**Project Course Final Report**

# Opportunities for start-ups in Agri warehousing and cold chain management

Under the *Guidance* of

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## EXECUTIVE SUMMARY

The warehousing companies in India are valued at 1501 billion INR in 2019 and are expected to grow at a rate of 13% CAGR to reach 2821 billion INR by 2024. Agricultural warehousing accounts for about 15% of the warehousing market in India. A gradual metamorphosis can be observed from the traditional concept of go downs to become modern formats of warehouses. Despite the development in the warehouse facility over the past few years, its reach to farmers and its role in the supply chain is very less in India. The expected growth in the warehouse market also opens up opportunities for its value chain management, linking these warehouses to farmers and producers to make them more accessible. We have tried to identify the opportunities of making warehousing an integral part of the Agri supply chain in India by finding areas for start-ups in the value chain. The project includes suggestions which will bring the farmers nearer to the cold store and make it more accessible.

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## INTRODUCTION

India has the highest arable land in the world and India ranks 2nd in farm output. In horticultural crops i.e., fruits and vegetables production, India ranks 2nd after China with more than 285 million metric tonnes of produce. Still India's rank in global hunger index is 101st among 116 countries and the major reason behind lagging in this index is high malnutrition. Despite the high production of all the agricultural commodities in India, the country is facing challenges of malnutrition. One of the reasons behind this very high agricultural wastage in India as compared to other countries. As per GT analysis report, post-harvest losses in cereals and pulses are in the range of 4 to 6% while in case of fruits and vegetables, it is around 6-18%. Lack of cold chain infrastructure and optimum storage facilities are important factors that contribute to high post-harvest losses. The cold storage facility availabe for farmers is very limited both in terms of capacity and accessibility. The warehousing companies in India are expected to grow at a rate of 13% CAGR to reach 2821 billion INR by 2024. This opens up great opportunities for its value chain management, linking these warehouses to farmers and producers to make them more accessible. Different parts in value chain where there is an opportunity for such start-ups are discussed in this project.

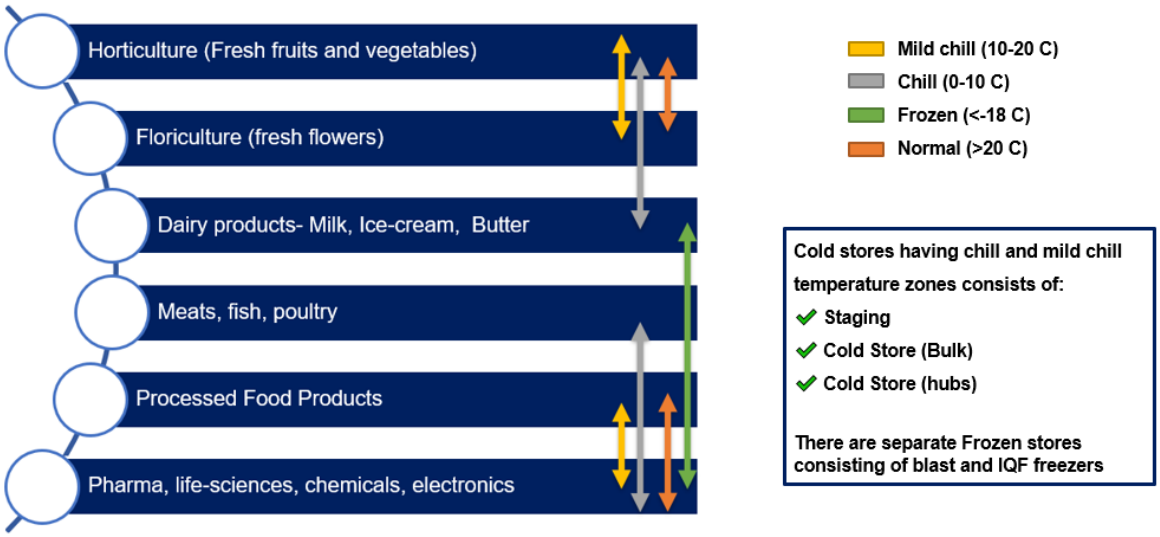
| Type of Agricultural Produce | Losses (in Percentage) |
|---|---|
| Cereals | 3.9% to 6% |
| Milk | 0.5% to 1% |
| Pulses | 4.3% to 6.1% |
| Oilseeds | 2.8% to 10.1% |
| Poultry and Meat | 2.3% to 4% |
| Fisheries | 2.9% to 6.9% |
| Fruits and Vegetables | 5.8% to 18% |

*Data Source: GT Analysis*

Cold Chain is a type of logistical system that ensures optimum storage conditions i.e., temperature and humidity for perishable products during transportation from farm gate to end consumer.


