EXPO 2018 ICE cold chain

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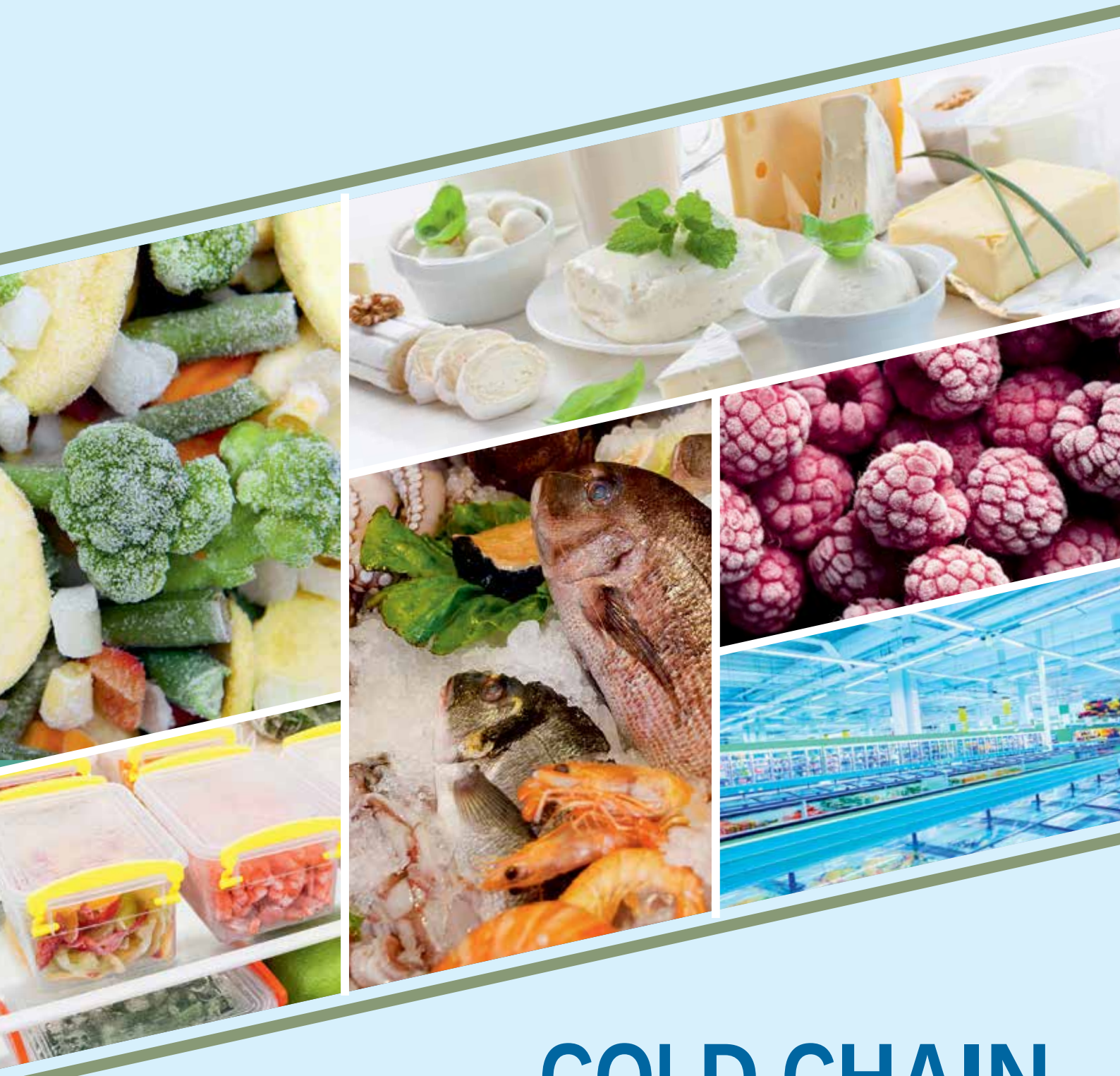

COLD CHAIN
OPPORTUNITIES IN INDIA
The Perishables Sector Perspective

TITLE	**Cold Chain Opportunities in India: The Perishables Sector Perspective**
YEAR	November, 2018
AUTHORS	YES BANK
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CONTACTS	**YES BANK Ltd.** Registered and Head Office YES BANK Tower, IFC 2, 15th Floor, Senapati Bapat Marg, Elphinstone (W), Mumbai 400 013, India **Tel** : +91 22 6669 9000 **Fax** : +91 22 2497 4088 **Northern Regional Office** 48, Nyaya Marg, Chanakyapuri New Delhi - 110 021 **Tel** : +91 11 6656 9000/ +91 11 46029299 **Email** : fasar@yesbank.in **Website** : www.yesbank.in

Message

The Indian cold chain industry, once limited only to a few produce types till as late as the first decade of this century, is transforming from traditional quantity stores for stand-alone commodities to quality cold chain- hence integrating various missing links. Thus, various business models utilizing cold chain logistic services at different stages have been recognized and well established on commercial lines. Few, worth mentioning are bulk stores in the areas of concentrated centers of production, multi-commodity multi-chambers cold stores around areas of consumption, controlled and modified atmosphere cold stores, fruit ripening chambers, IQF and blast freezing, freeze stores etc. More important is the trend towards complete refrigerated supply chain for the fresh and processed items like, milk and dairy, meat, confectionary and pharma, and of course, the fresh produce.

The Indian market is on the cusp of a revolutionary change with the expansion of middle class and affluence coming into the middle classes. The increase in demand for fresh produce, meat and perishable packaged foods is leading to significant growth in this sector, which is increasingly relying on sustainable cold chain network.

