, AI, etc. It will also connect the players in ecosystem and hence, improve avenues for collaboration between entrepreneurs and farmers.
4. Banking ecosystem- With Credit Guarantee, incentive and interest subvention lending institutions will be able to lend with a lower risk. This scheme will help to



## Foodgrain Warehouse Market in India 2025-2030

enlarge their customer base and diversification of portfolio. - Refinance facility will enable larger role for cooperative banks and RRBs.

The Scheme will be operational from 2020-21 to 2029-30. Disbursement in four years starting with sanction of Rs. 10,000 crore in the first year and Rs. 30,000 crore each in next three financial years. Moratorium for repayment under this financing facility may vary subject to minimum of 6 months and maximum of 2 years.

### Eligible Projects AIF

The scheme will facilitate setting up and modernization of key elements of the value chain including Post Harvest Management Projects and Viable projects for building community farming assets like:

- Supply chain services including e-marketing platforms
- Warehouses
- Silos
- Pack houses
- Assaying units
- Sorting & grading units
- Cold chains
- Logistics facilities
- Primary processing centers
- Ripening Chambers

### Size of the financing facility and eligible beneficiaries under AIF

Rs. 1 Lakh Crore to be provided by banks and financial institutions as loans to Primary Agricultural Credit Societies (PACS), Marketing Cooperative Societies, Farmer Producers Organizations (FPOs), Self Help Group (SHG), Farmers, Joint Liability Groups (JLG), Multipurpose Cooperative Societies, Agri-entrepreneurs, Startups and Central/State agency or Local Body sponsored Public Private Partnership Projects.

### Government Budgetary Support under AIF

Budgetary support will be provided for interest subvention and credit guarantee fee as also administrative cost of PMU. The details are as below:

**Table 14: Budgetary support under AIF**

| Sl. No | Name of Component        | Norms                                                                                                                                                                                                                                                                                                                                                                       |
|--------|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1      | Interest Subvention Cost | All loans under this financing facility will have interest subvention of 3% per annum up to a limit of Rs. 2 crore. This subvention will be available for a maximum period of 7 years. In case of loans beyond Rs.2 crore, then interest subvention will be limited up to 2 crore. The extent and percentage of funding to private entrepreneurs out of the total financing |



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|   |                            |                                                                                                                                                                                                                                                                                                                                                                                              |
|---|----------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|   |                            | facility may be fixed by the National Monitoring Committee                                                                                                                                                                                                                                                                                                                                   |
| 2 | Credit Guarantee Cost      | Credit guarantee coverage will be available for eligible borrowers from this financing facility under Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE) scheme for a loan up to Rs. 2 crore. The fee for this coverage will be paid by the Government. In case of FPOs the credit guarantee may be availed from the facility created under FPO promotion scheme of DACFW. |
| 3 | Administration Cost of PMU | Farmers Welfare Programme Implementation Society under DACFW will provide PMU support to the scheme at the central level and state PMUs of PM KISAN at state level. Services of knowledge partners will be engaged to identify clusters including export clusters and gaps in supply chains to target projects and prepare viable project reports to support the beneficiaries.              |

### Source:

Department of Agriculture, Cooperation & Farmers' Welfare, Ministry of Agriculture & Farmers' Welfare, Government of India 'Operational Guidelines for Scheme Guidelines for CENTRAL SECTOR SCHEME of Financing facility under 'Agriculture Infrastructure Fund'  
<https://pmkisan.gov.in/Documents/Operational%20Guidelines%20of%20Financing%20Facility%20under%20Agriculture%20Infrastructure%20Fund.pdf>

Additionally, the scheme covers the reimbursement of credit guarantee fees paid by banks. Government has approved the expansion of this scheme in 2024. This decision introduces a series of measures designed to make the AIF more attractive, impactful, and inclusive, reflecting the government's commitment to enhancing agricultural productivity and infrastructure.

### 1. Viable Farming Assets

The scheme now includes the creation of infrastructure for 'viable projects for building community farming assets'. This expansion allows all eligible beneficiaries to develop projects that enhance community farming capabilities, potentially improving productivity and sustainability in the agricultural sector.

### 2. Integrated Processing Projects

The list of eligible activities under AIF now includes integrated primary and secondary processing projects. However, standalone secondary projects remain ineligible and will continue to be covered under Ministry of Food Processing Industries (MoFPI) schemes.

### 3. PM KUSUM Component-A Integration

The government has allowed convergence between Component-A of the PM-KUSUM scheme and AIF. This integration is available for farmers, farmer groups, Farmer Producer Organizations (FPOs), cooperatives, and Panchayats. The aim is to promote sustainable clean energy solutions alongside agricultural infrastructure development.



#### 4. Enhanced Credit Guarantee Coverage

In addition to the existing Credit Guarantee Fund Trust for Micro and Small Enterprises (CGTMSE), the government proposes to extend AIF credit guarantee coverage for FPOs through the NABSanrakshan Trustee Company Pvt. Ltd.

This expansion of credit guarantee options is designed to improve the financial security and creditworthiness of FPOs, encouraging increased investments in agricultural infrastructure projects.

The scheme aims to attract investments for the development of agricultural infrastructure, with a total allocation of Rs 1 lakh crore to be distributed through banks and financial institutions until 2025-26.

#### 3.8. Construction of Silos under Public Private Partnership (PPP) mode

For augmentation and upgradation/ modernization of storage capacity, Government of India is regulating construction of steel silos, through various models, which are as under:

**A. Railway siding Model:** The Railway Siding Model of Construction of Silos under the PPP Mode in India is a modern, infrastructure-based initiative undertaken by the Food Corporation of India (FCI) and the Ministry of Consumer Affairs, Food & Public Distribution to streamline food grain storage and transportation.

This model is being implemented under the Public-Private Partnership (PPP) framework to create state-of-the-art silos equipped with direct railway connectivity, facilitating bulk handling and movement of grains, particularly wheat and rice. These silo projects are built on a Design, Build, Finance, Own & Operate (DBFOO) or Design, Build, Finance, Operate & Transfer (DBFOT) basis.

Government of India has approved an Action Plan for construction of 10 million MT silos across the country under PPP mode. Out of 10 million MT, silos with capacity of 2.9 million MT were to be constructed by FCI under PPP mode, 0.25 million MT by CWC and 6.85 million MT to be constructed by State Government.

According to the Annual Report 2024-25 of Department of Food and Public Distribution, construction at a capacity of 2.325 million MT at 42 locations has been completed and put to use.

**B. Hub & Spoke model of Silos:** With a view to modernize storage of food grains and to ramp-up the storage capacity for Food grains in India, a new model for development of grain Silos across the country i.e. Hub & Spoke Model for implementation in Public Private Partnership (PPP) Mode has been proposed.

It is anticipated that the Hub and Spoke model will be efficient and complexities related to land acquisition for rail siding silos would not be there. FCI has devised roadmap for development of 11.1125 million MT silos at 249 locations in phased



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## Foodgrain Warehouse Market in India 2025-2030

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manner across the country, most of which are be road-fed and will work on the Hub and Spoke model.

In the first phase of Hub and of silos, a capacity of 3.487 million MT silos at 80 locations is planned to be constructed, out of which 1.012 million MT capacity at 14 locations is under (Design, Build, Finance, Own & Transfer) DBFOT mode (FCI own Land) and 2.475 million MT capacity at 66 locations is (Design, Build, Finance, Own & Operate) DBFOO mode.

According to the Annual Report 2024-25 of Department of Food and Public Distribution, as on December, 2024, tenders have been awarded for all the locations and silos are under construction at 12 locations for 0.8625 million MT capacity, out of 14 DBFOT locations.

### 3.9. New warehouses to ensure food security<sup>2</sup>

In order to address the shortage of food grain storage capacity in India, the Government on May 31, 2023, approved the “World’s Largest Grain Storage Plan in Cooperative Sector”, which is being rolled out as a Pilot Project in different states/UTs of the country.

The plan entails creation of various agriculture infrastructure at PACS level, including setting up decentralized godowns, custom hiring centre, processing units, Fair Price Shops, etc. through convergence of various existing schemes of the Government of India (GoI), such as, Agriculture Infrastructure Fund (AIF), Agricultural Marketing Infrastructure Scheme (AMI), Sub Mission on Agricultural Mechanization (SMAM) Pradhan Mantri Formalization of Micro Food Processing Enterprises Scheme (PMFME), etc.

Under these schemes, PACS can avail subsidies and interest subvention benefits for construction of godowns/storage facilities and setting up of other agriculture infrastructure.

Further, NABARD is also extending financial support to PACS by refinancing them at highly subsidized rates of around 1 percent, after incorporating the benefits of 3% interest subvention under AIF scheme for projects up to Rs. 2 Crore.

Therefore, the plan aims to strengthen the economic condition of PACS by diversifying their business activities and giving them additional sources of revenue thus improving their financial sustainability.

The creation of decentralized storage capacity at PACS level aims to provide various benefits to the farmers, including the following:

1. They will be able to store their produce in the godown constructed at PACS and avail bridge finance for the next cycle of crop and sell the produce at a time of

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<sup>2</sup> <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2039582>



## Foodgrain Warehouse Market in India 2025-2030

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their choice, or sell their whole crop to the PACS at Minimum Support Price (MSP), which would enable them to avoid distress sale of crops.

2. They will be able to get various agri inputs and services at the Panchayat/ village level itself.
3. Through diversification of business, farmers will be able to get additional sources of income.
4. Through integration with the food supply management chain, farmers will be able to expand their market size and realize better value for their produce.
5. Creation of adequate food grain storage capacity at PACS level will help in reduction of post-harvest losses, thus enabling farmers to earn better prices.
6. Since PACS would be operating as procurement centre as well as Fair Price Shops (FPS), the cost incurred in transportation of food grains to procurement centres and again transporting the stocks back from warehouses to FPS would also be saved.
7. In addition to the above, this Plan would help in ensuring food security across India.

### 3.10. Hiring of godowns through Private Warehousing Scheme (PWS)

In addition, as and when, required godowns are hired by FCI through e-tendering under Private Warehousing Scheme (PWS) from private parties by offering guaranteed hiring of two years extendable by one year to address immediate / urgent requirement of storage space.

### 3.11. Key Government Initiatives for post-harvest management

To improve post-harvest management, GOI has taken several initiatives some of the prominent one's are discussed below:

#### ▪ e-NAM (National Agriculture Market)

The **e-NAM (National Agriculture Market)** portal is a **pan-India electronic trading platform** launched by the Government of India in 2016 to create a unified national market for agricultural commodities. It integrates existing **Agricultural Produce Market Committees (APMCs)** across states to facilitate better price discovery and transparent trade.

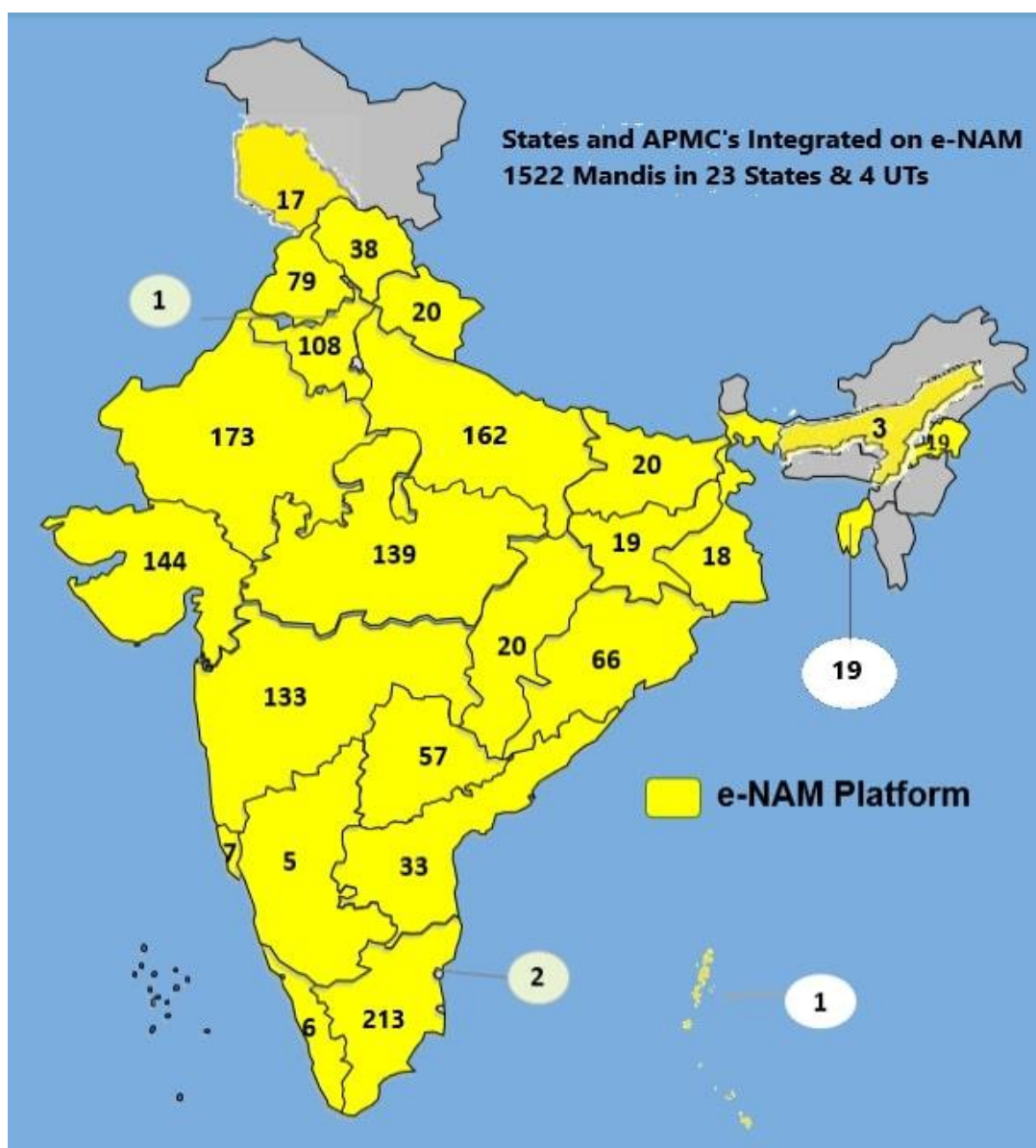
The primary objective of the e-NAM (National Agriculture Market) portal is to create a unified national digital marketplace for agricultural commodities by integrating the existing mandis operated under various state APMC laws.

This platform aims to enhance transparency in the agricultural trade system by allowing real-time, online trading of produce, thereby enabling better price discovery for farmers

based on actual demand and supply. It seeks to empower farmers by giving them wider access to markets beyond their local mandis, ultimately leading to better remuneration for their produce.

Additionally, e-NAM is designed to reduce transaction costs, streamline the supply chain, and minimize the role of middlemen, which often leads to price distortions. By encouraging fair and competitive bidding through a digital interface, the portal ensures that both buyers and sellers benefit from an efficient, transparent, and integrated marketing mechanism.

**Figure 12: State and APMC's integrated on e-NAM**



Source: <https://enam.gov.in>

### ▪ e-NWR Based Pledge Financing (CGS-NPF)



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The e-NWR based pledge financing under the Credit Guarantee Scheme for Negotiable Warehouse Receipts Financing (CGS-NPF) is a government-backed initiative to enhance credit access for farmers and small agribusinesses by enabling them to pledge their electronic Negotiable Warehouse Receipts (e-NWRs) and avail loans from banks and financial institutions. It was launched by the Department of Agriculture & Farmers Welfare (DA&FW), Government of India.

An **electronic Negotiable Warehouse Receipt (e-NWR)** is a digital proof of ownership of agricultural commodities stored in a registered warehouse with the **Warehousing Development and Regulatory Authority (WDRA)**. It is:

- **Transferable, negotiable, and secure.**
- Issued only by WDRA-registered warehouses.
- Legally recognized under the Warehousing (Development and Regulation) Act, 2007.

The main objective of CGS-NPF is to **encourage** institutional lending against e-NWRs, especially to small and marginal farmers and Farmer Producer Organizations (FPOs), by providing a **credit guarantee** to lending institutions in case of default.

**Table 15: Key Features of Credit Guarantee Scheme for Negotiable Warehouse Receipts Financing (CGS-NPF)**

| Feature                   | Description                                                                                  |
|---------------------------|----------------------------------------------------------------------------------------------|
| <b>Coverage</b>           | Farmers, FPOs, SHGs, and other eligible agri-entrepreneurs.                                  |
| <b>Loan Type</b>          | Pledge loan against e-NWRs issued by WDRA-registered warehouses.                             |
| <b>Guarantee Coverage</b> | Up to <b>75%</b> of the defaulted principal and interest amount.                             |
| <b>Credit Limit</b>       | Loan up to <b>₹5 lakh</b> per borrower (can vary).                                           |
| <b>Tenure</b>             | Typically 6 months to 1 year or as decided by the lender.                                    |
| <b>Purpose</b>            | Allows farmers to <b>avoid distress sale</b> by storing produce and getting working capital. |
| <b>No Collateral</b>      | Other than the stored commodity in a registered warehouse.                                   |

## Challenges

1. Low awareness among smallholders about e-NWR and pledge financing.
2. Limited number of WDRA-accredited warehouses in some regions.
3. Initial hesitancy among banks to accept e-NWR as the sole collateral.



## **Section IV:**

# **Foodgrain Storage Technology Paradigm**

## 4. Foodgrain Storage Technology Paradigm

Agriculture warehouse industry is regarded as the important industry for maintaining food security. In the past, there were antiquated ways for storing foods and grains that necessitated high physical labour, which was time-consuming and not efficient. Modern silo infrastructure is designed for durability, safety, and scalability.

Technological advancements are transforming traditional warehousing into smart, resilient systems. Five key focus areas are **silo infrastructure, automation, real-time monitoring, integrated pest & quality and advanced data & connectivity.**

### 4.1. Smart Food Grain Storage Warehouses: The Future of Post-Harvest Management

Smart food grain storage warehouses represent a revolutionary advancement in agricultural infrastructure, integrating cutting-edge technologies to transform traditional storage facilities into intelligent, automated systems. These facilities leverage Internet of Things (IoT), artificial intelligence (AI), machine learning, blockchain, and robotics to optimize grain storage conditions, reduce losses, and enhance operational efficiency.

As these technologies continue to mature and costs decrease, widespread adoption will transform the agricultural storage landscape, ensuring better food quality, reduced waste, and improved farmer livelihoods. The key features are discussed here followed by a detailed look at key technologies used in these modern foodgrain warehouses.

### Technology in Warehousing | Reforming Storage Solutions





**Automated Solar Powered Weighbridge**

Radio frequency identification (RFID) transmits the identity (in the form of a unique serial number), using radio waves. These weighbridge systems are unattended running on a standalone system keeps them operational for 24/7 without the need for an operator.



**Motorized Stacking**

Semi-automation is key to systematic stacking and ease in unloading the old stocks from the stack.



**Drone Tracking**

Drone Tracking is having 360 degree benefits starting from supervising infra defects, stocks, operations and many more



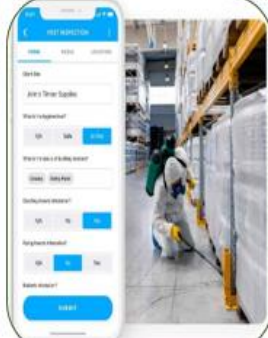
**Controlled Fumigation Chambers**

Specialized chambers to treat infested stock with specialized treatment.



**RFID Tagging to Jute Bags**

Helps in tracking and ensuring the stock quantity



**Enabled Precision Fumigation and Pest Management**

With wireless sensors and cloud based analysis technique use of tech not to monitor fumigation but to optimize the operational cost of fumigation. Absorption, leakage, ambient climate conditions are modelled to estimate fumigant distribution and insect mortality. Simulation output is presented in the app with intuitive, predictive metrics and notifications, allowing you to control treatments with ease and precision.

**Benefits:**

- ❖ Reduced operating expenses through slashed labor and travel costs, thanks to remote monitoring.
- ❖ Eliminate reinfestation risks and added costs with precise control, AI-based dosage and exposure time-keeping tools.
- ❖ Save on excessive fumigant costs, discover leakages quickly and restore integrity in pest treatments.



## 4.2. Core Technologies and Infrastructure

### ▪ IoT-Based Monitoring Systems

Smart warehouses deploy comprehensive sensor networks that continuously monitor critical environmental parameters including temperature, humidity, carbon dioxide levels, air quality, and grain moisture content. These IoT devices utilize various connectivity protocols such as LoRaWAN, Zigbee, NB-IoT, and Wi-Fi to transmit real-time data to centralized management platforms.

#### Key sensor technologies include

1. Temperature sensors: Monitor ambient and grain core temperatures to prevent spoilage and detect hot spots
2. Humidity sensors: Track moisture levels using DHT-11 and similar sensors to prevent fungal growth
3. Gas sensors: MQ135 and CO2 sensors detect harmful gas concentrations and assess grain quality
4. Weight sensors: Force sensors and load cells provide real-time inventory tracking
5. Motion sensors: Passive infrared sensors detect rodent activity and unauthorized access

### ▪ SMART Food Grain Storage System (SAFEETY)

Developed by the Society for Applied Microwave Electronics Engineering and Research (SAMEER) under India's Ministry of Electronics and Information Technology, SAFEETY technology incorporates:

1. Conveyorized loading and unloading systems for grain bags with 40-minute processing capacity for 28 tons
2. RFID tagging of grain bags for comprehensive traceability throughout the supply chain
3. Online weight and moisture measurement capabilities for real-time quality assessment
4. Radio frequency-based moisture removal technology for grain conditioning
5. Automated handling systems reducing manual labor and human error



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### ▪ **Advanced Analytics and AI Integration**

#### ***Predictive Analytics***

1. Smart storage systems employ machine learning algorithms to analyze historical data and predict potential issues before they occur. These systems can forecast:
2. Equipment failures through predictive maintenance algorithms
3. Grain quality deterioration using temperature and humidity trend analysis
4. Pest infestation risks based on environmental conditions and historical patterns
5. Optimal storage conditions for different grain types and seasonal variations

#### ***Computer Vision and AI-Powered Pest Detection***

Advanced systems utilize YOLO-based deep learning models for automated pest detection and counting on grain surfaces. The YOLO-SGInsects model achieves 94.2% mean average precision in detecting tiny stored-grain insects, providing:

1. Real-time pest identification of species like rice weevil, red flour beetle, and grain borer
2. Automated counting capabilities with root mean squared error of 0.7913
3. Early warning systems for integrated pest management strategies

### ▪ **Blockchain-Based Traceability**

Smart warehouses integrate blockchain technology to ensure complete supply chain transparency and food safety. Blockchain systems provide:

1. Immutable record keeping of grain origin, quality parameters, and storage conditions
2. Real-time traceability from farm to consumer with 0.42-second average query delay
3. Smart contract automation for quality-based payment releases and compliance verification
4. Data recovery mechanisms ensuring system resilience and fault tolerance

### ▪ **RFID Technology for Inventory Management**

Radio Frequency Identification systems enable sophisticated inventory tracking without line-of-sight requirements:



## Foodgrain Warehouse Market in India 2025-2030

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### ***Core capabilities include:***

1. Real-time inventory updates with 95%+ accuracy improvement over manual methods
2. Simultaneous multi-item scanning reducing inventory audit time by 60-80%
3. Location tracking enabling precise item placement and retrieval
4. Automated stock level monitoring preventing stockouts and overstock situations

#### **▪ Automated Storage and Handling Systems**

### ***Smart Silo Technology***

1. Modern silos incorporate advanced automation for optimal grain management:
2. Automated loading and unloading systems with conveyor integration
3. Climate control systems maintaining optimal temperature and humidity
4. Aeration control automatically adjusting airflow based on grain conditions
5. Inventory management with real-time tonnage and volume calculations

### ***Robotic Systems***

Advanced warehouses deploy robotic solutions for material handling, including:

1. Automated Guided Vehicles (AGVs) for internal transportation
2. Vertical Lift Modules (VLM) optimizing storage space utilization
3. Robotic picking systems for order fulfillment and inventory management

#### **▪ Integrated Management Platforms**

### ***Warehouse ERP Systems***

Comprehensive software solutions coordinate all warehouse operations:

1. Real-time inventory tracking from raw materials to finished products
2. Demand forecasting using AI and machine learning algorithms
3. Resource optimization for space, equipment, and labor allocation
4. Regulatory compliance automation ensuring quality and safety standards

#### **▪ Predictive Maintenance Implementation**



### ***Equipment Health Monitoring***

IoT sensors continuously monitor critical machinery parameters:

1. Vibration analysis for bearing and motor health assessment
2. Temperature monitoring of electrical components and motors
3. Oil analysis through smart sensors detecting contamination
4. Pressure monitoring in hydraulic and pneumatic systems

### **4.3. Silo Infrastructure**

- **Modular Steel Silos:** Built with **galvanized or Zincalume steel**, often prefabricated for fast assembly.

Modular steel silos are increasingly being adopted for bulk foodgrain storage due to their durability, fast deployment, and low maintenance needs. These silos are typically constructed using galvanized steel or Zincalume steel—an alloy of zinc, aluminum, and silicon—that offers superior corrosion resistance and longevity, especially in harsh weather conditions.

The modular design allows for prefabrication at the factory, followed by rapid on-site assembly using bolted or riveted panels. This significantly reduces construction time compared to conventional godowns or concrete silos.

These come in various capacities, ranging from a few hundred to tens of thousands of metric tons, and are often equipped with accessories such as:

1. Aeration systems,
2. Temperature sensors,
3. Sweep augers, and
4. Automated loading/unloading conveyors.

Their cylindrical, vertical form allows for optimal land utilization, while the sealed structure helps prevent pest infestation and moisture ingress.

In countries like Brazil, and the U.S., modular steel silos are widely used by public storage agencies, private grain traders, and agro-logistics firms to improve food security and reduce post-harvest losses.

Due to their scalability and ease of integration with real-time monitoring and automated handling systems, modular steel silos have become a key component of tech-enabled warehousing infrastructure, supporting efficient storage, better quality control, and long-term preservation of grains.



