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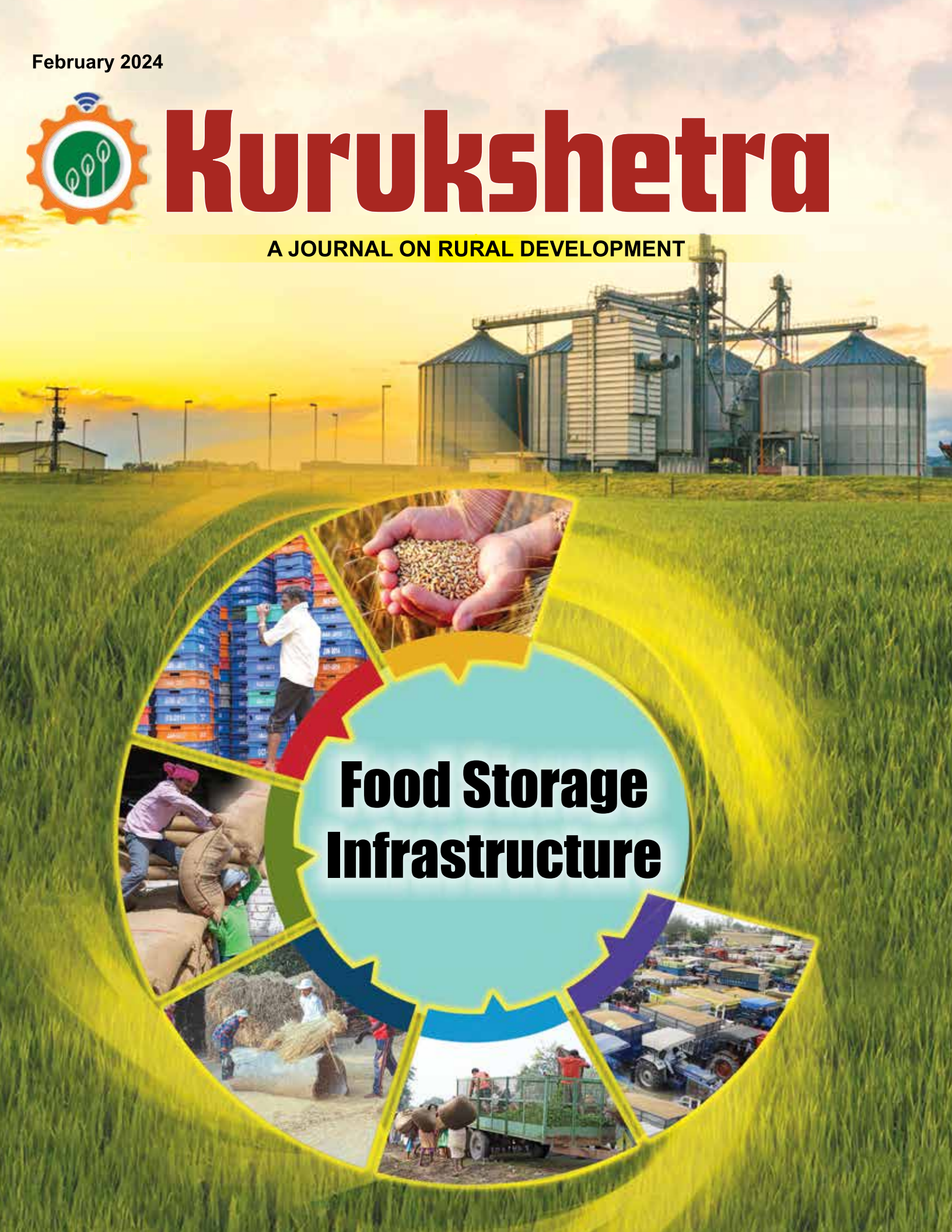
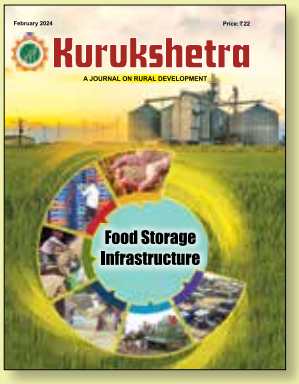


Food Storage Infrastructure



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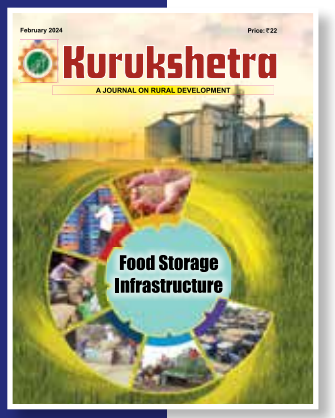


Editorial

Strong food storage is essential in a country where agriculture is the main driver of the economy. In terms of its potential for manufacturing, export, growth, and consumption, India's food sector ranks among the largest in the world. The February issue of Kurukshetra delves into the critical theme of **Food Storage Infrastructure**, assessing the current state, identifying challenges, and proposing avenues for improvement.

A resilient modern food storage infrastructure is indispensable for India's journey towards food security. The authors of the article ***Shaping Sustainable Food Systems with Storage Infrastructure: A Pathway to Viksit Bharat*** write that that food grain storage will directly support achieving the targets set for the Sustainable Development Goal of Zero Hunger, which aims to end all forms of hunger and malnutrition and double the agricultural productivity and incomes of small-scale food producers.

The article ***Warehousing: Changing Gears to Meet Present Challenges*** discusses the warehousing facilities in the country and the facilities provided by them. The warehouses are seen as vital links within supply chains, as key areas that enable an organisation to regulate the flow of goods between supply and demand points.

In the article, ***Mega Food Storage Plan: Challenges and Way Ahead***, the readers can read about the Ministry of Cooperation approving a network of integrated grain storage facilities across the country. By utilising the 'Whole-of-Government' approach, the new plan calls for the construction of a variety of agri-infrastructures at the Primary Agricultural Credit Societies (PACS) level, such as processing units, fair price shops, warehouses, and custom hiring facilities.

The article ***Entrepreneurial Opportunities in Food Storage Infrastructure*** mentioned that the rising demand for processed food could be a great potential opportunity for the country's farmers. Opportunities abound in terms of increased production, greater demand for raw materials for value-added products, diversification from grain-based crops to horticulture, and production of high-value process-able varieties, all of which tend to boost farmers' incomes, especially small and marginal farmers.

A comprehensive strategy encompassing governmental reforms, community participation, and public-private collaboration is needed as the country focuses on enhancing food security to feed its growing population. By prioritising investments in advanced storage facilities and promoting sustainable practices, India can fortify its agricultural supply chain, ensuring a stable and secure food future for its citizens. We hope that the readers will get an insight into the topic as well as the required information related to the subjects.

"A GRAIN SAVED IS A GRAIN PRODUCED".

Shaping Sustainable Food Systems with Storage Infrastructure

A Pathway to Viksit Bharat

A resilient storage infrastructure holds the key to agrifood systems sustainability that will ensure food and nutrition security for future generations, in-tandem with the economic, social, and environmental development goals. India is on the path of becoming a developed nation-*Viksit Bharat* by 2047. It is projected that India's population will be 1.64 billion by 2047, of which nearly 0.82 billion will be residing in urban areas. There is a need to strengthen the storage infrastructure to meet the food demand of the population and creation of sustainable food system.

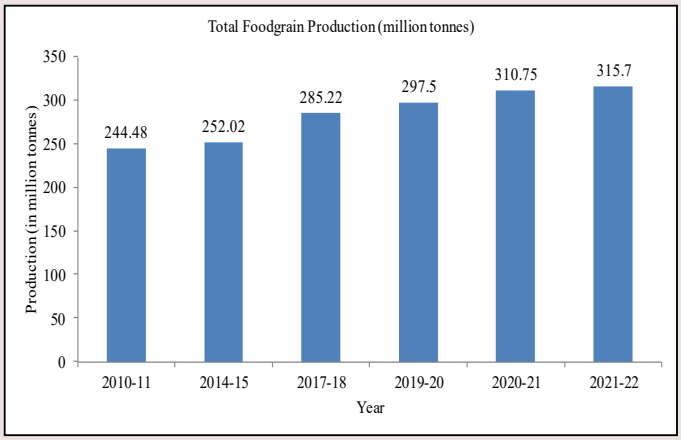
Several initiatives have been undertaken by the Government of India to strengthen storage infrastructure in the country. The largest grain storage structure has been approved by the Union Cabinet that will be disseminated through cooperatives. The enhanced storage infrastructures will provide robustness to the food value-chain. Also, it helps to mitigate post-harvest loss, maintain produce quality, storage of food buffer stock, avoid distress sale of produce, and enhance the income of the farmers.

* **Dr. Neelam Patel**
** **Dr. Tanu Sethi**

Agriculture is the mainstay of the Indian economy, which has witnessed a magnificent transition from being a food deficit to a food surplus and is now an agriculture produce exporter to the world. India holds the second-largest agricultural land in the world, with over 200 countries in its export basket (Ministry of Commerce & Industry, 2023). Food production in India has increased significantly since the last decade, from 244 million tonnes during 2010-11 to 310 million tonnes during 2021-22 (Fig. 1).

Since 1951, the Indian population has increased from 35.9 crore to 140 crore, and is now estimated to be 164 crore by 2047. Under the leadership of Prime Minister Narendra Modi, India is on the path of becoming a developed nation-*Viksit Bharat* by 2047-marking the centenary year of India's Independence. The vision of a developed nation by 2047 encompasses economic growth, social progress, environmental sustainability, and good governance (PMO, 2023). Currently, the agri-food system is transforming owing to the projected social-economic and environmental

Figure 1: Total Food Production in India over the Years



Source: Directorate of Economics and Statistics, Department of Agriculture, Cooperation and Farmers Welfare, Ministry of Agriculture and Farmers Welfare.

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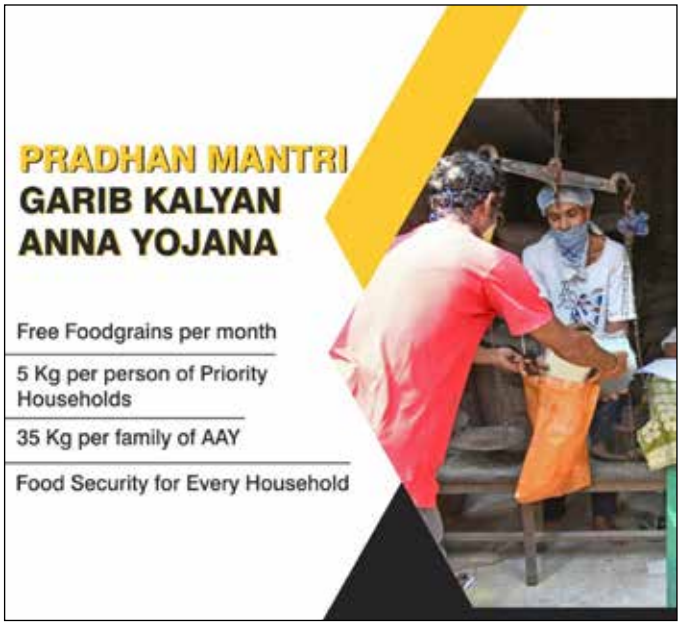
challenges, viz., climate change, rising population, land degradation, depleting natural resources, stagnant crop productivity, food losses, and waste etc.

There are significant advantages towards advancement in building storage infrastructures. Food loss and waste are major concerns for the sustainability of food systems. As per the FAO's State of Food and Agriculture (2019) report, around 14 per cent of the world's food (valued at $400 billion per year) is lost after it is harvested and before it reaches the shops. UNEP's Food Waste Index Report (2021) showed that a further 17 per cent of the food ends up being wasted in retail and by consumers, particularly in households (United Nations Environment Programme, 2021). Food that is lost and wasted accounts for 38 per cent of total energy usage in the global food system.

As per the study commissioned by the Ministry of Food Processing Industries and carried out by the Central Institute of Post-Harvest Engineering & Technology (CIPHET), Indian Council of Agricultural Research (ICAR), the economic value of quantitative losses of 45 major crops/commodities was found to be in the tune of Rs. 92,651 crore (Rs. 32,853 crore in case of 15 Cereals, Pulses and Oilseeds, Rs. 16,644 crore from 7 fruits, Rs. 14,842 crore from 8 vegetables, Rs. 9,325 crore in case of 9 Spices and Plantation crops and Rs. 18,987 crore in case of 6 Livestock produces) (Ministry of Agriculture & Farmers Welfare, 2023a). Therefore, enhancing sustainable and world-class storage infrastructures are inevitable to boost growth in agriculture and allied sectors and achieving the targets of UN-Sustainable Development Goals (UN-SDGs).



During 2022-23, total food grain production in the country is estimated to a record high of 329.68 million tonnes, which is higher by about 14.1 million tonnes than the production of food grains of 315.62 million tonnes achieved during 2021-22 (Ministry of Agriculture & Farmers Welfare, 2023). India accumulates a huge stock of staple food for specific purpose of supporting the poor and needy during urgent times. The Pradhan Mantri Garib Kalyan Anna Yojana (PMGKAY) is the World's biggest social welfare scheme aimed at ensuring national food and nutrition security and empowerment of weaker sections of the society. The PMGKAY envisions free food grains to about 81.35 crore beneficiaries for a period of five years with effect from 1st January 2024 (Ministry of Consumer Affairs, Food & Public Distribution, 2023).

The enhanced storage infrastructure will support meeting the food-demand, supply, and access to the nationals across the country. Various initiatives have been taken by the Government to encourage storage infrastructure and strengthen food systems under the 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), Pradhan Mantri Kisan Sampada Yojana (PMKSY), and Mission for Integrated Development of Horticulture (MIDH).

Sustainable Food Systems

The sustainable food system (SFS) is defined as a "food system that delivers food security and nutrition for all in such a way that the economic, social and environmental bases to generate food security and nutrition for future generations are not compromised" (FAO, 2018). The Food Systems (FS) approach encompasses the entire value-adding activities involved in the production, aggregation, processing, distribution, consumption, and disposal of food products that originate from agriculture, forestry, or fisheries, and parts of the broader economic, societal, and natural environments in which they are embedded. Here, storage infrastructure plays a

significant role in adding resilience to the food system and will positively impact food security and food availability. Storage management is an important link in the whole system of food grains procurement to its distribution for consumption. The use of scientific storage methods can reduce these losses to as low as 1%–2%. The traditional storage practices in India have improved in accordance with the diverse agro-climatic conditions, preventing a collapse of the food-supply system in the advent of any natural calamity or outbreak like COVID-19.

At present, several structures ensure the safe storage of grains, ranging from small metal bins to tall grain elevators/silos. These storage structures are classified under different categories like traditional storage structures, improved storage structures, modern storage structures, and farm silos. At any given time, 60-70% of grains are stored on the farm in traditional structures like Kanaja, Kothi, Sanduka, earthern pots, Gummi and Kacheri. However, indigenous storage structures are not suitable for storing grains for very long periods (Ashok Gowda et al., 2018). Warehouses or Silos are used for bulk storage of grains. Warehouses are scientific storage structures especially constructed for the protection of the quantity and quality of stored products.

In India, warehouses are owned by the Food Corporation of India (FCI), the Central Warehousing Corporation (CWC), or the State Warehousing Corporations (SWCs). Also, advanced cold chain storage infrastructure capacity has been strengthened for perishable food commodities. The cold storage capacity of 8.38 lakh MT has been created under the Integrated Cold Chain and Value Addition Infrastructure scheme.

Estimations of Post-harvest Food Losses

An estimation of post-harvest losses of various agriculture commodities, using primary survey was carried out by the Indian Council of Agricultural Research-Central Institute of Post-Harvest Engineering (ICAR-CIPHET) titled "Assessment of Quantitative Harvest and Post Harvest Losses of Major Crops and Commodities in India" (2015); and later by NABARD Consultancy Service Pvt. Ltd. (NABCONS) titled "Study to Determine Post-Harvest Losses of Agri Produce in India" (2022). Both studies indicated that the major post-harvest losses are reported in the allied sector, i.e, fisheries and eggs. Amongst the horticultural crops, the trend in losses is higher in fruits (between 6 - 16%) followed by vegetables (4-12%) than in plantations and spices (between 1-8%), respectively (Ministry of Food Processing Industries, 2022). The assessment of both studies is mentioned in Table. 1.