India is one of the largest producers of agricultural produce and has abundant supply base of different produce. There is an increasing awareness that agri-logistics require to develop with a delivery bias, to link with demand across regions, and not merely as a buffer against local demand. Distance and time assumes importance as the disparity of prices also induces movement. Efficient transportation has an immediate effect on the factor of time, which is an element in the price factor. Thus, the delivery system of perishables - always fighting against time, has become another important driver of its growth.

We are glad to have Yes Bank with us for the 10th edition of ICE. We look forward to many such fruitful endeavours with Yes Bank in future.

Atul Khanna
Director
GCCA - India
ICE Centre Of Excellence Pvt. Ltd.

Message

India is amongst the global leaders in food production, and is amongst the top 5 nations for key perishables viz. dairy, poultry and meat, seafood and fruits & vegetables. Food and food products constitute the largest portion of the Indian consumer's spend – about 40% share of the wallet. This, coupled with a population of 1.3 Bn, mostly young & growing at 1.2% annually, is expected to keep the food industry on a fast growth track for the next three decades. This growth is bound to be accompanied with significant changes in the food plate composition, which is witnessing significant change owing to rising income levels, rapid urbanization and rising consumer awareness regarding food safety, health and convenience.

A major challenge faced by the Indian food processing industry is the extent of wastage across the value chain of perishables. As per a study conducted by Central Institute of Post-harvest Engineering and Technology (CIPHET), the total harvest and post-harvest losses amounted to USD 14 Bn. The wastage levels in India vary across categories, with highest wastages in the F&V and Marine sector. Geographically fragmented production at the backend, limited power availability, inadequate roads and enabling infrastructure and lack of appropriate temperature control and monitoring systems are other key factors impacting quality and health of fresh and processed products. The National Centre for Cold Chain Development (NCCD) has identified a gap of 3.2 Mn MT in cold storage capacity, more than 69,000 packhouses, more than 50,000 reefer vehicles and a gap of around 8,000 ripening chambers in India.

This provides a huge opportunity for multi commodity & multi value chain legs based interventions especially for the development of post-harvest logistics, storage, handling and marketing infrastructure. Innovative approaches across the cold chain focusing on new age storage systems, real time monitoring of storage and quality parameters, data recording applications, leveraging ICT tools as well as use of renewable sources of energy are some of the innovations shaping up this space.

On the occasion of the ICE 2018 - International Exhibition and Conference on Cold-chain & Refrigeration Industry, I am pleased to present the collaborative **YES BANK- ICE Knowledge Report 'Cold Chain Opportunities in India: The Perishables Sector Perspective'**, which provides an in-depth overview of the key perishable sectors in the Indian market, their respective supply chain structures and upcoming innovation based developments in this space. I am confident that this report will serve as an effective reference for all stakeholders involved in the cold chain domain, including the industry as well as policy makers.

Nitin Puri
Senior President
Food and Agribusiness Strategic Advisory & Research (FASAR)
YES BANK Ltd.

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EXECUTIVE SUMMARY

India has seen a phenomenal growth in production of horticulture produce, dairy and meat products over the last decade. Presently, India occupies a position amongst the top three in production of a host of commodities including spices, fisheries, poultry, milk, fruits and vegetables. But even with such large production volumes, India's present share in global farm trade is still very small. A key deterrent to this is the high level of wastage across the value chain of key perishables. India witnesses nearly 4.6-15.9% wastage in fruits and vegetables, 5.2% in inland fish, 10.5% in marine fish, 2.7% in meat and 6.7% in poultry meat.

The cold chain industry in India is still at a nascent stage and despite large production of perishable produce, the cold chain potential still remains untapped due to high share of single commodity cold storage, high initial investment (for refrigerator units and land), lack of enabling infrastructure like power & roads, lack of awareness for handling perishable produce and lapse of service either by the storage provider or the transporter leading to poor quality produce. It is a highly fragmented industry and the unorganized sector accounts for an estimated 80-85% share of the total capacity. Wholesalers and organized retailers are the key user segments of cold chain services with a share of 70-75% and 10-15% respectively. Also, erratic power supplies, unavailability of skilled manpower, inefficient handling of perishables & availability of technology & financing options impact the industry adversely.

However, increasing urbanization and growth of organized retail, food servicing and food processing sector are boosting the growth of cold chain industry in India. The trend is shifting towards establishing multipurpose cold storages and providing end to end services to control parameters throughout the value chain.

The report gives an overview of the cold chain sector in India including present storage capacity and corresponding gaps in terms of cold chain infrastructure in the country. The National Center for Cold Chain Development (NCCD) which has identified a gap of 3.2 Mn MT in cold storage capacity, more than 69,000 packhouses, more than 50,000 reefer vehicles and a gap of around 8,000 ripening chambers in India. The report also sheds light on the uniqueness of individual supply chains of key perishable categories, various stakeholders involved and flow of raw material & end products in the supply chain.

The government's emphasis on Food Parks and Integrated Cold Chain Development has increased in the recent past. Government has taken several policy level and schematic steps to increase investment in this sector. Several schematic supports through Department of Agriculture, Ministry of Food Processing Industries (MoFPI), Agricultural and Processed Food Products Export Development Authority (APEDA), National Horticulture Board (NHB) and others. Similarly, numerous states under the ambit of their agriculture and industrial policies have charted out lucrative incentives for development of cold chain infrastructure.

Lastly, the report documents key innovations in the cold chain space across various sectors by means of individual case studies. The report also tries to explore opportunities in potential food processing and in turn; cold chain development prospects in states like Andhra Pradesh, Uttar Pradesh & Gujarat with focus on the key perishable commodities like dairy, fruits & vegetables, seafood and meat & poultry.

1 OVERVIEW OF COLD CHAIN SECTOR IN INDIA

1.1. Concept of Cold Chain

With an annual production of 165.4 Mn MT of milk (Rank 1), 277 Mn MT of fruits and vegetables (Rank 2), 11.4 Mn MT of fish (Rank 2) and 7.4 Mn MT in meat (Rank 1 in buffalo meat and Rank 2 in goat meat) India is at the forefront on the global stage in terms of production, opportunity for processing and cold chain innovations in perishables.