## Foodgrain Warehouse Market in India 2025-2030

**Table 16: Core Features of Modular Steel Silos**

| Feature                     | Description                                                                                                      |
|-----------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Material</b>             | Galvanized Steel (Z275–Z600 coating) or <b>Zincalume</b> (aluminum-zinc alloy) for enhanced corrosion resistance |
| <b>Modular Construction</b> | Prefabricated panels bolted together onsite; modular rings allow for expansion                                   |
| <b>Roof Type</b>            | Conical or dome-shaped, typically with manholes, pressure relief valves, and vents                               |
| <b>Foundation</b>           | Concrete pads with anchor bolts; no deep foundations needed for most installations                               |
| <b>Lifespan</b>             | 25–40 years depending on coating, environment, and maintenance                                                   |

**Sources:** PHD Research Bureau, PHDCCI

**Table 17: Advanced Technologies and function**

| Technology                             | Function                                                                           |
|----------------------------------------|------------------------------------------------------------------------------------|
| <b>Bolt-Together Prefab Panels</b>     | Accelerates installation time; easy dismantling or relocation                      |
| <b>Laser-Cut Precision Engineering</b> | Ensures leak-proof construction and tight sealing                                  |
| <b>Galvanized/Zincalume Coating</b>    | Protects against rust, salt spray, and acidic vapors                               |
| <b>Aeration Floors with Air Ducts</b>  | Built-in aeration systems for temperature and moisture control                     |
| <b>Sensors &amp; IoT Monitoring</b>    | Grain temperature, CO <sub>2</sub> , humidity, and pest risk alerts                |
| <b>Dust Control Systems</b>            | Cyclone separators and filters reduce fine dust emissions during filling/discharge |
| <b>External Catwalks &amp; Ladders</b> | Access for inspection, maintenance, and safety compliance                          |

**Sources:** PHD Research Bureau, PHDCCI



## Foodgrain Warehouse Market in India 2025-2030

**Table 18: Key Benefits of Modular Steel Silos**

| Benefit                    | Description                                                             |
|----------------------------|-------------------------------------------------------------------------|
| <b>Fast Assembly</b>       | 20–30% faster than RCC silos; 1,000 MT silo built in ~30–45 days        |
| <b>Scalability</b>         | Modular design allows easy capacity expansion                           |
| <b>Low Maintenance</b>     | Zinc/aluminum coatings require less frequent repainting                 |
| <b>Space-Efficient</b>     | Vertical storage saves footprint compared to godowns                    |
| <b>Relocatable</b>         | Dismantle and reassemble as needed — ideal for lease-based land         |
| <b>Lower Initial CapEx</b> | Especially in 2,000–10,000 MT scale vs. RCC silos                       |
| <b>Grain Protection</b>    | Airtight sealing supports CA fumigation or hermetic storage integration |

**Sources:** PHD Research Bureau, PHDCCI

**Table 19: Global & Indian Use Cases**

| Country       | Application                  | Example                                                   |
|---------------|------------------------------|-----------------------------------------------------------|
| <b>India</b>  | FCI, private agro-logistics  | Adani Agri Logistics uses modular silos in PUN, MP, AP    |
| <b>Brazil</b> | Soybean & maize export hubs  | Modular galvanized silos used at Port of Santos           |
| <b>Turkey</b> | Wheat & barley cooperatives  | Local manufacturers like Mysilo deliver prefab silo farms |
| <b>Egypt</b>  | National wheat storage       | USAID-funded zincalume silos in grain-deficit zones       |
| <b>USA</b>    | On-farm corn & wheat storage | GSI, Brock, Sukup modular silos dominate Midwestern farms |

**Sources:** PHD Research Bureau, PHDCCI

### ▪ **Modular Silo Comparison with Reinforced Cement Concrete (RCC) Silos**

Modular and RCC (Reinforced Cement Concrete) silos offer distinct advantages and disadvantages for storage, particularly in industrial settings. Modular silos, often made of steel, are known for their ease of construction, quicker installation, and portability, making them suitable for various locations and temporary storage needs.

RCC silos, on the other hand, are typically more durable, offer greater height and capacity, and are better suited for long-term, stationary storage. The choice between the two depends on specific requirements, including storage capacity, location, and budget.

**Table 20: Key features of Distinction between Modular and RCC Silos**

| Criteria                        | Modular Steel            | RCC Silos                            |
|---------------------------------|--------------------------|--------------------------------------|
| <b>Build Time</b>               | 1–2 months               | 6–9 months                           |
| <b>Expandability</b>            | Easy modular add-ons     | Not scalable once built              |
| <b>Corrosion Resistance</b>     | High (with coatings)     | Medium (depends on concrete quality) |
| <b>Fumigation Compatibility</b> | High (airtight possible) | Medium                               |
| <b>Relocation</b>               | Yes                      | No                                   |
| <b>Cost (per MT)</b>            | Medium                   | High (especially in small scale)     |

**Sources:** PHD Research Bureau, PHDCCI

- **Flat-Bottom vs. Hopper-Bottom Silos:** Flat-bottom for long-term storage; hopper-bottom for faster discharge. Silos range from **100 tons to 20,000+ tons**, with cluster design for mega grain parks.

Flat-bottom and hopper-bottom silos are two primary types of storage structures used for bulk materials, each with distinct advantages and disadvantages depending on the application. Flat-bottom silos are typically used for large-scale, long-term storage due to their higher capacity and ability to store large volumes of materials.

Hopper-bottom silos, on the other hand, are favored for smaller operations requiring frequent unloading, as their conical or sloped bottoms facilitate efficient material discharge.

**Table 21: Key features of Distinction between Flat-Bottom Silo and Hopper-Bottom Silo**

| Criteria               | Flat-Bottom Silo                                        | Hopper-Bottom Silo                              |
|------------------------|---------------------------------------------------------|-------------------------------------------------|
| Bottom Design          | Flat concrete base with central/side discharge          | Conical steel or concrete hopper-shaped bottom  |
| Discharge Method       | Requires mechanical unloading (sweep augers, conveyors) | Gravity-based discharge; minimal mechanical aid |
| Grain Residue          | Some leftover grain; manual/sweep clean-out needed      | Minimal residue; self-cleaning design           |
| Capacity Range         | Medium to very large (1,000 – 50,000+ MT)               | Small to medium (50 – 5,000 MT)                 |
| Foundation Requirement | Heavy-duty flat civil base                              | Elevated steel/concrete structure               |



## Foodgrain Warehouse Market in India 2025-2030

| Criteria                 | Flat-Bottom Silo                                           | Hopper-Bottom Silo                                       |
|--------------------------|------------------------------------------------------------|----------------------------------------------------------|
| Construction Cost        | Lower cost per MT                                          | Higher due to steel/concrete cone base                   |
| Best Suited For          | Long-term storage (months/year)                            | Short-term storage, daily operations, dispatch           |
| Space Utilization        | Good for large farms/logistics parks                       | Requires more vertical space, less efficient laterally   |
| Cleaning & Maintenance   | Higher effort; manual intervention needed                  | Easier to clean and maintain                             |
| Common Uses              | Wheat, maize, rice long-term bulk storage (e.g. FCI silos) | Feed mills, grain traders, seed processing, smaller FPOs |
| Automation Compatibility | Supports full SCADA + sensors + conveyors                  | Compatible with basic to moderate automation             |
| Loading Rate             | Moderate (depends on auger capacity)                       | Fast loading/unloading via gravity                       |
| Installation Time        | Slightly longer due to civil works                         | Faster setup, especially for prefab hoppers              |

**Sources:** PHD Research Bureau, PHDCCI

- **Insulated Panels:** To protect from external temperature fluctuations.

Insulated panels are increasingly being used in foodgrain warehousing to protect stored commodities from external temperature fluctuations, which can otherwise lead to moisture condensation, pest activity, and quality degradation.

These panels are typically made of sandwich structures, consisting of:

1. Core insulation material—such as polyurethane foam (PUF), expanded polystyrene (EPS), or
2. Mineral wool—encased between two outer metal sheets, often galvanized or pre-coated steel
3. The high thermal resistance (R-value) of these panels helps maintain stable internal temperatures inside storage units or silos, even in regions with extreme climates.

In silo enclosures, insulated panels are commonly used for roofing, sidewalls, and partitioning. They act as a thermal barrier, reducing the rate of heat transfer from outside to inside, thereby minimizing the risk of grain sweating, mold growth, and insect infestation.

In addition to thermal insulation, these panels also provide soundproofing, fire resistance, and structural rigidity, making them suitable for long-term use in both permanent and semi-permanent storage facilities.



## Foodgrain Warehouse Market in India 2025-2030

By stabilizing internal conditions, insulated panels help preserve grain quality, extend shelf life, and reduce the need for energy-intensive cooling or fumigation. Their modular design allows for quick installation, and they can be integrated with ventilation systems, smart sensors, and other automation technologies, making them a valuable component in climate-resilient warehousing infrastructure.

- **Hermetic Sealing:** Airtight structures to prevent moisture and pest ingress—critical for reducing losses.

Hermetic sealing is a technology used in foodgrain storage to create an airtight, gas-tight environment that naturally controls pests and preserves grain quality without the use of chemicals. In a hermetically sealed system—whether it’s a bag, bin, or silo—the oxygen inside the container is gradually depleted due to the respiration of insects and microorganisms, while carbon dioxide levels increase.

This modified atmosphere inhibits the growth of fungi and kills insects by suffocation, typically within a few days to weeks, depending on temperature and grain condition.

Common materials used for hermetic sealing include multi-layer polymer liners, PVC-coated fabrics, or specialized metal containers with tightly secured lids and valves. The technology is especially effective for smallholder farmers, cooperatives, and emergency grain reserves in regions with limited access to chemical fumigants or cold storage.

Benefits of hermetic storage include zero chemical residue, longer shelf life, protection from moisture ingress, and reduced storage losses (often <1% compared to 10–15% in traditional bags). It also helps maintain germination quality, making it suitable for seed storage. Hermetic sealing is widely adopted in Africa, Asia, and Latin America through products like PICS (Purdue Improved Crop Storage) bags, GrainPro cocoons, and airtight metal silos.

Overall, hermetic sealing is a low-cost, eco-friendly, and scalable solution for safe, decentralized, and chemical-free grain storage, playing a vital role in food security and post-harvest loss reduction.

**Table 22: Comparison: Hermetic Sealing versus Traditional Fumigation**

| Feature          | Hermetic Sealing                                                      | Traditional Fumigation                                            |
|------------------|-----------------------------------------------------------------------|-------------------------------------------------------------------|
| Mechanism        | Oxygen depletion, CO <sub>2</sub> buildup creates modified atmosphere | Use of toxic gases (e.g. phosphine, methyl bromide) to kill pests |
| Chemical Residue | None                                                                  | Leaves chemical traces; requires aeration                         |
| Pest Control     | Highly effective against insects, molds                               | Highly effective but may develop resistance over time             |
| Health & Safety  | Safe for users and environment                                        | Hazardous to humans; requires trained personnel                   |
| Storage Duration | Up to 12–24 months                                                    | Short-term control; may require repeat                            |



## Foodgrain Warehouse Market in India 2025-2030

| Feature               | Hermetic Sealing                  | Traditional Fumigation                           |
|-----------------------|-----------------------------------|--------------------------------------------------|
|                       |                                   | application                                      |
| Suitability for Seeds | Excellent (preserves germination) | Risk of seed viability reduction                 |
| Cost (long-term)      | Low to moderate; reusable         | Moderate to high; recurring chemical cost        |
| Infrastructure Needs  | Portable or fixed sealed units    | Requires airtight space, chemical handling tools |
| Environmental Impact  | Eco-friendly, no emissions        | Ozone-depleting gases; environmental risk        |
| Adoption Regions      | Smallholders, NGOs, seed banks    | Warehouses, exporters, ports                     |

**Sources:** Compiled by PHD Research Bureau, PHDCCI, from different sources

**Table 23: Global & Indian Use Cases of Hermetic Storage Adoption**

| Location Organization                | Technology Used      | Grain Type            | Outcome                                     | Impact                                            |
|--------------------------------------|----------------------|-----------------------|---------------------------------------------|---------------------------------------------------|
| Kenya (World Food Programme)         | GrainPro Cocoons     | Maize                 | Reduced post-harvest losses from 30% to <2% | Improved food security and inventory control      |
| India (Bihar, by NGOs)               | PICS Bags            | Paddy, Wheat, Lentils | Insect-free storage for 9+ months           | Farmers earned 10–15% more by delaying sale       |
| Philippines (IRRI)                   | EcoPro Dry Bags      | Rice                  | Maintained seed viability for 12 months     | Helped with decentralized seed distribution       |
| Guatemala (Catholic Relief Services) | Metal Hermetic Silos | Beans, Maize          | Community-led fabrication and training      | Created rural microenterprises and reduced losses |
| Tanzania (AGRA Program)              | PICS Bags + Training | Sorghum, Millet       | Post-harvest losses dropped from 20% to <3% | Scaled to 100,000+ households                     |

### 4.4. Warehouse Automation

Automation boosts operational efficiency and ensures consistent grain quality.

- **Automated Conveyor Belts & Elevators:** For grain infeed/outfeed with minimal manual handling.

Automated conveying systems move foodgrains **into, within, and out of** silos efficiently and with minimal human intervention. They reduce grain breakage and contamination,



## Foodgrain Warehouse Market in India 2025-2030

optimize loading/unloading time, ensure consistent grain flow and support real-time inventory control. Key components of the technologies are as below:

**Table 24: Key Components & Technologies**

| Component                        | Description                                                                                                                                    |
|----------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------|
| Belt Conveyors                   | Flat or trough-shaped belts used to move grain horizontally or at a slight incline. Ideal for high-volume, low-energy transport.               |
| Bucket Elevators                 | Vertical lifting devices using buckets attached to a belt or chain. Used to move grain to the top of silos or distribute across multiple bins. |
| Chain Conveyors (Drag Conveyors) | Use paddles or flights attached to chains in a trough. Good for moving grain horizontally with minimal damage.                                 |
| Screw Conveyors                  | Helical screw inside a tube; used for short-distance transport or for metering grain into dryers or bins.                                      |
| Telescopic Chutes/Spouts         | Extendable delivery systems that reduce grain dust and damage during silo filling.                                                             |
| Distributors/Valves              | Direct grain to specific bins/silos with precision based on automation controls.                                                               |

**Sources:** PHD Research Bureau, PHDCCI

**Table 25: World Examples including India**

| Country   | Application               | Example                                                                                                    |
|-----------|---------------------------|------------------------------------------------------------------------------------------------------------|
| India     | FCI & Adani silo projects | <b>Automated bucket elevators and belt conveyors</b> in states like Punjab & Bihar.                        |
| USA       | Midwest grain terminals   | <b>Cargill</b> uses <b>chain conveyors and belt systems</b> linked to remote SCADA systems.                |
| Brazil    | Port terminals            | Bunge's export silos use high-speed <b>bucket elevators</b> with telescopic chutes for soybeans and maize. |
| Australia | Inland storage            | <b>GrainCorp</b> deploys <b>drag conveyors</b> and auto distributors in silo clusters.                     |

**Sources:** PHD Research Bureau, PHDCCI

- **Pneumatic Grain Transfer Systems:** Less friction and damage compared to mechanical systems.

Pneumatic systems use air pressure (positive or negative) to move grains through pipelines, rather than using belts, chains, or screws. They're ideal for clean, damage-free, and flexible grain transfer, especially in tight or vertical spaces. Typical



## Foodgrain Warehouse Market in India 2025-2030

applications include -Inter-silo transfer within a storage terminal, feeding grains into processing or packaging units, and Ship loading/unloading at ports.

**Table 26: Core Components of Pneumatic Grain Transfer**

| Component                 | Description                                                                          |
|---------------------------|--------------------------------------------------------------------------------------|
| Airlock Feeder            | Feeds grain into an airstream without losing pressure (e.g., rotary valve).          |
| Blower/Compressor         | Creates airflow; size depends on distance and capacity.                              |
| Piping/Tubing             | Usually made of steel or abrasion-resistant polymer; connects intake to destination. |
| Cyclone Separator         | Separates grain from air at the delivery end.                                        |
| Filters & Dust Collectors | Remove grain dust from airflow, ensuring safety and cleanliness.                     |

**Sources:** PHD Research Bureau, PHDCCI

**Table 27: Advantages over Mechanical Conveyors**

| Feature          | Pneumatic System                                 | Mechanical Conveyors                       |
|------------------|--------------------------------------------------|--------------------------------------------|
| Grain Breakage   | Minimal                                          | Higher (especially with screws and chains) |
| Flexibility      | Highly flexible layout                           | Requires fixed routing                     |
| Space Efficiency | Compact                                          | Larger footprint                           |
| Cleanliness      | Cleaner, enclosed system                         | More prone to dust and spillage            |
| Remote Transfer  | Can transfer over 100m (horizontally/vertically) | Limited reach                              |
| Maintenance      | Fewer moving parts                               | More wear-prone parts                      |

**Sources:** PHD Research Bureau, PHDCCI

**Table 28: Global & Indian Use Cases**

| Country | Use Case               | Example                                                                                                                     |
|---------|------------------------|-----------------------------------------------------------------------------------------------------------------------------|
| India   | Modern grain terminals | <b>Silo complexes</b> (e.g., in Madhya Pradesh and Haryana) using pneumatic conveyors to move rice/wheat into sealed silos. |
| Brazil  | Soybean export silos   | Pneumatic systems used by <b>Bunge and Cargill</b> for damage-free bulk transfer.                                           |



## Foodgrain Warehouse Market in India 2025-2030

|       |                        |                                                                                            |
|-------|------------------------|--------------------------------------------------------------------------------------------|
| China | Urban food reserves    | Pneumatic systems used for <b>low-noise grain intake</b> in city-based underground silos.  |
| USA   | Corn and wheat storage | Used at <b>processing plants and elevators</b> for precision feeding into silos or dryers. |

Sources: PHD Research Bureau, PHDCCI

### Limitations

1. **Energy consumption** can be higher than mechanical systems.
  2. Best suited for **short-to-medium distances** and gentle transfer needs.
  3. Not ideal for **very large throughput (>200 tons/hour)** unless scaled up significantly.
- **Robotic Grain Samplers:** Automated grain sampling during intake and dispatch for quality checks.

Robotic grain samplers are automated systems that collect representative grain samples from trucks, wagons, or conveyor belts without manual intervention. They are used to ensure accurate quality control before grain enters storage silos or is dispatched for sale/export.

**How They Work: Automated Arm or Probe** extends into a grain truck, container, or belt and extracts **sample** from multiple depths and locations to avoid sampling bias. Subsequently, **sample is transferred** via tubes or conveyor to an on-site **grain lab** for testing (moisture, foreign matter, protein content, etc.). Sampling results are logged and often linked to **ERP, WMS, or traceability systems**.

**Table 29: Types of Robotic Grain Samplers**

| Type                   | Application                                   | Key Features                                          |
|------------------------|-----------------------------------------------|-------------------------------------------------------|
| Truck Samplers         | Sampling from trucks or tippers at silo entry | Robotic boom arm with vacuum or screw probe           |
| Conveyor Belt Samplers | Inline sampling during grain flow             | Rotary cutter or diverter integrated with belt system |
| Railcar Samplers       | Sampling bulk grain from wagons               | Hydraulic arms with automated position control        |
| Lab Samplers           | Distributes and divides samples for analysis  | Robotic sample dividers and conveyors                 |

Sources: PHD Research Bureau, PHDCCI

**Table 30: Global & Indian Use Cases of Robotic Grain Samplers**

| Country | Use Case                                      | Example                                                                        |
|---------|-----------------------------------------------|--------------------------------------------------------------------------------|
| India   | Entry-point quality control at silo complexes | FCI/Adani silos with <b>automated robotic samplers</b> at truck unloading bays |
| USA     | Pre-storage sampling in grain elevators       | Cargill uses robotic samplers linked to <b>digital grain testing labs</b>      |
| Brazil  | Soy and maize export terminals                | <b>Inline conveyor samplers</b> used by Bunge and Amaggi before bulk loading   |
| China   | High-throughput storage hubs                  | Robotic arms at <b>urban grain reserves</b> reduce manpower and time           |

- **Weighbridges & Auto-Weighing Units:** Integrated with software for instant data capture.

Weighbridges (Truck Scales) are large, platform-based scales used to weigh trucks before and after loading/unloading grain to determine net grain weight and Auto-Weighing Units are integrated or standalone systems for precise, real-time grain weight measurement during silo intake, transfer, or bagging. Fully automated versions can operate without human input.

**Table 31: Types of Auto-Weighing Systems**

| Type                       | Description                                                           | Usage                                  |
|----------------------------|-----------------------------------------------------------------------|----------------------------------------|
| Surface Weighbridge        | Mounted on a concrete slab; trucks drive over it                      | Ideal for silo yards and terminals     |
| Pit-Type Weighbridge       | Installed flush with ground; easy access for vehicles                 | Urban or space-constrained areas       |
| In-Motion Weighing Systems | Weigh trucks while moving slowly (dynamic weighing)                   | High-throughput check-in points        |
| Hopper Weighers            | For continuous weighing during grain transfer                         | Used inside silos and conveyors        |
| Bagging Weighers           | Precision weighing while filling sacks or bulk bags                   | Warehouse dispatch or export packaging |
| Batch Weighers             | Measures specific grain quantities before sending to dryers or mixers | Common in milling/feed industries      |

**Sources:** PHD Research Bureau, PHDCCI



## Foodgrain Warehouse Market in India 2025-2030

**Table 32: Key benefits of Auto-Weighing Systems**

| Feature            | Advantage                                                          |
|--------------------|--------------------------------------------------------------------|
| High Accuracy      | Precision up to $\pm 10$ kg on heavy vehicles                      |
| Faster Turnaround  | Reduces vehicle waiting time and bottlenecks                       |
| Less Human Error   | No manual data entry; fully automated weighing logs                |
| Inventory Accuracy | Real-time stock weight updates during intake and dispatch          |
| Compliance         | Supports government inspection and audit trails (FSSAI, FCI norms) |

**Sources:** PHD Research Bureau, PHDCCI

**Table 33: Global & Indian Use Cases of Auto-Weighing Systems**

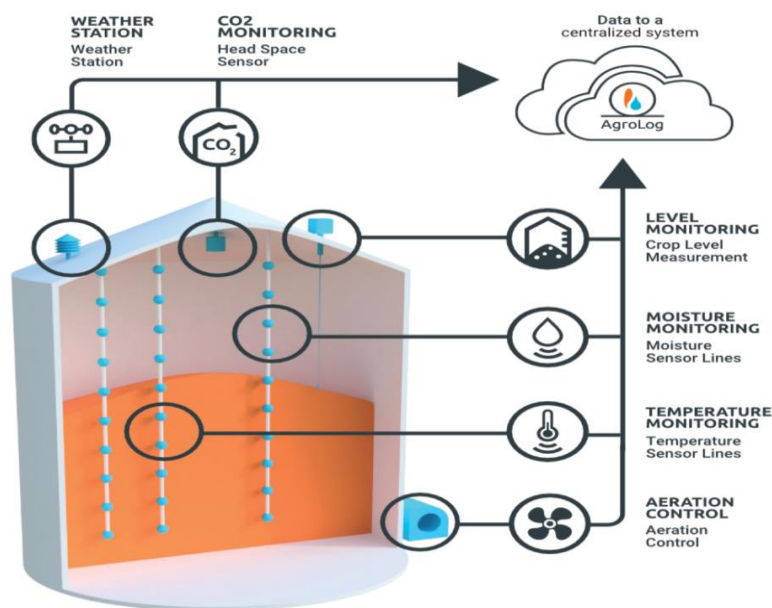
| Country | Application                    | Example                                                                               |
|---------|--------------------------------|---------------------------------------------------------------------------------------|
| India   | FCI/Adani silo complexes       | Entry/exit <b>pit weighbridges with RFID</b> , linked to eNWR systems                 |
| USA     | Grain elevators and processors | <b>In-motion and hopper weighers</b> integrated with SCADA and ERP                    |
| Brazil  | Port terminals                 | <b>Automated weighbridges</b> with biometric truck access at soybean terminals        |
| China   | Urban grain depots             | Smart <b>bagging weighers with IoT sensors</b> used for urban reserve grain packaging |

**Sources:** PHD Research Bureau, PHDCCI

- **Smart Aeration Systems:** Controlled fan-based systems to dry and cool grains uniformly using data inputs.

Smart aeration systems for foodgrains are advanced technologies designed to optimize the management of stored grain by controlling airflow, temperature, and humidity within grain storage silos to maintain grain quality, prevent spoilage, and reduce pest infestations.

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Source: <https://www.agrolog.io/news/optimizing-grain-storage-with-smart-grain-monitoring-systems>

**Table 34: Key aspects of Smart aeration systems**

| Aspect                                  | Description                                                                                                               |
|-----------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| <b>Optimal Management</b>               | <b>Airflow</b> Airflow rates of 2-4 L/s/t for cooling, 15-25 L/s/t for drying to maintain grain temperature and moisture. |
| <b>Automated Controllers</b>            | Use sensors to monitor grain temperature and humidity; dynamically adjust fan operation for efficiency.                   |
| <b>Energy Efficiency</b>                | Smart control and optimized fans reduce power consumption and wear, balancing airflow with cost savings.                  |
| <b>Grain Quality &amp; Pest Control</b> | Prevents hot spots, mold, and insect infestations by maintaining ideal environmental conditions in storage.               |
| <b>System Components</b>                | Includes fans, ducts, vents, and smart controllers integrated with sensors for real-time monitoring.                      |
| <b>Aeration Fan Selection</b>           | Choose fans based on airflow and backpressure; consider fan curves and system backpressure for performance.               |
| <b>Backpressure Consideration</b>       | Grain type, packing, and duct design influence backpressure; must be accounted for in system design.                      |
| <b>Application Examples</b>             | Turnkey smart aeration systems are expandable to multiple silos, enabling remote real-time control.                       |
| <b>Storage Environment Adaptation</b>   | Systems adjust for ambient conditions especially in tropical regions with higher temperature and humidity.                |

Sources: PHD Research Bureau, PHDCCI



## Foodgrain Warehouse Market in India 2025-2030

While much of the publicly available detailed product information focuses on slurry and manure aeration systems, the principles of controlled, automated aeration extend similarly to grain storage applications, emphasizing automated control and energy-efficient air delivery for optimal quality preservation.

**Table 35: Global & Indian Use Cases of Advanced Smart Aeration Systems**

| Country | Use Case                                  | Example                                                                                     |
|---------|-------------------------------------------|---------------------------------------------------------------------------------------------|
| India   | Modern grain storage silos (PPP projects) | FCI & Adani silos using <b>automated aeration with embedded sensors</b>                     |
| USA     | Corn & soybean storage bins               | <b>OPI Blue &amp; BinManager systems</b> used across Midwest for real-time aeration control |
| Brazil  | Soybean & maize silos                     | Smart fans and <b>CO<sub>2</sub>-based alerts</b> used by Amaggi and Bunge terminals        |
| Canada  | Wheat & barley storage                    | Cloud-based aeration using weather-synced fan control                                       |
| China   | Urban grain depots                        | Aeration linked to <b>central SCADA</b> and <b>blockchain traceability</b>                  |

Source: PHD Research Bureau, PHDCCI

### 4.5. Real-Time Monitoring Systems: IoT

Real-time monitoring systems using IoT (Internet of Things) are revolutionizing foodgrain storage by providing continuous, automated, and remote tracking of critical parameters inside storage silos, warehouses, and bins. These systems help to minimize spoilage, streamline inventory management, and improve overall grain quality and value. These devices enable real-time monitoring in agricultural warehouses, and with cloud-based dashboards, managers can view and analyse this data from anywhere. This ensures a proactive approach rather than a reactive one.