Table 1: Post-harvest losses of Major Crops and Commodities as per different Studies

Crops/ Commodities	Loss (%)	
	As per ICAR-CIPHET Study (2015)*	As per NABCONS study (2022)**
Cereals	4.65 - 5.99	3.89-5.92
Pulses	6.39 - 8.41	5.65-6.74
Oil Seeds	3.08 - 9.96	2.87-7.51
Fruits	6.70-15.88	6.02-15.05
Vegetables	4.58-12.44	4.87-11.61
Plantation Crops & Spices	1.18-7.89	1.29-7.33
Milk	0.92	0.87
Fisheries (Inland)	5.23	4.86
Fisheries (Marine)	10.52	8.76
Meat	2.71	2.34
Poultry	6.74	5.63
Egg	7.19	6.03

Source: Ministry of Food Processing Industries (https://pib.gov.in/PressReleaseIframePage.aspx?PRID=1885038)

Government Initiatives

Since Independence, the agriculture storage infrastructure or warehousing policies have been evolving in India. The introduction of the National Policy on Handling, Storage, and Transportation of Food Grains in 2000 saw a major policy shift on warehousing as it promoted the participation of the private sector in building warehouses and storage infrastructures (Gopal Naik et al., 2022). The leading agencies for implementing national schemes to promote supply chain infrastructure in India are the Department of Food & Public Distribution (DFPD), the Ministry of Agriculture, the Ministry of Food Processing Industries, the Agricultural & Processed Food Products Export Development Authority (APEDA), and the Department of Animal Husbandry, Dairying & Fisheries.

The Food Corporation of India (FCI) is set up under the Food Corporation's Act of 1964 and is the only government agency entrusted with the movements of food grains from procuring states to consuming states through a network of storage infrastructure, owned or hired by FCI in the whole of India. FCI monitors the storage capacity and based on the storage gap assessment, storage capacities are created/hired. FCI augments its storage capacity through the following schemes:- Private Entrepreneurs Guarantee (PEG) Scheme, Central Sector Scheme (CSS), Construction of Silo's under Public Private Partnership (PPP) mode, Hiring of godown from Central Warehousing Corporation (CWC)/ State Warehousing Corporations (SWCs)/State Agencies, Hiring of godown through Private Warehousing Scheme (PWS). As on 01.07.2023, the Food Corporation of India has a network of 1923 warehouses (Owned/Hired) with a capacity of 371.93 LMT for storage of Central Pool food grains (Ministry of Consumer Affairs, Food & Public Distribution, 2023a).

The total food grain production in India is about 311 MMT and total Storage Capacity in India is only 145 MMT, i.e., there is a shortage of 166 MMT of Storage. To address the shortage of food grain storage capacity in the country, the Government last year approved the 'World's Largest Grain Storage Plan in Cooperative Sector', which have been rolled out as a Pilot Project in different states/UTs of the country. The plan entails creation of various agri infrastructure at the Primary Agricultural Credit Societies (PACS) level, including setting up decentralised godowns, custom hiring centers, processing units, Fair Price Shops, etc. through convergence of various existing schemes of the Government of India (GoI) under different Ministries, such as, Ministry of Agriculture and Farmers Welfare (Agriculture Infrastructure Fund (AIF), Agricultural Marketing Infrastructure Scheme (AMI), Sub Mission on Agricultural Mechanization (SMAM), Mission for Integrated Development of Horticulture (MIDH); Ministry of Food Processing Industries (Pradhan Mantri Formalization of Micro Food Processing Enterprises Scheme (PMFME), Pradhan Mantri Kisan Sampada Yojana (PMKSY); Ministry of Consumer Affairs, Food and Public Distribution (Allocation of food grains under the National Food Security Act, Procurement operations at Minimum Support Price) (Cabinet, 2023).

These Pilot projects are implemented by the National Cooperative Development Corporation (NCDC) with the support of NABARD, Food Corporation of India (FCI), Central Warehousing Corporation (CWC), NABARD Consultancy Services (NABCONS), National Buildings Construction Corporation (NBCC), etc. in different States/ UTs.

Through schemes, PACS can avail of subsidies and interest subvention benefits for the construction of

godowns/storage facilities and setting up of other agri infrastructure. There are more than 1,00,000 Primary Agricultural Credit Societies (PACS) in the country, with a huge member base of more than 13 crore farmers. Further, NABARD is also extending financial support to PACS by refinancing them at highly subsidised rates of around 1 per cent, after incorporating the benefits of 3% interest subvention under the AIF scheme for projects up to Rs. 2 Crore. States/ UTs and the 'national level' cooperative federations, like the National Cooperative Consumers Federation (NCCF) and the National Agricultural Cooperative Marketing Federation of India Ltd. (NAFED), and 1,711 PACS have been identified for the creation of storage capacity under the Pilot Project. Presently, construction of godowns is going on in 13 PACS of 13 States/ UTs under the Pilot Project (Ministry of Cooperation, 2023). The creation of decentralised storage capacity will range from 500 MT to 2000 MT at the PACS level.

There has been a recent push to increase the cold storage capacity available in India – with extensive tax breaks. The Income Tax Act, 1961 allowed for a deduction of up to 150% on expenditures incurred towards setting up cold storage. It also allowed an exemption on profits earned for the first five years and a 25-30% exemption for the next five years. The setting up of cold storage is also exempt from service tax and excise duty. The cold storage infrastructure will surely enhance the life cycle of perishable commodities.

Achieving Sustainable Development Goals

Food grain storage will directly support in achieving the targets made under the Sustainable Development Goal of zero hunger, which aims to end all forms of hunger and malnutrition and double the agricultural productivity and incomes of small-scale food producers. Also, indicators under target 12 i.e. sustainable consumption and production can be achieved through advancement in storage infrastructures in India.

Way Forward

Modernisation of post-harvest storage infrastructures, improved warehousing capacity, private sector participation, and hands-on–training on scientific storage methodology can empower farmers/stakeholders in the management and storage of agricultural commodities. The promotion of decentralised local storage system will reduce the wastage of food grains, strengthen food security, and prevent distress sales by farmers. The increased investment in modernisation of warehousing, logistics, cold chain, food processing, and integrated value chain development can enable the goal of becoming a development nation and achieving the Sustainable Development Goals. ❑

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Warehousing
Changing Gears to meet Present Challenges

This article starts by giving a brief background of the challenges faced by farmers at the post-harvest stage. Then, it discusses the Warehouse Receipt System and Transferability of Receipts. The salient features of the participants of a good warehouse receipt system (WRS) – depositors, warehousemen, assayers, financial institutions, and a regulator - are outlined. The concept behind Negotiable Warehouse Receipts (NWR) is explained as also the role of WDRA in implementing the NWR system in the country.

* **T.K. Manoj Kumar**
** **Sai Pradeep G**

A warehouse is, simply put, a house for goods, analogous to rented accommodation or a guest house, for the material in its journey along the supply chain. Warehouses in the past were always termed cost centres, under the notion that they rarely added value. But, there has been a sea change in warehouse operations, owing to various factors like the movement of production into developing countries, the growth of e-commerce, and a simultaneous increase in consumer demand.

Warehouses are now seen as vital links within supply chains, as key areas that enable an organisation to regulate the flow of goods between supply and demand points. The ultimate goal of warehousing is to minimise operating costs while maintaining quality service. It aims to achieve this through an optimal blend of the following actions:

i) Maximising storage space use;
ii) Deploying handling equipment;
iii) Preserving the quality of the goods;
iv) Guaranteeing access to goods as and when needed; and
v) Maintaining necessary security measures.

As we will see, the warehouse receipt also plays a key role in warehousing operations for obtaining timely finance. Therefore, warehousing is not just about storage; it encompasses a host of other activities, which are equally important.

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Views expressed are personal.

Farmers face major problems at the post-harvest stage, particularly those of liquidity. Often, they have no other option but to go to the nearest mandi and sell their stocks. However, immediately after harvests, prices usually fall. The farmer will get remunerative prices only if he can wait for some time. But, unfortunately, he cannot do this as he needs funds to pay back outstanding crop loans, and to meet his consumption needs, besides meeting the requirements of the next sowing season. He needs money for that. The farmer may also suffer from the lack of a trustworthy storage system. Debates in the media about farmers' incomes, distress sales due to financial want, and storage facilities are legion. This is despite increases in food production, and credit flow into the agricultural sector (Thanks to the green revolution, increased credit flow and Government's policy support, the total foodgrain production in the country has risen to record levels of 3296.87 lakh tonnes for 2022-23[1]. The total number of operational Kisan Credit Card (KCC) Accounts as on March 2023 was 7.35 crore with a sanctioned limit of Rs. 8.85 lakh crore).

The fact of the matter is that though the credit flow into agriculture has increased, liquidity in rural areas is still low. If we analyse the credit flow to the sector, the major chunk is pre-harvest finance, and post-harvest finance is only about 2% of total agricultural credit. The percentage of farmers benefiting from direct lending from banks can also be improved. The farmers would not also realise a good value for their produce if have to sell it immediately after harvest (in 2006, this was estimated at not more than 35% of the actual value of the produce, when it was sold immediately after harvest)[2].

Therefore, there is need to increase credit flow at the post-harvest stage to improve farmers' incomes. One way to solve this problem is to bestow sufficient tradability and negotiability on warehouse receipts, so that banks come forward to extend pledge finance against warehouse receipts for the farmer's stock. The existence of a well-regulated warehouse receipt system is essential to increase the confidence of such lending institutions. In this article, we will explore some basic concepts of the warehouse receipt system in the Indian context.

Warehouse Receipts and Warehouse Receipt Systems

A warehouse receipt is an acknowledgement in writing or in electronic form issued by a warehouseman or his duly authorised representative on receiving goods, not owned by him, for storage. At some stage, nearly everyone has used instruments similar to warehouse receipts. They may have left their coat in a coat check or their luggage in a cloak room at an airport while traveling. In each case, they would have received a receipt, which they expect to hand back and get the items they left for safekeeping, in the same condition as when they were given. This is the same principle behind warehouse receipts. However, people depositing goods using a warehouse receipt sometimes use the receipt to secure a loan from a bank or other financial institution. In other words, the goods underlying the warehouse receipt can be used as collateral for a loan. The legal underpinnings of the receipt and its linkage to the stored goods create this opportunity for the owners of the goods.

Warehouse receipts have a long history and were recorded as grain receipts in Mesopotamia around 2,400 BC. Athens, Egypt, Persia, Jerusalem, and Rome too traded some form of warehoused goods. Warehouse receipts have continuously evolved over time with specialised laws. However, for a long time, these receipts did not enjoy the complete fiduciary trust of banks due to fears about the quality and quantity of underlying goods, fraud, or mismanagement by warehousemen, which would make it difficult to recover the loans given against receipts. The available legal remedies were also time consuming. Further, the format of warehouse receipts was not uniform. There were impediments to the negotiability of warehouse receipts. (Negotiability of a receipt may be defined as the power to transfer the title over underlying goods from a seller to buyer through endorsement of the receipt. See box 1 on page 14 for details).

Lack of negotiability created difficulties for depositors and farmers in taking full advantage of their stock at the time of harvest by obtaining pledge finance against the goods. One way of

overcoming these problems is to use a Negotiable Warehouse Receipt (NWR), which, apart from being proof that the underlying goods have been deposited in the warehouse, is also a document of title regulated by a statutory entity.

Box 1: Transferability of Receipts

The modalities of transfer of a warehouse receipt will depend on whether the receipt is negotiable or non-negotiable.

Negotiable Warehouse Receipts

Such receipts can be issued "to the bearer," i.e., to anyone in physical possession of the receipt, in which case the ownership of the goods is transferred simply by delivery of the warehouse receipt. To sell the receipt and the underlying goods, one needs only to physically give the receipt to the buyer. Negotiable warehouse receipts can also be issued to the order of a named person. In that case the "negotiation" or sale of the goods is complete when the receipt is delivered and the buyer (i.e., the subsequent holder of the warehouse receipt) endorses the receipt. In India, delivery of goods through a negotiable warehouse receipt can be made to the order of a named person, and that person or a subsequent endorsee can endorse it.

Non-negotiable Warehouse Receipts

Such receipts are issued to a specific individual. Their transfer requires three steps:

i. An agreement between the receipt holder and the buyer;
ii. Sending a written notice to the warehouse operator; and
iii. A confirmation from the warehouse operator that the goods are now held in the warehouse on behalf of the buyer.

NWRs have several benefits over ordinary receipts as shown in the comparison between an ordinary warehouse receipt and NWR in the table below:

Comparison of an Ordinary Warehouse Receipt and NWR

Ordinary Warehouse Receipt/ Stock Receipt	NWR
Not regulated	Regulated by a statutory authority
No uniformity of information in the receipt	Receipts contain information in a standard format, as prescribed under the regulatory act and rules
Problems in valid transferability of goods in case of transfer/ endorsements, due to lack of legal negotiability of warehouse receipts.	Transfers are easier due to the regulatory backup

There are many legal concepts governing documents of title, but at their core, they evolved from a simple principle: it is always easier to transport and transfer a piece of paper than a physical good, especially bulky commodities like grain. Therefore, documents of title, like negotiable warehouse receipts and bills of lading, become important for ease of doing business, which would suffer if physical goods had to be presented each time a transaction took place.

Understandably, parties accepting a warehouse receipt require adequate legal protections. In the English common law countries like the United Kingdom, and the United States, this protection arises from:

- The laws dealing specifically with bailments and issuance of warehouse receipts and the licensing of warehouses;
- The laws governing negotiable instruments or bills of exchange (regarding the rights of transferees);
- The laws concerning the sale of goods (regarding the status of warehouse receipts as title documents and the passage of title to goods covered by warehouse receipts); and
- The laws relating to the pledging of goods.

These laws would enable the smooth functioning of a warehouse receipt system (WRS). Details of a WRS

are given in the box below. In addition to any legislation governing the rights and obligations of parties in the country where the warehouse is located, the rights and obligations are further defined by the terms and conditions of written storage agreements and wording of storage documents.

Warehouse Receipt System (WRS)

The main participants in a WRS are the following:

1. **Depositor:** A depositor brings goods to a warehouse. He bears three types of costs: Transportation costs, Storage fees charged by the warehouse (including any grading, cleaning, fumigating fees required to store the goods properly) and financing costs charged by banks if the warehouse receipt is used as collateral for a loan. Depositors expect the following benefits: lower post-harvest losses due to better storage; possible price increases after harvest season; opportunity to grade the products; availability of insurance coverage; and, access to credit, using the warehouse receipt as collateral.
2. **The Warehouseman:** On receipt of the goods from the depositor, the warehouseman tests, grades and weighs it and gives the depositor a receipt showing this information. The duties of warehouse operators are generally specified by law. They are expected to take due care of the goods when handling and storing them. This implies that the operator will protect the goods from risks ranging from theft, to weather hazards, to infestation by pests and disease. Ultimately the warehouseman must be able to deliver the goods as per the specifications indicated on the warehouse receipt in terms of quantity and quality upon presentation of the receipt.
3. **The Bank or Financial Institution:** The depositor can pledge the warehouse receipt, for a loan from a bank. Banks usually provide loans against only a percentage of the current market value of the commodity stored, ranging from 50 to 80%. This is to account for potential price fluctuations of the commodity and the likely costs involved in recovering and selling the commodity, if the borrower default on loan repayment. While extending loans, banks should mark lien over NWRs. Once this is done, no other operations are allowed and warehouseman cannot deliver the goods unless the lien is removed by the bank. In case of non-payment of loan by the borrower, the bank invokes the lien and transfers the receipt to its name. It can then be used to liquidate the goods. If the loan is repaid, the lien is removed and warehouseman can deliver the goods to the holder of the receipt.
4. **Insurance companies, testing agencies etc.:** A good warehouseman takes insurance coverage for all the goods stocked in his warehouse, to meet hazards like fire, floods, burglary etc. He may use the services of a testing agency for assaying certain goods. The warehouse operator plays a key role in a WRS. Depositors need to believe that their goods will be kept safely and returned to them intact when needed. Banks will extend loans against warehouse receipts only if they are convinced of the warehouse receipt's trustworthiness, and thereby the warehouseman's reliability. Therefore, the role of the warehouseman—his duties and rights—needs to be clearly defined for the WRS to flourish. The relationship between the warehouse, the depositor, the buyer of the warehoused goods, banks and insurance companies is based on the expectation of good faith on the part of the warehouseman.
5. The regulator does a general oversight of the activity of the WRS through registration of warehouses, conducting periodic on-site inspections, serving as the first stop in dispute resolution between parties to the warehouse receipt transaction and imposing punitive measures against proven offenders etc. The role of a regulator is important to ensure that the trust of all the stakeholders in the WRS is maintained at all time.