However, a major challenge faced by the Indian food processing industry is the extent of wastage across the value chain. According to a study conducted by Central Institute of Post-harvest Engineering and Technology (CIPHET) in 2015, the total harvest and post-harvest losses amounted to USD 14 Bn. The wastage levels vary across categories and provides a huge opportunity for wastage reduction through food processing and development of post-harvest logistics, storage and marketing infrastructure. The wastage levels in India vary across categories, with highest wastages in the F&V and Marine sector. The maximum losses take place during the farm operations and transportation.

Exhibit 1: Level of wastage in perishables in India

India witnesses nearly 4.6-15.9% wastage in fruits and vegetables annually, due to lack of modern harvesting technologies and cold chain infrastructure. moreover, the processing levels in fruits and vegetables stands at a meagre 2%

The wastage levels in other perishables is also significantly high - 5.2% in inland fish, 10.5% in marine fish, 2.7% in meat and 6.7% in poultry meat

Estimated annual value of losses of agri produce currently stands at INR 92,651 crore. Annual value of losses in F&V, meat, fish and milk stands at INR 58,478 crore

Lack of upgradation and customisation (multi commodity storage) of existing cold storages

Source: Opportunities in Food Processing In India, World Food India 2017

A cold chain is a temperature-controlled supply chain network, with storage and distribution activities carried out in a manner such that the temperature of a product is maintained in a specified range, required to keep it fresh and edible for a much longer period than in normal ambient conditions. The industry comprises of two segments- Temperature Controlled Warehousing (TCW) and Temperature Controlled Transportation (TCT) Vehicles (Reefer Vans). The key components of the cold chain industry include:

- ✓ Procurement and Delivery Systems
- ✓ Pre Cooling Facilities
- ✓ Refrigerated Vehicles
- ✓ Ripening Chambers
- ✓ Cold/Controlled Atmosphere (CA)/Modified Atmosphere Stores
- ✓ Refrigerated Retail Outlets
- ✓ Information Systems and Traceability

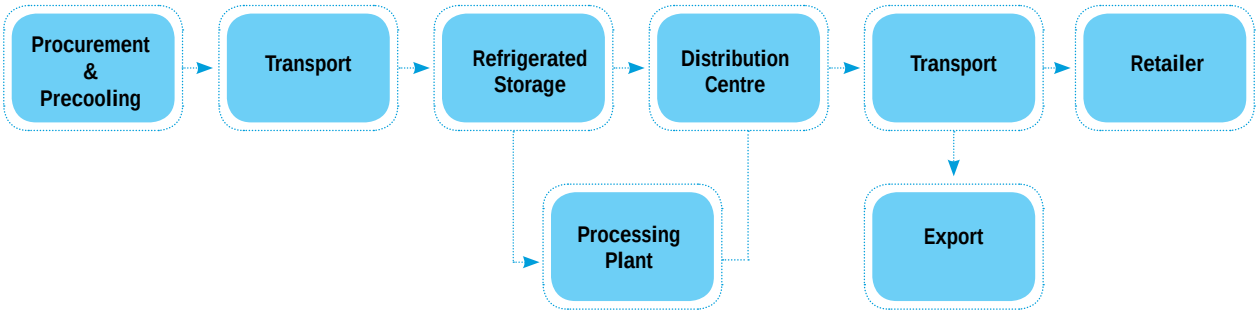
As per present day practice in India cold storage can be classified as follows:

- ✓ Bulk cold stores: For storage of single commodity, which mostly operates on seasonal basis e.g. potatoes, chillies etc.
- ✓ Multipurpose cold stores: Designed for variety of commodities which operate round the year like fruits, vegetables, dry fruits, spices, pulses, milk products etc.
- ✓ Frozen food stores with freezing facility for fish, meat, poultry, dairy products and processed fruits & vegetables with or without processing facility. However, percentage of foods processed is extremely low and a great potential exists for growth in this category.
- ✓ Mini units/walk in cold stores situated at hotels, restaurants and super markets.
- ✓ Controlled atmosphere (CA) stores for fruits like apples, pears and cherries.
- ✓ Ripening chambers for ripening of fruits, mainly setup for bananas and mangoes.

Controlled Atmosphere (CA) Storage: CA stores are cold storages fitted with additional equipments to actively control the atmospheric content inside the closed chamber. The broad concept involves forcibly taking away the air from the closed room and replacing with other inert gas to quickly obtain a low level of oxygen inside the chamber which further reduces the physiological rates of fruits/ vegetables stored in such environment. CA technology helps in reducing produced respiration, slowing ethylene production, inhibiting pathogen infestation and also killing insects thus increasing the shelf life of the produce. Ripening chambers are examples of short term controlled atmosphere storage in which ethylene and carbon dioxide are controlled parameters and are used for ripening of fruits like mango and banana.

1.2. Process Flow of Cold Chain

A typical cold chain network comprises of following stages.



- ✓ The first stage is procurement of produce from farmers and bringing the produce after harvesting to a pre-cooling centre/collection centre, which is located nearby the production zone. Pre-cooling is carried out within a short period after procurement to prepare the fruit or vegetable for transportation over long distances. Refrigerated or reefer trucks are used to transport the harvested produce at controlled temperatures from the pre-cooling centre to the cold storages. Primary processing of produce like sorting, grading and packaging is done at collection centers before storage.
- ✓ Cold storages are generally centrally located built to cater to multiple production zones and pre-cooling centers like a typical hub and spoke model in logistics. Here, depending on factors like how long the product needs to be stored and what use it is going to be put to, the product is stored under different conditions using chilled storage, cold room storage, controlled atmosphere storage. Storage under chilled conditions and controlled atmosphere essentially slow down the ripening process of the food product and enhance its shelf life.
- ✓ The produce from cold stores is transported in reefer trucks to a distribution centre from where it is either exported or transported to retailers. In retail stores, the food products are stored at low temperatures in refrigerated display units to maintain freshness as well as to increase shelf life.
- ✓ The produce from cold stores is also used for manufacturing processed food items like jams, jellies, pickles or juices. Many processing plants also source fruits and vegetables directly from the production zone or pre-cooling centre.