*Figure: Post Harvest Supply Chain*

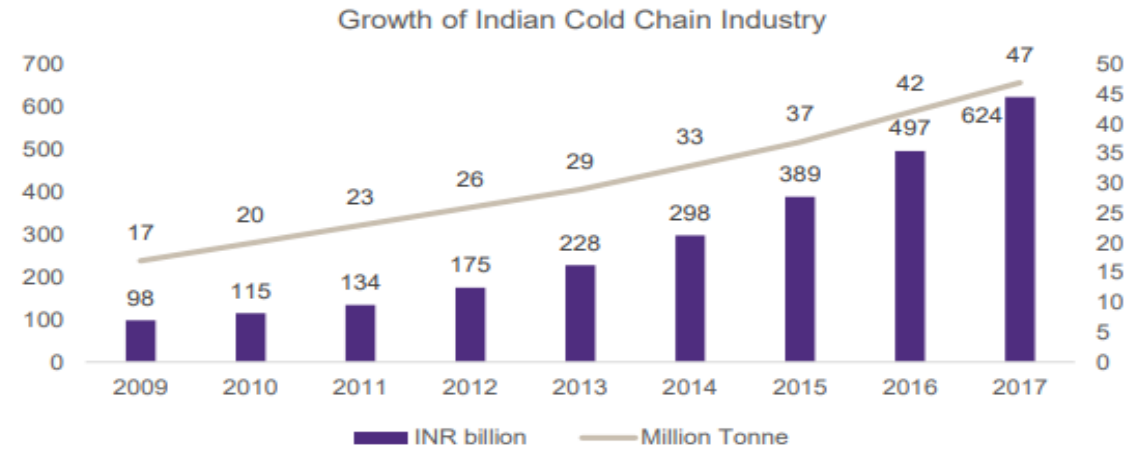
Different types of agricultural products require cold storage facilities and have different temperature requirements. Since, fresh fruits, vegetables and floricultural produce are highly perishable in nature, they require cold chain to increase their shelf life. For processed food, cold chain preserves quality and prevent microbial attack on food.




*Source: National Center of Cold Chain Development*

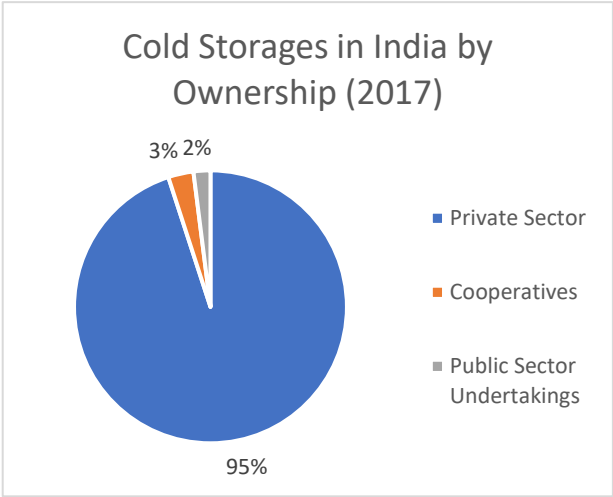
## CURRENT SCENARIO

Integrated cold chain industry of India which comprise both surface storage and refrigerated transport was valued around INR 62.7 crores has been growing very rapidly with a compound annual growth rate (CAGR) of 27%. The major factors behind such growth of cold industry are growing fast food market, rapid growth in organized retail, e-commerce industry and food processing industry.




Source: Secondary sources, GT analysis

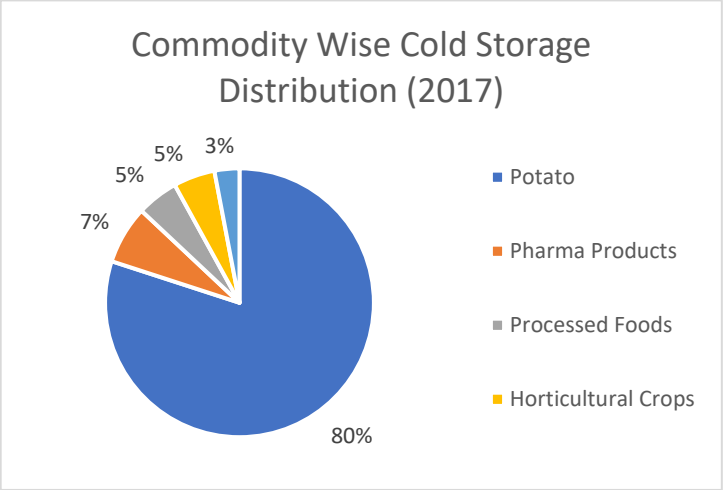
In India, Cold chain industry is unorganized and fragmented. As per National Center of Cold Chain Development (NCCD) data, there were more than 3500 players present in this space and share of organized sector is just 10%. In terms of ownership, private sector owns 95% of cold storages, 3% owned by cooperatives and rest 2% by public sector undertakings (PSUs)




| Type of Infrastructure | Infrastructure Requirement | Infrastructure Created | Infrastructure Gap |
|---|---|---|---|
| Pack Houses | 70080 | 249 | 69831 |
| Cold Storage | 35100662 MT | 31823700 MT | 3276962 MT |
| Reefer Vehicles | 61826 | 9000 | 52826 |
| Ripening Chamber | 9131 | 812 | 8319 |

*Data Source: National Center of Cold Chain Development*

Currently, distribution of cold storage is quite uneven among states as well as crops. Uttar Pradesh accounts for more than 40% of national cold storage capacity and only potato accounts for more than 70% cold storage utilizations which reflects uneven utilization of cold storage.