In India, Warehousing (Development & Regulation) Act was enacted in 2007, to give legal backup to negotiable warehouse receipts. The Government sought to establish a negotiable warehouse receipt system by enacting this Act for all commodities, including agricultural commodities. This measure had been recommended in an RBI report[3], which had stated:

"Data in respect of finance extended by a few large banks was examined. It reveals that financing against Warehouse Receipt is still not a popular method of financing though it is showing an upward trend. The concerned banks counted lack of negotiability, absence of electronic Warehouse Receipts, difficulty in disposal of security in case of default and lack of trust in the receipts issued by private warehouses as constraints

in further expansion of such financing. The Group appreciates that it will be desirable that a Warehouse Receipt Act be passed putting the negotiability of Warehouse Receipts on firm legal footing."[4]

The Act was expected to make warehouse receipts a prime tool of trade and facilitate finance against it throughout the country, and also allow banks to improve the quality of their lending portfolio and enhance their lending in respect of goods deposited in warehouses.

WDRA and New Directions in Warehousing

The Warehousing (Development and Regulation) Act, 2007

The enactment of the Warehousing (Development & Regulation) Act, 2007 provided for the establishment of a comprehensive warehouse receipt system (WRS), based on negotiable warehouse receipts (NWRs), for the first time in India. Among other things the Act provides for the following salient measures:

i. Establishment of the Warehousing Development and Regulatory Authority (WDRA) to exercise the powers conferred on it, and to perform the functions assigned to it under this Act.

ii. Made registration of warehouses with WDRA compulsory for those warehouses which are intending to issue Negotiable warehouse Receipts (NWRs).

iii. Defined various liabilities and duties of registered warehousemen in the interest of depositors.

iv. Defined warehouse receipt and its mandatory particulars to standardise warehouse receipts.

v. Defined the negotiability and non-negotiability of warehouse receipts and various warranties related to it.

vi. Identified various offences by warehouseman/ depositor and penalties for the offences.

vii. Recognised the lien of warehouseman on goods for recovery of all lawful charges for storage and preservation of the goods.

viii. Given special powers to warehouseman to deal with perishable and hazardous goods.

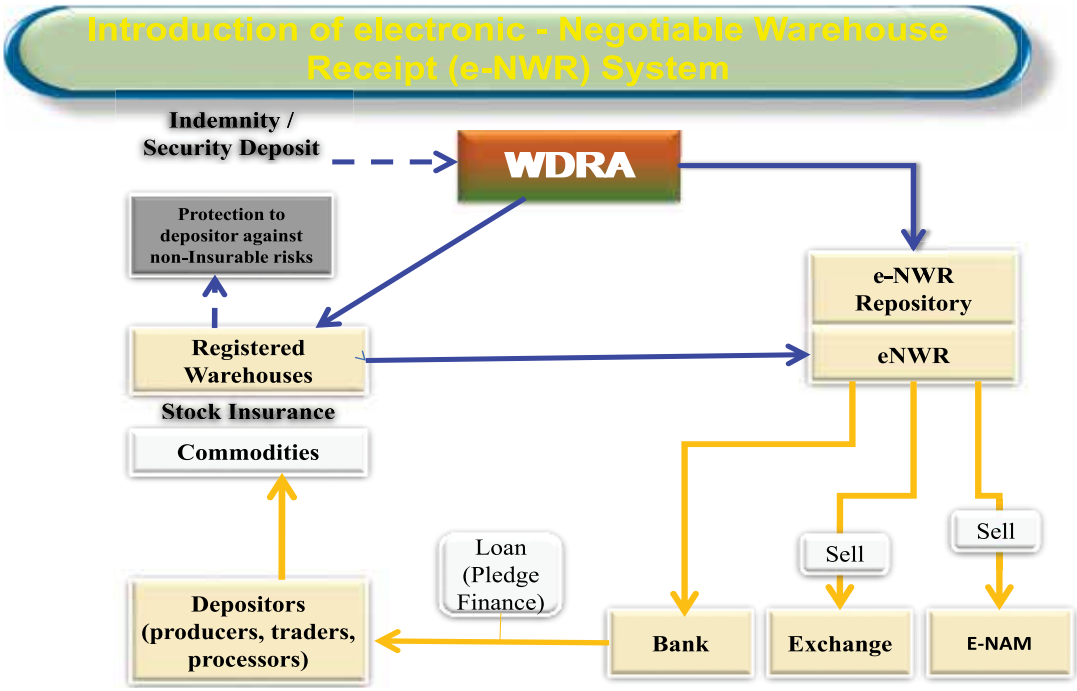
ix. Constituted an Appellate Authority to hear appeal by any person aggrieved by an order of WDRA made under this Act, or any rules or the regulations.

x. Formed a Warehousing Advisory Committee to advise the Authority on matters relating to the making of regulations under the Act and to make recommendations for effective implementation of the Act.

xi. The Act has overriding effect on anything inconsistent contained in any other law in force or any instrument having effect by virtue of any law other than this Act.

Comparison between Paper based WR and e-NWR

Paper Based Warehouse Receipt	e-NWR
Can be shared with prospective buyer in a one-to-one mode only	Help farmers / depositors to have access to a large number of buyers nationwide with better bargaining powers
Cannot be split	eNWRs can be split with obligation to transfer only a part of the commodity
Prone to loss, mutilation, tampering, fudging WR information etc.	No possibility of any such eventuality
Inherent difficulties in efficient clearing and trading in a transparent manner	Promote an efficient clearing, settlement and delivery system with transparency in trading of agricultural produce
Difficult to share vital information of the WR with multiple stake holders	It is easy to share vital information of the receipts with multiple stake holders. Market participants can view and manage their receipts via an online portal
Assaying is not mandatory	Reporting the quality of goods in eNWR is mandatory
Raising finance/ selling the goods underlying the receipts is a cumbersome process.	Easing access to finance by enabling multiple transfers without physical movement of goods.
Risk of issuing of duplicate NWR without following the procedure	Not possible
Fraudulent overstatement of the value of goods is possible	Agmark.net prices are retrieved in the electronic portal issuing eNWRs, to serve as a benchmark
Monitoring and surveillance are costly	Regularly monitored by WDRA at reduced monitoring costs. This builds credibility amongst market participants
Problems in valid transferability of receipts in case of transfer/ endorsements	Being electronic in nature multiple transfers are easy, with due backup of W(D&R) Act 2007
There are cases of Multiple finance against the same warehouse receipt	Multiple finance against the same eNWR is not possible due to electronic lien marking.



Conclusion

The WDRA has more than 5,000 valid warehouse registrations as on 31 December 2023. Annual loaning against eNWR went up to Rs. 2442 crore in 2022-23. The figure had reached Rs. 2582 crore on 31 December 2023. The State Bank of India has launched a special product for extending pledge finance to farmers against eNWRs without any additional collateral or processing fees. More banks may follow suit.

WDRA's journey, so far, has shown that with appropriate legislation and regulation the warehouse receipt can become an accepted instrument for the pledge and transactions of the underlying commodities between parties located far from the warehouse. It increases the range of goods that can be used to secure a loan, moving farmers beyond the traditional collateral: land. In addition to facilitating agricultural credit against warehoused goods, WDRA's regulation also encourages other financial services such as insurance. All this will encourage depositors to store their produce in scientific warehouses registered with WDRA, and get the loans against them from banks, which in turn will help farmers to get better prices by avoiding distress sale at the time of harvest.

In the agricultural sector, in the long run, the introduction of the warehouse receipt legislation can also have a transformative effect beyond the provision of finance, by the professionalisation of the warehouse industry. Benefits include lowering post-harvest losses, reducing seasonal price volatility, improving production and yield assessment, etc. WDRA's regulatory ecosystem will undoubtedly help in improving warehousing standards in the country. Indeed, the very presence of warehouses constructed on similar standards and following approved SOPs will improve inter-operability between warehouses and increase efficiency.

Further, an effective legal framework for warehousing is a crucial component for a healthy agricultural sector and business climate. Effective pledge finance facilities can enable farmers, processors, and traders to expand their business activities using bank finance rather than through the slower process of capital formation through accumulation of retained earnings. It is pertinent to state that SEBI has mandated that settlement of trades on commodities exchanges, should be done through eNWRs issued by warehouses registered with WDRA. Similarly, the Food Corporation of India insists that its stocks can be stored in privately owned warehouses, only if these are registered with WDRA or have applied for it. This shows the trust of these entities in the regulated warehouses.

It would not be wrong to say that WDRA's regulation has succeeded in creating an effective WRS, based on NWRs in India. It should provide a solution to meet the challenges facing the warehousing sector, which include need for better infrastructure and scientific storage practices, greater trust between participants and increased pledge finance.

However, since warehouse registration with WDRA is not mandatory unless the warehouseman intends to issue e-NWRs, it is a fact that WDRA's ambit does not presently cover all the warehouses in the country. Nevertheless, its registered warehouses should stand as a beacon of good quality and professional practices, in the warehousing sector. ❑

Endnotes

1. as per Final Estimates for 2022-23
2. As per the 14th report of the Standing Committee on Food, Consumer Affairs and Public Distribution (2006-07)
3. Report of the Working Group on Warehouse Receipts & Commodity Futures, 2005
4. Page x ibid

Institutionalised Management of Food Security

FCI's Role in Safe Storage, Distribution and Transportation of Food Grains

India runs the world's largest food security management system, not only in terms of number of people who benefit directly but also in terms of volume of operations and vastness of the related supply chain. While safe storage of food is the most important requirement to run this complex system, transportation from surplus regions to deficit regions and eventual distribution among a large number of beneficiaries and institutions are equally important features. The nodal institution managing this herculean task is Food Corporation of India (FCI), a Government of India undertaking. This article brings out the contemporary status of the food storage infrastructure required for food security management, along with the related supply chain of transportation and distribution of food grains across the country.

*** Ashok KK Meena**
**** Chandrasen Kumar**

At present, the projected population[1] of India is about 1.40 billion, which constitutes about 17.5% of the global headcount of 8 billion.[2] The Government of India distributes free food grains under Pradhan Mantri Garib Kalyan Ann Yojana (PMGKAY) to about 81.35 crore people[3] across the country, identified as per the guidelines contained in the National Food Security Act (NFSA), 2013. While 8.93 crore people (in families with an average size of 3.76 persons) are covered under the Antodaya Anna Yojana (AAY) and given 35 kg of free food grains per family per month, irrespective of the number of persons in a family, Priority Household (PHH) people,

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i.e., remaining 72.42 crore people are given 5 kg of food grains per person, per month. Apart from PMGKAY, the Government also runs some other welfare schemes (OWS) like ICDS, PM-POSHAN, Annapurna, hostels, welfare institutions, etc. The total requirement of food grains to run all these schemes is about 610 lakh MT.

At the time FCI was established on 14 January 1965, India was a food-deficit nation that often imported food grains from other nations, particularly from United States of America (USA) under PL-480 agreements. The 'Short Tether Policy' of the then USA President Lyndon B Johnson to tighten food supply to India under PL-480 through short-term approvals of shipments brought India into a 'Ship-to-Mouth' situation. It was also the greatest challenge that undermined India's sovereign standing.

During this era India launched 'Green Revolution' to augment food production with the use of high yielding verities of seeds and deployment of technology in agriculture. The success of Green Revolution required constant support to farmers by way of guaranteeing returns so that food grain production could become viable and profitable enough for cyclic investment. This task was performed quite well by FCI. MSP purchase by FCI and allied state government agencies, particularly wheat and paddy is known as central pool procurement and led to constant increase in production (Chart – 1). In fact, during 2023 Government purchased about 760 lakh MT of wheat and rice from about 1.25 crore farmers and has directly credited Rs. 2,19,140 crore into their bank accounts.

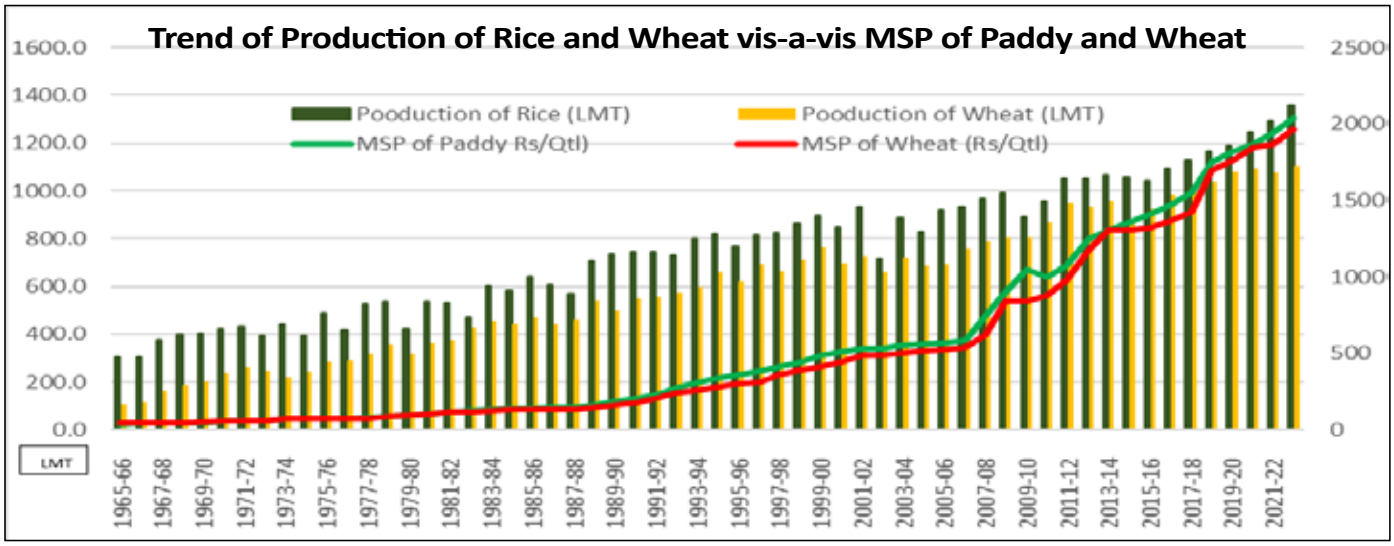

Chart-1: Impact of Support Prices in production of wheat and rice during 1965-2022.

The continued procurement from farmers encouraged them to produce more, due to which procurement share of the total production also started rising (Chart – 2). India soon became self-sufficient and even food surplus. Our dependence on imports declined, and within a span of six years, Indian Government decided to cancel imports from USA even before PL-480 agreements had expired. The food situation intermittently passed through some stress due to floods and droughts but largely remained manageable due

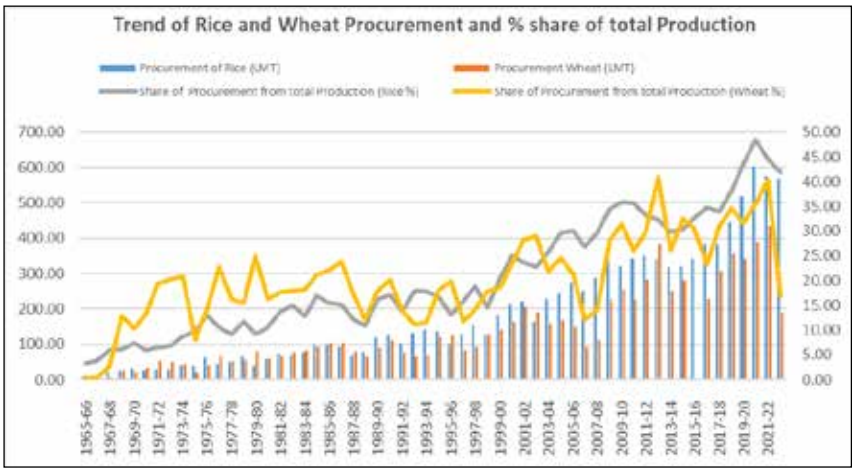

Chart-2: Rising procurement and share of total production of rice and wheat during 1965-2022.

to the institutionalised structure of operations led by FCI.

This long institutionalised journey had started with four mandates given to FCI. They included:

a) To provide remunerative prices to the farmers,

b) To provide food grains to vulnerable sections of the society at affordable prices,

c) To maintain buffer stock reserves for exigencies, and

d) To intervene in market for price stabilisation.

In order to achieve these mandates, FCI had to constantly enhance its operations, particularly storage, transportation, and distribution of food grains.

Storage Operations for Food Grains in Central Pool

For any agricultural produce and its value-added products, it is important that they are stored properly for preservation of their qualities, future usage, and consumption. Thus, storage forms a very important aspect of food security operations not only for regular consumption during every cycle of production but also for maintaining buffer reserves for use during exigencies.