**Table 36: Key Features of IoT-Based Real-Time Monitoring for Foodgrains**

| Feature                                     | Description                                                                                                                |
|---------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| <b>Sensor Networks</b>                      | Deploy sensors to monitor temperature, humidity, CO <sub>2</sub> , grain level, vibration, or weight inside storage units. |
| <b>Data Connectivity</b>                    | Transmits sensor data via Wi-Fi, LoRaWAN, or GSM to controllers or cloud platforms for remote real-time access.            |
| <b>Automated Alerts &amp; Early Warning</b> | Sends real-time alarms (SMS, email, notification) if any parameter exceeds preset safety thresholds.                       |
| <b>Remote Control &amp; Automation</b>      | Enables automated or remote activation of fans, cooling, or pest controls to optimize storage conditions.                  |



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|                                               |                                                                                                                   |
|-----------------------------------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Data Logging and Analytics</b>             | Provides timestamped logs, trend analysis, and predictive analytics for spoilage risk and inventory optimization. |
| <b>Enhanced Traceability &amp; Compliance</b> | Ensures full environmental storage records for food safety, traceability, and regulatory compliance.              |

Source: PHD Research Bureau, PHDCCI

**Table 37: Key Benefits of IoT-Based Real-Time Monitoring for Foodgrains**

| Benefit                        | Impact                                                   |
|--------------------------------|----------------------------------------------------------|
| <b>Reduces spoilage</b>        | Up to <b>30% reduction</b> in post-harvest losses        |
| <b>Saves energy</b>            | Cuts unnecessary fan operation by <b>30–50%</b>          |
| <b>Preserves grain quality</b> | Maintains optimal <b>moisture content and appearance</b> |
| <b>Enables traceability</b>    | Conditions logged for <b>audit/compliance/export</b>     |
| <b>Integrates with ERP</b>     | Works with WMS, SCADA, or blockchain food safety systems |

### 4.6. Integrated Pest & Quality Management

- **Non-chemical Fumigation:** E.g., controlled atmosphere (CO<sub>2</sub>/N<sub>2</sub> flushing), hermetic sealing. Conventional fumigants like **phosphine** and **methyl bromide** are increasingly regulated due to:
- **Toxic residues** in grains
- **Resistance in pests**
- **Worker safety issues**
- **Export restrictions** (e.g., EU regulations)

**Table 38: Emerging Non-Chemical Fumigation Methods**

| Technology                                         | Description                                                               | Target Pests              | Pros                         | Limitations                           |
|----------------------------------------------------|---------------------------------------------------------------------------|---------------------------|------------------------------|---------------------------------------|
| <b>Controlled Atmosphere (CA)</b>                  | Replaces oxygen with CO <sub>2</sub> or N <sub>2</sub> to suffocate pests | Insects & larvae          | No residues, widely accepted | Slow (5–21 days)                      |
| <b>Hermetic Storage (e.g., PICS Bags, Cocoons)</b> | Airtight enclosures cause O <sub>2</sub> depletion and pest death         | All grain insects         | Low-cost, chemical-free      | Not scalable beyond 100 tons easily   |
| <b>Thermal Fumigation (Hot)</b>                    | Grain exposed to 50–60°C to kill pests                                    | Insects (all life stages) | Fast (1–3 hrs), residue-free | High energy use, careful temp control |



## Foodgrain Warehouse Market in India 2025-2030

| Technology                                          | Description                                              | Target Pests              | Pros                        | Limitations                                             |
|-----------------------------------------------------|----------------------------------------------------------|---------------------------|-----------------------------|---------------------------------------------------------|
| <b>Air or Heat Treatment)</b>                       |                                                          |                           |                             | needed                                                  |
| <b>Ozone (O<sub>3</sub>) Fumigation</b>             | Ozone gas kills pests by oxidation                       | Stored grain pests        | Fast, eco-friendly          | Needs onsite O <sub>3</sub> generator; safety protocols |
| <b>Microwave &amp; Radio Frequency (RF) Heating</b> | Heats grain uniformly to kill internal insects           | Internal & external pests | Penetrates kernels, uniform | Expensive setup                                         |
| <b>Vacuum Treatment</b>                             | Low pressure removes air and kills insects due to anoxia | Eggs, larvae, pupae       | No chemicals, fast          | Requires sealed vacuum chamber                          |
| <b>UV-C Radiation + Airflow</b>                     | Surface disinfestation using UV lamps & forced air       | Surface mold, insects     | Compact, energy-efficient   | Only surface-level effectiveness                        |

Source: PHD Research Bureau, PHDCCI

**Table 39: Global & Indian Use Cases of Emerging Non-Chemical Fumigation Methods**

| Country          | Technology                            | Application Example                                                                                            |
|------------------|---------------------------------------|----------------------------------------------------------------------------------------------------------------|
| <b>India</b>     | Controlled Atmosphere & Hermetic Bags | Warehouses in Madhya Pradesh use <b>Eco2Fume</b> (CO <sub>2</sub> -based); <b>PUSA cocoons</b> promoted by FCI |
| <b>USA</b>       | Ozone & RF Treatment                  | RF treatment used for <b>organic grain exporters</b> ; Ozone used by eco-storage operators                     |
| <b>Australia</b> | Nitrogen Fumigation & Hermetic Silos  | CSIRO recommends CA systems for grain exporters                                                                |
| <b>Brazil</b>    | Heat & Vacuum Treatments              | Used in maize and coffee silos for <b>residue-free</b> export                                                  |
| <b>China</b>     | Microwave & Controlled Atmosphere     | Urban reserves use <b>hybrid tech</b> (ozone + CA) to meet food safety goals                                   |

Source: PHD Research Bureau, PHDCCI



## Foodgrain Warehouse Market in India 2025-2030

**Table 40: Benefits of Non-Chemical Fumigation**

| Benefit                | Description                               |
|------------------------|-------------------------------------------|
| Zero Residue           | Meets organic/export requirements         |
| Broad-Spectrum Control | Effective on resistant pest strains       |
| Worker-Safe            | No toxic gases or PPE-intensive handling  |
| Eco-Friendly           | No impact on soil, air, or groundwater    |
| Compliant              | Accepted by EU, USFDA, Codex Alimentarius |

Source: PHD Research Bureau, PHDCCI

**Table 41: Non-Chemical Fumigation Technology Comparison Matrix**

| Technology                                                     | Cost US\$ per MT (Approx.) | Time Required          | Scalability                 | Residue-Free | Best For                                  |
|----------------------------------------------------------------|----------------------------|------------------------|-----------------------------|--------------|-------------------------------------------|
| Controlled Atmosphere (CA)(CO <sub>2</sub> or N <sub>2</sub> ) | \$5–15                     | 5–21 days              | High (silo/warehouse scale) | Yes          | Large-scale grain silos, export grain     |
| Hermetic Storage(e.g., PICS Bags, Cocoons)                     | \$1–3                      | 7–15 days              | Low–Medium (small lots)     | Yes          | Farmer-level or small warehouse use       |
| Heat Treatment(Hot Air 50–60°C)                                | \$10–20                    | 2–6 hours              | Medium (batch-based)        | Yes          | Mills, seed storage, silo cleaning        |
| Ozone (O <sub>3</sub> ) Fumigation                             | \$4–10                     | 2–24 hours             | Medium–High                 | Yes          | Silo chambers, short-term disinfestation  |
| Microwave / RF Heating                                         | \$15–40                    | 30 mins – 2 hrs        | Low–Medium (batch)          | Yes          | Premium/organic grains, seeds             |
| Vacuum Treatment                                               | \$10–25                    | 6–12 hours             | Low (sealed chamber)        | Yes          | Specialty grains, export packaging        |
| UV-C + Forced Air                                              | \$2–5                      | Minutes (surface only) | High (inline)               | Yes          | Surface mold/insect control pre-packaging |

Source: PHD Research Bureau, PHDCCI

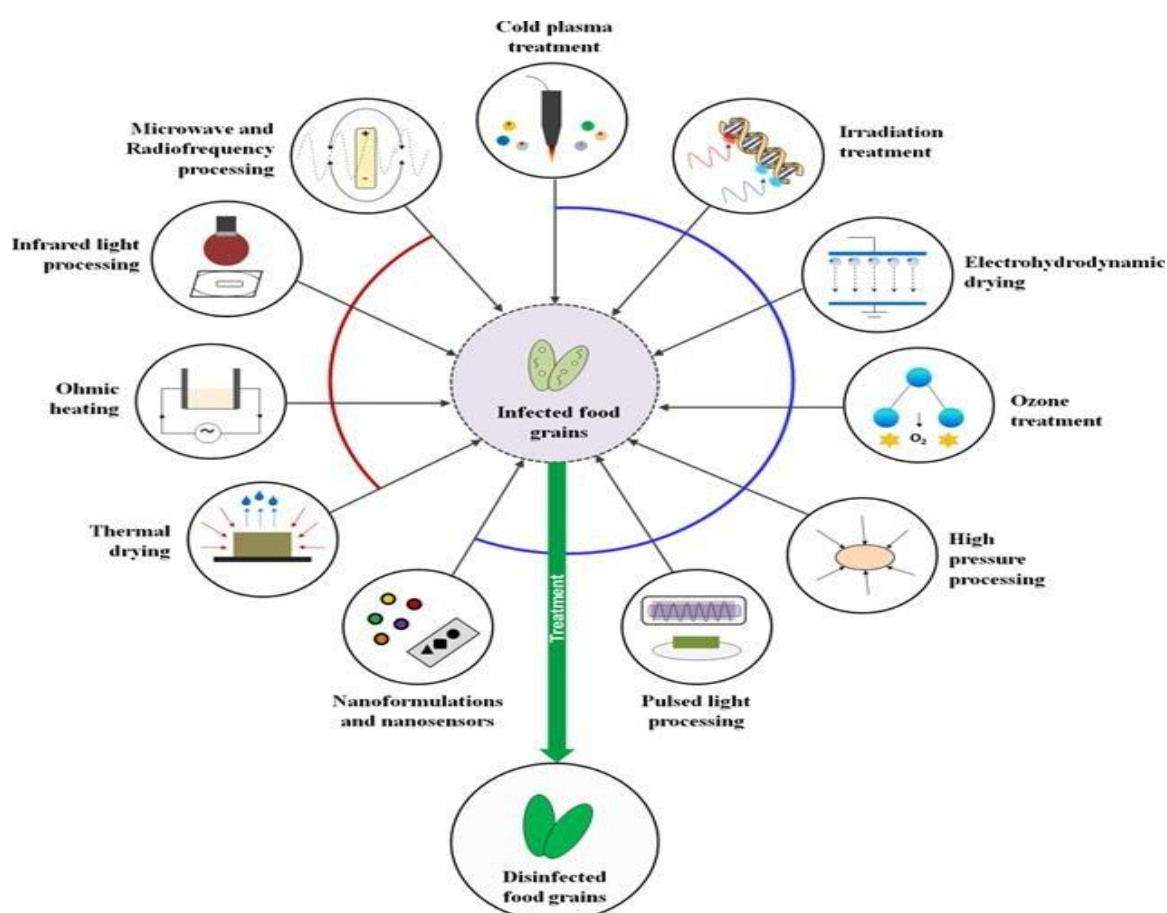
- **Infrared & Microwave Treatment:** For pest sterilization without chemical residue.

As food safety regulations tighten and consumer preferences shift toward chemical-free products, infrared (IR) and microwave (MW) technologies are emerging as sustainable, effective alternatives to conventional fumigation in foodgrain warehousing.

Infrared and microwave treatments are emerging as sustainable, non-chemical alternatives for pest sterilization in foodgrain warehousing. Traditional fumigation methods, such as the use of phosphine or methyl bromide, have long been used to control storage pests, but they come with significant drawbacks.

These include health hazards for workers, chemical residues that can contaminate food, environmental risks, and increasing pest resistance. Moreover, many countries are tightening regulations around chemical fumigants, especially for export-bound grains, creating a need for safer alternatives.

**Figure 13: Technologies for disinfection of food grains**



Source: <https://www.sciencedirect.com/science/article/abs/pii/S0963996921002957>

Infrared (IR) treatment works by emitting radiant heat that penetrates the surface layers of stored grains, effectively killing insects through protein denaturation. It is particularly effective against surface pests such as *Sitophilus* and *Tribolium* species. The method is energy-efficient, quick, and leaves no toxic residue, making it suitable for surface-level sterilization without affecting grain quality.

Microwave (MW) treatment, on the other hand, uses dielectric heating to generate heat from within the grain mass. Microwaves penetrate deep into the grain, heating pests faster than the grain itself, leading to their thermal death.

This method is especially effective against internal feeders like rice weevils that reside inside grain kernels. Microwave treatment ensures high pest mortality—often up to 100% in controlled trials—and, when properly calibrated, has minimal impact on grain germination and nutritional quality.

Both IR and MW technologies are environmentally friendly and align with global food safety standards, as they eliminate the need for chemical residues. They are also compatible with automated handling systems and can be integrated into silo or processing infrastructure.

However, challenges remain in terms of scaling, including the high initial investment costs and the need for specific calibration based on grain type and volume. Despite these hurdles, pilot projects in countries such as India, China, and Israel have demonstrated promising results, and some commercial grain mills in Europe and North America have already adopted these technologies.

In conclusion, infrared and microwave treatments represent a forward-looking, eco-friendly solution for pest control in foodgrain warehousing. Their ability to sterilize without chemicals supports both domestic food safety and international trade compliance, making them a vital tool for the future of grain storage.

### Why Move Beyond Chemical Fumigation?

**Conventional methods** use chemicals like phosphine or methyl bromide, which can leave residues and harm the environment. It is not only having health hazards for workers but also face regulatory restrictions (especially for exports). Further, it has created pest resistance and pose environmental and soil contamination risks.

**Table 42: Global & Indian Use Cases of modern non-chemical fumigation**

| Case Study                                    | Location / Institution                                                               | Treatment Type       | Grain Type | Target Pests                           | Key Findings                                                         | Outcome                                                                          |
|-----------------------------------------------|--------------------------------------------------------------------------------------|----------------------|------------|----------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------|
| <b>1. Microwave Treatment in Rice Storage</b> | CIPHET (Central Institute of Post-Harvest Engineering and Technology), Punjab, India | Microwave (2.45 GHz) | Rice       | <i>Sitophilus oryzae</i> (rice weevil) | >98% pest mortality; no effect on germination or nutritional quality | Proven safe and effective; recommended for integration into post-harvest systems |
| <b>2. Infrared Radiation for Wheat</b>        | Kansas State University,                                                             | Infrared             | Wheat      | <i>Tribolium castaneum</i> (red flour  | Surface heating to 60–65°C for                                       | Effective for surface pests;                                                     |



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| Case Study                                             | Location / Institution                                  | Treatment Type | Grain Type                | Target Pests                                   | Key Findings                                                                   | Outcome                                                                     |
|--------------------------------------------------------|---------------------------------------------------------|----------------|---------------------------|------------------------------------------------|--------------------------------------------------------------------------------|-----------------------------------------------------------------------------|
| <b>Disinfestation</b>                                  | USA                                                     |                |                           | beetle), <i>Rhyzopertha dominica</i>           | 60 seconds killed >90% of pests                                                | potential for pre-milling treatment                                         |
| <b>3. Microwave Sterilization in Corn Silos</b>        | China Agricultural University, Beijing                  | Microwave      | Corn                      | <i>Sitophilus zeamais</i>                      | Mortality rate of 100% at optimal energy exposure; minimal grain moisture loss | Suitable for industrial-scale treatment; included in automated silo lines   |
| <b>4. Infrared Treatment for Organic Grain Storage</b> | Tel Aviv University, Israel                             | Infrared       | Barley and oats (organic) | General surface and internal feeders           | 85–95% pest mortality; no chemical use; retained organic certification         | Used in organic-certified facilities as an eco-friendly pest control method |
| <b>5. Pilot Trials in Pulses Warehousing</b>           | ICAR-IIPR (Indian Institute of Pulses Research), Kanpur | Microwave      | Chickpeas and lentils     | <i>Callosobruchus chinensis</i> (pulse beetle) | High efficacy; short exposure time; no quality degradation                     | Potential for adaptation in public distribution systems                     |

Source: PHD Research Bureau, PHDCCI

### ▪ Automated Quality Labs

**Automated Quality Labs** are transforming how foodgrain quality is assessed and managed during storage, procurement, and distribution. Traditionally, quality testing involved manual sampling, subjective grading, and laboratory delays. Today, portable and automated devices are bringing **speed, consistency, and objectivity** to quality control, especially in large-scale warehousing and public procurement systems.

One of the most impactful innovations is the use of **Portable Near-Infrared (NIR) Analyzers**. These devices can instantly analyze multiple quality parameters—including protein content, oil percentage, starch, and gluten—without damaging the sample. NIR analyzers are compact, field-ready, and often integrated with mobile apps or cloud dashboards. They allow for real-time decision-making during grain procurement and reduce dependence on centralized labs.

**Digital Moisture Meters** are another cornerstone of automated labs. Accurate moisture measurement is critical, as even a 1–2% deviation can lead to spoilage, fungal growth, or



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rejection during export. Modern meters use capacitance or resistance principles and are pre-calibrated for multiple crop types. Some advanced versions include Bluetooth connectivity and data logging features.

**Automated Grading Systems** use machine vision and AI to assess grain size, shape, color, and presence of foreign matter. These systems eliminate human bias and accelerate grading, which is especially valuable in government procurement schemes like India's MSP operations. Some systems are integrated with conveyor belts or sampling hoppers to continuously scan bulk grains.

Together, these technologies create a **smart, integrated quality control environment**, improving transparency, reducing disputes, and ensuring consistent quality across the supply chain. When connected to centralized Warehouse Management Systems (WMS), these tools help generate **digital quality certificates**, enable traceability, and support quality-linked payments to farmers and suppliers.

Here is a table of case studies showcasing the use of Automated Quality Labs — featuring Portable NIR Analyzers, Moisture Meters, and Automated Grading Systems — in foodgrain warehousing and procurement:

**Table 43: Global & Indian Use Cases of Automated Quality labs**

| Case Study                                  | Location / Institution                                                | Technology Used                                                 | Grain Type                 | Purpose                                                         | Key Findings / Outcomes                                                               |
|---------------------------------------------|-----------------------------------------------------------------------|-----------------------------------------------------------------|----------------------------|-----------------------------------------------------------------|---------------------------------------------------------------------------------------|
| 1. NIR Analyzers in MSP Procurement         | Food Corporation of India (FCI), Haryana & Punjab                     | Portable NIR Analyzers (e.g., FOSS, Bruker)                     | Wheat, Paddy               | Instant protein, gluten, and starch analysis during procurement | Reduced lab dependency; faster quality-based payment decisions; improved transparency |
| 2. Moisture Meter Integration in Warehouses | Warehousing Development and Regulatory Authority (WDRA), India        | Digital Moisture Meters with Bluetooth (e.g., GrainSense, Kett) | Wheat, Maize, Pulses       | On-spot moisture testing for storage and release decisions      | Improved stock rotation; minimized spoilage due to moisture misreporting              |
| 3. AI-based Grading in Mandis               | eNAM (Electronic National Agriculture Market), Multiple Indian States | Machine Vision Grading System                                   | Rice, Chickpeas, Groundnut | Automated grain grading for digital auctions                    | Faster auction cycles; elimination of grading disputes; farmer satisfaction improved  |
| 4. Cloud-linked NIR in Agribusiness         | Olam International, Nigeria & India                                   | Cloud-enabled NIR Devices                                       | Sesame, Cashew, Maize      | Centralized quality monitoring                                  | Real-time dashboard for remote QA                                                     |



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| Case Study                                    | Location / Institution   | Technology Used                            | Grain Type      | Purpose                                           | Key Findings / Outcomes                                                          |
|-----------------------------------------------|--------------------------|--------------------------------------------|-----------------|---------------------------------------------------|----------------------------------------------------------------------------------|
| Warehouses                                    |                          |                                            |                 | across silos and processing units                 | teams; enabled predictive stock dispatching                                      |
| 5. Portable Quality Lab Kits for Cooperatives | IFFCO Kisan, Maharashtra | Mobile Lab Kits (NIR + Moisture + Grading) | Sorghum, Pulses | Empower village-level FPOs for quality assessment | Enhanced farmer bargaining power; reduced rejection rates at procurement centers |

**Source:** PHD Research Bureau, PHDCCI

### 4.5 Advanced Data & Connectivity

- **Blockchain:** For traceability of grain from farm to storage to buyer.
- **Digital Twins:** Simulate warehouse operations and grain behavior under various scenarios.
- **5G/LoRaWAN Connectivity:** For seamless communication among silo sensors in remote areas.

#### Integration with IoT and Processing Data

Modern blockchain-enabled agri-food supply chains are increasingly integrating IoT sensors. These sensors monitor critical disinfection parameters (like temperature, humidity, pest presence) and upload data directly to the blockchain. This ensures:

- Real-time, verifiable logs of disinfection cycles,
- Recording of environmental conditions during storage and transport,
- Instant alerts and corrective actions via smart contracts should deviations from standards occur
- A Digital Twin is a real-time digital replica of a physical warehouse or storage system that simulates and predicts how grain and infrastructure behave under different conditions. Using data from IoT sensors (temperature, humidity, gas levels, grain flow), the digital twin models thermal behaviour, moisture migration, aeration efficiency, and even pest development.

This enables warehouse managers to test “what-if” scenarios—such as delayed fumigation, power outages, or seasonal shifts—without risking actual spoilage. It helps

optimize energy use, grain turnover, and preventive maintenance, ultimately improving shelf life and reducing losses.

**Table 44: Typical Digital Twin System Architecture**

| Layer                          | Functionality                                                                      |
|--------------------------------|------------------------------------------------------------------------------------|
| <b>Data Acquisition</b>        | IoT sensors monitor temperature, humidity, CO <sub>2</sub> , fill levels, etc.     |
| <b>Integration Layer</b>       | Connects with warehouse management, logistics, procurement, and trade platforms.   |
| <b>Analytics Engine</b>        | Runs simulations, forecasts inventory changes, and suggests interventions.         |
| <b>Visualization/Dashboard</b> | Provides real-time digital representation of the warehouse for staff and managers. |
| <b>Control Layer</b>           | Sends commands to systems: aeration, cooling, robots, or conveyor systems.         |

Source: PHD Research Bureau, PHDCCI

Digital twins are evolving to merge with AI/ML, enhancing predictive capabilities, and with blockchain, for tamper-proof audit trails. As adoption grows, expect increased requirements for standardization and interoperability throughout the global agri-food value chain.

**Figure 14: Warehouse Design and Layout Optimization**



Source: <https://addverb.com/digital-twin-in-warehouses-benefits-and-applications/>

Advanced wireless communication technologies like **5G** and **LoRaWAN** (Low Power Wide Area Network) are essential for connecting grain silos and warehouses in **remote or rural areas**. These networks ensure **real-time transmission** of sensor data (temperature, CO<sub>2</sub>, moisture, fill level) from across large, scattered sites.



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- **5G** supports high-speed data for video analytics, drone mapping, and digital twins, while **LoRaWAN** offers **long-range, low-power connectivity**, ideal for battery-powered devices in rural regions. Together, they enable **predictive alerts**, **centralized dashboards**, and **low-latency control**, making smart warehousing viable even in infrastructure-poor zones.

**Table 45: Summary Table of Advanced Technologies in Foodgrain Warehousing**

| Technology    | Function                                  | Key Benefits                                               | Typical Applications                                |
|---------------|-------------------------------------------|------------------------------------------------------------|-----------------------------------------------------|
| Blockchain    | Immutable record-keeping for traceability | End-to-end transparency, fraud reduction, buyer confidence | MSP procurement, exports, organic certification     |
| Digital Twins | Simulate and monitor warehouse operations | Predict spoilage, optimize aeration, reduce energy use     | Smart silos, logistics planning, remote diagnostics |
| 5G / LoRaWAN  | Wireless data transmission from sensors   | Real-time monitoring in remote areas, scalable networks    | Silo farms, remote warehouses, drone connectivity   |

Source: PHD Research Bureau, PHDCCI

**Table 46: Global Adoption of Silo Infra, Automation & Monitoring Technologies in Foodgrain Warehousing**

| Country | Key Focus                                      | Silo Infra                           | Automation                                        | Real-Time Monitoring                                                  | Example Projects/Companies                |
|---------|------------------------------------------------|--------------------------------------|---------------------------------------------------|-----------------------------------------------------------------------|-------------------------------------------|
| India   | Public sector modernization, reduce grain loss | Steel silos (25K–50K MT), PPP-based  | Conveyor systems, auto weighing, robotic samplers | IoT sensors (temp, humidity, CO <sub>2</sub> ), integrated dashboards | FCI, Adani Agri Logistics, Arya.ag, e-NAM |
| USA     | High-efficiency storage, large-scale logistics | Large silos (>50K MT), modular steel | Pneumatic conveyors, automated dryers             | BinSense, OPI Blue for remote monitoring & analytics                  | Cargill, CHS Inc., GSI Group              |
| Brazil  | Climate-resilient storage, export-grade grain  | Hermetic & galvanized silos          | Automated infeed/outfeed at terminals             | Remote platforms for spoilage detection, smart aeration               | Bunge, Amaggi, Coamo                      |



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| Country   | Key Focus                                   | Silo Infra                                    | Automation                              | Real-Time Monitoring                                  | Example Projects/Companies         |
|-----------|---------------------------------------------|-----------------------------------------------|-----------------------------------------|-------------------------------------------------------|------------------------------------|
| Australia | Export-ready logistics, climate control     | High-capacity silos with insulation           | Auto quality testing, smart dryers      | IoT-linked climate & stock tracking, drone inspection | GrainCorp, Viterro Australia       |
| China     | Food security, traceability, urban reserves | Climate-controlled, steel & underground silos | Fully automated logistics with robotics | AI-powered monitoring, blockchain traceability pilots | Sinograin, COFCO, Beidahuang Group |

**Source:** PHD Research Bureau, PHDCCI

# Section V: Foodgrain Storage Market in India



## 5. Foodgrain Storage Market in India

Storage which is an important marketing function, involves holding and preserving goods from the time they are produced until they are needed for consumption<sup>3</sup>. According to Food and Agriculture organization estimates, approximately one third of the food does not reach the consumer for whom it was grown, and the effort and money required to produce it are lost-forever. Thus, minimizing post-harvest losses is of immense importance.

Good quality and affordable warehousing infrastructure for agricultural commodities would allow the farmers to avoid distress sale of their produce as they can store their produce without quality loss and avail credit through pledging. Warehouses help reduce post-harvest losses, enabling producers/traders to take advantage of intertemporal price differences and thereby arbitrage opportunities and ensuring food security.

### 5.1 Function of storage facilities

1. **Creation of Time Utility:** Certain products are manufactured consistently throughout the year, while their consumption tends to be seasonal. Storage facilities allow these goods to be accessible to consumers whenever there is demand.
2. **Creation of Place Utility:** Storage also plays a role in providing products right at the buyer's location when needed. This is achieved through the strategic positioning of warehouses, enabling retailers to receive their goods within a matter of hours or even minutes by reaching out to wholesalers.
3. **Finance Function:** Having stored goods can help businesses secure loans, as these items serve as collateral, enhancing their financial position.
4. **Creation of Form Utility:** Some products can enhance in quality or appeal while stored, such as the aging of liquor or the curing of tobacco. Therefore, storage contributes to increased form utility for certain items.
5. **Price Stabilization:** Another essential role of storage is to stabilize market prices by ensuring that goods are available whenever there is a demand.
6. **Regular Production:** Storage helps mitigate production inconsistencies, ensuring a continuous supply of products in the market.
7. **Ability to Withstand Natural Calamities:** Storage systems enable society to better handle natural disasters such as floods, droughts, or famines by supplying stored goods during critical times.
8. **Risk Reduction:** By choosing reputable warehouses for storage, owners of goods can lessen their risks, as these warehouses take on part of the responsibility.
9. **Savings on Transportation Costs:** Storage facilitates the accumulation of stock, allowing for bulk transportation which, in turn, reduces shipping expenses.
10. **Economies of Large Scale:** Finally, storage allows businesses to benefit from the economies of scale in production and distribution since goods can be stored efficiently.