| REGION WISE STORAGE CAPACITY (IN MILLION METRIC TONNES | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Region** | **2014** | **2015** | **2016** | **2017** | **2018** | **2019** | **Growth Rate** |
| Eastern | 4.75 | 4.17 | 4.6 | 5.07 | 6.03 | 6.02 | 4.85% |
| North-Eastern | 0.88 | 0.76 | 0.9 | 0.61 | 0.73 | 0.71 | -4.20% |
| Northern | 29.88 | 37.95 | 39.86 | 38.34 | 32.75 | 38.1 | 4.98% |
| Southern | 12.78 | 9.98 | 9.74 | 9.26 | 11.61 | 11.03 | -2.90% |
| Western | 7.23 | 4.19 | 4.1 | 3.58 | 4.35 | 4.9 | -7.49% |
| Central | 18.68 | 14.4 | 22.29 | 20.68 | 28.84 | 24.8 | 5.83% |
| All India | 74.2 | 71.44 | 81.48 | 77.54 | 84.3 | 85.56 | 2.89% |

*Note: Storage Capacity pertains to Central Warehousing Corporation (CWC), State Warehousing Corporation (SWC) and Food Corporation of India (FCI). It includes owned and hired, covered and capped storage.*
*Data Source: Agricultural Statistics at a Glance (2018), Dept. of Food and Public Distribution (2019)*

## EXISTING PROBLEMS IN COLD CHAIN MANAGEMENT

Currently, there are a lot of issues in the existing cold chain faced by both farmers as well as warehousing companies. Some of the important issues are as follows.

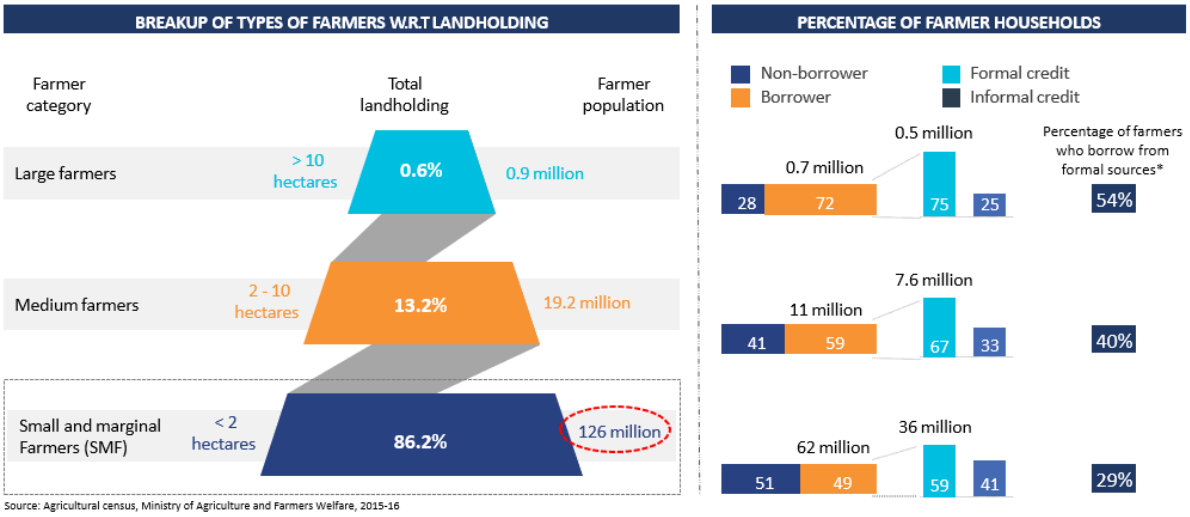
**High Operating Costs:** In India, cold chain operating costs are almost double as compared to western countries. It is around INR 80-90 per cubic foot per year in India while it is just INR 30 per cubic foot per year in western countries. The major reason for high operating cost is high cost of energy consumption. In india, energy costs accounts for 30% of total operating costs while it is just 10% in case of western countries. (FNB News - Challenges

and Barriers in Management of Cold Chain | FNB News, 2021). These costs act as entry barrier for new entrants in this industry.

**Availability of reefer vehicles:** In India, reefer (cold storage) vehicles are very less as compared to the production of perishable commodities. To maintain the quality and increasing the shelf life of the products, reefer vehicles are required that carry products from farm gate to cold stores and from cold stores to customers. In India, logistics of perishable products by reefer vehicles accounts for only 4% of total inter-city perishable transport. Among all the products, transported by reefer vehicles, milk accounts for more than 80% which shows skewed distribution of reefer vehicles among different perishable commodities. ("India as an agriculture and high value food powerhouse: A new vision for 2030", 2013)

**Uneven distribution of cold storage:** Distribution of cold storage is quite skewed among states as well as crops. As per National Center of Cold Chain Development, Uttar Pradesh accounts for approximately 40% of national cold storage capacity and only potato accounts for more than 70% cold storage utilizations.

**Finance availability**




From the above, we can see that more than 85% of farmers are small and marginal. Among them, more than 70% still take credit from informal sources like moneylenders, relatives etc. In the informal sector, interest rates are quite high i.e., generally more than 35%. Just after the harvesting of produce, farmer requires free cash or working capital to buy agri-inputs for next season. Also, agricultural commodities are perishable, and farmers generally

don’t have the facility to store the produce for longer time. Because of these reasons, farmers generally sell their produce to village aggregator or local arthiya or in mandis without storing the produce in cold storages for better prices. One of the solutions to resolve the credit issues is warehousing receipt finance. In this, farmer stores in produce in warehouse and in return warehouse provides receipt to the farmer and he gets certain percentage of value of its produce basis on the receipt.