Food grains like wheat and rice with low-moisture and low pH activity fall under the non-perishable category and can be stored for a longer duration of 1 to 4 years. While wheat, after procurement, is bagged and stored in godowns as well as in bulk form (loose, unpacked grains) in silos, paddy, after procurement from farmers, is milled into rice and then stored in godowns in bagged form.

Conventional Godowns

The functional requirement of bagged wheat and rice storage are a quality conventional storage structure (warehouse/godown) along with management practices to provide protection against all possible causes of damages during storage. FCI's storage structure has following features:

a) Robust to withstand environmental stresses for long time, less maintenance cost.

b) Able to prevent entry of rodents, birds, and other animals.

c) Walls, floor, and roof must be damp proof and prevent entry of rainwater.

d) Provision for aeration to maintain uniform temperature and relative humidity as far as possible, sampling for observing insect pest incidence, pesticides application, and fumigation.

e) Properly located and connected with roads with sufficient space for entry and exit of trucks. Locations near the kilns, flourmills, garbage dumps, tanneries, slaughterhouses, and chemical industries have to be avoided.

Thus, a typical conventional godown may have following dimensions depending on capacity:

Godown type	Approx. Capacity (Tonnes)	Internal dimensions (m)		
		Length (m)	Width (m)	Height (m)
Small	1120	100	12	7.5
	2700	250	20	9
	5400	500	34	12
	10500	1000	35.5	18
	28510	2500	97.19	14.48
Large	57020	5000	129.74	21.34

(Note: for storage capacity above 2500 MT, godowns are divided in suitable compartments)

Major engineering requirements of such a warehouse/godown (Fig. 1) are as follows:

- Suitable foundation, damp proof, and rigid floor free from cracks and crevices.
- Plinth at 80 cm above the ground level for truck loading and 1060 mm for the rail.
- Platform width of 183 cm for road-fed and 244 cm for rail-fed with slope 1:40 (minimum).
- 23 cm thick longitudinal walls of brick/stone masonry up to 5.6 m height from the plinth.
- Steel ventilators of opening 1494×594 mm2 placed near the top on the longitudinal walls.
- Air inlets steel ventilator of 620×620 mm2 placed at 600 mm above the floor level.
- Suitable number of steel ventilators glazed with fixed wire-mesh on the gable walls.

- Single span structural steel or tubular trusses for roof.
- Cantilever trusses are fixed on to RCC columns at 4000 mm height.

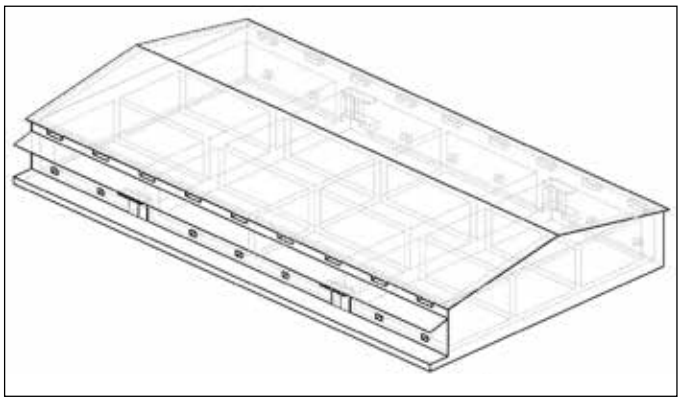

Fig. 1: A typical bag storage structure with stacking floor plan

CAP (Covered and Plinth) Storage: A Phased Out Method in FCI

A low-cost and short-term storage facility for wheat was in use earlier, particularly at the time of harvest in major wheat procuring states due to a lack of covered storage space. Bags are stacked on a wooden frame (dunnage) placed on a raised platform (plinth), and the lot is covered with 800-1000-gauge thick polyethylene sheets (Fig. 2). This storage method is known as cover and plinth (CAP) and is common for the storage of wheat and paddy at present in India.

Fig. 2: An earlier view of phased out CAP storage

The CAP storage site should be at a higher elevation than adjoining areas and away from drainage, canals, and flood-prone areas to prevent flooding. Normally, the plinth is made with brick and mortar, which is at least 150 mm above ground level. Anti-termite treatment is essential to avoid termite attacks.

The main disadvantages of CAP are that the fumigation is not very effective and the covers are damaged at times of high wind and rain, bird attack, monkey attack, etc., which make food grains vulnerable. For these reasons, FCI has phased out CAP storage since 2022.

Bulk Storage - Silos

Silo is a relatively modern technique of storage consisting of a vertical container used for storing food grains and other granular materials in loose and bulk form. Bins and silos of varying capacities, along with bulk handling, aeration, and fumigation systems, are very popular worldwide for grain storage (Fig. 3). These structures are made of masonry, reinforced concrete, or metals (plain or corrugated), with a conical hopper or flat bottom. In hopper-bottom bins, the grains flow under gravity and do not deposit in the bin while unloading (self-cleaning system), and shovelling equipment is not required.

Fig. 3: Concrete silos at FCI, Mayapuri, New Delhi, and Commercial hopper bottom storage silos

Modern silos have facilities for temperature recording and monitoring at different grain depths. Temperature gradients in metal silos are high in comparison to wood or concrete bins due to the high thermal conductivity of the metals, which causes more moisture transfers inside the silo. Spout lines are also a concern in bulk storages when uncleaned grain is stored. During filling of the bin, fine particles, admixtures, and small grains usually concentrate at the center of a heap, whereas wholegrains flow away towards the periphery. This core of high-dockage in the center of the pile is known as the spout line. It acts as a source of heat development and pest propagation

in the silo. The spout lines obstruct the air circulation during aeration, which may affect the shelf life of grain.

Preservation of Food Grains during Storage

In order to maintain and preserve the quality of stored food grains in godowns and silos, FCI regularly conducts periodical inspections by trained professional staff. Depending on the situation, food grains are inspected for classification, categorisation, disinfestation, and fitness for liquidation following the FIFO principle. Food grains are kept infestation-free by prophylactic treatment with malathion and deltamethrin and disinfected by curative treatment through fumigation with aluminum phosphide (Fig. 4).

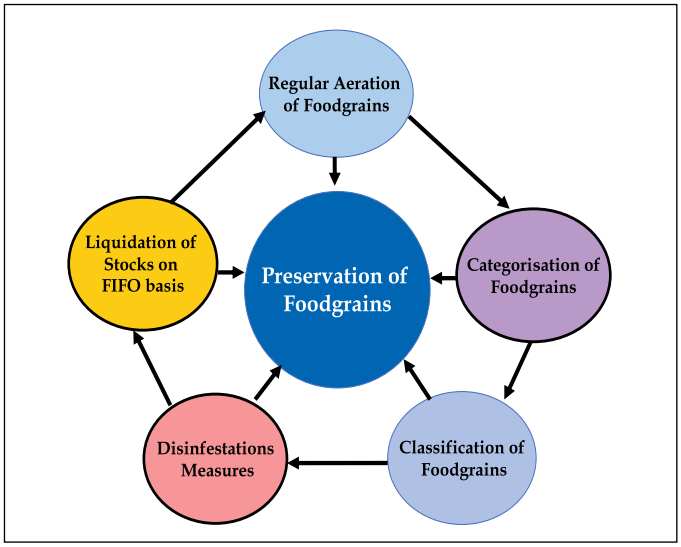

Fig-4: Tenets of quality maintenance and preservation of food grains by FCI during storage

Storage Capacity in Central Pool

By the end of 2023, FCI has 761.29 lakh MT storage space for safe storage of food grains at about 2000 locations, even after phasing out CAP storage. This storage capacity is about 125 times the storage capacity on 6.18 lakh MT at the time of its inception in 1965-66. While 363.69 lakh MT is with FCI, about 397.60 lakh MT is with state government agencies. FCI has augmented 146.5 lakh MT of scientific covered storage in the form of 414 conventional godowns under the Private Entrepreneurship Guarantee (PEG) scheme with a Public-Private Partnership (PPP).

As a part of modernising its storage infrastructure, FCI is creating 111 lakh MT state-of-the-art modern silo storage in hub and spoke model of which about 15 Lakh MT has already been completed. As per the plan 25 lakh MT silos would be created for hub at 36 locations and 86 Lakh MT silos for spoke at 249 locations. It has also constructed 0.77 lakh MT storage in difficult terrains. About 0.83 lakh MT is under construction for storing adequate amount of food grains in such areas. FCI has improved the infrastructure of existing godowns in a phased manner, introduced LED illumination in place of conventional lighting for energy efficiency, reduced carbon footprint, and installed high-quality CCTV to improve godown security.

Transportation and Distribution of Food Grains

As food grains have to be distributed among 81 crore people all over the country, procured food grains from surplus states are transported to deficit states. Efficient transportation is pivotal in connecting surplus grain-producing regions with deficit areas. FCI employs a multimodal transportation approach, utilising railways, roadways, and waterways. Typically, wheat is transported from Punjab, Haryana, and Madhya Pradesh to all other states, while rice is transported from Punjab, Haryana, Uttar Pradesh, Uttarakhand, Chhattisgarh, Odisha, Andhra Pradesh, Telangana, and Madhya Pradesh to all other states.

During the last 5 years, the average quantity of food grain transported was about 600 lakh MT. This is about 40 times the food grains transported during 1965-66, when interstate movement was just 15 lakh MT. This supply chain involves interstate transportation of about 82% wheat procured in 3 surplus states and about 66% rice procured in 9 surplus states. Thus, on average, a food grain bag travels about 1200 km in the country.

The food grains transported in the deficit regions are also stored in local godowns to reach 5.45 lakh Fair Price Shops (FPSs) across the country through state government agencies. The implementation of biometric authentication and the One Nation One Ration Card (ONORC) has brought transparency and efficiency to the distribution process and security to migrant workers. FCI has distributed about 700 lakh MT food grains during 2023, which is about 39 times the amount distributed during 1965-66.

Technology Integration and reduction in losses

Over the years, FCI has actively embraced

technological advancements to enhance its operations. The integration of digital systems for inventory management like Depot-on-Line System (DoS), GPS-enabled Vehicle Tracking System (VLTS), linking of rice mills with individual Depots/ warehouses for delivery of rice, and allocation of space at individual warehouses for absolute transparency in the procurement process (WINGS), use of e-procurement platforms, setting up a dedicated 'Call Centre' to address grievances of all external stakeholders have not only improved the accuracy and efficiency of FCI's processes but have also contributed to transparency and accountability throughout the supply chain.

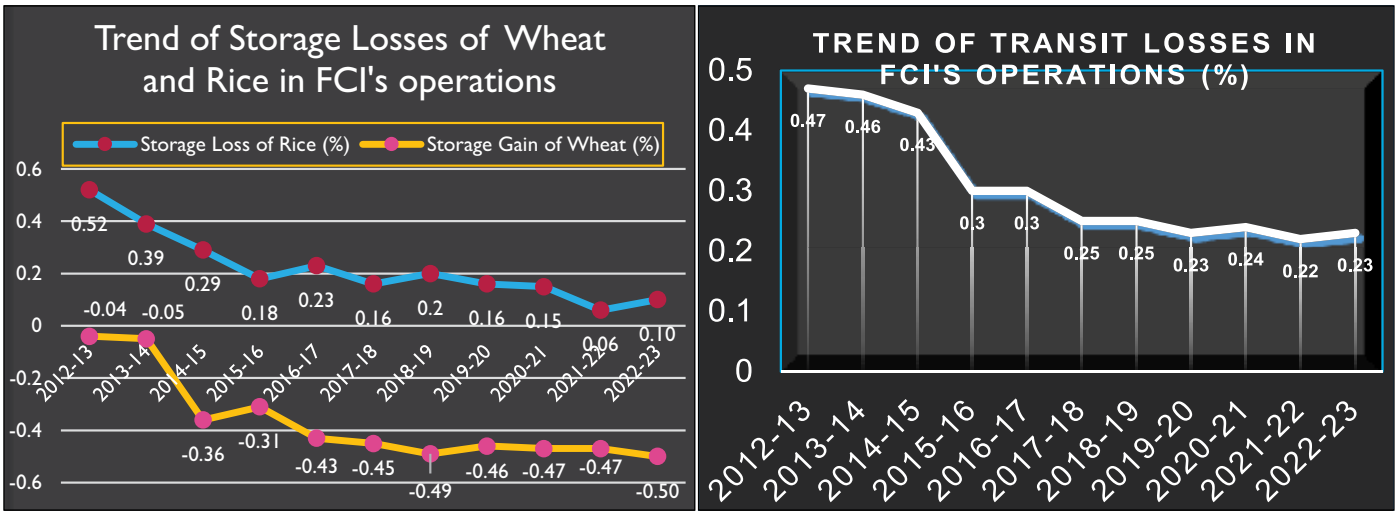

Chart-3: Trend of Storage and Transit Losses from 2013-14 to 2022-23

While a scientific study by ICAR to evolve scientific norms for losses coupled with online documentation aided with improved operations have improved overall storage losses of 0.17% in 2013-14 to an overall gain of -0.12% in 2022-23, steps like exhaustive joint verification (JV) and high security seals have brought down transit losses from 0.46% to 0.22% during the same period (Chart - 3).

Thus, FCI's food supply chain not only ensures food security to all the needy citizens in every nook and corner of the country but also make it the world's largest food system. The efforts to modernise its operations and to take along all the stakeholders is a continuing process to improve its efficiency and effectiveness. ❑

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Note: Storage, Chapter 9 in the book Agro-Processing and Food Engineering has been co-authored by Shri Chandrasen Kumar from where some parts of the content, figures of FCI, and tables have been sourced.

Mega Food Storage Plan

Challenges and Way ahead

The Ministry of Cooperation approved a network of integrated grain storage facilities through Primary Agricultural Credit Societies (PACS) across the country. There are more than 1,00,000 PACS spread across the country, with a huge member base of more than 13 crore farmers. This will be the world's largest grain storage plan in the cooperative sector.

Manjula Wadhwa

It is a well-known fact that India is the second largest food producer in the world, with an annual production of about 3,100 lakh tonne. However, currently, the country has a food grain storage capacity of 145 million metric tonnes (MMT) against the total food production of 311 MMT - leaving a gap of 166 MMT. This means the existing storage infrastructure can only accommodate approximately 47 per cent of the total produce. When compared to the USA and China, which process 65% and 23%, respectively, of their perishables, India is able to process a meagre 7%, which is quite negligible. The USA, Brazil, Russia, Argentina, Ukraine, France, and Canada have the capacity to store more food grains than they produce.

A study by the National Academy of Agricultural Sciences (NAAS) concludes that storage is the major cause of post-harvest losses for all kinds of food in India. Unfortunately, poor systems and techniques of handling, storage, and distribution result in post-harvest losses of around 10-16 per cent for major cereal crops, 26 per cent in the case of wheat, and 34 per cent in the case of vegetables and fruits. At the regional level, only a few of our southern states have a storage capacity of 90% or higher. In northern states like Uttar Pradesh and Bihar, it is below 50%.

At present, multiple government agencies, like the Food Corporation of India, the Central Warehouse Corporation, the Warehouse Development Regulatory Authority, the Railways, and the civil supply departments of states, are involved in the grain management. However, that has not yielded the desired results, and in the absence of sufficient storage facilities, food grains are sometimes stored in the open, which results in substantial damages.

It is a matter of concern to see grains, amounting to thousands of tonnes, getting wet in the market yards. Market yards fail to provide basic protection for the produce inside the yard. These issues also adversely affect the grains that are already harvested and the crops that are about to be harvested, resulting in huge losses to farmers. In this backdrop, reducing post-harvest losses is the key objective of the new storage infrastructure plan formulated by the Government of India. It is widely

(To be continued on page no. 28)

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2023 in Focus: A Year of Unprecedented Strides and Achievements

Humara Sankalp Viksit Bharat

JANUARY

PMGKAY extended for 5 years to provide

Free ration to 80 crore people

ensuring food security for everyone

Historic move by Modi Govt - Islands in Andaman & Nicobar named after

Param Vir Chakra Awardees

FEBRUARY

1300 railway stations being modernized

under Amrit Bharat Station Scheme to create a new atmosphere for development in the country

Cheetahs return to India

at their new home - Kuno National Park

MARCH

Bengaluru to Mysuru in 75 minutes

with the inauguration of new Access controlled Highway, improving connectivity between the twin cities

APRIL

India at the forefront in responding to crisis, evacuating 3,862 Indians from Sudan through

Operation Kaveri

MAY

Inauguration of New Parliament building

as a symbol of democratic strength and progress that blends tradition with modernity

JUNE

Yoga showcased at world-level

with PM Modi leading yoga session at U.N. HQ in New York

> "This is an India that is working hard to make its resolutions a reality. This India is unstoppable, this India is tireless, this India does not gasp and this India does not give up."
>
> *- Prime Minister Narendra Modi*

JULY

India becomes a hub for global exhibitions with the inauguration of

Bharat Mandapam

Sickle Cell Anaemia Elimination Mission

launched for better health of tribal communities

AUGUST

Chandrayaan-3 lands on the moon

making India the 1st country to touch the moon's south pole.