The market size of cold storage and reefer industry is expected to grow to around INR 250 Bn and INR 20-22 Bn respectively in 2016-17.

Exhibit 2: Types of cold chain infrastructure, products and end user segments

Business Models	Temperature Controlled Warehouse (TCW)	Temperature Controlled Vehicles (TCV)	Value Added Services (Sorting, Grading, Packaging etc.)
Key Products	Potatoes, F&V, Meat, Sea Food, Milk & Milk Products	Meat, Ice Cream, Milk & its products, Pharma products, Confectionery	Fruits (Apples), Pharma, Packaged Food, Meat & Sea Food
Technology used	✓ Ordinary Cold Store ✓ Gas Controlled Cold Stored ✓ Controlled Atmosphere Cold Store ✓ Deep Freezer Storage		
Key End User Segment	✓ Wholesalers (70-75%) ✓ Organized Retailers (10-15%) ✓ Food Service (15-20%) ✓ Others (3-5%)		

Source: Cold Chain opportunities in India – Yes Bank Dutch Embassy Collaborative Study

1.3. State wise cold storage capacity

The table below represents the State-wise total number of cold storages and installed capacity. There are around 7,640 cold storages in India with a total capacity of 34.9 Mn MT (up to 2017). Top 5 states in terms of total installed capacity are Uttar Pradesh (14.1 Mn MT), West Bengal (5.9 Mn MT), Punjab (2.1 Mn MT), Gujarat (2.9 Mn MT) and Andhra Pradesh/Telangana (1.78 Mn MT).

Exhibit 3: State-wise distribution of cold storages in India (up to 2017)

Sr. No.	Name of State	Total Number	Total Capacity (MT)
1	Uttar Pradesh	2,299	1,41,76,062
2	West Bengal	512	59,47,561
3	Gujarat	764	29,01,807
4	Punjab	660	21,55,704
5	Andhra Pradesh & Telangana	442	17,82,561
6	Bihar	306	14,15,595
7	Madhya Pradesh	300	12,63,665
8	Maharashtra	604	9,78,392
9	Haryana	338	7,49,830
10	Karnataka	198	5,60,178
11	Rajasthan	166	5,55,278
12	Orissa	171	5,40,141
13	Chhattisgarh	98	4,84,087
14	Tamil Nadu	174	3,37,625
15	Jharkhand	58	2,36,680
16	Uttrakhand	46	1,60,419
17	Assam	36	1,57,906
18	Himachal Pradesh	66	1,31,017
19	Delhi	97	1,29,857
20	Jammu & Kashmir	38	1,12,516
21	Kerala	198	80,405
22	Tripura	14	45,477
23	Chandigarh (UT)	7	12,462
24	Meghalaya	4	8,200
25	Goa	29	7,705
26	Nagaland	4	7,350

Sr. No.	Name of State	Total Number	Total Capacity (MT)
27	Arunachal Pradesh	2	6,000
28	Manipur	2	5,500
29	Mizoram	3	4,001
30	Sikkim	2	2,100
31	Andaman & Nicobar Islands (UT)	3	810
32	Pondicherry (UT)	3	85
33	Lakshadweep (UT)	1	15
	Total	**7,645**	**3,49,56,991**

Source: Press Information Bureau

In India, 83% of the cold storages are utilized for horticulture and agri based products, followed by 9% for processed food products, 7% for animal husbandry products and 1% for pharmaceutical products.

1.4. State wise requirement of cold storage

Based on the study done by NCCD titled, "All India Cold-chain Infrastructure Capacity (Assessment of Status & Gap), an overall estimation of cold chain infrastructure requirement in India has been arrived at as follows:

Exhibit 4: State-wise breakup of cold-chain infrastructure requirement

Sr. No.	Name of State	Total Capacity – CS Hub + CS Bulk (MT)
1	Uttar Pradesh	1,06,75,137
2	Bihar	51,23,982
3	Gujarat	22,39,476
4	MP	18,67,179
5	Punjab	16,93,408
6	J&K	9,07,842
7	Andhra Pradesh	5,30,925
8	Chhattisgarh	5,13,830
9	HP	3,06,147
10	Odisha	3,05,500
11	Telangana	2,77,129
12	Haryana	2,40,395
13	Karnataka	2,10,313
14	Tamil Nadu	1,94,640
15	Maharashtra	1,57,709

Sr. No.	Name of State	Total Capacity – CS Hub + CS Bulk (MT)
16	Assam	71,996
17	Rajasthan	53,395
18	Kerala	45,874
19	Delhi	40,122
20	Jharkhand	24,951
21	Meghalaya	18,704
22	Mizoram	8,920
23	Nagaland	8,675
24	Tripura	8,554
25	Arunachal	7,508
26	Manipur	5,062
27	Sikkim	2,621
28	Goa	2,271

Source: All India Cold-chain Infrastructure Capacity (Assessment of Status & Gap)

Based on production strengths and cold storage gaps, key states and potential interventions in the cold storage space is highlighted below:

Exhibit 5: Areas for Cold Chain Interventions

Commodity	Potential States	Indicative Interventions
Apples	Himachal Pradesh, Delhi NCR, J&K, Uttarakhand, Mizoram, Arunachal Pradesh, Sikkim	CA store, reefers, pre cooling solutions at farm level
Mangoes	Andhra Pradesh, Gujarat, Maharashtra	Ripening chambers, cold storage/ controlled atmosphere storage for mango, cold chain for mango pulp
Kiwi	Arunachal Pradesh	Cold Chain, modern pack house
Onion	Gujarat, Maharashtra	Technology for long term storage of onion
Banana	Gujarat, A.P, Tamil Nadu Maharashtra	Modern pack houses and ripening chambers
Potato	UP, West Bengal, Punjab	New technologies for storage of processing grade potato, Upgradation of existing cold chain
Fish	Andhra Pradesh, Kerala, Gujarat, Tamil Nadu, West Bengal, Odisha, Manipur, Mizoram	Cold storage and transportation (reefer vans), pre cooling infrastructure, freezing units- IQF, plate freezers, blast freezer and freezer cold storages

Commodity	Potential States	Indicative Interventions
Meat	Maharashtra, Andhra Pradesh, Kerala, Uttar Pradesh, Nagaland, Assam and other North Eastern states	Modern abattoirs and cold chain for meat and meat products
Dairy	Pan India	Processing plants for high value dairy products, low cost technology for chilling milk at farm level and insulated vehicles

Source: Opportunities in Cold Chain Sector in India, WFI 2017, MoFPI

Exhibit 6: Driving factors for Food Processing & Cold Chain in India

- India ranks 2nd in terms of food production globally, 2nd to China
- India ranks 1st in the world in production of milk, bananas, mangoes, guava, papaya, ginger and okra
- India ranks 2nd in the world in production of green peas, potatoes, tea, tomatoes, sesame seed and many other key commodities
- Strategic geographic location and proximity to food importing nations makes India favourable for export of processed foods
- With a coastline of 480 km, 4th in Shrimp production
- Processing levels for perishables in India is considerably low - F&V 2%, Marine produce - 23%, Poultry - 6%, Meat - 21%, Dairy - 35%
- Among the top 3 cashew producing states in India
- By 2020, Indian Food and retail market is projected to touch $ 482 Bn, the Indian Dairy industry is expected to double to $ 140 Bn, the Food processing industry has the potential of attracting $ 33 Bn of investment and by 2030, Indian annual household consumption to treble, making India 5th largest consumer globally

Source: Opportunities in Food Processing In India, World Food India 2017

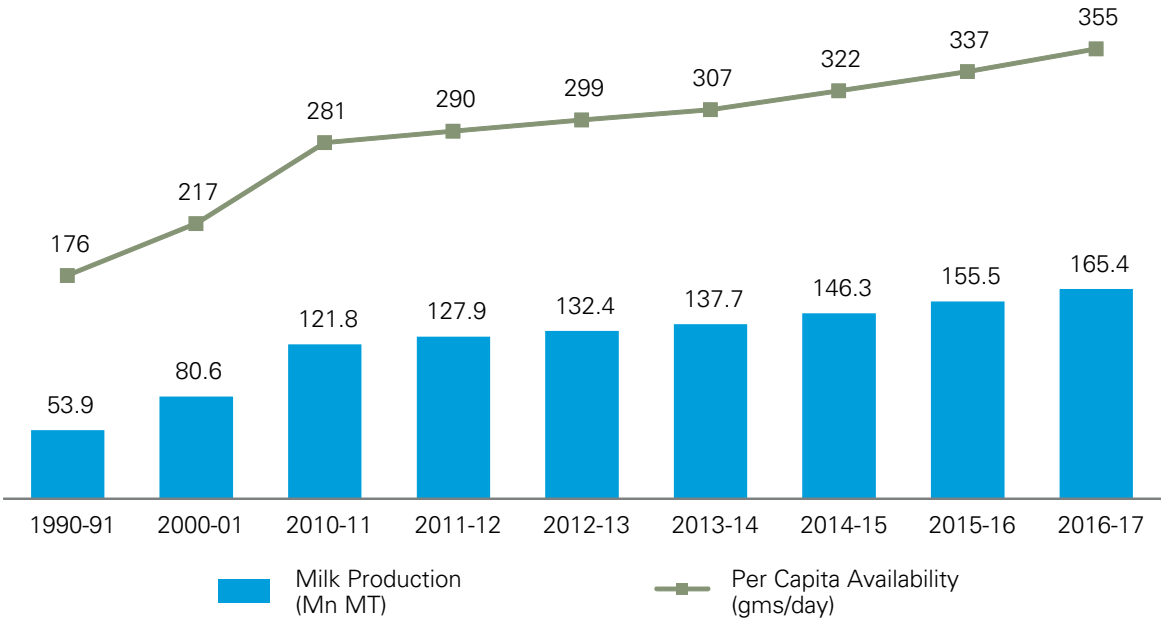
2 SECTORAL ASSESSMENT OF KEY PERISHABLES: DAIRY, FRUITS & VEGETABLES, SEAFOOD AND MEAT & POULTRY

2.1. Dairy Sector

2.1.1. Overview of Dairy Industry in India

India has been able to maintain its numero uno position in milk production globally which during 2016-17 touched 165.4 Mn MT. India is the world's largest producer and consumer of milk and dairy products, with 20% share in global milk production. Domestic milk production rose at a compounded annual growth rate (CAGR) of 5% between 2011-17 and is expected to further grow at a faster rate of 5-6% CAGR in the next 3 years, owing to increasing yield of in-milk cows and buffaloes. Strong farm gate prices and rising domestic demand for value-added dairy products are the major factors providing impetus to a steady increase in milk production.