## DIFFERENT AREAS AND OPPORTUNITIES FOR STARTUPS

### Decentralised cold storage establishment

In developed countries like US and UK, traveling 100 to 200 km is not difficult at all. Given the infrastructure of roads and trucks and lesser probability of their failure, it only takes couple of hours to reach the destination. Even when the cold store is 200 km away, it barely effects the quality of the produce. Such countries have the luxury of creating huge cold rooms and thereby increasing efficiency. But in developing country like India, these infrastructures are not so well built and are not reliable. With variation in terrains and weather, it might even take days together to carry the produce to a distance of 200 km. This will only get worse if there is no availability of trucks at the given time.

Cold storages in India, are largely constructed for bulk, single-temperature, and long-term warehousing of crops, particularly potatoes, which are held in the majority of the country's 8,186 facilities. But the current strategy of one size fits all might not be efficient in Indian scenario.

One of the ways to deal with this situation is by having a decentralised cold storage system thereby reducing the distance between farmer and the cold storage. A decentralised cold storage also gives the advantage of customising the room as per the local requirement. It is ideal for a diverse country like India with different climatic zones. The cold store can be customised to hold perfectly the local produce thereby increasing shelf life and also reducing transport losses.

### Cold storage logistics

The time required for transportation of the produce to cold storage is very high sometimes even taking days (depending on area and weather). Considerable portion of the produce is lost during the transport due to weather changes and damage due to handling. Even though

there are new start-ups coming in this segment, their reachability is very limited. Especially in terms of last mile reachability where a farmer is not producing enough to fill the truck on his own.

The hub and spokes model – This model was predominantly used in the aviation industry before the Southwest airlines introduced point to point network. It is a model where small quantities of produce are brought to one common place and from there it is taken in large trucks to the destination. This model not only allows contribution from smaller farmers but also makes transportation in difficult terrains possible. The model also includes usage of newer technology reefer trucks or frozen trucks with frozen bags or other cold storage technology for last mile pickup.

**Automation**

Tech integrated dynamic information transfer – According to ministry of Agriculture and Farmers Welfare, the information regarding capacity utilization, real time data regarding availability, cost etc on cold storage facilities is not centrally maintained by the ministry. Since the majority of the storage is owned by private entity, the information is not available to the farmers and traders easily. This gives an opportunity for a tech start up to open a real time monitoring system which is accessible to traders and farmers easily. This will help in planning and transporting the produce easily and reduce the trouble caused due to error in information. The dynamic information transfer requires automation, saving every minute load added to the storage automatically in real time. This is then shared with the application for stakeholders. Technology such as mini load ASRS (Automated Storage and Retrieval System) is essential to make this process easy. Mini-load ASRS is a highly dynamic ASRS that can efficiently and meticulously handle small parts, cartons, trays, and totes in a warehouse for storing, sorting, and picking purposes.

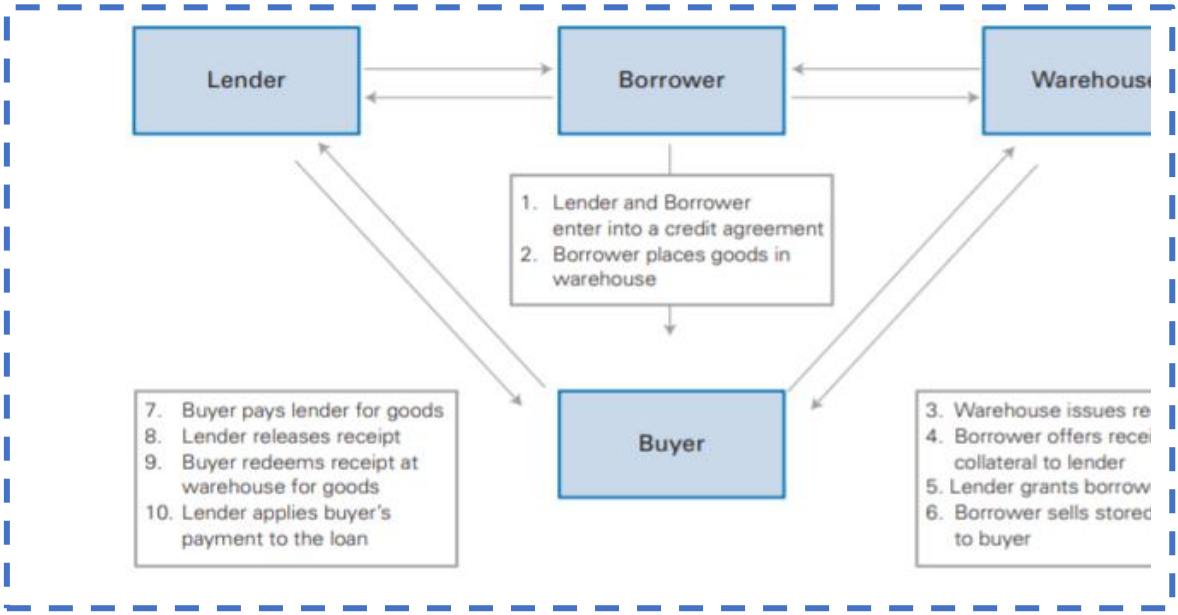
Another area for technology in warehousing is in sorting and grading. Technology to sort and grade the produce in a warehouse is very difficult to find in India. Majority of the warehouses are made just for the purpose of storage and they only serve the same. Much more value could be added if technology to automatically sort and grade the produce is introduced.