SEPTEMBER

India's G20 Presidency

becomes an epitome of success; Delhi Declaration adopted unanimously

Nari Shakti Vandan Adhiniyam ushers in a new era of inclusive governance with

33% reservation for women

in Lok Sabha and State Legislative Assemblies

OCTOBER

NaMo Bharat Train

India's first Rapid Rail Service launched, ensuring high-speed intercity regional connectivity

Access to affordable healthcare expanded with distribution of

Ayushman Cards crossing 26 crores

NOVEMBER

Viksit Bharat Sankalp Yatra

flags off with **'Modi Sarkar ki Guarantee Vans'** ensuring 100% coverage of welfare schemes

DECEMBER

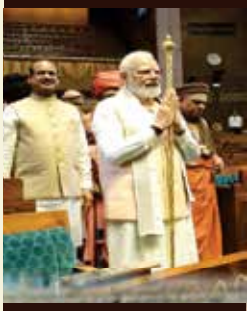
Ayodhya Airport inaugurated

ensuring seamless connectivity to Ram Janmabhoomi - a new era in Airport excellence

India gets new

Criminal justice laws

replacing three colonial-era laws



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acknowledged that checking post-harvest losses is critical for ensuring food security. It is pathetic that the State Governments are not able to provide basic storage facilities in the market yards, depriving farmers of remunerative prices and affecting the nutritional value of grains. Thus, the priority should be to provide safe and secure market yards, especially protecting grain stocks from natural calamities. The Central Government's new move will be a win-win for agricultural societies and farmers, as well as consumers. The farmers, apart from storing their produce in the facilities, will also be able to get up to 70% loans from these societies. In addition, this will also lead to significant savings in transportation costs. Moreover, it will reduce our import dependence and create employment opportunities in rural India.

Under the new plan, the Ministry of Cooperation has approved a network of integrated grain storage facilities through Primary Agricultural Credit Societies (PACS) across the country. There are more than 1,00,000 PACS spread across the country, with a huge member base of more than 13 crore farmers. This will be the world's largest grain storage plan in the cooperative sector. Spread over 1 acre of land, the integrated facility will be built at a cost of Rs. 2.25 crore; Rs. 51 lakh will come as a subsidy, while the remaining will come as margin money or a loan. The integrated modular PACS will have a custom hiring centre, procurement centres, primary processing units for cleaning and winnowing, a storage shed and container storage, and silos as well.

It purports to enhance food grain storage capacity by 70 MMT in the cooperative sector. The new storage plan is based on the hub and spoke model. Of the total 63,000 PACS across the country, 55,767 will function as spokes and will have a grain storage capacity of 1,000 metric tonnes each, while the remaining 7,233 PACS, which will function as hubs, will have a storage capacity of 2,000 MT each. The plan will let cooperatives set up decentralised storage facilities across the country in a move to reduce the burden on the Food Corporation of India, cut wastage of farm produce, and help farmers plan their sales better. The best part of the plan is that it will converge existing schemes of the ministry of agriculture and farmers welfare, the ministry of consumer affairs, food and public distribution, and the ministry of food processing industries, thus 08 schemes in totality, and it will utilise the funds available under the schemes for this purpose.

The Government of India had approved this plan on a pilot basis on 31 May 2023, with a view to establishing the world's largest food grain storage scheme under the cooperative societies sector, which will be funded with an allocation of about Rs. One lakh crore. The plan entails the creation of various types of agri-infrastructures at the Primary Agricultural Credit Societies (PACS) level, including warehouses, custom hiring centres, processing units, fair price shops, etc. by leveraging the 'Whole-of-Government' approach.

The plan is being implemented by utilising the approved outlays of the following Government of India ministries and schemes for the creation and modernisation of infrastructure facilities at the PACS level:

Ministry of Agriculture and Farmers Welfare	Ministry of Food Processing Industries	Ministry of Consumer Affairs, Food and Public Distribution
Agriculture Infrastructure Fund Agricultural Marketing Infrastructure Scheme Mission for Integrated Development of Horticulture Sub Mission on Agricultural Mechanisation	Pradhan Mantri Formalisation of Micro Food Processing Enterprises Scheme Pradhan Mantri Kisan Sampada Yojana	Allocation of food grains under the National Food Security Act Procurement operations at Minimum Support Price

An Inter-Ministerial Committee (IMC) has also been constituted for the effective and seamless implementation of the scheme. The said committee is authorised to modify the guidelines and implementation methodologies of the schemes

identified for convergence, as and when the need arises, within their approved outlays and prescribed goals for facilitating the pilot project. The Ministry of Cooperation has also constituted the National Level Coordination Committee (NLCC) under the chairmanship of the Secretary, Ministry of Cooperation, to steer the overall implementation of the plan and review the progress of implementation. In order to monitor the implementation of the pilot project and to ensure flawless integration of the plan with the existing programmes at the State level, States/UTs have also set up the State Cooperative Development Committee (SCDC) at the State level and the District Cooperative Development Committee (DCDC) in each District under the chairmanship of Chief Secretary and District Collector, respectively. The committees will, inter alia, examine the storage gap, including existing storage facilities, their capacity utilisation, the capacity of proposed godowns, the viability of the applicant PACS, the location of the proposed project, connectivity, logistics, the availability of basic infrastructure, market linkages, etc. The programme involves constructing a 2,000-tonne capacity godown in every block and raising India's food grain storage capacity by 70 MMT. In the next five years, it is proposed to expand the storage capacity to 215 MMT.

Why Mega Plan Needed?

India, the most populous country in the world, accounts for 18 per cent (1.4 billion) of the global population (7.9 billion). However, it contains only 11 per cent (160 million hectare) of the cultivable land (1,380 million hectare). Also, India runs the world's largest food programme under the National Food Security Act, 2013, that covers about 81 crore people. Therefore, to ensure food security of a billion plus population, a robust network of food grain storage facilities becomes essential.

Implementing Agencies

The National Cooperative Development Corporation, with the support of NABARD, NABARD Consultancy Services, the Central Warehousing Corporation, the Food Corporation of India, etc., is implementing the pilot project in 24 PACS of 24 different States/UTs. Construction has started at five PACS, one each in the States of Tripura, Haryana, Tamil Nadu, Uttar Pradesh, and Madhya Pradesh. Detailed project reports are under preparation for the remaining PACS. The creation of decentralised storage capacity ranging from 500 MT to 2000 MT at the PACS level would reduce food grain wastage by creating sufficient storage capacity, strengthen the food security of the country, prevent distress in the sale of crops, and enable farmers to realise better prices for their produce. Since PACS would be operating as procurement centres as well as fair price shops, the cost incurred in transportation of food grains to procurement centres and again transporting the stocks back from warehouses to fair price shops would also be saved. The estimated cost of the project for each PACS would vary and depend upon various yardsticks such as storage capacity, requirement for custom hiring centre, processing units, etc. Interest Subvention under the Agriculture Infrastructure Fund would be synched with the subsidies available under the identified schemes for the construction of rural godowns and other agri-infrastructure units at the PACS level.

Why Implement

A number of benefits can be derived by augmentation of the Storage facilities, as summarised below:

- First of all, the stepping-up of storage capacity will reduce transportation costs for farmers, enabling them to maximise their profits.
- Farmers would have a choice to sell their produce depending on the market conditions and not be forced into distress sale.
- The modern silos will have the facility of computerised real-time monitoring systems.
- Strengthening food security is the crucial objective of this scheme, as it will ensure a more stable and consistent supply of food grains across the country, thus reducing our dependence on imports.
- The expansion of storage facilities will create numerous employment opportunities in rural areas. The construction of godowns and the subsequent management and maintenance of these facilities will generate jobs thereby contributing to the overall development of rural folks.

- The Ministry of Cooperation aims to leverage the strength of cooperatives and transform them into successful business enterprises, aligning with the vision of *'Sahakar se Samriddhi'* (Cooperation for Prosperity).
- By establishing agri-infrastructure such as warehouses, custom hiring centres, and processing units at the PACS level, the plan seeks to empower PACS, which play a significant role in the agricultural and rural landscape.
- With over 1,00,000 PACS and a membership base of more than 13 crore farmers, the plan aims to enhance the economic viability of PACS and contribute to the growth of the Indian agricultural sector.

Challenges Ahead

Like any other new scheme, this novel concept also faces a lot of scepticism as under:-

- **Conflict with FPOs:** The main objective of promoting Farmer Producer Organisation (FPOs) is to address the well-recognised limitations of cooperative societies and it is aimed to cover all the blocks of the country. FPOs are also involved in post-harvest handling of the produce that may come in conflict with the agriculture cooperatives.
- **Agri-Cooperatives:** Agriculture cooperatives have been given financial responsibilities and storage infrastructure implementation. This decision is unclear, especially since FPOs have better governance as businesses. The problems associated with agriculture cooperatives include elite capture, and poor marketing, etc. As a result, small and marginal farmers lose on gaining access to competitive markets and getting remunerative prices.
- **Infrastructure Management and Maintenance:** It is easy to create infrastructure, but managing and maintaining it is a bigger challenge. India has an unenviable record of maintaining its infrastructure, be it FCI storage, drinking water systems, irrigation systems, etc. Capital maintenance expenditure (Capex) is rarely incorporated into annual budgets. Moreover, India has storage capacity for only one-eighth of its annual perishable produce.
- **Food Quality Management:** Maintaining food quality is pivotal for nutrition security. Often the poor quality grains are distributed under Public Distribution System, due to low quality storage infrastructure with primitive technologies (FCI godowns) and long spans of storage.
- Besides, multiplicity of institutions with cross-cutting objectives is likely to dilute their effectiveness.
- Policies formulated for small and marginal farmers often end up serving the interest of medium and large farmers.

Possible Solutions

The latest data shows that the value of food losses (agriculture, horticulture, milk, meat, and fish) turns out to be above Rs. 1,40,000 crore per year. Hence, finding out the practical solutions for removing the hurdles in the seamless implementation of the above scheme is necessary. Let us explore the possibilities:-

- ☛ It would definitely be much better if this scheme is implemented in Public-Private Partnership mode. Even, implementing it through Farmers Producer Organisations seems to be better option.
- ☛ Secondly, the modernisation of the existing storage infrastructure needs to be prioritised. In fact, the storage facilities for not only food grains but also other perishable goods like fruits, vegetables, milk, and meat need to be modernised.
- ☛ Since the ambitious target of doubling the farmers' income is linked with the cultivation of high value crops, it would be highly desirable if adequate storage facilities are provided for horticultural crops.

The Pilot is new with of course, lots of apprehensions and hurdles ahead, but every new concept brings along varied challenges. So it would be better to remember the words of our current Prime Minister and move steadily and judiciously towards translating them into reality:-

"At present, we need to pay maximum attention to processing in every sector of agriculture and for this, it is very necessary that farmers get modern storage facilities near their villages." ❑

Entrepreneurial Opportunities in Food Storage Infrastructure

While we are aspiring for Viksit Bharat @ 2047, a strong and robust food storage infrastructure system will not only address the problems of hunger, malnutrition, food wastages, it will also enhance the economic well-being of farming community by creating livelihood and entrepreneurial avenues for rural youth, women and small and marginal farmers.

Partha Pratim Sahu

India's food industry is one of the biggest in the world in terms of their contribution to country's manufacturing, export, growth, and consumption potentialities. With the rise in population, urbanisation, new markets, and innovations, rising disposable incomes, change in food and dietary behaviours, this industry has grown manifold in the recent years. With a potential size of US$ 535 billion in 2025, India's food processing sector provides ample opportunities for entrepreneurs as well as farmers.

The rising demand for processed food could be a great potential opportunity for the country's farmers. Opportunities abound in terms of increased production, greater demand for raw material for value-added products, diversification from grain-

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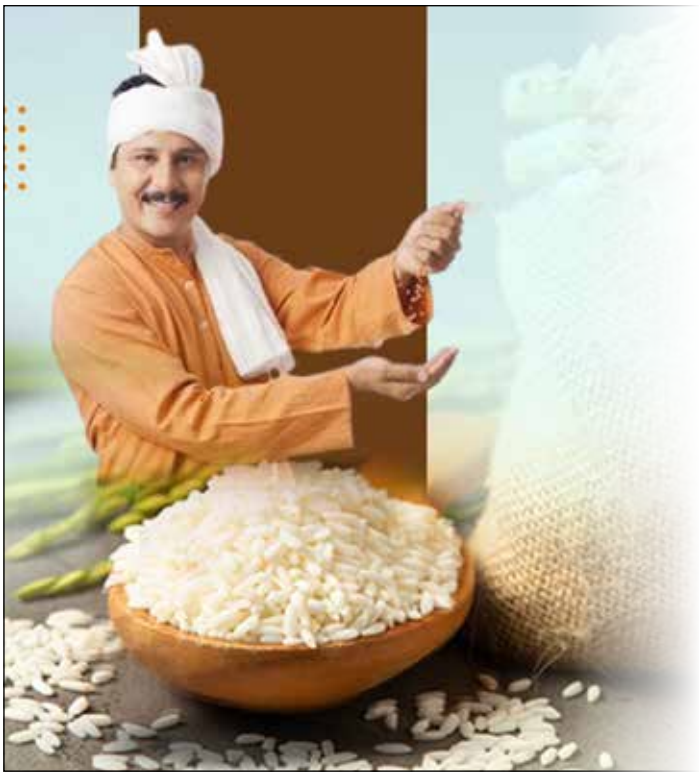
based crops to horticulture, and production of high-value process-able varieties, all tend to boost the farmers' income, especially small and marginal farmers. However, there are emerging challenges including lack of cold chain infrastructure, modern logistics, and storage infrastructure. These are also the primary reasons that cause high levels of post-harvest wastage of agriculture produce in the country. In developing countries, 40% of food loss occurs after harvest and early in the supply chain, which translates to more than $ 310 billion of food waste and loss annually – mostly because of inadequate refrigeration and unreliable and expensive energy supply. Food loss affects producers, reducing their income by at least 15%, and consumers. At the same time, food waste is the third-largest emitter of CO_2 globally.

The Food Corporation of India (FCI), the Central Warehousing Corporation (CWC) and the Central Railside Warehouse Company (CRWC) are bodies providing storage facilities at pan India level. However, there are issues and concerns relating to both capacity and quality, including condition of godowns, rise in storage costs, losses, non-availability of storage facilities at farm gate level, and so on. The Shanta Kumar Committee (2015) has, therefore, recommended modernising storage to ensure enhanced quality of food grains, negligible loss as compared to food grains storage in bag, efficient utilisation of land (silo requires 1/3rd land as compared to conventional storage warehouses), higher operational efficiency, and bring in private investment into the sector.



Entrepreneurial Possibilities in Food Storage Infrastructure

Food system infrastructure covers everything needed in the supply chain of activity between the consumer and the producer, be that a farm, fishery or community garden. Infrastructure covers everything needed for agri-food entrepreneurs to move food from the farm to the plate or to move products. Agri-food supply chains involve:

A. Production: Inputs such as seed, feed, and harvesting services and equipment;

B. Processing: Activities such as washing, drying and freezing food;

C. Aggregation and Distribution: Things such as marketing cooperatives, storage facilities, brokerage services, logistics management, and delivery trucks;

D. Retailing: All those who sell or serve food to consumers, from restaurants, grocery stores and hospitals, to schools, caterers, and fast-food outlets etc.;

E. Marketing: The effort that goes into promoting products such as advertising, campaigns, packaging materials, branding and so on; and

F. Capital: Finance, natural capital (i.e. land, water and other ecological resources), human capital, and social capital.

There are many layers of entrepreneurship possibilities in all these activities. Entrepreneurship in and around food storage infrastructure is one of the crucial components but should not be promoted independently, as these are intricately linked with other activities.