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<sup>3</sup> [http://www.agritech.tnau.ac.in/amis/warehouse\\_storeage.html](http://www.agritech.tnau.ac.in/amis/warehouse_storeage.html)

## 5.2. Types of foodgrain storage facilities in India

In India, there are two main storage methods utilized for food grains. The first is covered storage, which includes facilities like conventional godowns and silos, while the second is open storage, known as CAP (covered and plinth). Though food grains are mainly stored in covered facilities, CAP is utilized when sufficient storage options are lacking. Both the FCI and State Government Agencies (SGA) manage their storage capacities through a combination of owned and hired facilities.

**Table 47: Types of Storage Infrastructure in India**

| Type                                           | Description                                                                                                                                                                                                                                                     | Use Case                                         |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| <b>Conventional Godowns</b>                    | Brick-and-mortar warehouses with stacked bag storage                                                                                                                                                                                                            | Dominant form (~80% of capacity)                 |
| <b>Covered and Plinth (CAP)</b>                | Temporary, open-air storage with plastic sheets                                                                                                                                                                                                                 | Used during procurement surges; being phased out |
| <b>Hermetic Storage</b>                        | Hermetic storage refers to a method of storing grain and other agricultural commodities in airtight and moisture-tight containers, creating a modified atmosphere that inhibits the growth of insects and mold, thus preserving the quality of the stored goods |                                                  |
| <b>Steel Silos</b>                             | Modern, mechanized grain storage with temperature/moisture control                                                                                                                                                                                              | Long-term storage, improved efficiency           |
| <b>On-Farm Storage</b>                         | Bins, bags, and small godowns at farm level                                                                                                                                                                                                                     | For short-term, decentralized holding            |
| <b>Rural Godowns (Gramin Bhandaran Yojana)</b> | Small to medium capacity warehouses in rural areas                                                                                                                                                                                                              | Used by farmers, FPOs, co-ops for local storage  |

### 5.2.1. Conventional Godowns

Most of the warehousing capacity in India comprises conventional godowns constructed with RCC columns and roof structures. The foundation is generally made of brick or stone masonry with cement mortar.

Within these godowns, agriculture commodities are stored in gunny bags of 50 kg or 100 kg capacity, stacked one upon another. Through interactions with warehouse owners, we learned that godown units are typically constructed in modules of 5000 tons.

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Government subsidies often limit one warehouse operator to avail incentives for construction up to 5000 tons. As a result, 5000 tons is the most common capacity for warehouses (in line with a WDRA survey which found the average warehouse capacity to be 4700 tons).

Due to the widespread use of these godowns, FCI and CWC have issued standardized specifications for their construction. With the materials and know-how available, godowns can be easily constructed in 3-4 months. As per CWC specifications, a 5000 tons warehouse requires nearly 1.75 acres of land for the godowns unit and ancillary buildings.

The godowns unit can be constructed in two configurations—inner dimensions of 125.55m x 21.8m divided into three compartments or 92.8m x 28.7m divided into two compartments.

After accounting for the wall and one verandah, the size equals 126m x 24.09m and 93.26m x 30.99m for a total area requirement of 3035 sq. m and 2890 sq. m, respectively. A plinth between 0.6m to 0.9m must also be constructed to support the structure.

The godowns height from the plinth to the trusses must be 5.48m. Within the godown, agriculture commodities are stored in stacks of size 6.1m x 9.14m, and a total of 36 such stacks are made in a 5000 tons godowns. Each stack contains between 140-150 tons of food grains stored in 2800 to 3000 gunny bags of 50 kg each.



**Source:** Globus Warehousing and Trading Private Limited (GWTPL)

Once stored in the godown, regular monitoring of the food grains is conducted, and several measures are taken to ensure deterioration does not occur. The godown

structure (floor, walls, and roof) and openings (doors, windows, and ventilators) are designed to be waterproof to control the moisture level. Daily aeration of the stocks is undertaken by opening the godown doors and using ventilators.



**Source:** Globus Warehousing and Trading Private Limited (GWTPL)

Fumigation is also conducted occasionally to maintain pest control. Protection against rodents is ensured by making the plinth an outward sloping platform, and birds are stopped using 'jalis' at windows and ventilators. These measures successfully preserve grain quality, and grains can be stored in godowns for 16-18 months with minimal spoilage.

### **5.2.2. CAP (Cover and Plinth) Storage**

CAP storage, or Cover and Plinth, is a temporary storage structure that consists of stacking gunny bags on a raised platform and covering them with polythene material tarpaulin to prevent damage. The usage of CAP storage was started in 2014 due to the unavailability of warehousing capacity near the procurement center (transportation of food grains more than 30 km is not preferred).

A single CAP structure consists of 2750 jute bags or 150 food grains. CAP stack is not dissimilar to a stack in a godown except for a tarp serving as a protective medium rather than concrete walls.

Since CAP storage comprises open storage of food grains, there is a higher possibility of spoilage from rain and pests. If scientific storage specifications are followed, then spoilage can be limited to 0.1% for a month storage period. However, if food grains are stored for longer, as is often the case, then spoilage can be as high as 5-7%.



**Source:** CAP Storage in Sukharsh Khaira (Punjab region) – CAG Report

### 5.2.3. Hermetic storage

Hermetic storage is an airtight storage technology for agricultural commodities. It is used by the agricultural produce integrator, Arya Collateral Warehousing Services Private Limited. The storage uses the concept of a modified atmosphere to protect commodities that are sensitive to moisture. This technology removes the possibility of pest infestation by preventing gas exchange from the surrounding environment.

Lack of interaction with the atmosphere also ensures that the stored commodities are free from toxic substances like aflatoxin. The oxygen is reduced inside the storage to make it difficult for any harmful insects to survive. No pesticides or insecticides are used for storage. Figure below shows the hermetic storage used by Arya Collateral WSP.



**Source:** Arya Collateral WSP, Website: <https://www.arya.ag>



Hermetic storage is found to be ideal for storing commodities like coffee beans, cocoa, and spices that need to retain aroma for a long time. The life of hermetic storage is 10-15 years.

### **5.2.4. Modern storage facilities**

Warehouses constructed earlier used to have walls that were 18 feet high, but now only a 10 feet wall is constructed, and profile sheets are used for the next 10 feet. This arrangement results in a 10% cost reduction, reduces the time spent in construction and the higher height leads to better aeration.

Even within profile sheets, aluminium sheets are preferred instead of GI (galvanized iron) sheets because they keep the warehouse temperature 4-5 °C lower despite costing almost double the GI sheets.

In addition, aluminium does not rust, leading to lower maintenance costs and higher resale value. Another significant technology used is turbo ventilators. Turbo ventilators work by pulling out the warm air above the gunny bag stacks, which helps to keep the grains cool.

Over time, better technologies have been developed to decrease costs associated with constructing and running a warehouse and maintaining the quality of the stored commodities. These have been adopted to various extents by warehouse owners. According to private warehouse players, changes made during the construction have resulted in significant differences.

### **5.3. Replacing Cover and Plinth (CAP) storage with modular, low-capex conventional warehouses**

India is rightly pivoting towards modernization of foodgrain warehouses in India and giving up CAP capacities over time. Cover and Plinth (CAP) storage is an outdated, weather-dependent system responsible for substantial foodgrain spoilage. The shift towards modular conventional warehouses would materially accelerate deployment, improve quality control, generate rural employment, and align India with global best practices in post-harvest management.

#### **Case for Modular, Low-Capex Conventional Warehouses**

##### **1. Rapid Deployment**

Modular warehouses use prefabricated materials and standardized designs, enabling faster construction than traditional brick-and-mortar facilities. This is critical for closing India's storage gap of 50–60% relative to production.

##### **2. Lower Capital Intensity**

Lightweight materials, local sourcing, and simplified designs reduce both upfront investment and ongoing maintenance costs, making these attractive for private and community investment.



### **3. Enhanced Quality Control**

Enclosed warehouses protect grains from rain, pests, and humidity, dramatically cutting spoilage and preserving nutritional value—a key requirement for domestic food security and export markets.

### **4. Scalable and Flexible**

Modular units can be expanded or relocated as production patterns shift, offering future-proof infrastructure that adapts to changing agricultural landscapes.

### **5. Rural Employment Generation**

Construction, operations, and maintenance of these warehouses generate local jobs in engineering, skilled labor, and logistics—multiplying the economic impact beyond the farm gate.

### **6. Integration with Digital Systems**

Modern warehouses are more amenable to digitization (e.g., remote monitoring, RFID tracking, climate control), supporting transparency, traceability, and integration with warehouse receipt financing.

Replacing CAP storage with modular, low-capex conventional warehouses is a pragmatic, high-impact reform for India's agri-logistics. This model lowers food losses, raises farmer incomes, creates rural jobs, and future-proofs infrastructure—while being financeable at scale through private, institutional, and REIT-led channels.

With bold policy action, India can leapfrog its post-harvest challenges, setting a global benchmark for sustainable, scalable, and employment-generating food storage. The recommendation section of the report provides workable solution for deploying conventional modular foodgrain warehouses in India.

## **5.4. Agriculture Warehousing Ecosystem in India: Challenges and the REIT Opportunity**

Real Estate Investment Trusts (REITs) are a proven global mechanism for pooling institutional and retail capital into income-generating real estate assets. While traditional REITs—investing in offices, malls, and apartments—dominate North America, Europe, Singapore, and Japan, farmland and agriculture warehousing REITs represent a newer, specialized niche in the agricultural value chain.

Globally, farmland REITs own, operate, manage, and lease agricultural land and related infrastructure, including storage facilities. Leading private equity and institutional investors (pension funds, endowments, sovereign wealth funds) have increased allocations to agriculture and rural real estate due to attractive yields, inflation hedging, portfolio diversification, and low correlation to equities or bonds.



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These investors see agricultural real estate as productive, inflation-resilient, essential infrastructure —critical for food security and supply chain resilience. The main income streams for farmland and agriculture warehousing REITs include rental income from land leases, crop share agreements, ancillary services (cold storage, processing), and—increasingly—renewable energy leases.

### REIT Pathway for India

Developing an agriculture warehousing REIT ecosystem in India could unlock billions in institutional capital for food storage infrastructure—accelerating the creation of modern, climate-resilient, and scalable post-harvest systems. To make it operational following needs to be done:

1. **Regulatory and Structural Reforms:** India must enable a legal and tax regime for agriculture warehousing REITs, similar to commercial and rental housing REITs, but tailored for the agricultural sector. This would require clarity on title, land use, leasing, and ownership structures.
2. **Professionalization and Digitization:** Embrace warehouse digitization, blockchain for asset transparency, and third-party accreditation for grading and storage management. This builds global investor confidence in asset quality and cash flow visibility.
3. **Standardized Lease Contracts:** Develop standardized, long-term, inflation-linked lease agreements between REITs (asset owners) and FCI, private operators, or commodity exchanges. This assures steady rental income for investors and operational flexibility for tenants.
4. **Scale and Portfolio Diversification:** Enable REITs to scale quickly by aggregating portfolios of “rent-ready” agricultural warehouses across production zones, rather than focusing on single assets. This spreads risk and enhances appeal to institutional investors.
5. **Credit Guarantees and Warehouse Receipts:** Expand the reach and credibility of the warehouse receipt system, making it a tradable, bankable instrument that can be used to access working capital and reduce counterparty risk for REITs.
6. **Capital Market Integration:** Create conditions for agriculture warehousing REITs to be listed and traded on Indian exchanges, broadening the investor base and improving liquidity.
7. **Policy Alignment:** Integrate agriculture warehousing REITs with government schemes for subsidy, private participation, and export promotion, ensuring alignment with national food security



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### Expected Impact

- A functioning agriculture warehousing REIT ecosystem could rapidly mobilize institutional capital (domestic and global), bridge the massive warehousing deficit, reduce post-harvest losses, increase farmer incomes, and strengthen India's food security and export competitiveness. It would also create a new asset class for Indian and international investors, diversifying risk and improving portfolio returns.
- Agriculture warehousing REITs are a powerful, but underdeveloped, global tool for institutional capital mobilization into essential rural infrastructure.
- India faces a critical post-harvest storage gap, with massive economic losses and food security risks—providing a compelling business case for REIT-led investment.
- Developing an Indian agriculture warehousing REIT ecosystem will require bold policy reforms, professionalization of asset management, integration with commodity markets, and alignment with food security goals.
- If executed well, such an ecosystem could close India's infrastructure deficit, reduce food loss, and create a globally relevant new asset class—positioning India as a leader in innovative agriculture logistics finance.

The time is ripe for India to pioneer agriculture warehousing REITs—blending global institutional capital with local agricultural transformation for lasting impact.

### 5.5. Foodgrain warehousing market

The Government of India has approved a National Policy on Handling, Storage and Transportation of Food grains in July 2000. The aim of the policy was to moderate the system of handling, storage and transportation of the food grains procured by the FCI and to attract resources through private sector involvement.

(i) Introduction of a scheme to encourage use of metal bins as well as non-metallic storage structures at individual farm level and construction of RCC bins at community level with appropriate financial incentives.

(ii) Modernization and upgradation of Bulk Grain Handling Infrastructure.

(iii) For storage of food grains procured by the FCI, integrated bulk handling facilities with silos of large capacity for wheat along with testing facilities for quality control would be created at about 20 identified central locations in producing and consuming areas as well as a few port towns. FCI will guarantee utilization of these facilities to the extent of 100 per cent for the first ten years and 75 per cent for the next 10 years.



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### National Food Security Act, 2013

National Food Security Act was passed in September 2013 to provide for food and nutritional security in human life cycle approach, by ensuring access to adequate quantity of quality food at affordable prices to people to live a life with dignity and for matters connected therewith or incidental thereto.

Section 16 of the Act requires that every State Government shall constitute a State Food Commission for the purpose of monitoring and review of implementation of this Act.

As per Section 22 of the Act, the Central Government shall, for ensuring the regular supply of food grains to persons belonging to eligible households, allocate from the central pool the required quantity of food grains to the State Governments under the Targeted Public Distribution System (TPDS), as per the entitlements under Section 3 and at prices specified.

As FCI is responsible for maintenance of central pool and supply of required quantity to the States, its role is significant in implementation of this Act. Under the existing procurement policy of the GoI, procurement of food grains for the Central Pool is done by FCI & State Government Agencies (SGAs). Procurement of wheat and paddy for the Central Pool is carried out on open-ended basis at Minimum Support Price (MSP) fixed by the GoI.

In wheat and paddy procuring States, like, Punjab, Haryana & some parts of Rajasthan, procurement from farmers is undertaken by the FCI/State Agencies through Arhatias (commission agents) as per State APMC (Agriculture Produce Market Committee) Act. In other States, procurement of wheat and paddy is made directly from farmers by FCI/SGAs.

Food grains stock in the Central Pool consists of stock held by FCI, DCP States and the SGAs for both buffer and operational requirements. While four months' requirement of food grains for issue under Targeted Public Distribution (TPDS) and Other Welfare Schemes (OWS) is earmarked as operational stocks, surplus over that is treated as buffer stock and physically both buffer and operational stocks are merged and are not distinguishable.

According to the present practice, the GoI treats the food stock over and above the minimum norms as excess stock and liquidates it from time to time through exports, open market sales or additional allocations to the States.

The total annual stock of food grains in the Central Pool are distributed over different quarters of the year depending upon off-take and procurement patterns. The seasonality of production and procurement is thus, a decisive factor in determining the minimum norm of food grains stocks required in a particular quarter of the year.

The Food Corporation of India (FCI) procures foodgrains at Minimum Support Prices (MSP) from farmers across the country, particularly in major surplus states like Punjab, Haryana, Madhya Pradesh, and Chhattisgarh. Once procured, these grains are stored in



## Foodgrain Warehouse Market in India 2025-2030

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FCI's extensive warehousing network to build buffer stocks for food security and price stability.

Besides having own storage capacity, FCI has hired storage capacities from Central Warehousing Corporation (CWC), State Warehousing Corporations (SWC), State Agencies and Private Parties for short term as well as for guaranteed period under Private Entrepreneurs Guarantee (PEG) Scheme and Private Warehousing Scheme (PWS). Storage Capacity is used for keeping the Central Pool stock of food grains for TPDS & OWS and maintaining buffer stocks for ensuring food security of the country.

FCI regularly undertakes fumigation, pest control, and quality monitoring to ensure safe grain storage.

To reduce losses and improve efficiency, FCI is increasingly adopting the silo storage model—bulk handling facilities equipped with temperature and moisture control systems. These are being developed through Public-Private Partnerships (PPP) across key procurement zones under long-term contracts.

FCI's storage also acts as a buffer during natural calamities, pandemics (like COVID-19), or price shocks. The stockpiled grains allow the government to release food quickly to stabilize supply and address emergencies.

### 5.6. Foodgrain storage Capacity FY2018 to FY2024

The table below documents the historical trend of food grain storage capacity in India, measured in million metric tonnes (MT) and categorized by different types of infrastructure from FY 2018 to FY 2024.

Over this period, there has been a noticeable overall expansion followed by a distinct contraction in national storage capacity. Starting at 35.9 million MT in FY 2018, total storage rose steadily to peak at 46 million MT in FY 2022, reflecting substantial investments and expansion notably in State Warehousing Corporation (SWC) capacity, the introduction and scaling up of Private Warehouses Scheme 2010 (PWS 2010) and silos, as well as consistent growth in both CWC and PEG facilities.

Owned storage capacity climbed from 12.8 million MT in FY 2018, reaching as high as 15.1 million MT in FY 2022, while SWC showed an 8 million MT expansion over the same span. However, post-2022, the trend reverses: by FY 2024, total capacity drops sharply to 36.3 million MT, with marked reductions across both SWC (down 1.6 million MT from 2022), PEG (down 3.2 million MT), and CWC as well.

Coverage from silos and PWS 2010, though showing modest gains during earlier years, plateaus and then stagnates. 'Cover and Plinth storage' figures are unavailable for FY 2023 and FY 2024, further obscuring the exact extent of storage contraction.

This pattern indicates that after an initial phase of rapid infrastructure buildup—likely responding to rising food grain production and policy interventions—the sector entered a period of rationalization or reorganization, such as decommissioning aging facilities,



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consolidating resources, or shifting towards more sustainable and technologically advanced forms of storage.

The volatility in PEG and SWC capacity especially suggests a changing role for hired and cooperative warehousing in the government's storage strategy. The data thus captures the evolving priorities and structural adaptations in India's grain storage landscape, marked by a recent emphasis on efficiency and modernization following a significant—yet not sustained—expansion phase.

**Table 48: Historical Trends in Foodgrain storage Capacity (2017-18 to 2023-24) – Million MT**

| Year           | Owned | CWC | SWC  | PEG  | PWS<br>2010 | Silos | Other<br>private<br>parties | Cover and<br>Plinth storage<br>(Owned &<br>Hired) | Total       |
|----------------|-------|-----|------|------|-------------|-------|-----------------------------|---------------------------------------------------|-------------|
| <b>FY 2018</b> | 12.8  | 2.5 | 6.8  | 10.3 | 0.0         | 0.3   | 0.6                         | 2.6                                               | <b>35.9</b> |
| <b>FY 2019</b> | 12.8  | 2.8 | 8.0  | 11.2 | 0.1         | 0.5   | 0.2                         | 2.6                                               | <b>38.3</b> |
| <b>FY 2020</b> | 12.8  | 3.1 | 8.9  | 11.5 | 0.3         | 0.5   | 0.3                         | 2.6                                               | <b>40.0</b> |
| <b>FY 2021</b> | 12.7  | 3.0 | 8.4  | 11.5 | 0.7         | 0.6   | 0.2                         | 3.2                                               | <b>40.4</b> |
| <b>FY 2022</b> | 15.1  | 3.7 | 10.5 | 10.8 | 1.1         | 0.9   | 0.2                         | 3.6                                               | <b>46.0</b> |
| <b>FY 2023</b> | 14.8  | 3.1 | 9.0  | 7.9  | 0.9         | 1.1   | 0.0                         | Not Available                                     | <b>36.9</b> |
| <b>FY 2024</b> | 14.7  | 2.9 | 8.9  | 7.6  | 0.9         | 1.3   | 0.1                         | Not Available                                     | <b>36.3</b> |

**Source:**

1. Report of Comptroller and Auditor General of India on Storage Management and Movement of Food grains by Food Corporation of India, 2023
2. Data for FY2023 and FY2024 is taken from <https://www.data.gov.in/resource/zone-wise-details-storage-capacity-food-corporation-india-fci-ownedhired-and-utilization>

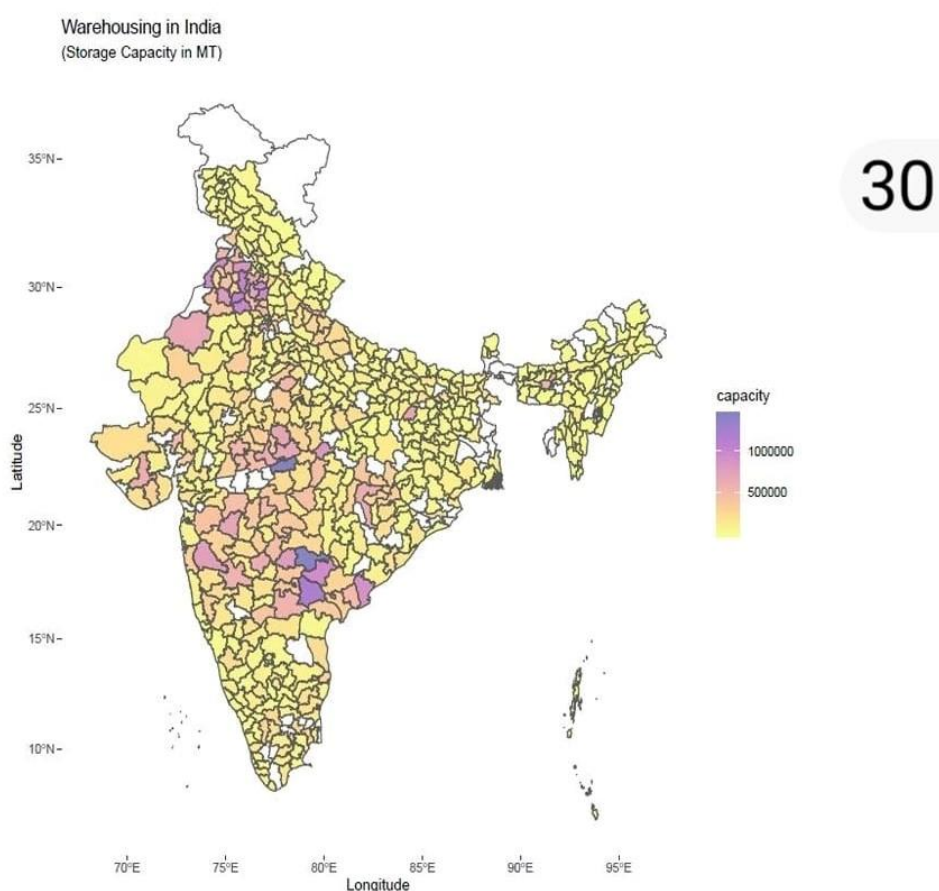
**Note:** After receiving the Action plan of phasing out of CAP from Ministry vide letter dated May 10, 2022, all CAP capacities are deleted from the statement by FCI.

New Godowns are being constructed by FCI mainly through Private Participation under Private Entrepreneurs Guarantee Scheme. FCI is also augmenting and modernizing its storage capacity in the form of silos through Public Private Partnership.

## 5.7. Foodgrain Storage capacity 2024-25

The total foodgrain storage capacity i.e. covered and C&P, at India level, with FCI – Covered and CAP - (Owned plus Hired), as on June 30, 2025 stands at 44.34 million MT. For the same period the capacity with State Agencies including SWCs (excluding capacities given to FCI) for storage of foodgrains Covered & CAP stands at 42.01 million MT totalling 86.36 million MT.

**Figure 15: Geographic Distribution of warehousing capacity in India**



Source: 'Web directory of warehouses', which was jointly developed by NABARD and WDRA: <http://warehousedirectory.gov.in/>

MT= Metric ton

### FCI storage infrastructure and utilization across India, as of June 30, 2025

FCI storage capacity is primarily divided into three major segments: FCI-owned infrastructure, covered and hired storage facilities, and Cover and Plinth (CAP) storage systems. FCI-owned infrastructure constitutes 14.61 Million MT (30.2% of total capacity) through owned facilities, supplemented by a minimal 0.11 Million MT (0.2%) from FCI silo storage, establishing the foundation of government-controlled storage capacity.



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The covered and hired storage capacity total 32.34 Million MT, which includes State Warehousing Corporation (SWC) facilities providing 11.97 Million MT (24.7%), Private Entrepreneurs Guarantee (PEG) scheme contributing 9.32 Million MT (19.3%), Central Warehousing Corporation (CWC) facilities offering 3.87 Million MT (8.0%), Private Warehouses Scheme 2010 providing 2.91 Million MT (6.0%), hired silo storage accounting for 1.90 Million MT (3.9%), state government facilities contributing 2.17 Million MT (4.5%), and private hired storage adding 0.21 Million MT (0.4%).

The Cover and Plinth (CAP) storage system, representing temporary outdoor storage solutions, comprises 1.33 Million MT divided between CAP-owned facilities at 0.68 Million MT (1.4%) and CAP-hired facilities at 0.65 Million MT (1.3%).

Collectively, this diversified storage infrastructure achieves a total national capacity of 48.38 Million MT, currently holding 44.67 Million MT of stocks, resulting in an impressive overall utilization rate of 92.3%, demonstrating the efficient deployment of India's grain storage resources across multiple institutional frameworks including government agencies, cooperative societies, and private sector partnerships.

The table presents a detailed state-wise and zone-wise breakdown of storage capacity, stock levels, and utilization rates and geographical distribution of warehousing capacity is given in the figure below.