**Warehouse Receipt Financing-**

Warehouse Receipts are basically the documents published by warehouses to depositors against the commodities deposited in the warehouses; for this, the warehouse is the bailee. Warehouse Receipts may be either negotiable or non-negotiable in nature. Negotiable Warehouse Receipts instruments can be traded, sold, exchanged, used as collateral to support borrowing, or carried for delivery against a derivative instrument like a futures contract.

Warehouse Receipt (WHR) Lending is considered as one of the most innovative and oldest lending products. It has been in vogue since Mesopotamian times. It is a system of financing working capital to Commodity Traders, Farmers and Producer Companies against their commodity stock deposited in warehouses and engaged with the lenders. Warehouse receipt finance utilises securely reserved goods as loan collateral. It is sometimes called as "inventory credit". It permits clients, such as farmers, processors, traders, and others to deposit commodities in a protected warehouse based on a receipt certifying the deposit of goods of a specific quantity, quality and grade. Clients can then utilise the receipt as portable collateral to request a loan from a financial institution.

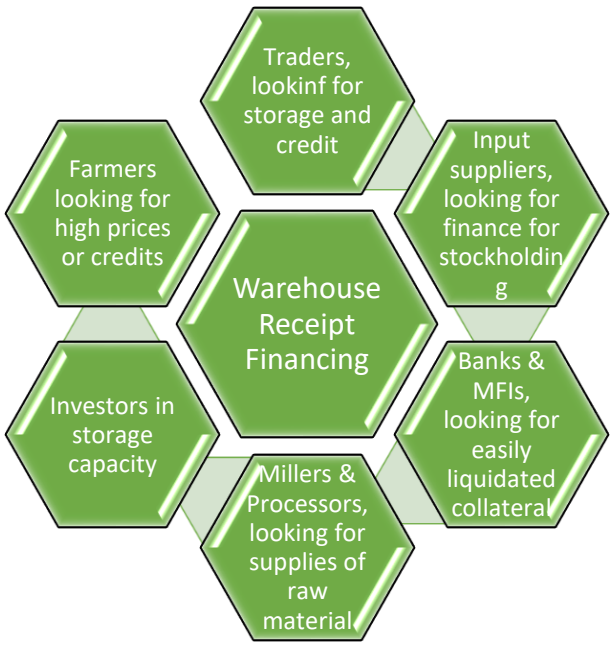
**Features of warehouse receipt financing transaction-**



**Process flow of WRF--**

- ✓ Client(Farmers or traders) deposits a specific amount of goods into a warehouse in exchange for a warehouse receipt. The warehouse receipt represents the right to withdraw a specified amount and quality of the commodity at any point of time from the warehouse.
- ✓ It is the warehouse manager's responsibility to guarantee the safety and quality of the stored item.
- ✓ The warehouse receipt can then be given to a bank, which equips a loan equivalent to a specific percentage of the value of the reserved commodity in the warehouse.
- ✓ At its maturity, the client sells the commodity to a buyer who then either pays the bank by himself or pays the borrower, who then repays it to the bank.
- ✓ On obtaining the funds or a sufficient payment instrument (such as, confirmed Letter of Credit), the bank surrenders the warehouse receipt to either the buyer or the seller (depending on the specifics of the transaction), who will submit the warehouse receipt to the respective warehouse, which releases the commodity. *NOTE-* In case of default on loan, the bank can utilise the warehouse receipts in its control to take delivery of and sell the items stored in the warehouse to offset the amounts it is owed.

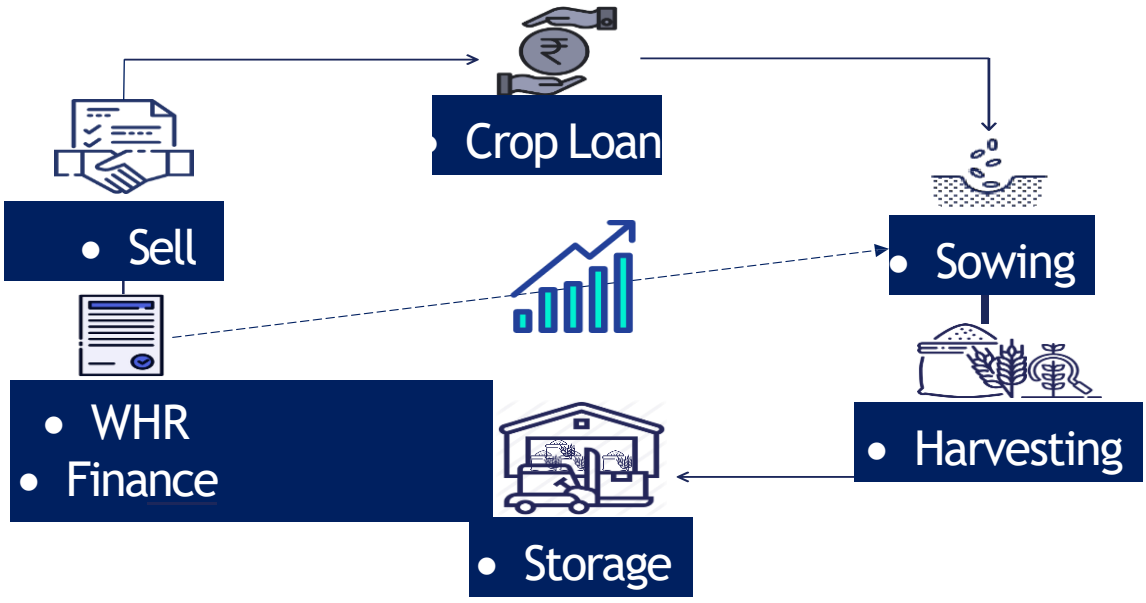
**Parties with incentives to participate in WRF-**