The food industry is clearly significant for all economies worldwide, but the industry faces huge challenges such as food supply, food security or food

waste that might offer interesting opportunities for aspiring entrepreneurs developing innovative solutions to these pressing issues. Enterprises and start-ups in food storage infrastructure will not only lead to employment creation, especially for the rural youths, women, SHGs but also will contribute to enhancing the income of small and marginal farmers. However, for an inclusive and sustainable enterprise development, a robust ecosystem or enabling environment needs to be developed which will provide all kinds of support services on a single platform. Persisting problems such as lack of funding, marketing problems, lack of knowledge of IT, complying with various legal formalities, lack of training facilities and extension services, lack of regular mentoring and handholding, etc. need to be addressed. A large variety of entrepreneurial avenues can be explored in food storage infrastructure (See Box 1). It is, however, necessary to conceptualise food value chain to create a map of the entrepreneurial opportunity space in food storage infrastructure.

Box 1: Entrepreneurial Opportunities in Food Storage Infrastructure
Custom hiring centres
Common facility centres
Transportation logistics
Procurement logistics
Cold storage/warehousing facilities on rental basis
Fumigation and sterilisation services for warehouses
Pest management services
Gunnies and packaging material stores
Processing units (sorting and grading, powdering etc.)
Packing houses
Various types of maintenance and repair services
Mentoring and hand holding services
Use of ICTs in storage
Energy suppliers (electricity, solar etc.)

Schemes and Programmes

We have a large network of formal institutions, agencies operating at different level and implementing variety of schemes and programmes to promote entrepreneurship in general and in food storage infrastructure development in particular. In addition to Central Government and State Government schemes, many initiatives are also being undertaken by NGOs and CSR affiliates. However, so far as food storage infrastructure are concerned, it has not witnessed significant headways. On the one hand, there is very little awareness among various stakeholders, including farmers, about the schemes and programmes due to lack of education and training and on the other hand, the regulatory procedures, compliances and formalities are still cumbersome. There is a need to sensitise both aspiring and existing entrepreneurs about formal institutions and the whole of range of programmes and schemes, which are meant for them. It is also equally important to simplify regulatory compliance formalities for setting up enterprises. Under Pradhan Mantri Kisan Sampada Yojana (PMKSY), establishment of mega food parks, massive scale cold chain structures, the development, and growth of food processing and preservation capacities, agro-processing clusters, etc. are supported. Few of the important schemes are as discussed below.

1. Mega Food Parks: The scheme aims to link agricultural production to markets by using a cluster approach, implemented by an SPV. It supports the creation of infrastructure for setting up of modern food processing units in the park and connecting it with a well-established supply chain. The scheme provides a capital grant of 50-75%, subject to a maximum of $ 7.15 Mn per project. Till March 2019, 42 such parks were under various stages of implementation.

2. Cold chain, Value Addition and Preservation Infrastructure: The scheme aims to provide integrated cold chain and preservation infrastructure facilities along the entire supply chain of food processing. It covers Minimal Processing Centre having weighing, sorting, grading, packing, storage and quick freezing facilities. Grant-in-aid, up to a maximum of $ 1.43 Mn, is provided for 35% - 50% storage infrastructure and transport infrastructure and 50-75% value addition and processing infrastructure. Until March 2019, 299 approved cold chain projects were under various stages of implementation.

3. Creation of Food Processing and Preservation Capacities: The scheme aims to create and modernise

processing and preservation capacities by increasing the level of processing and value addition, leading to a reduction in wastage. Under the scheme, a capital grant of 35-50%, subject to a maximum of $0.71 Mn per project, is provided. Till December 2018, 134 projects were approved under this scheme.

4. Creation of Backward and Forward Linkages: The scheme aims to provide effective and seamless backward and forward integration in the processed food industry. Financial assistance is provided for setting up primary processing centres, collection centres, and modern retail outlets. This is supplemented with connectivity through insulated or refrigerated transport. The scheme provides a capital grant of 35-50%, subject to a maximum of $ 0.71 Mn per project. Till December 2018, 70 projects were approved under this scheme.

5. Food Safety and Quality Assurance Infrastructure: The scheme aims to make India's food and agro-processing sector have a competitive edge in the market by creating infrastructure for safety and quality assurance services. Under this scheme, the government extends financial assistance of 50-70% for the cost of laboratory equipment and 25-33% for civil work and 50-75% reimbursement for HACCP/ ISO Standards/Food Safety/Quality Management Systems. Till November 2018, 76 Food Testing labs were instituted under the scheme.

6. Agro Processing Cluster: The scheme aims at cluster approach based development of modern infrastructure and common facilities to encourage a group of entrepreneurs to set up food processing units. The scheme provides grants-in-aid of 35-50% of eligible project cost, up to a maximum of $ 1.43 Mn per project. Till December 2018, 33 projects were approved under the scheme. **(For Sl. No. 1 to 6, Source: https://www.makeinindia.com/6-schemes-would-reduce-food-waste-benefit-farmers)**

7. PM Formalisation of Micro Food Processing Enterprises (PMFME): The recently announced PM Formalisation of Micro Food Processing Enterprises Scheme (PMFME Scheme) by the Ministry of Food Processing Industry (MoFPI) aims at providing financial, technical, and business support for the upgradation of existing micro food processing enterprises. Under this scheme, skill training and hand holding support is also provided to prepare bankable business plan. Support towards capital investment, common infrastructure such as Common Facility Centres (CFCs) and branding and marketing are also provided to FPOs, SHGs, and PCs to formalise and grow. Under CFCs, there is provision to establish cold storage.

8. Common Facility Centres (CFCs) under MSE-CDP: Under cluster development programme of Ministry of MSME, there is

provision of establishing Export Promotion Facilities for FPO such as for processing, storage (cold chains), Pack Houses, testing, and packaging.

9. Mission for Integrated Development of Horticulture (MIDH): Under MIDH, to avoid damage to the agriculture/horticulture produce, besides Cold Storage, financial assistance is also provided for setting up of Pre-cooling Unit, Cold Room, Pack Houses, Integrated Pack House, Preservation unit, Reefer Transport, Ripening Chamber, etc. The components are demand/entrepreneur driven for which Government assistance in the form of credit linked back ended subsidy is available at the rate of 35% of the project cost in general areas and at the rate of 50% of the project cost in hilly and scheduled areas through respective State Horticulture Missions (SHMs).

10. There are schemes and programmes under the Ministry of Agriculture and Farmers Welfare, Ministry of Fisheries, Animal Husbandry and Dairying, and so on. The Government has also created regulatory bodies like the National Horticulture Board (NHB), National Horticulture Mission (NHM), Agriculture and Processed Food Products Export Development Authority (APEDA) to support entrepreneurship in these areas.

Way Forward

Adequate food storage facilities at affordable costs is the need of the hours not only to reduce food wastage but also to help small and marginal farmers to escape from distress sales. Improvements in food quality can be obtained through food processing and storage technologies, which are not always available to MSMEs because they have no access to credit and training programmes. Recently, a clusters of small and medium enterprises (SMEs) offering potato cold storages in Bihar, India, is a good example. These have allowed small farmers to store their produce and wait for much higher prices in the off-season. Innovative, cost –effective, and environment friendly storage facilities are to be encouraged. For instance, made from terracotta clay, the MittiCool refrigerator is ideal for storing water, milk, fruits and vegetables. It is very easy to use and it runs without electricity. Similarly, Subjee-Cooler manufactured by RuKart Bhubaneswar is an innovative cold storage for flowers, fruits and vegetables, which needs water to run and improves shelf life of vegetables by 3-6 days; improves selling price of vegetables by 25-30%; and it can also be installed at the farm-gate.

In remote areas, where the electricity grid does not reach or does not work, access to energy especially decentralised renewable solutions such as solar and hydro-powered mini-grids can be planned. In addition, solar energy-based innovative techniques such as solar dryers or solar storage for perishables can preserve food quality and prevent waste. These techniques can also alleviate global warming, because solar energy generates up to 90% fewer GHG emissions than natural gas and coal. Huge private investment is needed to develop food processing, refrigeration, storage, warehousing, and retail markets to reduce food waste. Investments are also needed in ICTs that facilitate farmers' access to localised and tailored information about weather, water consumption, diseases, yield, and input and output prices. ICT and storage systems are also important to plan and predict food supplies and hence, stabilise food market prices.

Accelerating the reduction of food waste and loss calls for developing food processing, refrigeration, storage and warehouse technologies. Therefore, efforts should be made to establish one cold storage in every Gram Panchayat by undertaking a detailed mapping exercise of crops, fruits and vegetables grown and their market outreach. Such efforts can reduce transport and storage requirements and create an enabling environment for the demand and supply of safe and nutritious foods. However, it should be emphasised that only by developing a robust forward and backward linkages can ease large price fluctuations, ensure remunerative price for farmers, and provide lower prices for consumers: a win-win situation for all. ❑

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Making India the Food Basket of the World

Currently, India is the second-biggest producer of wheat and rice, the two staples. India can become the largest food supplier in the world. It has cultivable land, all the seasons for production of all varieties of fruits and vegetables, and an agribusiness system that works. By building an efficient and effective supply chain using state-of-the-art techniques, it is possible to serve the hungry with value-added food while simultaneously ensuring remunerative prices for the farmers.

Rajiv Theodore

The spectre of a global food shortage continues to be a concern. Out of 8 billion people on this planet, 828 million are going hungry every day. A total of 29.6% of the global population does not have adequate access to food. Around 9 million people die from hunger-related causes every year; many are children under the age of 5. Even if we rebound from the economic fallout of the pandemic, the UN predicts that we may fall well short of our goal for Zero Hunger by 2030. At the end of this decade, it is estimated that there will still be 670 million people facing hunger. Over 122 million more people have been facing hunger in the world since 2019 due to the pandemic and repeated weather shocks, according to the latest State of Food Security and Nutrition in the World (SOFI) report published jointly by five United Nations specialised agencies. If trends remain as they are, the Sustainable Development Goal of ending hunger by 2030 may not be reached, the Food and Agriculture Organization of the United Nations (FAO), the International Fund for Agricultural Development (IFAD), the United Nations Children's Fund (UNICEF), the World Health

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Organization (WHO) and the World Food Programme (WFP) warn.

However, amidst this scenario there is much more than a ray of hope—India, which has enough food for its people, is geared up to supply food stocks to the world if the World Trade Organization (WTO) allows, Prime Minister Narendra Modi had told the US President Joe Biden in their virtual meeting recently. "We already have enough food for our people but our farmers seem to have made arrangements to feed the world." He added that "the world is facing a new problem now. The food stock of the world is getting empty if WTO permits, India is ready to supply food stock to the world from tomorrow." The global food crisis has already seen Indian traders signing contracts for exporting food grains of about 30 lakh (3 million) tonnes during the April-July period. The official projection suggests another bumper harvest of wheat at over 110 million tonnes this season.

At home, the investor-friendly policies by the Government are taking the food sector to new heights with the creation of an agri-export policy, bolstering a nationwide logistics and infrastructure framework, setting up 100 district-level hubs connecting the district to global markets, and increasing the number of mega food parks from 2 to more than 20. All this has jacked up India's food processing capacity from 12 lakh metric tonnes to more than 200 lakh metric tonnes, which is 15 times more than it was in the last nine years. Prime Minister Modi gave examples of agricultural produce that are being exported from India for the first time and mentioned black garlic from Himachal Pradesh, dragon fruit from Jammu & Kashmir, soya milk powder from Madhya Pradesh, Karkitchoo apples from Ladakh, Cavendish banana from Punjab, Gucchi Mushrooms from Jammu, and Raw honey from Karnataka.

Can India Do This?

Currently, India is the second-biggest producer of wheat and rice, the two staples. It has a stock of over 850 lakh (85 million) tonnes, of which 513 lakh (51.3 million) are with the Food Corporation of India and another 340 lakh (34 million) tonnes of unmilled paddy lying with states have provided a cushion to the government to make an offer to supply foodgrains to other countries. Of this stock, 21 million tonnes are segregated as its strategic reserve and the Public Distribution System (PDS), which has bettered its reputation during the Covid-19 pandemic by providing food to about 80 crore (800 million) people, as per the Government figures. Indian supplies can also calm down rising commodity prices. India supplies some of the cheapest wheat and rice. India exports wheat to about 70 countries and rice to about 150.

Some of the strengths outlined below underline India's intent to be the world's food supplier:

Millets

- India could help mitigate the world food crisis by offering millets. India is the largest producer of millets in the world. India's two varieties of millets, namely pearl millet (bajra) and sorghum (jowar), will together contribute approximately 19 per cent in world production in 2020. India's pearl millet production accounts for 40.51 per cent followed by sorghum 8.09 per cent in the world production of millets in 2020. The major millet producing states in India are Rajasthan, Karnataka, Maharashtra, Uttar Pradesh, Haryana, Gujarat, Madhya Pradesh, Tamil Nadu, Andhra Pradesh, and Uttarakhand. Together, these ten states account for around 98 per cent of millets production in India during the period 2020-21. Six states, namely Rajasthan, Karnataka, Maharashtra, Uttar Pradesh, Haryana, and Gujarat, account for more than 83 per cent of total millet production.

- Terming millets as part of India's 'Super Food Bucket', Prime Minister Narendra Modi pointed out that the nutri-rich coarse grain will reach every corner of

the world just as Yoga did. "In India, we have given it (millets) the identity of *Shree Anna*. Millets are also the most secure crops for small farmers as they are resilient and climate-adaptable in both hot and drought environments. India produces all the nine commonly known traditional Millets, viz., sorghum, pearl millet, finger millet, foxtail millet, proso millet, little millet, barnyard millet, browntop millet, and kodo millet. Millet is a common term for categorising small-seeded grasses that are often called Nutri-cereals. Most of the states in India grow one or more millet crop species.

- The Government of India spearheaded the United Nations General Assembly (UNGA) resolution for declaring the year 2023 as the International Year of Millets and the proposal of India was supported by 72 countries. Millets are making a resurgence in line with the International Year of Millets declared by the United Nations. These grains, some of the oldest in the world, are rich in protein, fiber, minerals, iron, calcium, and have a low glycaemic index. Their short growing season makes them ideal for multiple cropping systems, both under irrigation and dryland farming, and their long shelf life has earned them the status of famine reserves. Notably, the millet grain varieties are said to be intrinsic to future food security given the exigencies of climate change and the potential impact on high water-usage crops. Millets have been historically grown in the country across different varieties and remain in the comfort zone of farmers. In response to the declaration of the International Year of Millets, the Indian government has prioritised their promotion through the National Food Security Mission and several states are also running their own Millet Missions.

- High-yielding varieties, including bio-fortified millets, have been introduced to increase production, and the Government has recognised the health benefits of millets by including them in the POSHAN Mission and designating them as nutri-cereals. The Indian Council of Agricultural Research (ICAR) and Indian Institute of Millets Research (IIMR) are promoting farmer producer organisations and startups to boost millet production as well as technology and value addition in the segment. Millet-focused food products are being provided support under the Production Linked Incentive (PLI) scheme to enhance value addition. The recent budget has designated IIMR as a Centre of Excellence for sharing millet-related best practices and technologies at the international level. Many efforts are being made towards mainstreaming millets into the consumption basket by way of introducing healthier, millet-based value-added products.

Food Processing Industry

The food processing industry has an important role to play while India seeks to create a food basket for the world. This is increasingly being done by linking the farmers to the final consumers in domestic as well as international markets. Food processing combined with marketing has the potential to solve the basic problems of agricultural surpluses, waste, rural jobs, and better remuneration for growers. In the next ten years, food production is expected to double. These products, if processed and marketed smartly, can make India a

leading food supplier in the world. The Government of India has set a vision for the sector to achieve a target of doubling its contribution to the GDP by 2030. The sector's size is estimated to be around US $ 322 billion, and it is expected to reach US $ 543 billion by 2025, growing at a CAGR of 14.6%.

Food Supply Chain

Another key area that would go a long way for the country to become the food basket for the world is strengthening the Food Supply Chain. India is one of the largest food and grocery markets in the world, a large consumer of food products, and has a huge opportunity to become a leading global food supplier through the right marketing strategies and an agile, adaptive, and efficient supply chain. India has diversity in terms of its population, with several religious groups with different food habits and cultures. India is well positioned to translate this situation into an opportunity and create food hubs. Some of it could be the organic food hub, the vegetarian food hub, and the sea food hub among others. The food supply chain is complex, with perishable goods and numerous small stakeholders. In India, the infrastructure connecting these partners can be strengthened. Each stakeholder: farmers, wholesalers, food manufacturers, and retailers- all can work together. Also, demand forecasting should be there so that the farmers try not to push what they produce into the market. Data integration, financial flow management, supply-demand matching, collaborative forecasting, information sharing, and goods movement synchronisation through efficient transport scheduling, are very well practised in high technology industries with immense benefits. These best practices should find their way into the food supply chains. Cold chain logistics supply chains are today taking advantage of technology improvements in data capture and processing, product tracking and tracing, synchronised freight transport transit times for time compression along the supply chain and supply demand matching. Also, the supply chain needs to be designed and built as a whole in an integrated manner with the processes of new product development, procurement and order to delivery processes well designed and well supported using IT tools and software.