## Foodgrain Warehouse Market in India 2025-2030

**Table 49: Agency-wise Storage Capacity with FCI (Owned + Hired) and Utilization Summary During the Month of June, 2025 – Million Metric Ton (MMT)**

| S. No. | Region/UT                    | FCI Owned   | FCI Silo    | Total Owned - FCI | Covered and Hired - State Government | Covered and Hired - CWC | Covered and Hired - SWC | Covered and Hired - PEG | Covered and Hired - PWS 2010 | Covered and Hired - Silo | Covered and Hired - Private | Total Covered and Hired | Total Covered | CAP - Owned | CAP - Hired | Total CAP   | Grand Total | Stocks held | Utilization (%) |
|--------|------------------------------|-------------|-------------|-------------------|--------------------------------------|-------------------------|-------------------------|-------------------------|------------------------------|--------------------------|-----------------------------|-------------------------|---------------|-------------|-------------|-------------|-------------|-------------|-----------------|
| 1      | Bihar                        | 0.35        | 0.00        | 0.35              | 0.00                                 | 0.12                    | 0.32                    | 0.18                    | 0.02                         | 0.25                     | 0.01                        | 0.90                    | 1.25          | 0.00        | 0.00        | 0.00        | 1.25        | 0.97        | 77%             |
| 2      | Jharkhand                    | 0.10        | 0.00        | 0.10              | 0.00                                 | 0.04                    | 0.03                    | 0.23                    | 0.09                         | 0.00                     | 0.00                        | 0.38                    | 0.48          | 0.00        | 0.00        | 0.00        | 0.48        | 0.34        | 70%             |
| 3      | Odisha                       | 0.37        | 0.00        | 0.37              | 0.00                                 | 0.12                    | 0.19                    | 0.00                    | 0.00                         | 0.00                     | 0.00                        | 0.31                    | 0.67          | 0.00        | 0.00        | 0.00        | 0.67        | 0.47        | 70%             |
| 4      | West Bengal                  | 0.95        | 0.00        | 0.95              | 0.00                                 | 0.02                    | 0.00                    | 0.00                    | 0.04                         | 0.08                     | 0.01                        | 0.14                    | 1.10          | 0.00        | 0.00        | 0.00        | 1.10        | 0.78        | 71%             |
| 5      | Sikkim                       | 0.01        | 0.00        | 0.01              | 0.00                                 | 0.00                    | 0.00                    | 0.00                    | 0.00                         | 0.00                     | 0.00                        | 0.00                    | 0.01          | 0.00        | 0.00        | 0.00        | 0.01        | 0.01        | 83%             |
|        | <b>Total East Zone</b>       | <b>1.77</b> | <b>0.00</b> | <b>1.77</b>       | <b>0.00</b>                          | <b>0.29</b>             | <b>0.54</b>             | <b>0.41</b>             | <b>0.15</b>                  | <b>0.33</b>              | <b>0.02</b>                 | <b>1.73</b>             | <b>3.51</b>   | <b>0.00</b> | <b>0.00</b> | <b>0.00</b> | <b>3.51</b> | <b>2.56</b> | <b>73%</b>      |
| 6      | Assam                        | 0.37        | 0.00        | 0.37              | 0.01                                 | 0.04                    | 0.01                    | 0.03                    | 0.02                         | 0.05                     | 0.00                        | 0.16                    | 0.53          | 0.00        | 0.00        | 0.00        | 0.53        | 0.32        | 60%             |
| 7      | Arunachal PD.                | 0.04        | 0.00        | 0.04              | 0.00                                 | 0.00                    | 0.00                    | 0.00                    | 0.00                         | 0.00                     | 0.00                        | 0.00                    | 0.04          | 0.00        | 0.00        | 0.00        | 0.04        | 0.04        | 80%             |
| 8      | Meghalaya                    | 0.02        | 0.00        | 0.02              | 0.00                                 | 0.00                    | 0.01                    | 0.02                    | 0.00                         | 0.00                     | 0.00                        | 0.03                    | 0.05          | 0.00        | 0.00        | 0.00        | 0.05        | 0.02        | 44%             |
| 9      | Mizoram                      | 0.03        | 0.00        | 0.03              | 0.00                                 | 0.00                    | 0.00                    | 0.00                    | 0.00                         | 0.00                     | 0.00                        | 0.00                    | 0.03          | 0.00        | 0.00        | 0.00        | 0.03        | 0.03        | 78%             |
| 10     | Tripura                      | 0.04        | 0.00        | 0.04              | 0.01                                 | 0.01                    | 0.00                    | 0.00                    | 0.00                         | 0.00                     | 0.00                        | 0.02                    | 0.06          | 0.00        | 0.00        | 0.00        | 0.06        | 0.04        | 71%             |
| 11     | Manipur                      | 0.07        | 0.00        | 0.07              | 0.00                                 | 0.00                    | 0.00                    | 0.00                    | 0.00                         | 0.00                     | 0.00                        | 0.00                    | 0.07          | 0.00        | 0.00        | 0.00        | 0.07        | 0.04        | 60%             |
| 12     | Nagaland                     | 0.04        | 0.00        | 0.04              | 0.00                                 | 0.02                    | 0.00                    | 0.00                    | 0.00                         | 0.00                     | 0.00                        | 0.02                    | 0.06          | 0.00        | 0.00        | 0.00        | 0.06        | 0.04        | 72%             |
|        | <b>Total North East Zone</b> | <b>0.62</b> | <b>0.00</b> | <b>0.62</b>       | <b>0.02</b>                          | <b>0.07</b>             | <b>0.02</b>             | <b>0.04</b>             | <b>0.02</b>                  | <b>0.05</b>              | <b>0.00</b>                 | <b>0.22</b>             | <b>0.84</b>   | <b>0.00</b> | <b>0.00</b> | <b>0.00</b> | <b>0.84</b> | <b>0.53</b> | <b>63%</b>      |
| 13     | Delhi                        | 0.33        | 0.00        | 0.33              | 0.00                                 | 0.00                    | 0.00                    | 0.00                    | 0.00                         | 0.00                     | 0.00                        | 0.00                    | 0.33          | 0.00        | 0.00        | 0.00        | 0.33        | 0.29        | 88%             |
| 14     | Haryana                      | 0.88        | 0.00        | 0.88              | 0.84                                 | 0.35                    | 0.73                    | 3.25                    | 0.18                         | 0.40                     | 0.00                        | 5.75                    | 6.62          | 0.29        | 0.00        | 0.29        | 6.91        | 6.72        | 97%             |
| 15     | Himachal PD.                 | 0.03        | 0.00        | 0.03              | 0.00                                 | 0.01                    | 0.00                    | 0.04                    | 0.02                         | 0.00                     | 0.00                        | 0.07                    | 0.10          | 0.00        | 0.00        | 0.00        | 0.10        | 0.09        | 90%             |
| 16     | J & K                        | 0.10        | 0.00        | 0.10              | 0.01                                 | 0.01                    | 0.00                    | 0.04                    | 0.10                         | 0.00                     | 0.00                        | 0.15                    | 0.25          | 0.00        | 0.00        | 0.00        | 0.25        | 0.21        | 85%             |
| 17     | Ladakh                       | 0.03        | 0.00        | 0.03              | 0.00                                 | 0.00                    | 0.00                    | 0.00                    | 0.01                         | 0.00                     | 0.00                        | 0.01                    | 0.03          | 0.00        | 0.00        | 0.00        | 0.03        | 0.02        | 66%             |
| 18     | Punjab                       | 2.66        | 0.06        | 2.72              | 1.11                                 | 0.81                    | 4.89                    | 4.07                    | 0.61                         | 0.63                     | 0.07                        | 12.19                   | 14.91         | 0.33        | 0.56        | 0.89        | 15.80       | 16.08       | 102%            |
| 19     | Chandigarh                   | 0.00        | 0.00        | 0.00              | 0.00                                 | 0.01                    | 0.00                    | 0.00                    | 0.00                         | 0.00                     | 0.00                        | 0.01                    | 0.01          | 0.00        | 0.00        | 0.00        | 0.01        | 0.01        | 89%             |
| 20     | Rajasthan                    | 0.84        | 0.00        | 0.84              | 0.11                                 | 0.31                    | 0.22                    | 0.05                    | 0.67                         | 0.08                     | 0.12                        | 1.56                    | 2.40          | 0.06        | 0.08        | 0.14        | 2.54        | 2.46        | 97%             |
| 21     | UP                           | 1.52        | 0.05        | 1.57              | 0.00                                 | 0.76                    | 1.61                    | 1.29                    | 0.09                         | 0.15                     | 0.00                        | 3.89                    | 5.46          | 0.00        | 0.00        | 0.00        | 5.46        | 4.69        | 86%             |
| 22     | Uttarakhand                  | 0.08        | 0.00        | 0.08              | 0.01                                 | 0.05                    | 0.06                    | 0.01                    | 0.00                         | 0.00                     | 0.00                        | 0.13                    | 0.21          | 0.00        | 0.00        | 0.00        | 0.21        | 0.19        | 90%             |



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| S. No. | Region/UT        | FCI Owned | FCI Silo | Total Owned - FCI | Covered and Hired - State Government | Covered and Hired - CWC | Covered and Hired - SWC | Covered and Hired - PEG | Covered and Hired - PWS 2010 | Covered and Hired - Silo | Covered and Hired - Private | Total Covered and Hired | Total Covered | CAP - Owned | CAP - Hired | Total CAP | Grand Total | Stocks held | Utilization (%) |
|--------|------------------|-----------|----------|-------------------|--------------------------------------|-------------------------|-------------------------|-------------------------|------------------------------|--------------------------|-----------------------------|-------------------------|---------------|-------------|-------------|-----------|-------------|-------------|-----------------|
|        | Total North Zone | 6.45      | 0.11     | 6.56              | 2.08                                 | 2.31                    | 7.51                    | 8.74                    | 1.68                         | 1.25                     | 0.19                        | 23.76                   | 30.31         | 0.68        | 0.65        | 1.33      | 31.64       | 30.76       | 97%             |
| 23     | Andhra Pd.       | 0.86      | 0.00     | 0.86              | 0.00                                 | 0.05                    | 0.21                    | 0.00                    | 0.00                         | 0.00                     | 0.00                        | 0.25                    | 1.12          | 0.00        | 0.00        | 0.00      | 1.12        | 0.87        | 78%             |
| 24     | Andman & Nicobar | 0.01      | 0.00     | 0.01              | 0.00                                 | 0.00                    | 0.00                    | 0.00                    | 0.00                         | 0.00                     | 0.00                        | 0.00                    | 0.01          | 0.00        | 0.00        | 0.00      | 0.01        | 0.01        | 86%             |
| 25     | Telangana        | 0.67      | 0.00     | 0.67              | 0.00                                 | 0.16                    | 0.76                    | 0.05                    | 0.45                         | 0.00                     | 0.00                        | 1.42                    | 2.08          | 0.00        | 0.00        | 0.00      | 2.08        | 1.69        | 81%             |
| 26     | Kerala           | 0.59      | 0.00     | 0.59              | 0.00                                 | 0.01                    | 0.00                    | 0.00                    | 0.00                         | 0.00                     | 0.00                        | 0.01                    | 0.60          | 0.00        | 0.00        | 0.00      | 0.60        | 0.54        | 90%             |
| 27     | Karnataka        | 0.46      | 0.00     | 0.46              | 0.00                                 | 0.17                    | 0.27                    | 0.04                    | 0.07                         | 0.03                     | 0.00                        | 0.57                    | 1.03          | 0.00        | 0.00        | 0.00      | 1.03        | 0.92        | 89%             |
| 28     | Lakshdwee        | 0.00      | 0.00     | 0.00              | 0.00                                 | 0.00                    | 0.00                    | 0.00                    | 0.00                         | 0.00                     | 0.00                        | 0.00                    | 0.00          | 0.00        | 0.00        | 0.00      | 0.00        | 0.00        | 67%             |
| 29     | Tamilnadu        | 0.65      | 0.00     | 0.65              | 0.00                                 | 0.29                    | 0.24                    | 0.02                    | 0.05                         | 0.05                     | 0.00                        | 0.65                    | 1.29          | 0.00        | 0.00        | 0.00      | 1.29        | 1.21        | 94%             |
| 30     | Pudducherry      | 0.05      | 0.00     | 0.05              | 0.00                                 | 0.00                    | 0.00                    | 0.00                    | 0.00                         | 0.00                     | 0.00                        | 0.00                    | 0.05          | 0.00        | 0.00        | 0.00      | 0.05        | 0.02        | 47%             |
|        | Total South Zone | 3.29      | 0.00     | 3.29              | 0.00                                 | 0.67                    | 1.47                    | 0.11                    | 0.57                         | 0.08                     | 0.00                        | 2.90                    | 6.18          | 0.00        | 0.00        | 0.00      | 6.18        | 5.26        | 85%             |
| 31     | Gujarat          | 0.49      | 0.00     | 0.49              | 0.01                                 | 0.13                    | 0.00                    | 0.00                    | 0.15                         | 0.15                     | 0.00                        | 0.44                    | 0.93          | 0.00        | 0.00        | 0.00      | 0.93        | 0.85        | 91%             |
| 32     | Dadar & Nagar    | 0.00      | 0.00     | 0.00              | 0.00                                 | 0.00                    | 0.00                    | 0.00                    | 0.00                         | 0.00                     | 0.00                        | 0.00                    | 0.00          | 0.00        | 0.00        | 0.00      | 0.00        | 0.00        | 0%              |
| 33     | Maharashtra      | 0.92      | 0.00     | 0.92              | 0.00                                 | 0.19                    | 0.40                    | 0.00                    | 0.29                         | 0.05                     | 0.00                        | 0.93                    | 1.85          | 0.00        | 0.00        | 0.00      | 1.85        | 1.60        | 86%             |
| 34     | GOA              | 0.02      | 0.00     | 0.02              | 0.00                                 | 0.00                    | 0.00                    | 0.00                    | 0.00                         | 0.00                     | 0.00                        | 0.00                    | 0.02          | 0.00        | 0.00        | 0.00      | 0.02        | 0.02        | 84%             |
| 35     | MP               | 0.42      | 0.00     | 0.42              | 0.00                                 | 0.02                    | 0.94                    | 0.00                    | 0.01                         | 0.00                     | 0.00                        | 0.98                    | 1.40          | 0.00        | 0.00        | 0.00      | 1.40        | 1.36        | 97%             |
| 36     | Chattisgarh      | 0.63      | 0.00     | 0.63              | 0.05                                 | 0.19                    | 1.09                    | 0.03                    | 0.02                         | 0.00                     | 0.00                        | 1.39                    | 2.02          | 0.00        | 0.00        | 0.00      | 2.02        | 1.74        | 86%             |
|        | Total West Zone  | 2.49      | 0.00     | 2.49              | 0.06                                 | 0.53                    | 2.43                    | 0.03                    | 0.48                         | 0.20                     | 0.00                        | 3.74                    | 6.22          | 0.00        | 0.00        | 0.00      | 6.22        | 5.56        | 89%             |
|        | Grand Total      | 14.61     | 0.11     | 14.72             | 2.17                                 | 3.87                    | 11.97                   | 9.32                    | 2.91                         | 1.90                     | 0.21                        | 32.34                   | 47.06         | 0.68        | 0.65        | 1.33      | 48.38       | 44.67       | 92%             |

Source: FCI Website

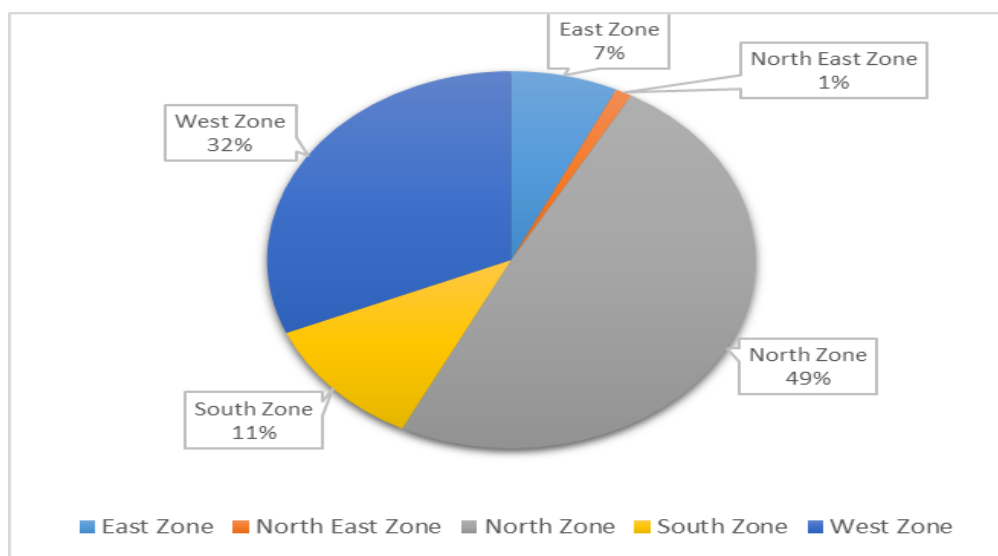
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**Table 50: Storage Capacity with FCI and State Government Agencies as on February 1, 2025 Million Metric Ton (MMT)**

| Zones           | FCI Covered and CAP (Owned) | FCI Covered and CAP (Hired) | Total FCI Covered and CAP (Owned plus hired) | State Agencies including SWCs (excluding capacities given to FCI) for storage of foodgrains Covered & CAP | Total        |
|-----------------|-----------------------------|-----------------------------|----------------------------------------------|-----------------------------------------------------------------------------------------------------------|--------------|
| East Zone       | 1.76                        | 1.56                        | 3.32                                         | 2.78                                                                                                      | 6.10         |
| North East Zone | 0.62                        | 0.22                        | 0.84                                         | 0.12                                                                                                      | 0.95         |
| North Zone      | 7.24                        | 20.94                       | 28.18                                        | 14.32                                                                                                     | 42.50        |
| South Zone      | 3.29                        | 2.86                        | 6.15                                         | 3.59                                                                                                      | 9.74         |
| West Zone       | 2.49                        | 3.37                        | 5.85                                         | 21.21                                                                                                     | 27.06        |
| <b>Total</b>    | <b>15.39</b>                | <b>28.95</b>                | <b>44.34</b>                                 | <b>42.01</b>                                                                                              | <b>86.36</b> |

Source: <https://www.data.gov.in/resource/stateut-wise-details-central-pool-storage-capacity-food-corporation-india-fci-and-state>

**Figure 16: Total Storage Capacity Zone-wise (%) 2024-25**



Source: <https://www.data.gov.in/resource/stateut-wise-details-central-pool-storage-capacity-food-corporation-india-fci-and-state>

Most of the foodgrain storage capacity in India is built in North Zone and West Zone with percentage share of 49% and 32% respectively. The reason attributed to high foodgrain production in these Regions are:



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- **North Zone (Punjab, Haryana, and Western UP):** These states are the **grain bowl of India**, especially for **wheat and rice**. Punjab and Haryana alone contribute a significant share to the central food procurement system.
- **West Zone (Rajasthan, Gujarat, parts of MP and Maharashtra):** Also, major producers of **wheat, pulses, and oilseeds**.

**Table 51: Statement showing Agency-wise State-wise status of Silo construction as on November 30, 2024 (Figures in MMT)**

| Agency           | State            | Target as per Action Plan | Completed   | Under Construction | Grand Total |
|------------------|------------------|---------------------------|-------------|--------------------|-------------|
| FCI              | Assam            | 0.05                      | 0.05        | 0.00               | 0.05        |
|                  | Bihar            | 0.45                      | 0.15        | 0.20               | 0.35        |
|                  | Chhattisgarh     | 0.10                      | 0.00        | 0.00               | 0.00        |
|                  | Delhi            | 0.10                      | 0.00        | 0.00               | 0.00        |
|                  | Gujarat          | 0.10                      | 0.15        | 0.00               | 0.15        |
|                  | Karnataka        | 0.03                      | 0.00        | 0.00               | 0.00        |
|                  | Haryana          | 0.30                      | 0.25        | 0.00               | 0.25        |
|                  | Maharashtra      | 0.10                      | 0.00        | 0.00               | 0.00        |
|                  | Punjab           | 0.43                      | 0.38        | 0.00               | 0.38        |
|                  | Rajasthan        | 0.15                      | 0.00        | 0.00               | 0.00        |
|                  | Uttar Pradesh    | 0.70                      | 0.15        | 0.20               | 0.35        |
|                  | West Bengal      | 0.40                      | 0.00        | 0.10               | 0.10        |
|                  | <b>Total FCI</b> | <b>2.90</b>               | <b>1.13</b> | <b>0.50</b>        | <b>1.63</b> |
| CWC              | Punjab           | 0.25                      | 0.00        | 0.00               | 0.00        |
| State government | Andhra Pradesh   | 0.35                      | 0.00        | 0.00               | 0.00        |
|                  | Bihar            | 0.50                      | 0.00        | 0.00               | 0.00        |
|                  | Gujrat           | 0.20                      | 0.00        | 0.00               | 0.00        |
|                  | Haryana          | 0.65                      | 0.00        | 0.00               | 0.00        |
|                  | Madhya Pradesh   | 1.00                      | 0.45        | 0.00               | 0.45        |
|                  | Maharashtra      | 0.05                      | 0.00        | 0.00               | 0.00        |



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| Agency             | State                | Target as per Action Plan | Completed   | Under Construction | Grand Total |
|--------------------|----------------------|---------------------------|-------------|--------------------|-------------|
|                    | <b>Orrisa</b>        | 0.20                      | 0.00        | 0.00               | 0.00        |
|                    | <b>Punjab</b>        | 2.43                      | 0.20        | 0.00               | 0.20        |
|                    | <b>Rajasthan</b>     | 0.48                      | 0.00        | 0.00               | 0.00        |
|                    | <b>Telangana</b>     | 0.15                      | 0.00        | 0.00               | 0.00        |
|                    | <b>Uttar Pradesh</b> | 0.50                      | 0.00        | 0.15               | 0.15        |
|                    | <b>West Bengal</b>   | 0.35                      | 0.00        | 0.00               | 0.00        |
| <b>Total</b>       |                      | <b>6.85</b>               | <b>0.65</b> | <b>0.15</b>        | <b>0.80</b> |
| <b>Grand Total</b> |                      | <b>10.00</b>              | <b>1.78</b> | <b>0.65</b>        | <b>2.43</b> |

**Source:** <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2101244>

**Note:** In addition, the silos under process, it has been decided to construct further silos under Hub & Spoke model.

### 5.5 World's Largest Grain Storage Plan in Cooperative Sector

Under the Pilot Project of World's Largest Grain Storage Plan in cooperative sector, godowns at Primary Agricultural Credit Societies (PACS) level have been constructed in 11 PACS of 11 States namely Maharashtra, Uttar Pradesh, Tamil Nadu, Karnataka, Gujarat, Madhya Pradesh, Uttarakhand, Assam, Telangana, Tripura and Rajasthan, with the support of National Cooperative Development Corporation (NCDC), National Bank for Agriculture and Rural Development (NABARD) & NABARD Consultancy Services (NABCONS).

Out of 11 constructed storages, 3 have been kept by PACS for their own use in the state of Maharashtra, Rajasthan and Telangana. Three have been hired by State/Central agencies in the State of Uttar Pradesh, Madhya Pradesh and Gujarat.

**Table 52: Construction of Godowns under the Pilot Project World's Largest Grain Storage Plan in cooperative sector**

| S. No.   | State          | District | Name of PACS                                                          | Capacity of Godown (MT) |
|----------|----------------|----------|-----------------------------------------------------------------------|-------------------------|
| <b>1</b> | Maharashtra    | Amravati | Neripanglai Vividh Karyakari Sahakari Sanstha                         | 3,000                   |
| <b>2</b> | Uttar Pradesh  | Mirzapur | Bahudeshiya Prathamik Grameen Sahakari Samiti Limited, Kotwa Panday   | 1,500                   |
| <b>3</b> | Madhya Pradesh | Balaghat | Bahudeshiya Prathamik Krishi Saakh Sahakari Society Maryadit Parswada | 500                     |



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| S. No. | State        | District       | Name of PACS                                               | Capacity of Godown (MT) |
|--------|--------------|----------------|------------------------------------------------------------|-------------------------|
| 4      | Gujarat      | Ahmedabad      | The Chandranagar Group Seva Sahakari Mandli Limited        | 750                     |
| 5      | Tamil Nadu   | Theni          | Silamarathupatti Primary Agriculture Credit Society        | 1,000                   |
| 6      | Rajasthan    | Sri Ganganagar | Ghumudwali Gram Seva Sahakari Samiti Limited               | 250                     |
| 7      | Telangana    | Karimnagar     | Primary Agriculture Credit Society Limited, Gambhiropet    | 500                     |
| 8      | Karnataka    | Bidar          | Primary Agriculture Cooperative Federation Limited, Ekamba | 1,000                   |
| 9      | Tripura      | Gomati         | Khilpara Primary Agriculture Credit Society Limited        | 250                     |
| 10     | Assam        | Kamrup         | 2 No. Pub Bongshar G.P.S. Limited                          | 500                     |
| 11     | Uttarakhand  | Dehradun       | Bahudeshiya Kisan Seva Sahakari Samiti Limited, Sahaspur   | 500                     |
|        | <b>Total</b> |                |                                                            | <b>9,750</b>            |

Source: <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2080612>

Further, the Pilot Project has been extended and more than 500 additional PACS have been identified as on 21.11.2024 across the country for construction of godowns under World's Largest Grain Storage Plan in Cooperative Sector.

Under the Plan, subsidies and interest subvention are given to PACS through convergence of various existing Government of India schemes, like Agriculture Infrastructure Fund (AIF), Agricultural Marketing Infrastructure Scheme (AMI), etc.

Under AIF Scheme 3% interest subvention is provided for the project up to Rs. 2 crore with loan repayment period of 2+5 years. Further, under AMI Scheme 33.33% subsidy is provided to PACS for construction of storage units.

Moreover, under the AMI scheme Margin Money requirement for PACS has been reduced from 20% to 10%. Apart from assistance for Storage Infrastructure on Capital Cost (including ancillaries like Boundary Wall, Drainage, etc.), now there is additional subsidy to PACS on ancillaries that is restricted to a maximum 1/3rd of the total permissible subsidy of the godown component or actual whichever is lower.

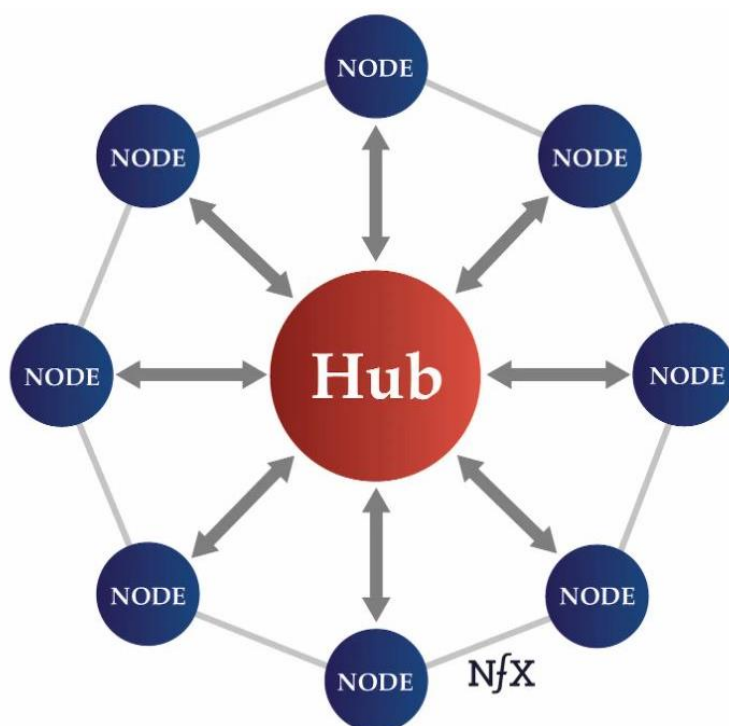
## 5.6. Hub and Spoke Model for foodgrain storage

The hub & spoke model for foodgrain storage in India is a modernized infrastructure strategy designed to address inefficiencies in traditional storage, reduce post-harvest losses, and create an integrated, scalable network for grain management. Here's an in-depth look at its structure, deployment, and benefits:

### Structure of the Hub & Spoke Model

- **Hubs:** Large, central grain silos with dedicated railway siding and container depot facilities. These are the primary nodes for bulk storage and facilitate long-distance transportation by rail, leveraging economies of scale for storage and movement.
- **Spokes:** Smaller silos or godowns, often located at regional, rural, or procurement centers (e.g., Primary Agricultural Credit Societies—PACS). Grain from farmers or local markets is first stored at these spokes before being transported to the hub.