**Approaches to various warehousing finance and storage-**

*Public Warehousing:* Public warehousing does not imply public ownership but directs to a company storing goods for the public in general on behalf of whosoever desires to deposit in the warehouse and cases to the respective depositors' warehouse receipts that can be utilised for trading purposes or as collateral for boosting finance.

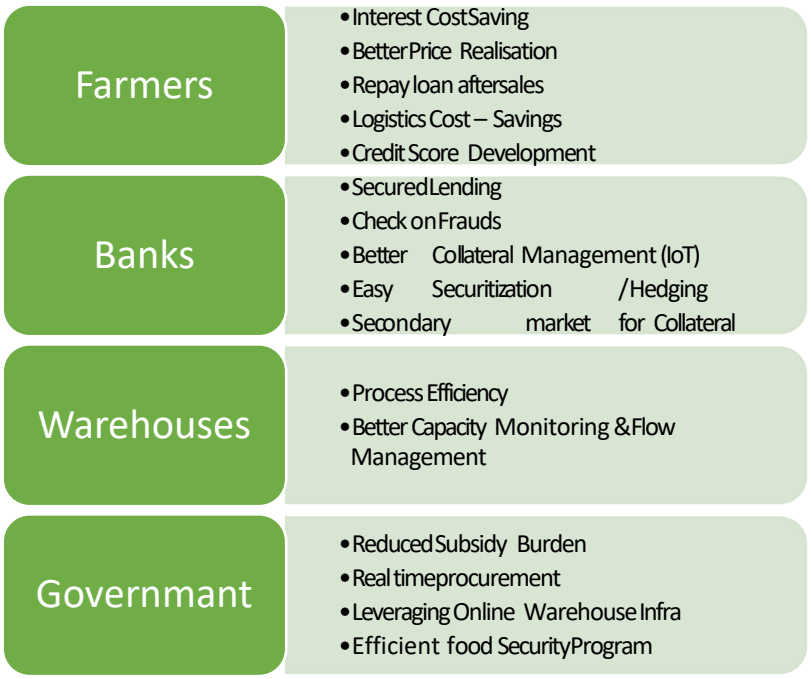
*Private Warehousing:* This system would allow private players to issue warehouse receipts against their stock to raise bank financing and transmit title to buyers. Potentially this could boost market efficiency to the advantage of both farmers and consumers at either end of the chain. It could assist in establishing a more level playing field among trading companies, making it more leisurely for local operators to access low-cost capital. It is moreover a sort of self-propelling invention, building on the grounds of the proposing company. However, it is quite a risky approach, where the regulator has little direct control over the actions of the licensee, who may move stocks around without the information of a regulator who is not on the site. Moreover, if such a warehouse operator proceeds bankrupt, it may also be challenging for the bank to prevent priority being given to additional creditors




*Farmer focused Warehousing approaches*: These strategies involve the storage and financing of commodities deposited by farmers to supply local food needs in rural areas or bulk products before marketing. There is a general requirement to increase farmers' function in crop storage. If more is stored locally in villages, rural people will be more certain in the lean season, notably households who produce inadequate to cover their needs

or sell early for financial motives. Occasionally rural storage endeavours have resulted in significant increases in seasonal storage, lessening the need for States to set price stabilization mechanisms.

**Multi Stakeholders Benefits--**




## GOVERNMENT SCHEMES

**Mission for Integrated Development of Horticulture (MIDH):**

The Mission for Integrated Development of Horticulture (MIDH) is being implemented by the Department of Agriculture Cooperation and Farmers Welfare, and it provides financial help for different horticulture operations, including the establishment of cold storage facilities. The component is demand/entrepreneur driven, and government assistance in the form of credit linked back ended subsidies is available for both public and private sector enterprises at a rate of 35 percent (for general areas) and 50 percent (for hilly and scheduled areas) of eligible capital cost of the project.