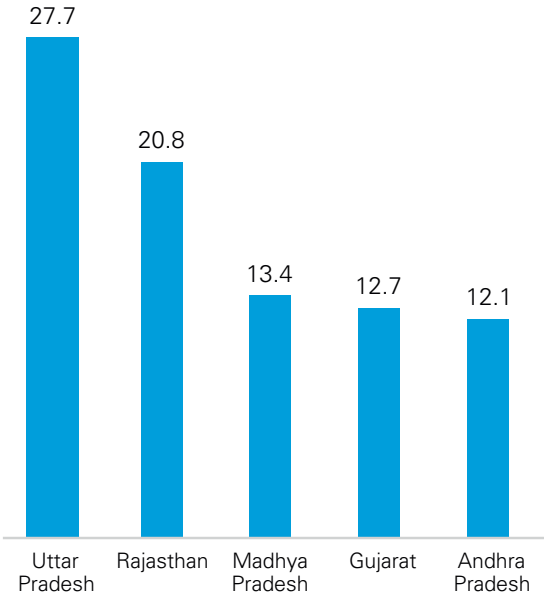
Exhibit 7: Milk Production and Per Capita Milk Availability Trends in India

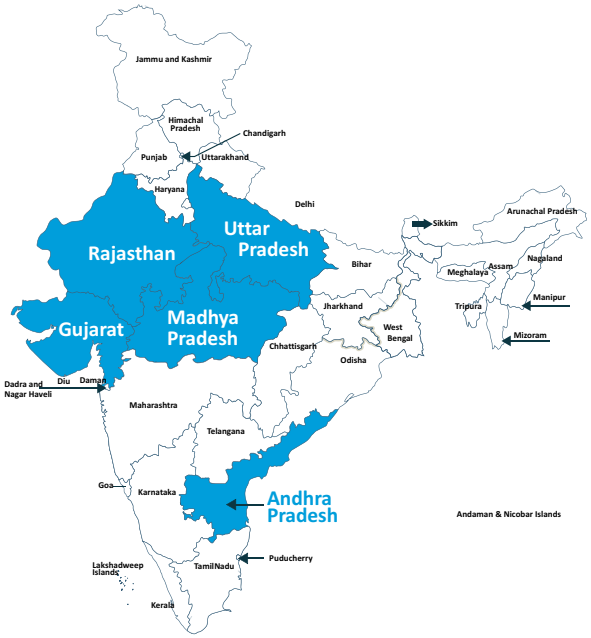


Source: NDDB

Uttar Pradesh is the highest milk producing state contributing approximately 16.8 % of the total milk production. Top 10 milk producing states viz Uttar Pradesh, Rajasthan, Gujarat, Madhya Pradesh, Andhra Pradesh, Punjab, Maharashtra, Haryana, Bihar and Tamil Nadu together accounted for close to 80% of milk produced during 2016-17.

Exhibit 8: Top 5 Milk producing states in India (Mn MT)

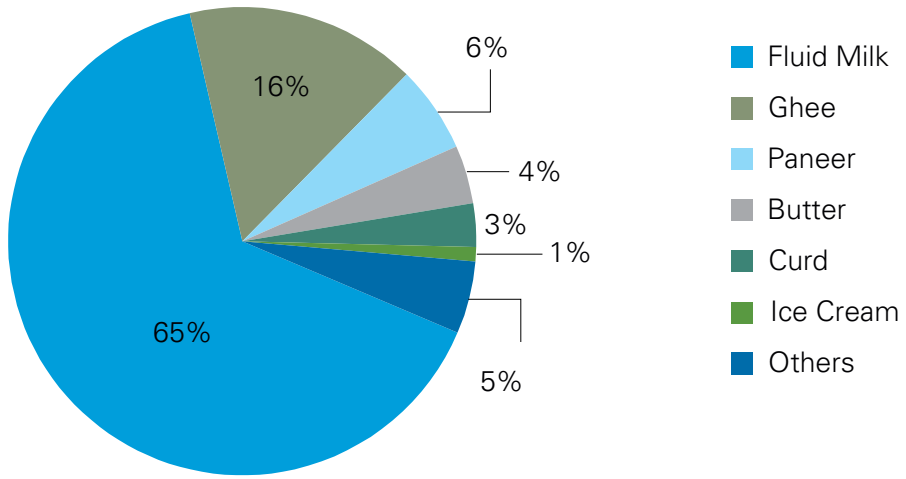




Source: NDDB

The Indian dairy industry was estimated at around INR 5,000-5,250 Bn in 2016-17. Growth in the dairy and milk products industry will be mainly driven by realizations, with faster growth in volume expected only in a few segments such as ice cream, cheese, yoghurt and ghee. Fluid milk accounts for the largest product category accounting for approximately 65% of total dairy market. Value Added Dairy Products (VADPs) including Ghee, Paneer, Butter, Ice Cream and Curd accounting for ~31% in value terms. The fastest growing product was ice cream (20%), followed by cheese (19%) and paneer (15%). The share of the VADPs is expected to increase to 38-40% by 2021 on account of rising income levels, changing consumer preferences and urbanization patterns which would eventually lead to higher penetration of VADPs in the dairy industry.