Transportation from spoke to hub is typically done by road, and between hubs via rail, ensuring faster, cost-effective, and efficient grain handling and movement.



### Key Benefits

1. **Reduces Post-Harvest Losses:** By adding modern, scientific silos and minimizing open storage, the model aims to curb post-harvest losses, currently estimated at up to 25% of production.
2. **Efficient Logistics:** Centralized hubs with rail connectivity streamline large-scale movements, while decentralized spokes bring storage closer to farmers, cutting down on long-distance and repetitive transportation.



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3. **Cost-Effectiveness:** Bulk handling, reduced trans-shipment, and less spoilage translate into lower logistics and wastage costs.
4. **Support to Farmers:** Declaring silos as sub-mandi yards makes procurement more accessible and efficient. Farmers can store produce locally, avoid distress sales, rent equipment, and access value-adding infrastructure at the spoke level.
5. **Employment and Rural Development:** Construction and operation of silos, associated facilities, and allied activities generate employment and stimulate economic activity at multiple levels.

FCI has initiated another scheme for the construction of Silos under the Public-Private Partnership (PPP) mode with Viability Gap Fund (VGF). The maximum limit of VGF is 20%. It aimed to construct silos with a total capacity of 10 million MT by 2020.

Silos are being built under various modes in India viz.

1. Silos under PPP with VGF funding (Niti Aayog model)
2. Silos under PPP with VGF (DEA model)
3. Silos on non VGF model
4. Silos by State Governments (MP)
5. Silos by State Governments (Punjab)
6. Silos by CWC
7. Silos at Private Freight Terminals (PFTs)

In October 2022, FCI planned to construct 11.1125 million MT modern steel silos at 249 locations spread across 12 states under Hub & Spoke model under Public Private Partnership with total investment of approximately Rs. 9236 crores to be constructed in three phases over next 3-4 years.

**Phase I:** In the first phase of Hub & Spoke model, silos of 3.4875 million MT capacity at 80 locations were to be constructed by FCI. Out of this, 1.0125 million MT at 14 locations would be under DBFOT mode and 2.475 million MT at 66 locations under DBFOO mode. These modern Silos with bulk handling facilities is a scientific way of storage of foodgrains and ensures better preservation of foodgrains.

The proposed model of development is DBFOT (Design, Build, Finance, Operate and Transfer) and DBFOO (Design, Build, Finance, Own and Operate) wherein the private entities shall be responsible for construction and operation of these modern Silos for a pre-defined period. Through this Public Private Partnership (PPP) mode of DBFOT, the land is to be provided by FCI while under the DBFOO mode, the land is to be acquired by the private entities.

These Silos at 80 locations will be spread across 9 states and 1 UT i.e. Punjab, Haryana, Uttar Pradesh, Madhya Pradesh, Gujarat, Rajasthan, Maharashtra, Bihar, West Bengal and Jammu & Kashmir. These projects are conceived in consultation with state governments, Niti Aayog, Ministry of Finance, Ministry of Railways, and Ministry of Steel.



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**Phase II:** For phase-2, FCI had floated tenders for 25.125 million MT silos at 54 locations in 17 bundles/Projects under DBFOO mode in September 2024. Technical bids and Financial bids of all 17 projects/bundles have been opened and under finalization.

In Phase III, construction of Silos will be taken up based on the experience gained in construction of Rice Silos. Further additional capacity is proposed to be created by mainly by concerned State Governments.

### 5.7 Under construction silos under various modes in Phase II

A total of 1.96 million MT capacity is being construction under various project modes in India as on June 30, 2025. It is assumed that the capacity will be commissioned in two year based on industry feedback.

**Table 53: Silos at under-construction stage under DBFOO (MMT)**

|                                                              | 2025-26                          | 2026-27     | 2027-28     | 2029-30                          | 2030-31                          |
|--------------------------------------------------------------|----------------------------------|-------------|-------------|----------------------------------|----------------------------------|
| <b>List of silos at under-construction stage under DBFOO</b> | No capacities under construction | 1.31        | 0.65        | No capacities under construction | No capacities under construction |
| <b>Total</b>                                                 | <b>0.00</b>                      | <b>1.31</b> | <b>0.65</b> | <b>0.00</b>                      | <b>0.00</b>                      |
| <b>Under construction</b>                                    |                                  |             |             |                                  |                                  |

**Source:** Food Corporation of India, Government of India, Extracted from <https://fci.gov.in/view/Modes-of-Silos-542>

These silos near farms would act as purchase centres (mandies) and expected to reduce distance for farmers and further reduce operational difficulties and complexities.

Mechanized operations make silos operational round the clock and also reduce turn-around time for intake and off take of agriculture produce and would improve overall efficiency.

### 5.8 Planned Foodgrain storage capacities

The table below presents India's planned silo storage capacity expansion under the Design-Build-Finance-Own-Operate (DBFOO) model spanning from FY 2025-26 to FY 2030-31, measured in million metric tonnes.

The table reveals a phased implementation strategy where no new storage capacities are planned for the initial two years (2025-26 and 2026-27), followed by a concentrated deployment starting from 2027-28.

**The expansion comprises three distinct projects:** The Silos under Hub & Spoke Model Phase II under DBFOO will contribute the largest capacity at 0.82 million MT, Project-II DBFOO Model will add 0.21 million MT, and Project-III DBFOO Model will contribute 0.22 million MT.



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Once operational from 2027-28 onwards, these capacities remain constant through 2030-31, indicating a stable long-term infrastructure addition totaling 1.25 million MT annually. This planning approach suggests a strategic delay in implementation, possibly allowing for preparatory work, land acquisition, or policy finalization during 2025-27, before launching simultaneous construction across all three projects.

The consistent capacity figures from 2027-28 through 2030-31 reflect the permanent nature of these silo facilities, which will provide sustained storage infrastructure to support India's grain management system under public-private partnership models that leverage private sector expertise in design, construction, financing, and operations while maintaining government oversight of this critical food security infrastructure.

**Table 54: Planned food storage capacities from FY26 to FY31 (MMT)**

|                                                               | 2025-26                      | 2026-27                      | 2027-28     | 2029-30     | 2030-31     |
|---------------------------------------------------------------|------------------------------|------------------------------|-------------|-------------|-------------|
| <b>Silos under Hub &amp; Spoke Model Phase II under DBFOO</b> | No capacities planned        | No capacities planned        | 0.82        | 0.82        | 0.82        |
| <b>Project-II DBFOO Model</b>                                 | No capacities planned        | No capacities planned        | 0.21        | 0.21        | 0.21        |
| <b>Project-III DBFOO Model</b>                                | No capacities planned        | No capacities planned        | 0.22        | 0.22        | 0.22        |
| <b>Total Planned</b>                                          | <b>No capacities planned</b> | <b>No capacities planned</b> | <b>1.25</b> | <b>1.25</b> | <b>1.25</b> |

Source: <https://fci.gov.in/view/Modes-of-Silos-542>

It is assumed that the planned capacity will be constructed / commissioned in three year based on industry feedback.

## 5.9 Future Outlook on foodgrain production, procurement, buffer stocks and storage market gap

### Projection of foodgrain production 2025-30

According to Working Group report on Crop Husbandry, Agriculture Inputs, Demand and Supply 2024 prepared by Niti Aayog, foodgrains occupy more than half of the gross cropped area. The gross cropped area (GCA) is expected to increase at annual growth of 0.45 % during 2019-20 to 2047-48. The incremental acreage will come from improvements in cropping intensity. In their Business as Usual Scenario (BAU), Rice and wheat will remain dominant crops.

In India additional production to meet the domestic demand will come from yield improvements as expansion in gross cropped have limited increase potential.



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In the BAU scenario, the rice yield is expected to increase from 2722 kg/ha in 2019-20 to 3454 kg/ha in 2047-48 at annual growth rate of 0.88 %. However, there exists a large yield gap, which if abridged, the yield may go upto 5000 kg/ha in 2047-48. Wheat yield is forecasted to reach to 4737 kg/ha by 2047-48 in the BAU scenario, and to 5527 kg/ha in the HYG scenario.

By 2047-48, the average yield of nutriceals will increase to 2001 kg/ha in the BAU scenario and 2801 kg/ha in the HYG scenario. Maize yield will experience a significant increase, reaching to 6355 kg/ha in 2047-48 in the BAU scenario and to 8512 kg/ha in the HYG scenario.

Pulses yield in India is currently low, which is projected to increase to 1258 kg/ha in the BAU scenario and 1485 kg/ha in the High Yield Scenario (HYG) scenario. The average yield of vegetables and fruits was 18373 and 15090 kg/ha in 2019-20, respectively, which is projected to increase to 25039 and 20182 kg/ha by 2047-48 in the BAU scenario, and to 36266 and 27150 kg/ha in the HYG scenario.

**Table 55: Forecast of Foodgrain production under Business-As-Usual and High Yield Variety scenario (FY 2025-26 to 2030-31) (MMT)**

| Crops         | 2025-2026 | 2026-27 | 2027-28 | 2028-29 | 2029-30 | 2030-31 |
|---------------|-----------|---------|---------|---------|---------|---------|
| Foodgrains    | 332       | 338.91  | 345.96  | 353.15  | 360.50  | 368.00  |
| Cereals       | 305       | 311.15  | 317.42  | 323.82  | 330.34  | 337.00  |
| Rice          | 133       | 135.32  | 137.68  | 140.08  | 142.52  | 145.00  |
| Wheat         | 117       | 119.67  | 122.41  | 125.21  | 128.07  | 131.00  |
| Nutri-cereals | 17        | 16.80   | 16.59   | 16.39   | 16.20   | 16.00   |
| Maize         | 36        | 37.30   | 38.65   | 40.05   | 41.50   | 43.00   |
| Pulses        | 27        | 27.76   | 28.53   | 29.33   | 30.16   | 31.00   |

**Source:** Working Group report on Crop Husbandry, Agriculture Inputs, Demand and Supply 2024 prepared by Niti Aayog

**Note:** Cereals include Rice, Wheat, Maize, nutri/cereals

### **Procurement of foodgrains during marketing seasons Khariff Marketing Season (KMS) and Rabi Marketing season (RMS) - Procurement Policy of Wheat and Rice**

State Government agencies and Food Corporation of India (FCI) purchase wheat & paddy within the stipulated period with prescribed Fair Average Quality (FAQ) specification at Minimum Support Price (MSP) for Central Pool for distribution under National Food Security Act (NFSA) and Other Welfare Schemes (OWS).

The estimates for procurement of wheat and paddy are finalized by Government of India (GoI) in consultation with State Governments and Food Corporation of India,



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before the commencement of each marketing season based upon estimated production, marketable surplus and agricultural crop pattern. Paddy and wheat are procured under Decentralized Procurement System (DCP) and Non-DCP system.

- **Centralized Procurement System (Non-DCP)**

Under Centralized Procurement System, the procurement of foodgrains in Central Pool are undertaken either by FCI directly or State Government agencies procures the foodgrains and handover the stocks to FCI for storage and subsequent issue against GoI allocations in the same State or movement of surplus stocks to other States.

- **Decentralized Procurement System (DCP)**

Under this scheme, the State Government itself undertakes direct purchase of paddy/rice and wheat and also stores and distributes these foodgrains under NFSA and other welfare schemes. If the stocks of the Rice/wheat procured by the State Government exceeds its allocation under TPDS and other Welfare Schemes, such excess stocks shall be handed over to the FCI by the State Government.

### Procurement Policy of Wheat and Price

DFPD has finalized the guidelines wherein States are allowed to procure coarse grains from farmers at MSP under central pool subject to the prior approval of GOI on the detailed procurement plan prepared by State Governments in consultation with FCI. The whole quantity shall be distributed under TPDS (Targeted Public Distribution System)/OWS (Other welfare Schemes) in the State/UTs.

**Table 56: Procurement of rice and wheat - Actual versus estimates during KMS/RMS seasons FY2020 to FY2025 (MMT)**

| Year    | Wheat                 |                    | Rice                  |                    |
|---------|-----------------------|--------------------|-----------------------|--------------------|
|         | Procurement Estimates | Actual Procurement | Procurement Estimates | Actual Procurement |
| 2019-20 | 35.65                 | 34.13              | 52.91                 | 51.83              |
| 2020-21 | 44.25                 | 38.99              | 64.26                 | 60.25              |
| 2021-22 | 43.53                 | 43.34              | 64.00                 | 57.59              |
| 2022-23 | 44.40                 | 18.79              | 62.61                 | 58.67              |
| 2023-24 | 34.15                 | 26.20              | 62.80                 | 52.55              |
| 2024-25 | 37.29                 | 26.61              | 49.56                 | 43.99              |

**Source:** Demand for Grants (2025-26), Standing Committee on Consumer Affairs, Food and Public Distribution (2024-2025), Lok Sabha Ministry of Consumer Affairs, Food and Public Distribution (Department of Food and Public Distribution)



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### Notes:

1. Actual procurement of rice in 2024-25 is up to February 13, 2025
2. Procurement estimate for 2024-25 is for Kharif

### Buffer Stock Policy of the GOI

The concept of buffer stock was first introduced during the IV Five Year Plan (1969-74). Buffer stock of food grains in the Central Pool is maintained by the GOI for

- (i) Meeting the prescribed minimum buffer stock norms for food security,
- (ii) Monthly release of food grains for supply through TPDS and Other Welfare Schemes,
- (iii) Meeting emergency situations arising out of unexpected crop failure, natural disasters, etc. and
- (iv) Price stabilisation or market intervention to augment supply so as to help moderate the open market prices.

### Buffer Stock requirements

To moderate the market prices and enhance the availability of foodgrains, the Government of India sells surplus food grains (Wheat & Rice), beyond the public Distribution System (PDS) and Other Welfare Schemes (OWS)<sup>4</sup> requirements, through open sale under Open Market Sales Scheme[(Domestic) (OMSS(D))]. This helps increase the availability of foodgrains in the market, control inflation, ensure food security and make foodgrains more affordable for the general population.

In addition, Bharat Atta and Bharat Rice were launched on November 6, 2023 and February 6, 2024, respectively, with a view to provide atta (wheat flour) and rice to general consumers at subsidized rates under OMSS(D) policy.

Further, in order to manage the overall food security and to prevent hoarding and unscrupulous speculation, the Government of India has imposed stock limits on Wheat applicable to Traders/Wholesalers, Retailers, Big Chain Retailers and Processors in all States and Union Territories. The Cabinet Committee on Economic Affairs fixes the minimum buffer norms on quarterly basis: i.e as on 1st April, 1st July, 1st October and 1st January of every financial year.

**Table 57: The details of stock position as on 1st July 2025 vis-a-vis buffer norms are as below (Fig. in million MT)**

| Buffer Norms |      |       |       |
|--------------|------|-------|-------|
| As on        | Rice | Wheat | Total |

<sup>4</sup> <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2146811>



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|                                 |       |       |       |
|---------------------------------|-------|-------|-------|
| <b>1<sup>st</sup> July 2025</b> | 13.54 | 27.58 | 41.12 |
|---------------------------------|-------|-------|-------|

| Stocks in Central Pool          |       |       |       |
|---------------------------------|-------|-------|-------|
| As on                           | Rice  | Wheat | Total |
| <b>1<sup>st</sup> July 2025</b> | 37.78 | 35.88 | 73.66 |

Source: <https://www.pib.gov.in/PressReleaseDetailm.aspx?PRID=2146811>

## 5.10. Market Size forecast of Foodgrain storage capacity requirement in India

### Market Size forecast of Foodgrain storage capacity in India 2025-30

Based on projected foodgrain production, procurement during KMS and RMS and buffer stock norms for rice and wheat we estimated the foodgrain storage requirement from 2025-26 to 2030-31. To project the under construction and planned projects during the same period we collected data on projects under various schemes and types under which these storages are built viz. PEG, conventional warehouses, silos (under PPP DBFOO and DBFOOT mode and PACS).

**Table 58: Market Size forecast of Foodgrain storage capacity in India 2025-30 (Million MT)**

|                                         | 2025-2026     | 2026-27       | 2027-28       | 2028-29       | 2029-30       | 2030-31       |
|-----------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| <b>Production</b>                       |               |               |               |               |               |               |
| <b>Rice</b>                             | 133.00        | 135.32        | 137.68        | 140.08        | 142.52        | 145.00        |
| <b>Wheat</b>                            | 117.00        | 119.67        | 122.41        | 125.21        | 128.07        | 131.00        |
| <b>Total Production</b>                 | <b>250.00</b> | <b>254.99</b> | <b>260.09</b> | <b>265.28</b> | <b>270.59</b> | <b>276.00</b> |
| <b>Procurement</b>                      |               |               |               |               |               |               |
| <b>Rice</b>                             | 54.82         | 55.78         | 56.75         | 57.74         | 58.75         | 59.77         |
| <b>Wheat</b>                            | 33.19         | 33.95         | 34.73         | 35.52         | 36.33         | 37.16         |
| <b>Total Rice and Wheat procurement</b> | <b>88.02</b>  | <b>89.73</b>  | <b>91.48</b>  | <b>93.26</b>  | <b>95.08</b>  | <b>96.93</b>  |
| <b>Buffer stocks</b>                    |               |               |               |               |               |               |
| <b>Rice</b>                             | 35.88         | 35.88         | 35.88         | 35.88         | 35.88         | 35.88         |
| <b>Wheat</b>                            | 37.78         | 37.78         | 37.78         | 37.78         | 37.78         | 37.78         |



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|                                                                            |               |               |               |               |               |               |
|----------------------------------------------------------------------------|---------------|---------------|---------------|---------------|---------------|---------------|
| <i>Total buffer stock</i>                                                  | 73.66         | 73.66         | 73.66         | 73.66         | 73.66         | 73.66         |
| <b>Total Buffer stock and Marketing seasons stocks storage requirement</b> | <b>161.68</b> | <b>163.39</b> | <b>165.14</b> | <b>166.92</b> | <b>168.74</b> | <b>170.60</b> |
| <b>Capacity (Existing+ Under construction +Planned)</b>                    | 87.01         | 88.32         | 90.22         | 100.47        | 101.72        | 101.72        |
| <b>Gap/Deficit</b>                                                         | <b>74.67</b>  | <b>75.07</b>  | <b>74.92</b>  | <b>66.45</b>  | <b>67.02</b>  | <b>68.88</b>  |

Source: PHD Research Bureau, PHDCCI

### Market Size – In Value Terms

To estimate the market size in terms of value we analysed capex in terms of Rs. Per MT of different warehouses of various sizes, location and types.

### Factors affecting Capex for Foodgrain Storage in India

Capex (capital expenditure) for foodgrain storage infrastructure in India is determined by a complex interplay of economic, technological, regulatory, and geographic factors. The key determinants include:

- **Storage Technology and Infrastructure Type:** The choice between traditional godowns (simple warehouses), modern bulk storage silos, or cover and plinth (CAP) systems significantly influences capital costs. Traditional godowns are cheaper to build but offer less protection and require frequent maintenance. Modern silos, especially those with climate control and automated handling, are far more expensive but reduce losses and improve grain quality.
- **Scale and Capacity Utilization:** Larger facilities (above 2,000 MT) generally have lower per-tonne capital costs due to economies of scale. Smaller rural godowns (up to 2,000 MT) command a higher per-MT capex due to fixed land and development costs not being spread over large volumes.
- **Location and Land Cost:** Land prices, site preparation (plinth, drainage, roads), and regional construction costs vary widely across India, directly affecting the total investment required.
- **Material and Construction Standards:** Use of brick, concrete, steel, and specialized materials for rodent-proofing, ventilation, and insulation impacts both upfront costs and long-term durability. Mechanized loading/unloading and aeration systems add to the capex but improve operational efficiency.
- **Compliance and Quality Control:** Regulatory requirements for pest control, fumigation, quality monitoring, and insurance add to the capital outlay. Non-compliance can lead to higher losses and, indirectly, to higher insurance costs (though insurance is an operational, not capital, expense).



## Foodgrain Warehouse Market in India 2025-2030

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- **Government Subsidies and Financing Schemes:** Schemes such as the Agriculture Infrastructure Fund (AIF) or NABARD-supported projects can reduce the effective capex borne by private investors or cooperatives.
- **Operational Model:** Public-private partnerships (PPPs) and community-based storage models may influence both the level of capex and its allocation between public and private entities.
- **Market Demand and Food Security Policy:** National buffer stock requirements, procurement volumes, and peak stock management strategies influence how much storage is built and where, which in turn affects total sectorial capex.
- **Asset Life and Maintenance:** The expected lifespan of the facility and maintenance requirements influence both initial design choices and long-term cost recovery.

### **Cost-Benefit Matrix of Covered, Steel Silo, and Steel Bunker facilities - 50,000 MT capacity**

**Grain Bunker** is a cost-effective scientific solution to store grain for a short to medium duration. Unlike Cover & Plinth (CAP) Storages of India which stores grain in bagged form on the ground, Grain Bunker stores grain in bulk form.

It is best alternative option for CAP model as it eliminates plinth construction, keeps land free from permanent superstructure and minimize grain losses and it is ideal use of vacant land with no permanent infrastructure retains. Further, no concrete foundation is required, only a compacted earth pad with rainwater drainage slope is sufficient.

Capacity of a Grain Bunker may range from as small as 500 MTs to as big as 30,000MTs each. They are modular and can be constructed to any length, width, or diameter as required at site.

It is equipped with Aeration System, Fumigation System and Temperature Monitoring system to preserve grain and a 10,000 MT bunker can be installed within 4-5 Days.

### **The key benefits include:**

1. Purchased in kit form and easily transportable.
2. Protected against the weather and pests with ground plastic sheets and weatherproof tightly sealed, rodent proof tarpaulin covers.
3. Grain bunkers are sturdy, flexible, and cost effective but scientific method of grain storage.
4. Countries such as Australia, USA, Turkey, Brazil, Israel, and Cyprus are using grain bunkers since many decades

**Covered godowns** on the other hand, are conventional brick-and-mortar warehouses with RCC or steel roofing. Operational costs are moderate, involving basic maintenance, labour, and fumigation. These godowns are relatively easy and quick to construct and can be decentralized across regions.

However, they have higher grain losses (2–3%) due to limitations in temperature, humidity, and pest control. Additionally, loading and unloading are largely manual, leading to slower turnaround times and higher labour dependence.

The choice of facility depends on strategic goals. Steel Silos are ideal for long-term, automated grain logistics and storage quality, despite the higher CapEx. Covered Godowns strike a balance between cost and control, making them versatile across regions. Steel Bunkers, while cheap, are only recommended as temporary measures due to high losses and limited protection.

**Steel silos** are automated vertical storage systems designed for bulk handling of foodgrains. For a 50,000 MT facility, the CapEx is significantly higher. However, they offer zero grain loss, automated operations, reduced manpower, and superior quality preservation through aeration, temperature control, and real-time monitoring.

Their operating cost is higher than godowns due to energy-intensive systems and tech maintenance, but they offer better long-term returns by minimizing wastage and improving storage efficiency. They are best suited for centralized, high-throughput grain logistics systems (e.g., railway siding + silos). The table below presents use-case based recommendation:

**Table 59: Use-Case Based Recommendation**

| Use Case                                            | Recommended Storage Type       | Why                                                                       |
|-----------------------------------------------------|--------------------------------|---------------------------------------------------------------------------|
| <b>Long-term bulk storage (2–10 years)</b>          | <b>Steel Silos</b>             | High shelf life, real-time monitoring, low losses, ideal for FCI/CWC hubs |
| <b>Short/medium-term storage (seasonal)</b>         | <b>Steel Bunkers</b>           | Rapid deployment, low capex, portable and expandable                      |
| <b>General-purpose bagged grain storage</b>         | <b>Covered Godown</b>          | Suitable for multi-commodity storage, cost-effective for smaller volumes  |
| <b>Remote/rural PACS-level storage</b>              | <b>Steel Bunkers</b>           | Easy to set up, no complex infrastructure needed                          |
| <b>Areas with land scarcity</b>                     | <b>Steel Silos</b>             | Efficient vertical space usage                                            |
| <b>Storage with low tech or limited power</b>       | <b>Covered Godown / Bunker</b> | Doesn't require mechanized systems                                        |
| <b>Regions prone to grain pilferage/infestation</b> | <b>Steel Silos</b>             | Mechanized, airtight, superior fumigation                                 |
| <b>Flexible or mobile storage requirement</b>       | <b>Steel Bunker</b>            | Modular, can be dismantled or scaled up easily                            |



## Foodgrain Warehouse Market in India 2025-2030

Source: PHDCCI Research Bureau

### Average Capex per Metric Tonne (Rs/MT) for Foodgrain Storage in India

Capex per MT varies significantly by facility type, scale, and ownership:

- **Traditional Rural Godowns:** Capital cost is about ₹2,800 per MT for small capacity (up to 2,000 MT) and ₹2,000 per MT for larger godowns (above 2,000 MT), inclusive of land, development, and preliminary expenses.
- **Modern Warehouses:** Construction cost for modern, scientifically designed warehouses is in the range of ₹4,000–6,000 per MT (as per recent NABARD-rated private sector projects).
- **Silos (Bulk Storage):** Silos, which are more capital-intensive, have much higher per-MT costs. For example, a recent government project estimated the Rs/ MT cost of constructing 1 MT silo capacity at around ₹10,000, though this figure may reflect a project-specific calculation and not a general industry benchmark.
- **CAP Storage:** While cover and plinth (CAP) is the most economical for short-term storage (used extensively by FCI for bagged grains), no specific per-MT capex figure is typically cited, as the infrastructure is temporary and often shared with permanent facilities.
- **Renovation of Old Warehouses:** Renovation costs for state-owned warehouses are reported at about ₹1,000 per MT.

**Table 60: Summary of Typical Capex per MT by Facility Type**

| Facility Type                   | Average Capex (₹/MT)                                           | Notes                                  |
|---------------------------------|----------------------------------------------------------------|----------------------------------------|
| Rural Godown ( $\leq 2,000$ MT) | 2,800                                                          | Inclusive of land, development         |
| Rural Godown ( $> 2,000$ MT)    | 2,000                                                          | Inclusive of land, development         |
| Modern Warehouse (Private)      | 4,000–6,000                                                    | NABARD-rated projects                  |
| Silo (Bulk Storage)             | Very High (₹10,000 crore/MT in one project, not generalizable) | Project-specific, not industry average |
| Renovation of Old Warehouse     | 1,000                                                          | State-owned facilities                 |

Source: PHD Research Bureau, compiled from various project tenders, PPP concession agreements



## Foodgrain Warehouse Market in India 2025-2030

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### Selection of average cost

We selected the average cost on the basis of an assumption that since most of new planned projects are based on semi-automated modern warehouses/silos in various locations and sizes.