**Pradhan Mantri Kisan SAMPADA Yojana (PMKSY):**

The Scheme for Integrated Cold Chain and Value Addition Infrastructure is being implemented by the Ministry of Food Processing Industries as part of the Pradhan Mantri Kisan Sampada Yojana (PMKSY) with the goal of reducing post-harvest losses of horticulture and non-horticulture produce and providing farmers with a remunerative price for their produce. Under the scheme, the Ministry provides financial assistance in the form of grant-in-aid at a rate of 35 percent for general areas and 50 percent for North East States, Himalayan States, ITDP areas, and Islands for storage and transportation infrastructure, as well as 50 percent and 75 percent for value addition and processing infrastructure, subject to a maximum of Rs.10 crore per project for setting up Integrated Cold Chain projects including Irradiation facilities. The Scheme does not cover stand-alone cold storages.

Standalone cold storages are not covered under the Scheme.

## CONCLUSION

India is a diverse country with different climatic zones and wide varieties of produce being grown in different parts of the country. The approaches used in developed countries like US and UK might not be apt for India. India requires a more decentralised approach with an agile model which can change according to the climate, type of produce and requirements of the local farmers. But the different types of automations and technologies used in the developed countries need to be incorporated in order to achieve higher efficiency in the value chain.

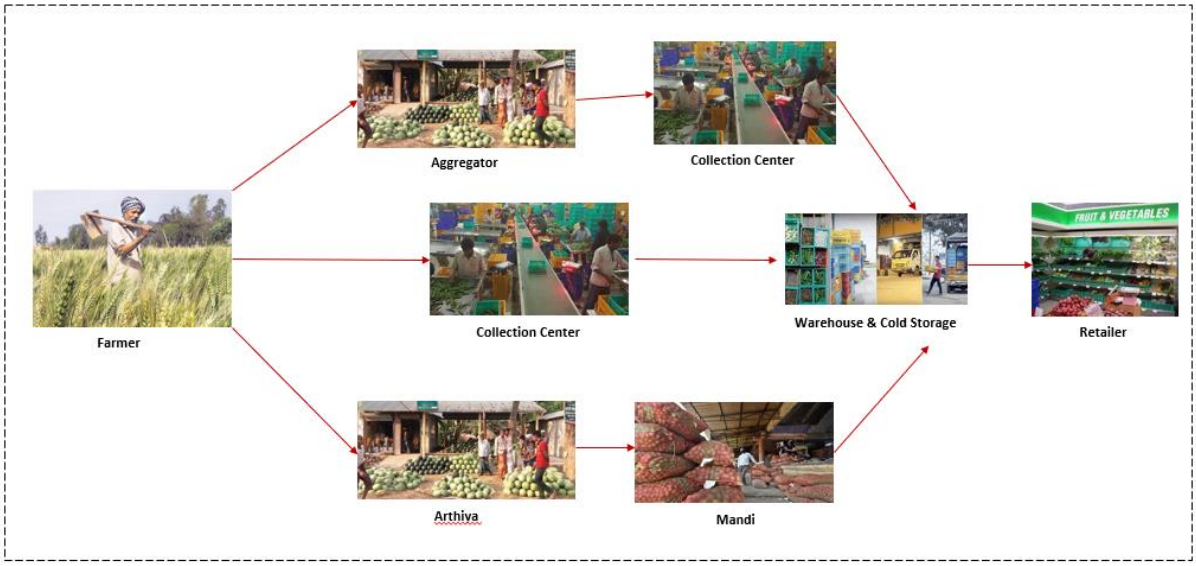
Efficiency in the supply chain is very essential in order to satisfy the demands of increasing population and the quality demanded due to increased awareness. There are numerous opportunities for start-ups in this domain. We have listed some of the areas of opportunity but there are many more yet to be found.

**Exhibit 1: State Wise Number of Cold Storages and Capacity (2020)**

| S. No. | State/Union Territory | No. of Cold Stores | Capacity (MT) |
|---|---|---|---|
| 1 | Andaman & Nicobar (UT) | 3 | 810 |
| 2 | Andhra Pradesh & Telangana | 405 | 1567664 |
| 3 | Arunachal Pradesh | 2 | 6000 |
| 4 | Assam | 39 | 178096 |
| 5 | Bihar | 311 | 1479122 |
| 6 | Chandigarh (UT) | 7 | 12462 |
| 7 | Chhattisgarh | 99 | 487292 |
| 8 | Delhi (UT) | 97 | 129857 |
| 9 | Goa | 29 | 7705 |
| 10 | Gujarat | 969 | 3822112 |
| 11 | Haryana | 359 | 819809 |
| 12 | Himachal Pradesh | 76 | 146769 |
| 13 | Jammu & Kashmir | 69 | 250167 |
| 14 | Jharkhand | 58 | 236680 |
| 15 | Karnataka | 223 | 676832 |
| 16 | Kerala | 199 | 80705 |
| 17 | Lakshadweep (UT) | 1 | 15 |
| 18 | Madhya Pradesh | 302 | 1293574 |
| 19 | Maharashtra | 619 | 1009693 |
| 20 | Manipur | 2 | 4500 |
| 21 | Meghalaya | 4 | 8200 |
| 22 | Mizoram | 3 | 4001 |
| 23 | Nagaland | 3 | 7150 |
| 24 | Orissa | 179 | 572966 |
| 25 | Pondicherry (UT) | 3 | 85 |
| 26 | Punjab | 697 | 2315096 |
| 27 | Rajasthan | 180 | 611831 |
| 28 | Sikkim | 2 | 2100 |
| 29 | Tamil Nadu | 183 | 382683 |
| 30 | Telangana | 74 | 410905 |
| 31 | Tripura | 14 | 46354 |
| 32 | Uttar Pradesh | 2406 | 14714235 |
| 33 | Uttarakhand | 55 | 191314 |
| 34 | West Bengal | 514 | 5947311 |
| | **TOTAL** | **8186** | **37425097** |