Exhibit 9: Indian Dairy Industry Market Size

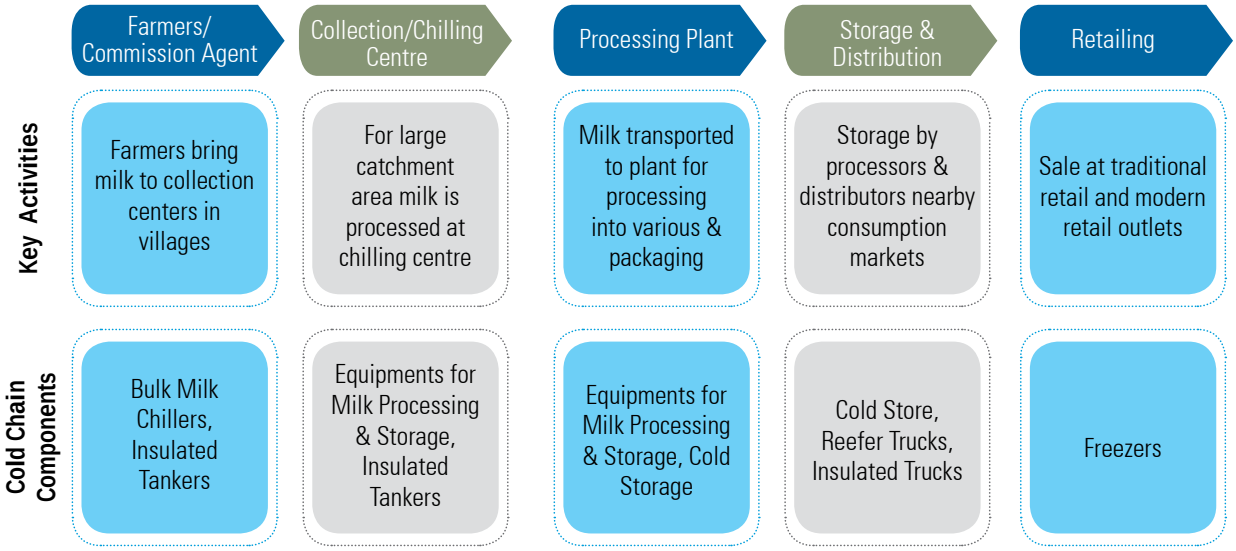


Source: USDA, NDDB, Industry, CRISIL Research

India's Export of Dairy products for 2017-18 stood at 48,039.4 MT with a value of USD 185.49 Mn. Major Export Destinations (2017-18) included UAE, Egypt, Bhutan, Afghanistan and Nepal.

Unlike other major milk producing countries, the growth story in India is driven largely by small scale dairy farmers. Around 80% of Indian cattle belong to farmers having herd size of 1 to 2 animals, producing on an average less than 4 kg milk per day. Due to fragmented production, the dairy industry in India is still predominantly unorganized with approximately 40% of marketable milk being routed through the organized channel. Private players account for approximately 45% of marketable surplus milk routed through the organized channel and rest 55% is procured by the cooperatives. Cooperative players procure milk directly from farmers while private dairy players procure milk either through contractors or directly from farmers or both. With increased focus on milk quality, private companies are also establishing milk procurement infrastructure to increase milk procurement directly from farmers.

Exhibit 10: Supply Chain of Indian Dairy Industry with Scope of Cold Chain Components



Source: YES BANK Analysis

2.1.2 Existing Dairy Supply Chain

Farmers and Village Service Providers (VSP) – Majority of the farmers in India are small, marginal or landless labour having two or three milch animals only. Farmers bring milk to Village Level Milk Collection Centres (VLCs) where it is collected in cans after testing. Farmers are paid basis Fat and SNF content in the milk. VLC is managed by a Village Service Provider (VSP) who is elected in a general village meeting. VSP gets about 2-4% of milk procurement price as commission. Payment is transferred by processors within 5 to 10 days in VSP account who gives payment to farmers. The processor's vehicle collects milk twice (morning and evening) daily from VLCs and transports it to Milk Chilling Centres (MCCs). Each vehicle covers a range of ~60-70 Kms. Milk is chilled below 4 degree Celsius at MCC and transported to the plant for processing.

Contractors/Commission Agents – Many companies purchase milk from contractors also. These contractors collect milk from individual farmers and supply it to the plant. The logistics and collection cost is borne by the contractor. But companies are facing challenges in terms of quality of milk supplied by contractors. Hence many companies are investing in building their own procurement infrastructure.

Processor – Milk from the chilling centre is received at the plant post second level quality check at plant dock. Milk is stored and processed into various products at plant. Mostly private players are selling milk and milk products under their own brand through distributors and retailers. Some players are also packaging milk and milk products on contractual basis for brands like Nestle, Mother Dairy.

Wholesaler/Distributor – The packed product is transported to the wholesaler/distributor from the plant. Some companies like Gopaljee have created distribution hubs from where the distributor takes the products and transports to retailers. Milk is generally transported in insulated vans and frozen products like ice cream in reefer vans.

Retailer – A retailer buys from the wholesaler/distributor and sells to the consumer. Retailer gives daily demand for milk to the wholesaler and payment is done on a daily basis.

2.1.3. Future Trends in the sector

- ✓ The dairy industry is estimated to grow at 12-13% CAGR until 2018-19, driven by rising milk prices, change in product mix, rising share of branded products and increasing consumption of value-added products.
- ✓ Steady rise in demand for value added products such as ice cream, curd, cheese, flavored milk is expected to drive strong industry growth
- ✓ Traditional dairy products such as ghee (clarified butter), curd (yogurt) and paneer (cottage cheese) is primarily catered to by the unorganized sector with share of organized sector ranging from ~1% to 10%. However, with increasing quality consciousness of consumers, organised sector play is expected to grow in these products in the near future.
- ✓ Significant investments are expected in establishment of new processing capacities along with strengthening of procurement infrastructure are expected in the domestic dairy industry.

Capturing a flavour of both production as well as consumption centers for regions and an assessment of commodities which are at various stages of development with respect to cold chain usage and where there is a potential to further develop the market, a sample opportunity is represented below:

Potential for cold chain in Gujarat

Based on the study by NCCD titled 'All India Cold-chain Infrastructure Capacity (Assessment of Status & Gap), the key cold chain requirements in the state of Gujarat is presented below:

Exhibit 11: Cold Chain infrastructure requirement in Gujarat

State	Packhouse (Nos.)	CS Bulk (MT)	CS Hub (MT)	Onion Storage (MT)	Ripening Chamber (MT)
Gujarat	4,835	21,74,886	64,590	3,05,066	6,299