The assumed average capex of Rs. 5000/ MT as per 2025 estimates was taken to estimate the market size in terms of value for FY2026. For remaining years of the forecast period 2026-2030 an average WPI inflation adjusted increase of 5% was taken. The table below present the market size.

Based on projected foodgrain production, procurement during KMS and RMS and buffer stock norms for rice and wheat we estimated the foodgrain storage requirement from 2025-26 to 2030-31.

To project the under construction and planned projects during the same period we collected data on projects under various schemes and types under which these storages are built viz. PEG, conventional warehouses, silos (under PPP DBFOO and DBFOOT mode and PACS).

### 5.11 Methodology

#### Food grain Production Projections

We obtained projected annual foodgrains production from Working Group report on Crop Husbandry, Agriculture Inputs, demand and supply published in 2024 by Niti Aayog Report. Summarized version is reproduced here related to projections.

#### 1. Foodgrain Production Projections

Aggregate Supply: Foodgrains production projected to meet and exceed demand, rising from 299 million MT (2019-20) to 457 million MT by 2047-48 in BAU.

- A. **Rice:** Projected production of 154 million MT by 2047-48.
- B. **Wheat:** Projected at 160 million MT by 2047-48.
- C. **Nutri-cereals:** Production likely to decline to 14 million MT unless policy diversifies area/yield upward; can remain stable with intervention.
- D. **Maize:** Production to increase to 80 million MT in BAU, can meet or surpass demand with yield improvement.
- E. **Pulses:** Production projected at 47 million MT in BAU, potentially enough for self-sufficiency if area/yield increase continues.



## Foodgrain Warehouse Market in India 2025-2030

### 2. Procurement projections

Collated historical and procurement data for wheat and rice during each marketing seasons viz. KMS and RMS for rice and wheat from Demand for Grants (2025-26), Standing Committee on Consumer Affairs, Food and Public Distribution, Lok Sabha Ministry of Consumer Affairs, Food and Public Distribution (Department of Food and Public Distribution) report. Data trend was analysed for the period from 2020-2021 to 2024-25.

**Table 61: Procurement during KMS/RMS seasons in million MT**

|                | Wheat              | Rice               | Wheat                     | Rice                      |
|----------------|--------------------|--------------------|---------------------------|---------------------------|
|                | Actual Procurement | Actual Procurement | Percentage of procurement | Percentage of procurement |
| <b>2020-21</b> | 38.99              | 60.25              | 36%                       | 48%                       |
| <b>2021-22</b> | 43.34              | 57.59              | 40%                       | 44%                       |
| <b>2022-23</b> | 18.79              | 58.67              | 17%                       | 43%                       |
| <b>2023-24</b> | 26.20              | 52.55              | 23%                       | 38%                       |
| <b>2024-25</b> | 26.61              | 43.99              | 23%                       | 30%                       |
| <b>Average</b> |                    |                    | <b>28%</b>                | <b>41%</b>                |

**Source:** Demand for Grants (2025-26), Standing Committee on Consumer Affairs, Food and Public Distribution (2024-2025), Lok Sabha Ministry of Consumer Affairs, Food and Public Distribution (Department of Food and Public Distribution)

To project the procurement for the forecast period, average of last 5 years both for wheat and rice was taken separately. An average of 28% is assumed for wheat and 41% for rice the forecast period.

#### 1. Buffer stocks

As mentioned above Cabinet Committee on Economic Affairs fixes the minimum buffer norms on quarterly basis: i.e as on 1st April, 1st July, 1st October and 1st January of every financial year. We have used the latest buffer stocks norms published by Ministry of Consumer Affairs, Food & Public Distribution.<sup>5</sup> For the forecast period, we have assumed that these norms to continue given our foodgrain production projections.

#### 2. Mapping of under construction and planned foodgrain storage capacities

<sup>5</sup> <https://www.pib.gov.in/PressReleasePage.aspx?PRID=2146811>



## Foodgrain Warehouse Market in India 2025-2030

We compiled latest data (construction status, commissioning dates, location, capacity) on foodgrain storage projects under the following major schemes/types from FCI, government announcements:

- I. Conventional Warehouses (FCI & CWC/State Warehousing Corporations/Private players)**
- II. Private Entrepreneurs Guarantee (PEG) Scheme (warehouse, godowns)**
- III. Modern Silos**
  - a. PPP-DBFOO Mode (Design-Build-Finance-Own-Operate)
  - b. PPP-DBFOOT Mode (Design-Build-Finance-Own-Operate-Transfer)
  - c. PACS (Primary Agricultural Credit Societies) Godowns
  - d. Any other government/private initiatives (Mega Food Parks, State projects, etc.)
  - e. Announcements made by state government agencies

Use official sources, RTI data, FCI/CWC/State reports, MoC&F press releases, and State-level data for capturing the universe of projects.

### 5.12 Market Size – In Value Terms

To estimate the market size in terms of value we analysed capex in terms of Rs. Per MT of different warehouses of various sizes, location and types.

#### i. Factors affecting Capex for Foodgrain Storage in India

**Capex** (capital expenditure) for foodgrain storage infrastructure in India is determined by a complex interplay of economic, technological, regulatory, and geographic factors. The key determinants include:

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## Foodgrain Warehouse Market in India 2025-2030

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- **Compliance and Quality Control:** Regulatory requirements for pest control, fumigation, quality monitoring, and insurance add to the capital outlay. Non-compliance can lead to higher losses and, indirectly, to higher insurance costs (though insurance is an operational, not capital, expense).
- **Government Subsidies and Financing Schemes:** Schemes such as the Agriculture Infrastructure Fund (AIF) or NABARD-supported projects can reduce the effective capex borne by private investors or cooperatives.
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### Selection of average cost

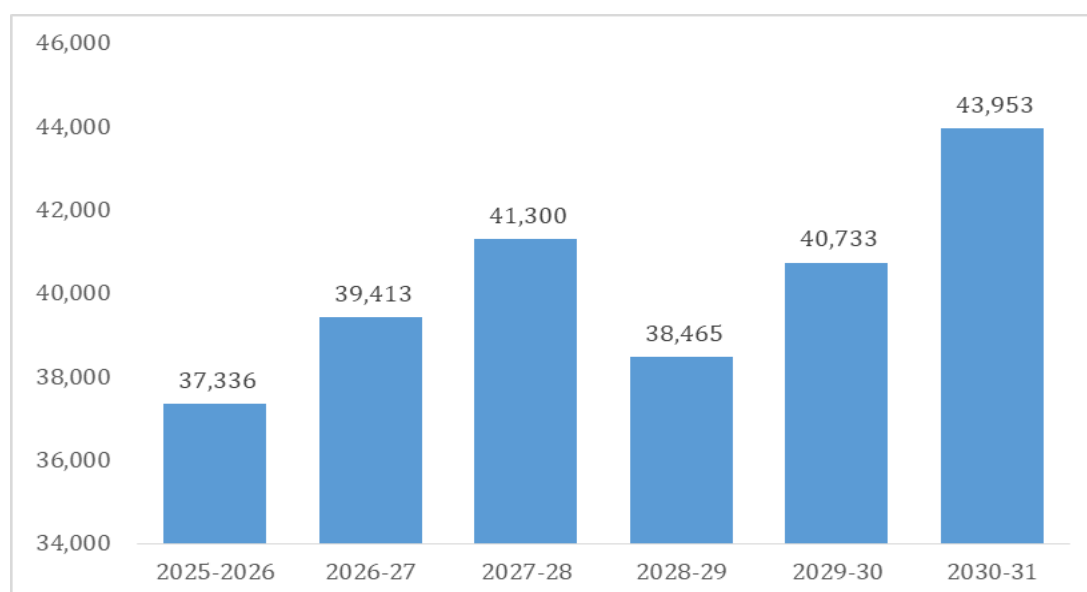
## Foodgrain Warehouse Market in India 2025-2030

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The assumed average capex of Rs. 5000/ MT as per 2025 estimates was taken to estimate the market size in terms of value for FY2026.

For remaining years of the forecast period 2026-2030 an average WPI inflation adjusted increase of 5% was taken. The table below present the market size.

**Figure 17: Market Size forecast of Foodgrain storage in India 2025-30 (Value in Rs. Crore)**



**Source:** PHD Research Bureau Analysis, PHDCCI

As per our analysis, the market size of foodgrain storage is slated to increase from Rs. 37,336 crore from 2025-26 to Rs. 43,953 crore in the forecast period with a CAGR of 3.32 percent. It provides private sector with substantial investment opportunity provided there as changes in government policies to mitigate taxation, financial incentives and operational challenges mentioned in Section VIII: Constraints and Challenges.

# **Section VI:**

## **Profile of Key Foodgrain storage Private Players in India**





## 6. Profile of Key Foodgrain storage Private Players in India

India's foodgrain storage sector has witnessed significant transformation in recent years, with increasing private sector participation supplementing traditional public systems like the Food Corporation of India (FCI), Central Warehousing Corporation (CWC), and State Warehousing Corporations (SWCs).

As demand for scientific storage, efficient logistics, and technology-enabled warehousing has grown, several private players have emerged as key contributors to foodgrain storage infrastructure. These companies operate across various verticals, including conventional warehousing, steel silo construction, collateral management, digital grain tracking, and logistics.

On the infrastructure side, Adani Agri Logistics has played a pivotal role in developing India's first integrated silo-based storage and transport system under public-private partnerships, with major facilities in procurement-heavy states like Punjab, Haryana, and Madhya Pradesh.

Companies like Origo Commodities and Kribhco Infrastructure Ltd. (KRIL) focus on warehousing and bulk handling, while Agrosaw and Prairies Partners Global specialize in designing and manufacturing galvanized steel silos with smart temperature and moisture control.

These private players are not only helping bridge India's storage gap but are also driving innovations such as digital traceability, mechanized loading/unloading, and e-Negotiable Warehouse Receipts (eNWRs). Their growing footprint is transforming India's post-harvest ecosystem into a more efficient, transparent, and farmer-friendly system—complementing government initiatives and improving national food security.

**Table 62: Major Private Players in Foodgrain Storage in India**

| Company                                                 | Core Activities                                                            | Geographic Reach                                     | Special Features                                                   |
|---------------------------------------------------------|----------------------------------------------------------------------------|------------------------------------------------------|--------------------------------------------------------------------|
| <b>Adani Agri Logistics</b>                             | Bulk grain handling, silos, transport logistics                            | Major procurement states (MP, Punjab, Haryana, etc.) | Pioneered silo-based handling under FCI PPP                        |
| <b>Sohan Lal Commodity Management (SLCM)</b>            | Warehousing, procurement, collateral management, warehouse receipt finance | PAN India, with presence in Myanmar                  | Barcode-based inventory, AI-driven quality control, WDRA-certified |
| <b>StarAgri Warehousing &amp; Collateral Management</b> | Agriculture warehousing, e-auctions, logistics, bank tie-ups               | 19 Indian states                                     | Blockchain integration, digital warehousing solutions              |
| <b>Globus Warehousing and Trading Private</b>           | Foodgrain warehousing (Owned Infrastructure)                               | Punjab and Madhya Pradesh                            | 50% of India's total PEG warehouse infrastructure.                 |



## Foodgrain Warehouse Market in India 2025-2030

| Company                                          | Core Activities                                                             | Geographic Reach                   | Special Features                                          |
|--------------------------------------------------|-----------------------------------------------------------------------------|------------------------------------|-----------------------------------------------------------|
| <b>Limited (GWTPL)</b>                           |                                                                             |                                    | ISO and ESG-certified                                     |
| <b>National Bulk Handling Corporation (NBHC)</b> | Post-harvest services, warehousing, testing, procurement, quality assurance | 900+ locations across India        | ISO-certified labs, eNWR services                         |
| <b>Arya.ag (Arya Collateral)</b>                 | Digital agriculture warehousing, financing, procurement, supply chain tech  | Active in rural & semi-urban areas | AI-enabled grain quality checks, farmer-centric model     |
| <b>Origo Commodities</b>                         | Warehousing, procurement, financing, auctioning                             | 15+ states                         | Real-time stock tracking, digital marketplace integration |
| <b>Kribhco Infrastructure Ltd. (KRIL)</b>        | Silo construction, bulk agri-logistics                                      | Gujarat, UP, Maharashtra           | Rail-linked silos, PPP model                              |
| <b>Agrosaw / Hindustan Alcox Ltd.</b>            | Turnkey steel silo construction and grain storage tech                      | All-India projects                 | Temperature & aeration-controlled storage                 |
| <b>Leap India</b>                                | Warehousing and logistics for agri and FMCG                                 | Pan India                          | Palletized storage, aggregation hubs                      |
| <b>Prairies Partners Global</b>                  | Modern silo and bulk storage systems                                        | Nationwide                         | Galvanized steel silos with remote monitoring             |

Source: PHD Research Bureau, PHDCCI

Profile of few key players is presented here:

### 6.1 Adani Agri Logistics Ltd (AALL) – Silo-Based Storage

Adani Agri Logistics is a pioneer in bulk handling, storage and transportation (distribution) of food grains, and in providing an end-to-end bulk supply chain solution to Food Corporation of India and various state governments. The company commissioned India's first modern grain storage infrastructure for Food Corporation of India in 2007.

It commissioned grain silos in Moga (Punjab) and Kaithal (Haryana) to store grains, and established receiving silos in Mumbai, Chennai, Bengaluru, Kolkata and Coimbatore, cities connected through Adani's dedicated railway rakes.

| Aspect | Details |
|--------|---------|
|--------|---------|



## Foodgrain Warehouse Market in India 2025-2030

| Aspect            | Details                                                                                                                               |
|-------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>Company</b>    | Adani Agri Logistics Ltd (AALL)                                                                                                       |
| <b>Model</b>      | BOO (Build-Own-Operate) under FCI contracts                                                                                           |
| <b>Locations</b>  | Panipat, Kaithal, Chennai, Coimbatore, Bangalore, Navi Mumbai, etc.                                                                   |
| <b>Capacity</b>   | Over <b>750,000 MT</b> across 10+ locations                                                                                           |
| <b>Highlights</b> | - Fully mechanized silo complexes- Integrated with rail sidings- Long-term lease from FCI- Bulk grain movement and automated handling |
| <b>Incentives</b> | 20-year contracts with FCI; assured usage charges and low operational risk                                                            |

### 6.2 Globus Warehousing and Trading Private Limited (GWTPL)

Globus Warehousing, a premier unit of the Sapphire Group, delivers scientifically managed and highly efficient warehousing solutions across 200+ locations in India.

With a total built-up area exceeding 26 million square feet, the company also boasts 10 large-scale agriculture warehousing sites in Punjab, spanning 440 acres of industrial land and covering 7.5 million square feet, positioning itself as a backbone of India's agricultural logistics ecosystem.

They operate majority of warehouses on an asset-light business model, allowing them to scale at a faster pace, in more geographies.

#### Operational Portfolio & Growth

Globus Warehousing, a unit of Sapphire Group, currently provides a robust portfolio of approximately 5.2 million MT of Central Pool Stock, comprising:

- 1.075 million MT capacity & stored 1.24 million MT food grain stocks in owned warehouses
- 3.25 million MT capacity and stores 3.73 million MT stored in owned/ leased by Pungrain/Punsup/ Markfed
- 0.25 million MT managed across 5 modern silos in Punjab and Madhya Pradesh With custodianship of 5 million MT warehousing in Punjab Schemes utilized by Globus:
  - 100% of PEG warehouse in Punjab State's foodgrain warehousing capacity
  - 50% of India's total PEG foodgrain warehouse infrastructure



## Foodgrain Warehouse Market in India 2025-2030

| Aspect                           | Details                                        |
|----------------------------------|------------------------------------------------|
| <b>Company</b>                   | Globus Warehousing and Trading Private Limited |
| <b>State</b>                     | Punjab & MP                                    |
| <b>Model</b>                     | PEG, PMS & PWS Scheme & Silos                  |
| <b>No of Sites</b>               | 210 Warehouse including 10 owned               |
| <b>Total Capacity Million MT</b> | 4.6                                            |
| <b>Capacity owned Million MT</b> | 1.076                                          |
| <b>Built-up area</b>             | Managing over 260 Lac square feet              |
| <b>Agency</b>                    | FCI, Pungrain, Markfed, Punsup & MPWLC         |
| <b>Incentives</b>                | Not available                                  |

### 6.3 LT Foods (Daawat) – Silos in Punjab under DBF00

LT Foods Ltd. is a leading Indian-origin global FMCG company in the consumer food space. It is a leading player globally in the specialty rice and rice-based foods business for more than last 70 years. The company delivers the finest quality and taste experiences in more than 80 countries across India, the U.S., U.K., Europe, the Middle East, the Far East and the Rest of the World.

It has a consolidated revenue of around Rs. 7,822 crore as of FY'24. LT Foods has an integrated “Farm to Fork” approach with a well-entrenched Distribution Network and Global Supply Chain Hubs backed by automated state-of-the-art and strategically located Processing Units in India, the U.S. and Europe.

LT Foods has 0.25 million MT Silos over 5 locations in Punjab and MP constructed under DBFOT with Pungrain and MPSWC i.e. 3 locations in Punjab and 2 in MP for 50000 MT each.

| Aspect            | Details                                                                                          |
|-------------------|--------------------------------------------------------------------------------------------------|
| <b>Company</b>    | LT Foods (Daawat brand)                                                                          |
| <b>Model</b>      | DBF00 (Design-Build-Finance-Own-Operate) under FCI's modern silo scheme                          |
| <b>Locations</b>  | Punjab and MP                                                                                    |
| <b>Capacity</b>   | 2,50,000 MT                                                                                      |
| <b>Highlights</b> | Automated grain receipt and dispatch- Government land allotted- Linked to procurement operations |



## Foodgrain Warehouse Market in India 2025-2030

| Aspect            | Details                                                       |
|-------------------|---------------------------------------------------------------|
| <b>Incentives</b> | 30-year concession with fixed annual concession fees from FCI |

### 6.4 Star Agriwarehousing & Collateral Management Limited

Star Agriwarehousing have a pan-India network of 2,189 warehouses (majority Leased) in 379 locations across 19 states is also used for procurement and delivery. The number of warehouse owners who lease their warehouses to them or have a revenue-sharing arrangement.

| Aspect            | Details                                                                                                                                                                     |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Company</b>    | StarAgri                                                                                                                                                                    |
| <b>Model</b>      | PEG Scheme                                                                                                                                                                  |
| <b>Locations</b>  | Rajasthan, Gujarat, Maharashtra                                                                                                                                             |
| <b>Capacity</b>   | 50,10,000 MT conventional + silos (As per Annual Report 2023-24, the capacity mentioned is 40,94,000 MT)                                                                    |
| <b>Highlights</b> | <ul style="list-style-type: none"> <li>- Mix of conventional and silo storage</li> <li>- Strong presence in agri value chain- Collateral management services too</li> </ul> |
| <b>Incentives</b> | Storage charges assured under PEG contracts                                                                                                                                 |

### 6.5 National Collateral Management Services Ltd (NCML) – Modern Silo Initiatives

Commodities Management Services Limited (NCML) is the country's largest and integrated post-harvest solution provider offering a bouquet of services along the entire supply chain in the commodity space. NCML provides Commodity Management Services in the area of Procurement, Storage, Transportation, Inspection, Testing, Electronic Trading, Crop, Weather, Price information, Training and consultancy for various agricultural, food and other commodities through the PAN India network of Service Centers.

NCML has a Department of Science and Technology recognised R&D centre working in the area of Weather and Crop monitoring, Yield Guidance and various aspects of food safety.



## Foodgrain Warehouse Market in India 2025-2030

| Aspect            | Details                                                                                                                                                               |
|-------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Company</b>    | NCML (part of Fairfax India)                                                                                                                                          |
| <b>Model</b>      | DBF00 and other PPP models                                                                                                                                            |
| <b>Locations</b>  | Bihar, MP, UP, Haryana                                                                                                                                                |
| <b>Capacity</b>   | 100,000+ MT silos                                                                                                                                                     |
| <b>Highlights</b> | <ul style="list-style-type: none"> <li>- State-of-the-art silos with IoT and sensors</li> <li>- Government-supported land</li> <li>- Long-term concessions</li> </ul> |
| <b>Incentives</b> | Fixed revenue model; public sector guaranteed offtake                                                                                                                 |

### 6.6 Keventer Agro Ltd – Eastern India Silo Projects

| Aspect            | Details                                                                                             |
|-------------------|-----------------------------------------------------------------------------------------------------|
| <b>Company</b>    | Keventer Agro Ltd                                                                                   |
| <b>Model</b>      | DBF00 with State Government collaboration                                                           |
| <b>Locations</b>  | West Bengal                                                                                         |
| <b>Capacity</b>   | ~25,000 MT                                                                                          |
| <b>Highlights</b> | First in the region to adopt silo model - Government land provided- Linked with procurement centres |
| <b>Incentives</b> | Concession model with revenue security                                                              |

Source: Compiled by PHDCCI Research Bureau

### 6.7 Summary of profiles

| Company                                    | Model                | State(s)            | Capacity (MT) | Contract Type                               |
|--------------------------------------------|----------------------|---------------------|---------------|---------------------------------------------|
| Adani Agri Logistics                       | BOO                  | Pan-India           | 750,000+      | 20-year lease (FCI)                         |
| Globus Warehousing Trading Private Limited | PEG, PMS, PWS, Silos | Punjab & MP         | 5,20,0000     | 10 Year, PEG - 3Year PMS/PWS 30 Year Silo's |
| LT Foods                                   | DBF00                | Punjab (3) & MP (3) | 2,50,000      | 30-year concession                          |



## Foodgrain Warehouse Market in India 2025-2030

| Company       | Model | State(s)                 | Capacity (MT)          | Contract Type         |
|---------------|-------|--------------------------|------------------------|-----------------------|
| StarAgri      | PEG   | Rajasthan, Gujarat, etc. | 50,10,000 <sup>6</sup> | 10-year assured lease |
| NCML          | DBFOO | Bihar, MP, Haryana, etc. | 100,000+               | Long-term PPP         |
| Keventer Agro | DBFOO | West Bengal              | ~25,000                | 30-year revenue model |

### Industry Recognition: LEAPS Award organized by Ministry of Commerce and Industry for recognition for excellence in agriculture warehousing

LEAPS is a national initiative organized by the Department for Promotion of Industry and Internal Trade (DPIIT), under the Ministry of Commerce & Industry. The award recognizes excellence, cutting-edge innovations, and best practices across the logistics sector, including warehousing and packaging.

Under its strategic guidance, the Ministry of Commerce and Industry has formally recognized agriculture warehousing as a dedicated infrastructure category, signaling a deliberate policy shift to encourage private sector participation in building and operating storage facilities for agricultural produce.

This recognition aligns with earlier reforms—dating back to the National Policy on Handling, Storage and Transportation of Food Grains (2000) and governmental notifications in the early 2000s—that opened built-own-operate (BOO) models and allowed private investment in warehousing infrastructure.

### Purpose & Process

- Promotes sustainability, operational efficiency, ESG practices, and gender inclusivity in logistics
- The evaluation process is robust, involving initial screening, in-depth assessments, and presentations to a high-level jury

The formal designation now serves as a cornerstone for mobilizing capital, enabling clearer regulatory frameworks, and integrating agriculture warehousing into national logistics planning.

In tandem, existing schemes such as the Agriculture Marketing Infrastructure (AMI) under ISAM—which offers capital subsidies of 25–33% on construction/renovation of rural godowns—and the Agriculture Infrastructure Fund (AIF) launched in July 2020 for debt-financed investment in post-harvest infrastructure, further enhance the incentive environment for private actors.

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<sup>6</sup> (As per Annual Report 2023-24, the capacity mentioned is 40,94,000 MT)



## Foodgrain Warehouse Market in India 2025-2030

Moreover, legacy initiatives such as the Private Entrepreneurs Guarantee (PEG) Scheme introduced in 2008, and the Grameen Bhandaran Yojana (GBY) of the early 2000s, continue to provide capital support and credit guarantees to private and cooperative entities constructing rural warehouses.

By elevating agriculture warehousing into a defined policy category, the Ministry aims to catalyse modern, technology-enabled storage systems—ranging from ambient warehouses to silos and cold storage—facilitating better quality certification, warehouse receipt financing, and integration into multimodal logistics networks. Together, these measures are expected to reduce post-harvest losses, stabilize market prices, and open the door to public-private partnerships essential for strengthening the agricultural value chain across India.

In its effort to elevate the agricultural logistics landscape, the Ministry of Commerce & Industry, through the Department for Promotion of Industry & Internal Trade (DPIIT), introduced LEAPS (Logistics Excellence, Advancement & Performance Shield) Award. This flagship recognition explicitly includes “Warehouse service provider (Agriculture)” as a distinct category, acknowledging outstanding innovation, efficiency, and sustainability in agriculture warehousing operations in the LEAPS 2024 cycle.

By spotlighting agriculture warehousing within its core categories, the Ministry is signaling strong policy intent to encourage private investment, institutional innovation, and ESG-aligned infrastructure development in the post-harvest agricultural value chain.

### Application Categories in LEAP Awards

#### A. Core Logistics Players

1. Air freight service provider
2. Road freight service provider
3. Maritime freight service provider
4. Rail freight service provider
5. Multimodal transport operators (MTOs)
6. Warehouse service provider (Industrial and Consumables)
7. Warehouse service provider(Agriculture)

#### B .MSME

1. Logistics Service Providers

#### C. Start-ups

1. Logistics technology service provider
2. Logistics operations service provider

#### D. Institutions

1. Education institute promoting logistics sector

#### E. Special Category

1. Logistics service delivery for e-commerce operations
2. Multimodal logistics service provider (3PL service provider, Custom Broker/Agent, Freight forwarder)

Source: <https://apps.dpiit.gov.in/leaps2024/>



## Foodgrain Warehouse Market in India 2025-2030

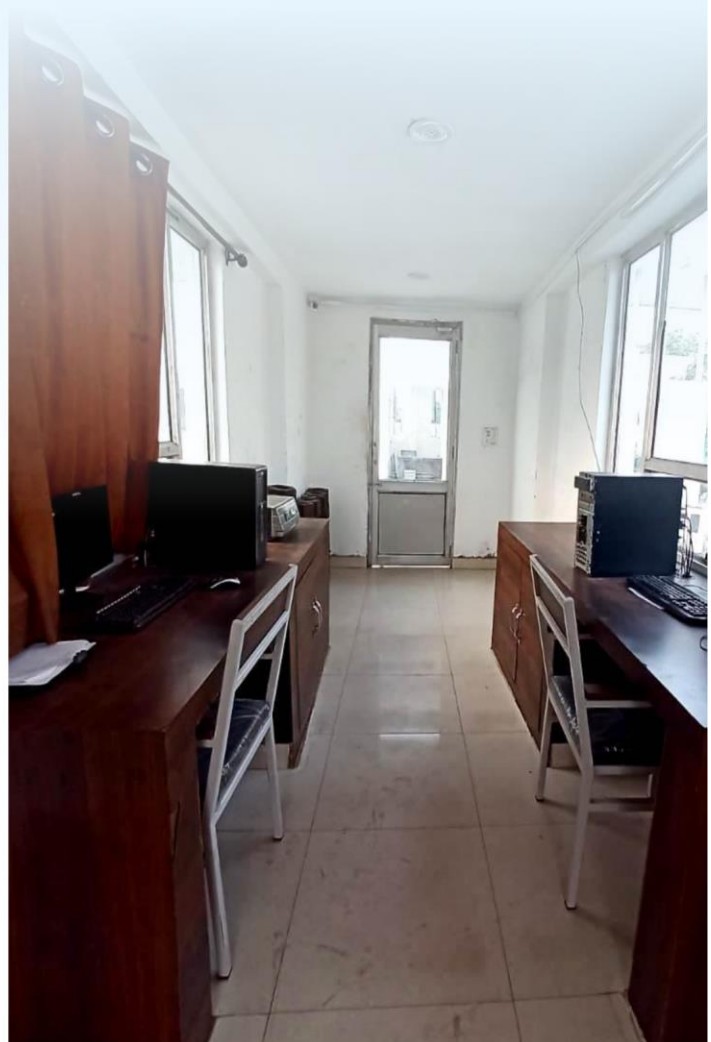
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### Highlights of LEAPS 2024

1. **Emphasis on Inclusivity and Sustainability:** LEAPS 2024 encourages broad participation from across the logistics value chain, emphasizing excellence in technology, sustainability, operational efficiency, and gender diversity.
2. **Diverse Categories for Recognition:** Participants have the opportunity to compete in up to two categories that align with their strengths and areas of expertise.
3. **Robust Evaluation Process:** The evaluation process is thorough and multi-faceted, involving an initial screening, detailed assessments, and presentations to a jury, ensuring that only the most deserving entities are recognized.
4. **Best Warehouse Service Provider (Agriculture) category:** Globus Warehousing was honored as the Best Warehouse Service Provider (Agriculture), a recognition conferred personally by the Union Commerce Minister and the DPIIT Secretary.