*Data Source: National Center of Cold Chain Development*

## Exhibit 2: Udaan Supply Chain




## Exhibit 3: Warehouse financing model

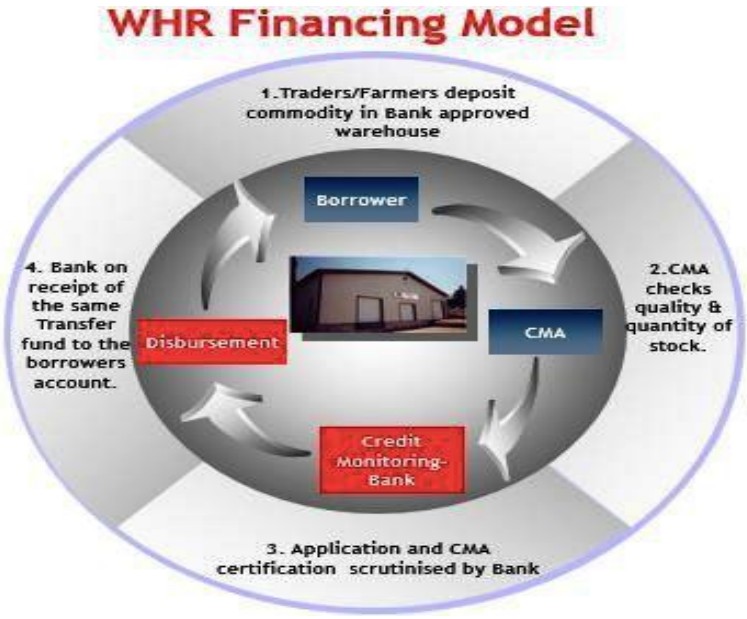


**Exhibit 3: Interview with farmer**

**Interviewee Name**: Mr Surender Gera **Age**: 35 Years
**Crops Grown**: Kinnow, Wheat, Cotton, Carrot, Mustard, Vegetables, Long Melon (Kakdi)
**Location**: Village – Kheri Barkhi, District – Hisar, Haryana
**Land Holding**: 9 Acres
**Contact Number**: 9466085000

**Q1: What kinds of problems do you face with selling of perishable commodities like vegetables?**

Vegetables are highly perishable and can't be left on field or at home after harvesting. So, we need to sell vegetables as early as possible. Also, there is no proper information on the prices in the mandi. For example, if we go to the mandi with some vegetables, it requires transportation cost and if we don't find the prices reasonable in the mandi, there is no option of coming back with the produce. Perishable nature of the commodity and transportation cost incurred bound us from coming back. Also, there is a requirement of money for sowing of next season which also pushes us to sell urgently. Sometimes, farmer is not able to recover the cost because of over supply and he doesn't find value in incurring transportation cost and that why there are news like farmer throw all the produce on the roads.

**Q2: Do you think cold storage facilities can solve these issues? Have you used cold storage facilities earlier?**

Cold storages can solve the issues of perishability and can provide us an option to sell on the later date when prices will be higher. But it doesn't solve the issue of the immediate credit requirement for sowing of next crop. Also, there are no cold storages in the nearby areas and taking the produce to far locations can result in spoilage of produce in between. Another thing is there should be proper information about the prices in the mandi and how will it going to be in future.

No, I haven't used cold storage facility till date. We sell our vegetables in the hisar vegetable mandi after harvesting. On calls, we get some idea about the prices of the commodity in mandi.

**Q3: Are you aware of warehouse receipt finance?**

No, I haven't heard of this. We don't have that much production and we can store staples at our home.
(I explained him warehouse receipt finance)
There is no government warehouse in the nearby city. Also, going to government warehouses and all the process will take a lot of time because of bureaucracy. Next thing is we don't know whether price will go up or down. Take the example of wheat, its Minimum Support Price (MSP) is INR 1975, but wheat prices are very less in open market i.e., around INR 1600. So, how we will ensure that prices will go up.

**Exhibit 4: Short interview with farmers**

Q1. How far is the nearest cold store to you?

Response 1: About 110 km

Response 2: 200 km in any direction. Not less than that

Q2. Have you used this facility before?

Response 1: No, it is much easier for me to just sell in the market. Taking the produce till the cold store itself is a problem for me. I would rather sacrifice some amount and sell it here itself.

Response 2: No. What is the guarantee that I will get better price after storing it? If it only adds to my cost and does nothing else, I would rather sell it now than later. Also, If I don't sell it now then where will I get the money?

Q3. If the cold store was available easily, would you use it? Do you think it would be beneficial?

Response 1: Yes. I would use it, but then I also require someone to give me proper information, otherwise I feel scared. If they purchase it from me directly that would be even better.

Response 2: I am not sure. As I told, I need a guarantee that it will fetch better price later, otherwise there is no use.

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