Food Packaging

Packaging is also emerging as a key ingredient as the country marches towards creating a food basket for the world. Dairy products, edible oils, farm products, sugar, fruit juices, concentrates, preserves, hot and cold beverages, breakfast foods, biscuits, confectionery, and atta are some major foods of daily necessities, and through packaging, India is able to distribute these products worldwide. Packages have become the competitive tool to reach the consumer, and the task assumes increasing responsibility with more and more competitive and substitute products being introduced. This has opened the sector for the introduction of modern technology for processing and packaging and the entry of a host of new organisations from all sectors of the economy, both domestic and overseas. Prime Minister Modi has himself disclosed that since 2014, India has been able to attract Rs. 50,000 crore in foreign direct investment (FDI) in the food and food processing sectors.

Standards

Standardisation is a powerful tool for improving supply chain efficiency, which the Government is fastidious about. There are two kinds of standards in the food supply chain. The first one is the food standard, which concerns itself with the content, the manufacturing process, the packaging, etc. There are several such standards for dairy, poultry, etc. The second standard concerns logistics and IT systems like standardisation of cartons, pallets, and IT software so that seamless transfer of goods and information is possible. This assumes significance as food safety and hygiene are growing concerns across the world. There is an increasing need to provide greater assurance about the safety and quality of food to consumers. The increase in world food trade and the advent of the Sanitary and Phytosanitary (SPS) Agreement under the World Trade Organization (WTO) have led to increasing recognition and adoption of food safety measures. The capacity of India to penetrate world markets depends on its ability to meet increasingly stringent food safety standards imposed in developed countries. Food standards are expected to acquire greater importance given increasing concerns on food safety on the back of breakout of diseases.

Conclusion

India can become the largest food supplier in the world. It has cultivable land, all the seasons for production of all varieties of fruits and vegetables, and an agribusiness system that works, although it needs to be improved. Shortcomings that need to be addressed are mostly in the area of supply chain management. By building an efficient and effective supply chain using state-of-the-art techniques, it is possible to serve the hungry with value-added food while simultaneously ensuring remunerative prices for the farmers. The surplus of cereals, fruits, vegetables, milk, fish, meat, and poultry can be processed as value-added food products and marketed aggressively both locally and internationally. Investments in cold chain infrastructure, applied research in post-harvest technologies, the installation of food processing plants in various sectors, and the development of the food retailing sector are mandatory for achieving gains in this sector. ❑

PM-JANMAN

Towards Benefiting the Tribal Community

Prime Minister Narendra Modi released the first instalment to 1 lakh beneficiaries of Pradhan Mantri Awas Yojana - Gramin (PMAY-G) under Pradhan Mantri Janjati Adivasi Nyaya Maha Abhiyan (PM-JANMAN) via video conferencing on 15th January, 2024. He also interacted with the beneficiaries of PM-JANMAN.

Shri Modi said, the goal of PM-JANMAN Maha Abhiyan is to benefit every member of the tribal community through the Government schemes. He informed that within two months, PM-JANMAN mega campaign has achieved the results that others could only dream of.

Recalling the challenges during the inauguration of PM-JANMAN on the birth anniversary of Bhagwan Birsa Munda, Shri Modi mentioned the difficulties in taking the benefits to far-flung, remote and border areas of the country which are home to tribal communities.

Explaining why the scheme was called JANMAN, the Prime Minister said, "'Jan' means the people and 'Mann' means their 'Mann Ki Baat' or their inner voice." He reiterated that all the wishes of the tribal communities will now be fulfilled as the government plans to spend more than Rs. 23,000 crores on PM-JANMAN mega campaign.

Talking about providing pucca houses to Particularly Vulnerable Tribal Groups (PVTGs), he said, money has been transferred directly to the accounts of tribal beneficiaries. They will get 2.5 lakh rupees for a pucca house which will be a source of dignified living with electricity, gas connection, pipe water and toilet. He said, these one lakh beneficiaries are just the beginning and the government will reach each and every deserving candidate.

The Ministry of Tribal Affairs also generating awareness regarding PM-JANMAN.

The Background

In line with the Prime Minister's efforts towards the vision of Antyodaya to empower the last person at the last mile, PM-JANMAN was launched for the socio-economic welfare of Particularly Vulnerable Tribal Groups (PVTGs) on 15th November 2023, on the occasion of Janjatiya Gaurav Diwas.

PM-JANMAN, with a budget of approximately Rs. 24,000 crores focuses on 11 critical interventions through 9 Ministries and is aimed to improve socio-economic conditions of the PVTGs by saturating PVTG households and habitations with basic facilities such as safe housing, clean drinking water and sanitation, improved access to education, health and nutrition, electricity, road and telecom connectivity, and sustainable livelihood opportunities.

(Source: PIB)

ODOP
Providing Framework for Value Chain Development

The One District One Product (ODOP) intervention has enabled and aggregation of onboarding of sellers of identified products on e-commerce platforms, which in turn enhances greater visibility for the small businesses and farmers from rural areas. For example, Tribal Cooperative Marketing Development Federation of India has promoted tribal products in semi-urban and urban markets, and also promoting export and creating livelihood opportunities at the grassroots level. Under this ODOP scheme, the Government of India approved 137 unique products in 713 districts of 35 States and UTs.

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** **Dr. Nandeesh V Hiremath**

Agricultural development is the backbone of the Indian economy. The development agenda focuses on making balanced regional development, which can be accomplished by various mechanisms and means; and this is essential for agri-based ecosystem. The overall positioning of India in global economy has gone up significantly with Aatmanirbhar Bharat initiative, which inculcates self-reliance as the new currency of the economic system. In true sense, it has focused on contribution to development within nation, and also aiding to global economy, which is an integral component of 'Vasudhaiva Kutumbakam' philosophy from India. In this regard, 'One District One Product' (ODOP) under 'Pradhan Mantri Formalisation of Micro Food Processing Enterprises (PMFME) Scheme' is a welcome initiative, taken by Government of India to foster the inclusive development, which is harnessing the export potential of each districts and helps in integrated development of local economy. Thus, the benefits of development must reach the last-mile citizens and those can be ensured by public policy interventions, which are effective and sustainable.

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PMFME Initiative

The food processing sector has played a vital role in the economic development agenda due to its strong linkages and interactions between 'agriculture' and 'industry'. With continuous changes in standard of living and lifestyles, the growth in demand of processed food items, thus increasing the scope and opportunities for food processing sector. It helps in diversification and commercialisation of farming ecosystems, increasing efficiency of resources usage, generating employment, promoting entrepreneurship and on the overall bringing a balanced regional development.

Under the Aatmanirbhar Bharat Abhiyan, the Ministry of Food Processing Industries (MoFPI) has launched 'PM Formalisation of Micro Food Processing Enterprises (PMFME) Scheme' for providing technical, financial, and business/enterprise enabling supports for setting-up and upgradation of micro-food processing units in India. This scheme, with a funding outlay of Rs. 10,000 crores has been in operation for five years' period during 2020-21 to 2024-25, with an objective to support over 2 lakh micro-food processing enterprises, comprising of FPOs (Farmer Producer Organizations), SHGs (Self-Help Groups) and Co-operatives in India, thus imparting multiple benefits. The scheme has been upgrading the agri-based ecosystem in various ways to the existing micro food processing firms in order to nurture them. The project coined the 'One District One Product (ODOP)' concept, which allows it to gain the benefits of scale in terms of common services, input procurement and management, and marketing of products in target markets.

Progress of One District One Product (ODOP) Scheme

The PMFME scheme with its flagship intervention through 'One District One Product (ODOP)' helps in imparting the benefits of scale in managing inputs, providing common services, and marketing/promoting

the local products in the food processing sector. The major objectives of the PMFME scheme through ODOP are: (a) improved access to financial assistance to micro food processing entrepreneurs for technological upgradation; (b) capacity building through skill training, enhanced technical knowledge, and hand holding & anchoring services; (c) support to Farmer Producer Organizations (FPOs), Self-Help Groups (SHGs) and Cooperatives; (d) enabling the existing informal entities into formal registration as 'agri-based business enterprises'.

Under this ODOP scheme, the Government of India approved 137 unique products in 713 districts of 35 States and UTs. It serves as a foundation for the development of value chains and the alignment of support infrastructure. Further, under the branding and marketing component, the FPOs, SHGs, Cooperatives as 'Special Purpose Vehicles (SPV)' of ODOP-based micro food processing enterprises have been getting support for market study and product standardisation, packaging material, quality control and food safety compliance for consumer retail sales, warehousing and storage rentals, and marketing of agri-products. The scheme would support clusters and groups along their entire value chain for sorting, grading, assaying, storage, common processing, packaging, marketing, and processing of variety of agri-products.

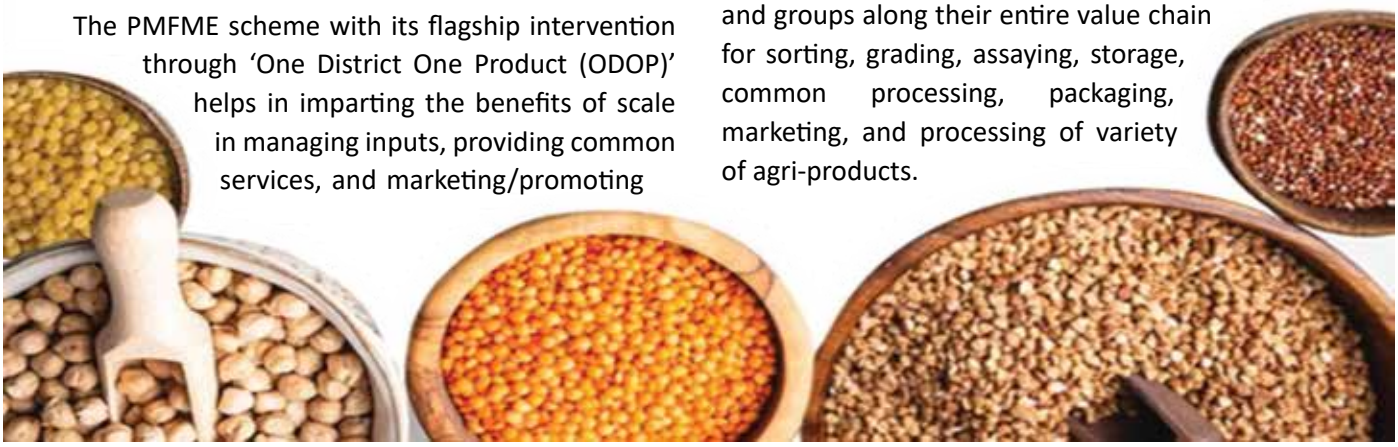

Table 1: Select List of ODOP Products Under PMFME

S. No	Name of State/UT (Alphabetically Listed)	No. of Districts	ODOP Products (Major Products from the District)
1	Andaman & Nicobar Island	3	Marine, Fish and Coconut Products
2	Andhra Pradesh	13	Spices, Groundnut, Mango, Tomato, Onion, Cashewnut
3	Arunachal Pradesh	26	Orange, Kiwi, Large Cardamom, Oilseed, Pickle, Ginger and Turmeric
4	Assam	33	Mustard Products, Banana based Products, Ginger based Products, Jackfruit based Products, Rice, Potato and Pickles
5	Bihar	38	Pulses, Makhana, Rice, Banana, Pineapple, Litchi, Betel and Bakery
6	Chandigarh	1	Bakery Products
7	Chhattisgarh	28	Rice, Papaya, Tomato, Mahua, Sugarcane and Turmeric
8	Dadar and Nagar Haveli & Daman Diu	3	Fish and Allied Products & Mushroom
9	Delhi	11	Bakery and Ready to Eat products- Namkeens
10	Gujarat	33	Banana, Finger Millet (Ragi), Cumin, Groundnut, Sapota
11	Goa	2	Coconut and Jackfruit based Products
12	Haryana	22	Milk, Bakery, Ginger, Mushroom, Amla
13	Himachal Pradesh	12	Apple, Fruit Wine, Peas, Ginger, and Turmeric
14	Jammu and Kashmir	20	Fish, Poultry/ Mutton, Milk, Apple, Mushroom, Honey, Olive and Bakery products
15	Jharkhand	24	Peda, Mango, Papaya, Honey, Potato, Chironjee
16	Karnataka	30	Fruits, Spices, Vegetable and Marine Products
17	Kerla	14	Rice, Coconut, Banana, Jackfruit
18	Ladakh	2	Apricot and Sea Buckthrone Products
19	Lakshadweep	1	Coconut Based products
20	Madhya Pradesh	52	Tomato, Potato, Orange, Guava, Sugarcane, Mustard and Turmeric
21	Maharashtra	36	Rice, Milk products, Spices, Millets, Marine Products, Mango, Pulses and Marine Products
22	Manipur	16	Fish, Pineapple, Kiwi, Turmeric and Coconut
23	Meghalaya	11	Sohiong, Pineapple, Jackfruit, Banana, Ginger
24	Mizoram	11	Mizo Chilli, Pineapple, Turmeric and Ginger
25	Nagaland	11	Pineapple, Kholar (Rajma), Kiwi, Soyabean, Fish
26	Odisha	30	Millets, Milk, Fish, Rice, Maize, Mushroom, Honey
27	Puducherry	2	Fish and Milk Based Products
28	Punjab	23	Meat/ Chicken/ Poultry, Pickle, Chillies, Milk, Litchi, Potato, Mango Guava and Mushroom
29	Rajasthan	33	Onion, Groundnut, Fruits, Mango, Potato, Mustard, Amla. Jamun, Custard Apple
30	Sikkim	6	Meat, Bakery Snacks, Red-cherry Pepper and Large Cardamom
31	Tamil Nadu	37	Fishery, Milk, Poultry, Coconut Products, Millet Products, Edible Oils, Banana based products
32	Telangana	33	Soybean, Milk, Rice, Millets, Mango, Chillies, Turmeric and Ready to Eat (Snacks and Savouries)
33	Tripura	8	Multiple Fruit Processing, Milk based product, Tea Products and Bakery products
34	Uttar Pradesh	75	Petha, Groundnut, Mango, Guava, Onion, Potato, Milk Products, Aonla-based Products, Oil Seed, Honey and Jaggery
35	Uttarakhand	13	Apricot based products, Kiwi based products, Turmeric based product, Apple and Bakery Products

Source: Compiled by the Authors

The summary of ODOP products (Table 1) indicates that India is known predominantly for some products like rice, maize, onion, spices, turmeric and its value-added products, coconut and its byproducts, mushroom, mango, banana, honey, milk and milk-based products, apple, bakery products, Mizo chilli, etc. to mention a few. This indicates the wide variety and diversity of products and their usages, based on the districts or regions they originate from.

The ODOP intervention has enabled and aggregation of onboarding of sellers of identified products on e-commerce platforms, which in turn, enhances greater visibility for the small businesses and farmers from rural areas. For example, the Tribal Cooperative Marketing Development Federation of India (TRIFED) has promoted tribal products in semi-urban and urban markets, and also promoting export and creating livelihood opportunities at the grassroots level. The stakeholders like districts and states played vital role in making India as an export powerhouse and in achieving vision of 'Vocal for Local' and 'Atamanirbhar Bharat'. This is aimed at creating a greater level of awareness and commitment at district level, thus building the capacity to establish new markets for the focused products. This decentralised and focused approach will enhance self-sufficiency and self-reliance of the districts, by providing access to global platforms.

As on 14 January, 2024, about 70,286 loans have been sanctioned under the credit-linked support as a part of the PMFME Scheme. The top 5 performing states are Maharashtra, Bihar, Tamil Nadu, Uttar Pradesh, and Telangana. Within the scheme, individual micro-enterprises will get the assistance in the form of capital subsidy with credit-linkage at 35% of the eligible project cost, up to a maximum of Rs.10 lakhs per unit. Additionally, clusters and groups like FPOs, SHGs, Producers Cooperative, will receive credit-linked grant at 35% for capital investment. There is also provision of seed capital of Rs. 40,000/- per member of SHGs, which process food products, for working capital and to buy capital goods. There will be a credit-linked grant of 35% to help FPOs, SHGs, Cooperatives, any government body, or private businesses to build common infrastructure. In addition to the above grants, 50% expenditure will be funded through the scheme, for branding and marketing.