“PHD Chamber of Commerce and Industry (PHDCCI), with Dr. Ranjeet Mehta, CEO and Secretary General of PHDCCI, as a jury member for the prestigious recognition programme, emphasized, “These recognitions are not merely acknowledgments of past achievements, but catalysts for future excellence. They inspire our industry leaders to continue their journey of innovation, sustainability, and global competitiveness.”

## **Section VII: ESG Framework for Foodgrain Storage**





## 7. ESG Framework for Foodgrain Storage

ESG (Environmental, Social, and Governance) frameworks are crucial for sustainable growth in the warehousing and logistics industry, particularly in relation to green infrastructure and compliance. These frameworks provide a structured approach for evaluating a company's commitment to long-term value creation by considering environmental impact, social responsibility, and governance practices.

India lacks a singular ESG law, but ESG obligations are enforced through a matrix of rules:

1. The Companies Act 2013 mandates a CSR committee and spending for qualifying companies.
2. SEBI's BRSR regime requires the top 1,000 listed firms to disclose ESG data, including environmental and supply-chain metrics.
3. National Voluntary Guidelines (NVGs) from the Ministry of Corporate Affairs (2011) created nine principles for responsible business behaviour.

### Green Infrastructure and ESG Compliance

Warehouses are increasingly adopting green building standards, incorporating features like LED lighting, renewable energy sources, and water conservation measures. ESG encourages the use of electric vehicles, optimized routing, and reduced packaging waste to minimize the environmental footprint of logistics operations.

As India modernizes its grain storage with silos, PPP models, and digital warehousing solutions, it is imperative to embed an Environmental, Social, and Governance (ESG) framework into this transformation.

We propose the following ESG aligned framework for the sector:

### Objective

To establish an ESG-aligned policy framework that ensures foodgrain storage in India is:

- **Environmentally sustainable**
- **Socially inclusive**
- **Governance-compliant and transparent**



## Foodgrain Warehouse Market in India 2025-2030

### Environmental (E) Framework

| Focus Area                          | Policy Interventions                                                              |
|-------------------------------------|-----------------------------------------------------------------------------------|
| <b>Energy Efficiency</b>            | Incentivize solar-powered warehouses via viability gap funding (VGF)              |
| <b>Emission Reduction</b>           | Promote electric/green logistics for intra-warehouse transport                    |
| <b>Climate Resilience</b>           | Mandate climate risk assessments in warehouse location planning                   |
| <b>Waste &amp; Water Management</b> | Implement grain spoilage recycling and rainwater harvesting in large storage hubs |
| <b>Green Infrastructure</b>         | Provide tax rebates for eco-certified construction of new silos and godowns       |

### Social (S) Framework

| Focus Area               | Policy Interventions                                                                |
|--------------------------|-------------------------------------------------------------------------------------|
| Farmer Inclusion         | Allocate 30% storage space in FCI/PEG godowns to FPOs and smallholder farmers       |
| Employment Generation    | Link storage projects with MGNREGA or skill development schemes in rural areas      |
| Worker Safety & Training | Standardize safety training for warehouse workers; enforce OSHA-style norms         |
| Gender and Equity        | Mandate 33% female participation in storage operations funded under central schemes |
| Community Engagement     | Require stakeholder consultations before storage facility setup in rural zones      |

### Governance (G) Framework

| Focus Area                  | Policy Interventions                                                                            |
|-----------------------------|-------------------------------------------------------------------------------------------------|
| Regulatory Compliance       | Integrate WDRA norms into all central/state foodgrain storage schemes                           |
| Transparency & Digitization | Expand the use of e-NWR (electronic negotiable warehouse receipts) & real-time stock dashboards |
| Audit & Monitoring          | Conduct annual third-party ESG audits of warehouses with >5,000 MT capacity                     |
| Grievance Redressal         | Establish online portals for farmers and workers to report disputes or delays                   |
| Corruption Mitigation       | Use blockchain for procurement-release traceability in FCI and PEG operations                   |



## Foodgrain Warehouse Market in India 2025-2030

### Implementation Strategy

| Agency                                                  | Role                                                                                        |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------|
| Food Corporation of India (FCI)                         | Oversee national-level implementation; integrate ESG benchmarks in FCI-owned/hired godowns  |
| Warehousing Development and Regulatory Authority (WDRA) | Frame ESG-based compliance and audit guidelines; monitor e-NWR usage                        |
| State Civil Supplies Departments                        | Local implementation, site identification, and regulatory approvals                         |
| Ministry of Food & Public Distribution                  | Provide policy and financial oversight; align with PM Gati Shakti, Atmanirbhar Bharat goals |
| Private Sector (PEG, silo operators)                    | Adopt ESG-aligned PPP models with clear contracts and reporting frameworks                  |

### Financing & Incentives

| Source                                      | Mechanism                                                                           |
|---------------------------------------------|-------------------------------------------------------------------------------------|
| Agriculture Infrastructure Fund (AIF)       | Provide concessional credit for silos and solar-powered warehouses                  |
| Green Bonds                                 | Issue ESG-linked bonds through NABARD/FCI for climate-smart warehousing             |
| Viability Gap Funding (VGF)                 | Support private players in adopting solar, smart meters, and low-emission transport |
| State Government Schemes                    | Offer CAPEX subsidies (as seen in Gramin Bhandaran Yojana)                          |
| Multilateral Institutions (e.g. World Bank) | Fund pilots for climate-resilient silos and digitized logistics in rural areas      |

This ESG framework will ensure that India's foodgrain storage transition is not just a logistical modernization effort, but also a **model for sustainable, inclusive, and responsible development**.

With focused interventions, robust metrics, and multi-stakeholder engagement, India can reduce its post-harvest losses, empower its farmers, and meet its climate commitments.

Implementing an ESG framework in foodgrain storage aligns India's agri-logistics with long-term sustainability, resilience, and inclusive growth. It ensures that modern storage practices not only improve efficiency but also contribute to environmental goals, empower communities, and uphold ethical governance. This becomes especially important as India invests in **silos**, smart warehouses, and digital supply chains under schemes like WDRA reforms and the Agriculture Infrastructure Fund (AIF).

# **Section VIII: Constraints and Challenges**





## 8. Constraints and Challenges for foodgrain storage sector in India

To create a truly inclusive and efficient agriculture warehousing ecosystem, several structural inequities and operational inefficiencies must be addressed alongside policy reforms in India. Despite a national capacity of 87.01 Million MT, India's scientific storage capacity remains insufficient. Given the projected production of 368 Million MT by 2030-31, an estimated 69 Million MT of scientific storage is still lacking, particularly in states like Bihar, Odisha, and Assam.

Bridging this deficit is crucial to reduce post-harvest losses and price volatility. This section highlights critical constraints and challenges faced by the industry that restrain private investment in India:

### 1. Stacking requirement constraints

Currently, Central Warehousing Corporation (CWC), State Warehousing Corporations (SWCs), and other State agencies are allowed stacking of bags to 174 MT but same is not available for the private sector which is allowed only 140 MT. This limits opportunities for private developers who often bring innovation and efficiency, and digital systems.

### 2. Escalation clause: WPI versus CPI (Industrial Workers)

Escalation and Financial Indexing: Warehouse infrastructure contracts involve:

- A. **Goods/materials (steel, cement, equipment)** → WPI-referenced escalation
- B. **Labour, services, utilities** → CPI-IW-referenced escalation

Many India regulators for example Central Electricity Regulatory Commission use a composite escalation index combining WPI and CPI-IW (e.g. 45% WPI plus 55% CPI-IW) to calculate annual escalation.

### 3. Shortage of Skilled Manpower

Inadequate trained personnel for scientific storage management ranks as the primary technical constraint. Labour scarcity, particularly in southern states during peak seasons, affects operational efficiency. Lack of technical supervision and skilled storage operators compounds operational challenges, requiring significant investment in training and capacity building that private operators find costly especially in the Micro, Small, and Medium Enterprises (MSME).

### 4. Limited Revenue Streams

Seasonal utilization patterns in agriculture mean warehouse spaces remain idle during off-seasons, affecting profitability. Cyclical nature of Indian agriculture combined with ever-increasing real estate prices results in high investments with owners suffering monetary losses. Restricted alternative use of agricultural warehouses limits revenue



diversification opportunities, as regulatory frameworks often prevent multi-purpose utilization of storage facilities.

## **5. Lack of awareness and limited access to credit and investment private storage options**

Limited awareness among farmers about warehouse receipt financing and private storage options constrains demand for private services. High transaction costs and complex procedures for availing warehouse receipt financing discourage farmers from utilizing private storage facilities.

Financing against Warehousing Receipts entails coordination between:

- 1) Warehouse operator (issuance of WR)
- 2) Grading agency (quality certification)
- 3) Collateral manager (oversight of storage and periodic checks)
- 4) Insurance provider (coverage of theft, spoilage)

Each intermediary charges fees and must be contracted, insured, and monitored, increasing loan processing complexity and time.

Further, banks in India overwhelmingly favour traditional collateral—notably land and buildings—over direct financing against Warehouse Receipts (WRs).

Private warehouse operators face challenges in accessing adequate financing for infrastructure development. Banks remain cautious about warehouse receipt-based lending due to lack of negotiability, absence of electronic warehouse receipts, and difficulty in disposing of security in case of default. This limits the private sector's ability to invest in modern storage facilities.

## **6. Land Acquisition Challenges**

Acquiring suitable land for warehouse construction remains a persistent challenge. Land acquisition processes are complex, time-consuming, and expensive, particularly near consumption hubs where demand is highest. The Land Acquisition Act, 2013 has made the process more stringent, further complicating private sector entry.

## **7. Modernization of conventional warehouses challenges:**

- Large scale warehouses of higher capacity as hubs are few besides it being a fragmented unorganized market
- The infrastructure needs upgradation and lack of mechanization and automation

## **8. Insurance cost and GST credit on insurance of stocks**

India's food security apparatus relies heavily on maintaining substantial foodgrain stocks through agencies like the Food Corporation of India (FCI). Insurance costs and GST implications are critical in this ecosystem, impacting both the viability of buffer stocks and the overall efficiency of food security mechanisms.



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## Foodgrain Warehouse Market in India 2025-2030

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- I. **High Premiums in Vulnerable Regions:** Farmers and agencies in climate-vulnerable districts face significantly higher insurance premiums—up to 70% more than those in lower-risk districts—while receiving 20% lower payouts, undermining the effectiveness of insurance as a risk mitigation tool.
- II. **Transparency and Payout Issues:** Delays, low payouts, and lack of transparency in claims settlement erode trust in the insurance system.
- III. **Operational Inefficiencies:** Manual crop surveys and data discrepancies contribute to higher administrative costs and disputes, increasing the effective cost of insurance for both farmers and foodgrain agencies.
- IV. **GST Credit Mechanism:** Only insurance companies can claim Input Tax Credit (ITC) on GST paid for input services; policyholders (including FCI or farmers) cannot claim ITC on premiums paid. This increases the net cost of insurance for foodgrain agencies and farmers, as the GST is embedded in the premium.

# **Section IX: Recommendations**



## 9. Recommendations for foodgrain storage in India

To enhance private sector participation in foodgrain storage, India needs comprehensive policy reforms including rationalization of state-level taxes and levies, creation of level playing fields between public and private operators, and simplification of regulatory processes. Based on the objectives of the report, following recommendation are provided here:

### Finance

#### 1. Escalation clause: WPI versus CPI (Industrial Workers)

- **Hybrid Escalation Mechanism:** The report recommends a blended index (e.g., 60% WPI + 40% CPI-IW) for escalation clauses in warehousing contracts to balance the cost inflation risk (captured by WPI) and real wage changes (captured by CPI-IW).
- **Annual Index Review:** Mandate adjustment of storage charges and long-term leasing contracts annually based on the agreed escalation formula to ensure fair compensation and project viability.
- **Transparent Clauses:** Standardize escalation clauses in government and PPP contracts to provide clarity for both public and private entities, addressing disagreements on index adoption.
- FCI should encourage warehouses that manage the commodities better through differential payment of charges and keeping the good quality stocks for an extended period.

#### 2. Limited Revenue Streams

- **Warehousing-as-a-Service:** Enable facilities to diversify usage (e.g., storage of allied agriculture goods, fertilisers, seeds, farm equipment) by updating warehousing norms for multipurpose utilization during lean seasons.
- **Value-added Services:** Allow private players to develop ancillaries (grading, packing, cold storage, third-party logistics, minor processing) as permitted activities to generate alternative revenue streams under the PPP modes.
- **Reinstate PEG scheme:** The PEG scheme which provided a 10 year guarantee for private players shall be reinstated to encourage private sector participation. It should be revived with proper implementation procedures considering CAG observations.
- **Government Support for Leasing Models:** Offer infrastructure support or incentives for flexible warehousing models such as space- or pallet-leasing, catering to small and medium enterprise tenants and agri-startups.

#### 3. Advocacy for replacing Cover and Plinth (CAP) storage with modular, low-capex and Leverage Agriculture-REIT

- **Accelerate Public-Private Partnerships:** Use viability gap funding, tax incentives, and streamlined approvals to encourage private sector and FCI investment in modular conventional warehouses.



## Foodgrain Warehouse Market in India 2025-2030

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- **Leverage Agri-REITs:** As outlined in policy review section, agriculture warehousing REITs could mobilize institutional capital for rapid, large-scale deployment of these assets across production zones.
- **Standardize Warehouse Design:** Develop and certify national standards for modular warehouse construction to ensure quality, interoperability, and easy replication.
- **Target High-Loss Regions:** Prioritize warehouse rollout in states and crops with the highest post-harvest losses, integrating warehouses with local mandis and FCI procurement centres.
- **Promote Rural Employment Schemes:** Link warehouse construction to rural employment programs (e.g., MGNREGA) for skilled and semi-skilled labour, ensuring inclusive growth.
- **Monitor Outcomes:** Implement real-time spoilage and quality metrics to demonstrate the ROI of modern warehouses versus CAP storage, supporting further policy adoption.

### 4. Insurance costs and GST credit on insurance of Stocks:

- a. Reduce GST rates on insurance for foodgrain stocks and allied agri-risks, possibly to 5%, while ensuring the ITC mechanism remains intact to prevent cost-push inflation in premiums.
- b. Expand GST exemptions to all rural and agriculture-centric insurance products, mirroring the approach for government-backed schemes, to improve affordability and penetration.
- c. Accelerate the use of satellite imagery, remote sensing, and digital crop surveys to reduce administrative costs, improve transparency, and ensure faster, fairer claims payouts.
- d. Central and state governments should collaborate to standardize statutory and non-statutory charges related to foodgrain procurement and storage, reducing the variance that complicates insurance pricing.
- e. Implement stricter oversight and faster grievance redressal for insurance claims to build trust and encourage wider adoption.

### 5. Waiver of CLU, Stamp Duty, and Construction-related Approvals

Provide concessions on Change of Land Use (CLU) charges, stamp duty, and construction-related approvals for land and infrastructure dedicated to government-aligned warehousing projects. This will ease entry barriers, reduce costs, and fast-track development timelines.

6. **Creating incentives for WDRA registration:** In the current system, there is no incentive for warehouse owners to register their warehouse under WDRA. An easy pledge loan finance without paying collateral management fees for those stocks stored in the WDRA facility will make it attractive for warehouse owners. A more accessible pledge loan enhances capacity utilization, and capacity utilization is the primary driver in the profitability of warehousing. Interest subvention for storage by farmers should be provided so as to make it attractive to store their produce during peak harvest season and benefit from higher prices during lean season.



**7. Lack of awareness and limited access to credit and investment private storage options**

- **Awareness Campaigns:** Run focused campaigns led by WDRA, NABARD, and State Agriculture Marketing Boards to inform farmers and traders about the benefits of scientific storage and WR-backed finance.
- **Digital Platforms:** Set up digital platforms/helplines providing real-time information on warehouse locations, vacancies, charges, and institutional credit options.
- **Expand Warehouse Receipt System:** Promote electronic National Warehouse Receipts (eNWR) adoption, and sensitize banks to increase direct lending against eNWRs from both public and private warehouses.
- **Risk Mitigation Products:** Encourage insurance and credit guarantee mechanisms for warehouse receipt-backed lending to make credit attractive and reduce reluctance of banks.
- **Single-window clearance mechanisms,** improved access to affordable finance, and consistent government support for private infrastructure development are essential for unleashing private sector potential in meeting India's growing storage requirements.

## Operations

1. **Stacking requirement constraints:** Currently, Central Warehousing Corporation (CWC), State Warehousing Corporations (SWCs), and other State agencies are allowed stacking of bags to 174 MT but same is not available for the private sector which is allowed only 140 MT. This limits opportunities for private developers who often bring innovation and efficiency, and digital systems.
  - **Adopt Standardized Protocols:** Develop and disseminate standardized stacking protocols based on crop type, storage structure (godown, silo), and safety guidelines to optimize space utilization while ensuring grain quality.
  - **Modernize Facilities:** Encourage investment in modern silos and automated handling systems that enable higher and safer stacking compared to traditional warehouses.
  - **Regulatory Flexibility:** Allow context-specific flexibility in stacking requirements under Warehousing Development and Regulatory Authority (WDRA) guidelines, subject to independent inspection and structural audits.
2. **Dispute resolution mechanism:** WDRA may set up an effective conflict resolution mechanism for resolving disputes between warehouse owners and users. Such a mechanism could be an online facility.
3. **Integration of Warehousing into Urban and Regional Master Plans:** Include warehousing infrastructure under city/town Master Plans, recognizing its national importance for food security. This would facilitate better public infrastructure access and improve connectivity, leading to enhanced valuation for private developers.
4. **Promotion of Rooftop Solar and Net Metering Policies**  
Encourage rooftop solar installations on warehouse infrastructure, supported by favourable policies of net metering and sale of surplus electricity to state



## Foodgrain Warehouse Market in India 2025-2030

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distribution companies. This will enhance sustainability, reduce operating costs, and contribute to India's renewable energy goals.

5. **Ease of doing business:** There should be ease of doing business for warehouse owners with the Government. Delays in payment by the government can cause substantial losses to warehouse owners.
6. **Shortage of Skilled Manpower**
  - **Skill Development Initiatives:** Launch targeted government-backed storage management training programs under schemes like National Skill Development Corporation (NSDC), focusing on scientific storage, fumigation, and logistics.
  - **Public-Private Collaboration:** Encourage partnership between storage operators, vocational institutes, and industry bodies to co-develop curriculum and certify skilled workers.
  - **Apprenticeship Programmes:** Include on-site apprenticeship and internships for hands-on learning to attract youth and address seasonal labour shortages.

## Technology

1. **Use of hermetic storage**
  - Hermetic bags and cocoon storage may be encouraged to prevent wastage and quality loss. This can be used at all levels – individual farmer, Farmer Producer organization, Government procurement, and private sector. There is a need to encourage research on hermetic storage and create awareness of these storages. Hermetic bags seem particularly useful for long storage and high-value commodities.
  - There is also a need to incentivize usage of hermetic bags in the initial 2-3 years of adoption. This will help overcome the initial hesitation of using new technology and create scale economies, which will bring down the per-unit prices of this storage equipment. This will help save grains and keep the quality of the product intact, particularly for those products where pesticide usage is rampant and organic character needs to be preserved.
  - Government procurement should use hermetic storage instead of CAP storage. This will help in adopting high-quality storage at procurement centres. This has the advantage of creating small capacity high-quality storage quickly and can be transported easily. With a good procurement process and quality assessment and tracking system, traceability can be enhanced and enable easier handling.
2. **Use blockchain technology:** Due to possible quality variations and long-distance transactions, the agricultural commodity value chain suffers from trust between the parties. Blockchain has been the emerging technology in enhancing trust and, therefore, is well-suited for agribusiness transactions, particularly the part of the value chain dealing with warehousing. Government should encourage the adoption of blockchain technology in warehousing operations.

Further, incentives should be provided to develop a quick and reliable quality assessment and traceability system so that value chain transactions are streamlined. If quality produce is hermetically bagged and quality assessment is



## Foodgrain Warehouse Market in India 2025-2030

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available, the product should go through the value chain without opening the bag till it reaches the ultimate users. A good digital traceability system will enhance the efficiency of transactions in the value chain. This will act as a warehouse receipt system, and banks may also come forward to finance more easily.

### 3. Substantial research support is needed to improve warehousing in India.

**Some key areas of research that need to be undertaken are as follows:**

- a. **Moisture loss:** there seems to be a lack of scientific understanding of moisture loss and gains for different commodities when they are stored under different conditions and locations. This seems to affect warehouse owners and often leads to malpractices and disputes. A scientific study should be conducted to arrive at a guideline for moisture loss/gain based on various factors such as location, storage conditions, changes in weather conditions, commodity stored, etc.
- b. **Packaging technology:** Studies should be conducted on effective packing technologies for storing different commodities under different situations. For example, studies should determine under what conditions it is profitable to use hermetic bags and cocoons. Hermetic bags may need different handling as hooks, generally used in handling bags, cannot be used. The use of types of machinery for such handling needs to be established.
- c. **Storage conditions:** Studies should establish the right temperature and humidity for different commodities during their storage in the warehouses. Fumigations and their impact on grain quality also need to be established.
- d. The problem of poorer quality grains brought to the warehouses is also common. Proper study on preparing produce for storage needs to establish guidelines and create awareness among farmers. Also, in some cases, warehouses themselves may provide services such as drying and cleaning of commodities, so that good quality produce is stored.
- e. Newer technologies such as computer visioning, near-infra-red, nuclear magnetic resonance, etc., should be explored to facilitate quick and cost-effective quality assessment, mainly when keeping the stocks in the warehouses.

**STUDY TEAM**



## Foodgrain Warehouse Market in India 2025-2030

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Ahmedabad - 380014  
Email: phdgujarat@phdcci.in

### HARYANA

PHD House, Sector -31A ,  
Chandigarh -160031  
Phone: 91-172-5001900, 5006900  
E-mail: rdchd@phdcci.in

### HIMACHAL PRADESH

B-85, Ground Floor, Near MBD House,  
Sector-1, Phase-1, New Shimla - 171009  
Telefax: 91-177-2807855  
E-mail: phdshimla@phdcci.in

### JAMMU

Ground Floor, Maa Vaishno Devi,  
Gas Premises, Main Chowk, Channi,  
Himmat, Jammu - 180 015  
Email: phdjammu@phdcci.in

### JHARKHAND

Building Number 174, 1st Floor,  
Tara Niketan, Behind Sushila Niketan,  
Radium Road, Ranchi - 834 001  
Phone: 91-651-2245356  
Email: phdranchi@phdcci.in

### KASHMIR

245, C-63, Rajbagh Extension,  
Srinagar - 190008  
Email: phdsrinagar@phdcci.in

### MADHYA PRADESH

22, Vaishali Nagar, Near Kamla Nagar,  
Police Station Kotra, Bhopal - 462 003  
Phone: 91-755-2670247  
E-mail : phdbhopal@phdcci.in

### MAHARASHTRA

1307-08, 13th Floor,  
Parinee Cresenzo Opp. MCA Club,  
Avenue 3G Block, BKC, Bandra East,  
Mumbai - 400051  
Phone: 91-22-61496622  
E-mail: phdmh@phdcci.in

### NORTH EAST REGION (NER)

(Arunachal Pradesh, Assam, Manipur,  
Meghalaya, Mizoram, Nagaland, Sikkim and  
Tripura)  
101, IIE Block, Rajdhani Apartment,  
R.G. Baruah Road, Ganeshguri,  
Guwahati - 781 006  
Phone: +91-361-2303136  
E-mail: nerguwahati@phdcci.in

### PUNJAB

TMA Complex 2nd Floor, 80, Court Road,  
Amritsar (Punjab)-143001  
Telephone : 0172-5001900, 5006900  
E-mail: rdchd@phdcci.in  
CICU Complex, E-648/A,  
Near BSNL Exchange,  
Phase-5, Focal Point,  
Ludhiana - 141010  
Telephone : 0172-5001900, 5006900  
E-mail: rdchd@phdcci.in

### RAJASTHAN

PHD House, Plot No.: G - 68  
CO Mansarovar Industrial Area,  
Near Galaxy Multiplex,  
Jaipur - 302 020  
Phone: 0141-2398825  
E-mail: phdjaipur@phdcci.in

### TAMIL NADU

Refex Building, 67 Buzullah Road,  
Parthasarathy Puram, T Nagar,  
Chennai - 600017  
Phone: 044-4340 5900/950  
Email: phdtn@phdcci.in

### TELANGANA

105, Surya Towers, First Floor,  
Sardar Patel Road,  
Secundrabad - 500003  
Email: phdtg@phdcci.in

### UTTAR PRADESH

PHD House, Plot-B, Phase-II,  
Vibhuti Khand, Near Apna Bazar,  
Gomti Nagar, Lucknow - 226 010  
Phone: 91-522-2728940  
E-mail: phdlucknow@phdcci.in

### UTTARAKHAND

166/296, 1st Floor Ankur Tower  
Behind HDFC Bank, Rajpur Road  
Dehradun-248001, Uttarakhand  
Phone: +91 85279 00622  
E-mail: phduk@phdcci.in

### WEST BENGAL

1st floor, 6/A, Regent Kusum,  
Dover Road, Ballygunge,  
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Email : phdwb@phdcci.in

## PHD CHAMBER OF COMMERCE AND INDUSTRY

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