The ODOP has facilitated in attaining balanced regional development across all the districts and will enable socio-economic development across India. It is providing the required support services to the local and rural economy, by improving the backward and forward linkages of identified products in select districts. It is already being adopted all over the states/UTs to realise the true potential of each district in terms of their contribution to export and national income, by creating a brand identity and positioning for these products.

Value Chain Development, Infrastructure and Marketing Support

Common Infrastructure: The ODOP scheme has made provisions for usage of common infrastructure facilities at rural areas for all the FPOs, SHGs, Cooperatives, while the private enterprises use the facilities on hiring basis, thus making the best use of existing capacity. The infrastructure facilities can be utilised for sorting, grading, warehousing, and cold storage of ODOP products. In addition to these benefits, the common processing facilities are also available along with incubation centres involving one or more product lines. To promote common infrastructure, the credit-linkage grant would be made available at 35%, by considering its contribution to the value chain.

Development of Clusters: There can be more than one cluster for one product in one district or it can be extended beyond two or more districts, particularly for value chain development and alignment of relevant support infrastructure, depending upon the nature of products and perishable goods. The ODOP products can be of perishable products, agri-based products, cereal based products, or any other value-added products produced in the districts. The major list of such products are tomato, litchi, mango, potato, tapioca, millets, milk, fruits and vegetables, etc. The scheme also supports strengthening of forward and backward linkages to provide common facilities, skilling/training, incubation centres, research and development, marketing, and branding.

Value Addition: The cluster-based approach adopted by various States/UTs in India have played an enabling role regarding storage for agri-based products, preventing the wastages, facilitating processing and most importantly ensuring effective marketing ecosystem for the various products under ODOP. The value addition to the products and enabling access to the customers is a significant leveraging point in respect of avoiding wastages and enhancing value on the other side.

Branding and Marketing: To make the ODOP products available to the consumers, strong branding and marketing support is required. Through this scheme a common brand, common packaging and common standard is highly critical. At the same time, the common branding and packaging may be different based on places/regions or products at district level, regional level or state level, which would be decided by the concerned State Nodal Agencies (SNAs). The support for branding and marketing would be limited to the meeting of permitted expenditures.

Institutional Architecture: With committees at district, state, and national level, the ODOP project envisages proper planning, effective execution, and close monitoring through robust institutional architecture. The Project Management Units (PMUs) are set up with experts and consultants to guide the State Nodal Agencies (SNAs), State Level Approval Committee (SLAC) and District Level Committee (DLC), Project Executive Committee (PEC), etc. This institutional development framework and arrangement is making the development process viable, valuable and sustainable.

ODOP Prospects and Benefits

The ODOP scheme has variety of benefits for the local and rural community, for different states and for the nation, which can be summarised as:

(a) Local and community development like in-situ employment, empowering rural women and youth, nurturing the sustainable livelihoods, thus improved standard of living;

(b) Promoting and preserving the local best practices/ micro-enterprises, thereby creating the local ecosystems of self-reliance;

(c) Skilling, upskilling. reskilling and training of local talent to enable localised entrepreneurship and region-specific innovations; and

(d) Local to global approach thereby enhancing exports/foreign exchange earnings to nation, thus boosting the inclusive and integrated development, which includes agri-based MSME development and therefore contributing to the 'Aatmanirbhar Bharat' movement.

When these aspects are considered, the development can be balanced, holistic and inclusive, by benefiting all the key stakeholders, by ensuring equity and equal distribution of opportunity, income, growth and development.

The digital ODOP GIS map indicating district-wise details of ODOP in 713 districts, 216 Integrated Tribal Development Areas, 112 Aspirational districts and 35 SC districts with 40 % SC population are being indicated on GIS Map for the ease of beneficiaries to identify and visualize its resources and positioning. This indicates the potential for growth and expansion of the ODOP product range.

Although the government has invested in cold chain infrastructure, the effective and fullest usage of such cold-chain infrastructure is considered as one of the challenges as a part of supply side bottleneck. In addition, uneven distribution of infrastructure, access to financial support, credit linkages, market linkages, etc. across districts are some of the other additional issues of concern. By addressing these challenges, the target objective of integrated development can be achieved.

Way Forward

The success of 'Democracy and Swaraj' depends upon 'how we plan for the unplanned and how we reach the unreached, how we get the best out of everyone, every district and every sector'. In a broader framework, to ensure contributions of all the people and from all places in the development agenda, that can be best achieved through ODOP of PMFME. It enhances value chain for majority of products, including agri-based products, marine, milk, and processed products, etc.

The ODOP intervention has received a lot of accolades and awards for its 'bottom-up approach' and its significant contribution to integrated development of India. The ODOP is a flagship initiative aimed at transformation in harnessing the true potential of a district, generating local employment and rural entrepreneurship, fostering inclusive development through localised/ regional empowerment, and boosting economic growth. In summary, India will emerge as a stronger economy with well-founded public policy support, enhanced awareness and infrastructure, improved institutional architecture along with cluster development, value addition, systematic marketing and branding for identified products, etc., through effective implementation of ODOP and its measurable outcomes, thereby achieving the goal of 'Atamanirbhar Bharat'. ❑

An Overview
Traditional Storage Infrastructure and Practices in India

India is heading towards the position of leading global exporter of food grains. We must explore the various food storage infrastructure and practices that are indigenous to our nation. These practices are not only cheap but also sustainable. They store grains without contaminating them with harmful chemical preservatives. This can help India to build an image of an exporter of clean and organic food grains to the entire world.

Dr. Namrata Singh Panwar

In the year 2022-23, India has crossed a major milestone by producing 3296.87 lakh tonnes of food grains which is higher by 140.71 lakh tonnes than the production of food grains of 3156.16 lakh tonnes achieved during 2021-22. Further, the production during 2022-23 is higher by 308.69 lakh tonnes than the previous five years (2017-18 to 2021-22) average production of food grains. India is not only self-sufficient in food grain production but also a leading exporter to other countries. However, to maintain this position, we must build enough infrastructure for storage of food grains. The food grain storage infrastructure is the baseline for achieving food security at the national level.

Interestingly, securing the food supply is a topic of interest of our ancestors too. The knowledge of storing grains in different types of bins or granaries as well as in underground godowns, was known from the Vedic age. Till today, such types of granaries can be seen in our

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villages. To build these bins, various types of materials were used from the ages. It included wood, cane, hay, cow dung, and clay.

During 2000 B. C. Aryan people settled in different colonies, towns, cities, etc. It is found that in such towns, hoards of grains were seen in common granary. That food distribution system must have been adopted by the people of Harappa and Mohen-jo-daro is highlighted by the evidence of granaries. Such evidences are also found in the Mahabharat era, and now in the modern era, we have fully developed this science. But still, it is debated that the traditional structures and practices of storing food grains are more sustainable and eco-friendly. These are the practices that are still supporting the small farmers who are not able to afford the modern sophisticated storage facilities.

Certain studies have estimated that nearly 60-70 per cent of the food grains produced in the country are stored at a home level in indigenous structures by using traditional practices. Therefore, it is very important to understand these practices and incorporate them into our policy circles.

Traditional Storage Structures in India

1. The farmers of Andhra Pradesh have adhered to their century-old traditional storage pits which can store grains for nearly a decade. The process involves digging a rectangular pit, at least 6 feet deep, in the open space in front of farmers' houses. The pit is then filled with a mixture of hay and clay. Harvested food grains are carefully placed inside the pit, which is then sealed with mud, creating a protective heap. By storing grains in this manner, farmers are relieved of concerns about potential losses due to calamities such as rain, theft, or fire accidents. These pits which are also sacred places for farmers are regularly coated with cow dungs and traditional rangoli by the women of the house.

2. **Bukhari:** It is a square-shaped structure constructed either with mud or brick and cement and also has an opening/outlet at the ground level. The upper portion of the Bukhari is plastered with mud and straw and covered with polythene to protect against moisture. This structure is raised above the ground by a wooden or masonry platform. It generally has a capacity of 3.5 to 18 tonnes.

3. **Morai:** This type of structure is used to store paddy, maize, and jawar in rural areas of the eastern and southern regions of India. These structures are like the shape of an inverted cone. The improved structure consists of circular wooden plankfloors supported on pillars using timber joints. The bamboo splits are placed vertically along the inner surface without leaving any gap between them. The height of the bamboo split is equal to the height of the structure to store the desired amount of grain. Keeping the bamboo splits in position, the grains are filled up to the cylinder height and then the bamboo splits are held straight and continuous filling of grain and winding of the rope goes on simultaneously. To provide a smooth surface, about 1 cm thick layer of mud plaster is applied over the rope. A conical roof with an ample overhang is placed. Rat-proofing cones are also provided 1.5 m above on all four pillars to avoid damage by rats.

4. **Kothar:** It is common in the northern part of the country and is used to store paddy, maize, sorghum, wheat, and barley. The capacity ranges from 9 to 35 tonnes. It is a wooden box-type structure elevated from the ground by pillars. The roof is tilted and can be made of planks or corrugated metal sheets with sufficient overhang on all sides. The structure is raised on timber pillars 1.5 cm above the ground level with rat-proofing cones.

5. **Cylindrical Grain Bins:** These are used for a variety

of food grains. It has a capacity of 10 to 40 tonnes. The structure has a concrete base and is supported by columns. Two openings are given in the structure for taking out and putting grains in. The top hole which has a locked hinged cap is wide enough for a person to get in for cleaning purposes. The manhole at the top is also provided with a watertight steel lid.

6. **Rectangular Grain Bin:** On a farm, different kinds of grains are raised and therefore there is a need to make storage structures that can store different grains. In this type of storage, different storage bins are made under the same shed. The bin walls are made 11.5 cm thick and laid in cement mortar. The front wall is provided with a rectangular hole at floor level to take out grains.

7. **Bharola:** It is an egg-shaped earthen yet portable storage bin that has a capacity of at least 40-80 kgs of food grains.

8. **Kupp:** It is a cheap and easy way of storing the chaff and wheat straw, which are eventually used as cattle fodder. After the area for making a Kupp is earmarked a circular boundary of straw and sticks is laid out. After this chaff is filled into the center to ensure it fits tightly into the earmarked space. This process is repeated several times till a particular height is reached. The hay is then secured with the help of rope or metal wire.

9. **Crib:** This is entirely made up of bamboo, wood, and metal wires, and roofed with thatch straws in a way that air can perpendicularly pass through them. It is a rectangular-shaped structure and elated above ground by 0.5m to 1m. The legs are fitted with a rat-proof device to prevent them from harming the product. Its shape allows the drying process of grains with ease as the natural ventilation continues.

10. **Kanaja:** It is an underground grain storage container made of bamboo. The base is usually round and has a wide opening at the top. The height and capacity vary. The Kanaja is plastered with mud and cow-dung mixture to prevent spillage and pilferage of grains. The top is also plastered with mud and cow dung mixture or may be covered with paddy straw or gunny bags.

11. **Sanduka:** These are usually used for storing smaller quantities of grains, pulses, and seeds. The storage capacity of these boxes may vary from 3 to 12 quintals. Partition walls may also be made inside the box to store two to three types of grains simultaneously. A big lid on the top with a small opening enables taking out the grains. To protect the grains from moisture, the box is kept 12 inches (about 30.5 cm) above the ground level with the help of stands/legs. The box must be regularly polished for its maintenance.

Traditional Storage Practices in India

1. In the northern part of the country, farmers indigenously store wheat after drying it in the sun and cleaning it by sifting it. It is scientifically agreed that this process reduces the chances of attack of storage pests.

2. Farmers store red gram after mixing with common table salt. These mixed grains are later packed in jute gunny bags and stitched. The corrosive action of salt on the skin of insects prevents the movement of insects in the gunny bag. This practice can be used to store red gram for a short period of 6-8 months.

3. Ash at the ratio 1:4 can be used to store Sorghum seeds in the airtight jute gunny bag. It has been reported that in Rajasthan and Punjab, farmers mix moth bean and moong with ash to prevent the attack of beetles. According to agro-scientists, Ash contains silica which acts as an insect repellent. Farmers strongly believe that ash application can control crop damage by 80 per cent.

4. Farmers in Tamil Nadu use neem and thumbai leaves in the storage of ragi. These leaves are cheap, organic, and safe methods to get rid of pests. Farmers also use neem seed kernel extract to treat the jute bags which can be further used to store food grains.

5. Camphor is also being used by the farmers to repel pests and insects during the storage of pulses and grains. The strong odor of camphor can protect grains for 3 months from the pests.

6. There is a practice of mixing Gingelly seeds (Sesamum) with paddy to prevent the webbing of larvae of Indian meal moths in oil seeds. This method can be used to store the oil seeds for at least 3 months. Gingelly oil which is also used to cook food in some regions of India, is stored with palm jaggery pieces in the tin container. This not only avoids the problem of rancidity but also helps to preserve oil for at least 18 months. To tackle the problem of spoilage and fetid in stored oil, farmers first heat the long iron rod of 8 cm width and 6.93 length on the earthen stove for 30 months. When the iron rod becomes reddish then it is dipped in stored oil for 5 minutes and the narrow opening of the container is tightly sealed with a cotton cloth.

7. There is a practice of storing tamarind in earthen pots with salt. This will help in loosening the flesh of tamarind and prevent it from pests and moths.

8. For the last 40 years, farmers have been practicing an indigenous technique of storing grain with sweet flags. In this technique grains, pulses, etc are mixed with powdered sweet flag. The strong odor of the sweet flag prevents the infestation in the grains.

These traditional structures and practices of storing food grains are mostly eco-friendly, cheap, and well-suited for the region in which they are used. These traditional methods of foodgrain storage are time-tested and have evolved to avoid losses that occur due to insect and pest infestation. The evolution of traditional storage practices has taken place because of the diverse agro-climatic conditions prevalent in India. Traditional storage structures have varying designs, materials, and capacities suiting different agro-climatic regions. It enables food grain storage at the pan-India level, besides helping against any imminent collapse of the food-supply system in the advent of any natural calamity (Mann et.al, 2016). But these have some weaknesses too. They are good to use at the farm level but when one thinks about the national food security, these are not sufficient. We need to integrate these traditional structures with new and modern technology to generate more sustainable, long-lasting, and gigantic structures that can operate at the national level.

Several steps must be followed before the storage purpose. The better handling of grains at these stages can save a considerable amount of grains for the storage stage. To minimise the loss of crops before storage, some precautions should be taken which are described below:

1. The harvesting time of the grains should be appropriate. Harvesting should be done at the right time to ensure grains' optimum moisture level and maturity.

The premature grains will contain more moisture and natural chemicals known as enzymes and therefore more susceptible to damage. It also increases the drying cost of the grains before storage. On the other hand, harvesting grain in the post-maturity period will increase the chances of pests, rodents, and fungi attacking the crops. A study conducted in Karnataka, India found that delayed harvesting caused paddy harvesting losses to rise by 10.3% (from 1.74% to 1.92%) (Kannan et al.,2013, MuganyiZi et al.,2023)

2. India being a labour-intensive country, still uses traditional methods of harvesting like sickles and knives. These methods are not only affordable but also much more accessible to the small farmers. However, usage of the same wastes a substantial amount of grain in shattering and scattering. This necessitates the use of machines on the farms. Similarly, in the case of threshing, the use of manual threshers results not only in high operating costs due to limited output but also in considerable grain losses due to spills, grain cracking unexpected downpours, and fire incidents.

3. Cleaning and winnowing are the common methods to clean the grains after threshing. But again, manual methods result in substantial grain loss. However, an India-based hand-driven mechanical winnower is a simple, eco-friendly, and efficient technique that not only minimises the loss of grains but also provides a 90 per cent cleaner product.

4. The loss of grains can also be minimised by using solar dryers which is an environmentally friendly and cost-effective way to remove moisture from the grains and make them ready for storage. The other conventional methods result in the wastage of grains.

5. The traditional formats of transportation of grains that farmers generally use are marred by the risk of grain spillage and damage during transit, as well as being contaminated with undesirable substances. Therefore, at the farm level farmers should be encouraged to use innovative methods like solar-powered electric vehicles and better transportation bags. At the regional and national level, the Government should encourage the increased use of fuel-efficient vehicles with a low carbon footprint. Moreover, the Government should make the necessary investments in rural transportation infrastructure and services, not only to cut transportation

costs but also to alleviate poverty and enhance living and economic standards in rural areas. ❑

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