Source: NCCD

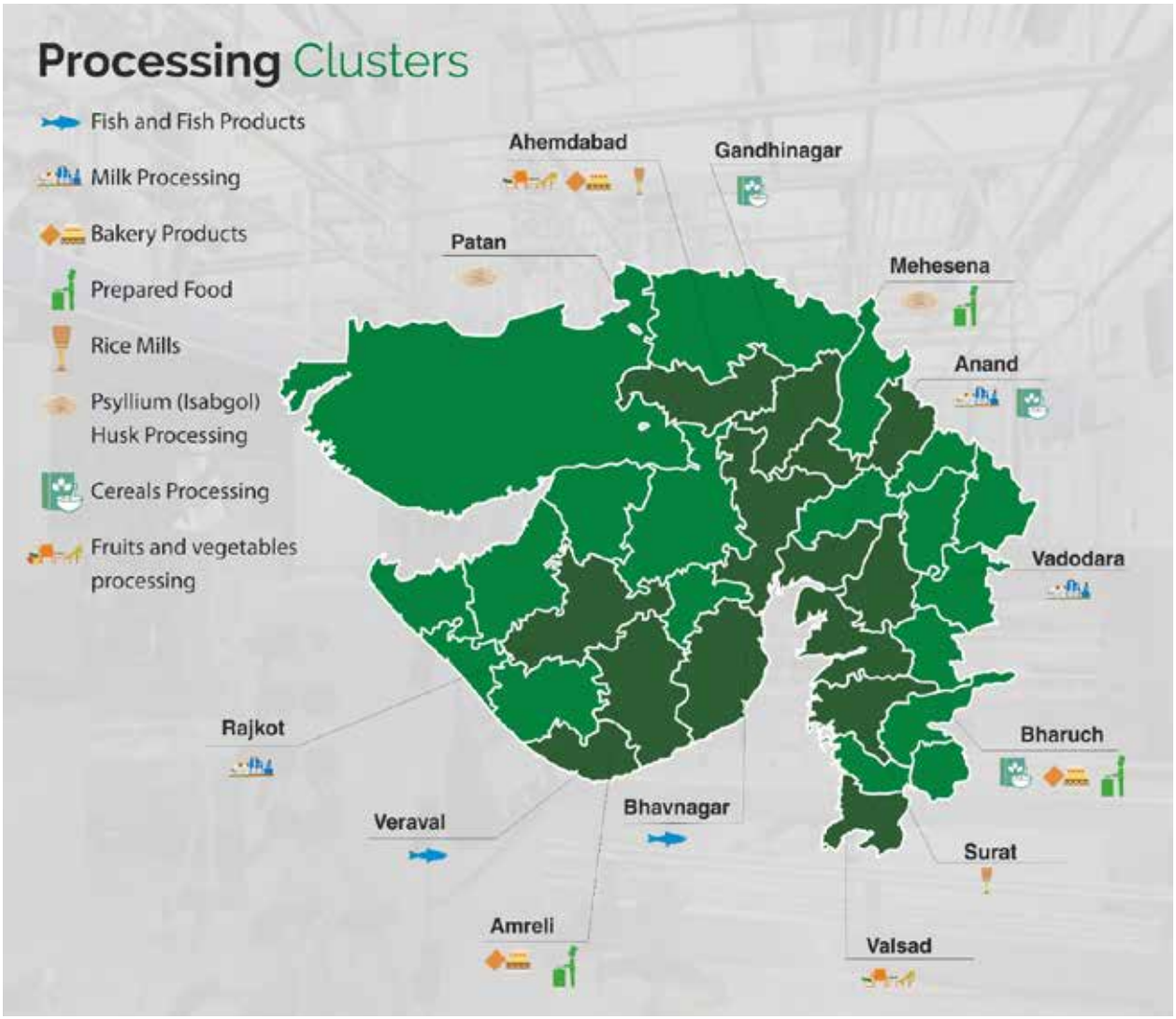
Gujarat is one of the most developed states in the country and is known to be the birthplace of 'Operation Flood' in India. Gujarat is one of the largest milk producing states in India with the contribution of 7.75% share in the total milk production. The state having 17 Cooperative dairy milk unions & 25 private dairy plants has a milk collection of 3.45 Bn liters with over 3 Mn milk producers, affiliated to more than 15,000 Primary Milk Cooperative Societies. Milk contributes to 22% to the Agricultural GDP of Gujarat and is one of the biggest sectors for supporting livelihood in the state.

Exhibit 12: Value proposition for dairy sector projects in Gujarat

Project	Processable Products	Value Proposition
Cold Chain Terminal Market, Multi-modal Logistics Park, Gujarat	-	• Terminal Market is a service provider to agricultural growers and buyers of agricultural products in the districts, forming a critical element in the agriculture marketing system. The terminal market is linked to number of collection centres, set up at key production centres allowing easy access to farmers for marketing of their produce
Whey and Casein Products	Whey & casein	• Gujarat is the largest producer of milk and units developing products based on milk but not the traditional products will add to the demand for milk
Establishment of High-Tech Dairy Farming Unit	Technology Driven-dairy unit	• Project aims at establishing a high technology driven dairy unit in the Kutch region given the high potential of raw material availability and demand in the region
Establishment of Cattle Feed Manufacturing and Processing Unit	Cattle feed	• Establish a manufacturing and processing unit for Cattle Feed in Gujarat. Given abundance in terms of dairy processing unit in Gujarat there is high demand for the quality product
Establishment of Organic milk and milk product manufacturing and processing unit	Milk	• Setting up of a manufacturing unit for organic milk and milk products in Gujarat by establishing an integrated modern animal husbandry model with a modern milk processing unit, to manufacture range of organic milk products under strict hygienic condition so that the milk is untouched by human hands and air. The entire process is automated and carried out in a vacuum sealed environment

Source: Investment Environment and Opportunities in Food Processing: Gujarat, WFI 2017, MoFPI

Key processing clusters in Gujarat is depicted below



Source: MoFPI, World Food India 2017

State Incentives: Comprehensive Agro Business Policy 2016-2021

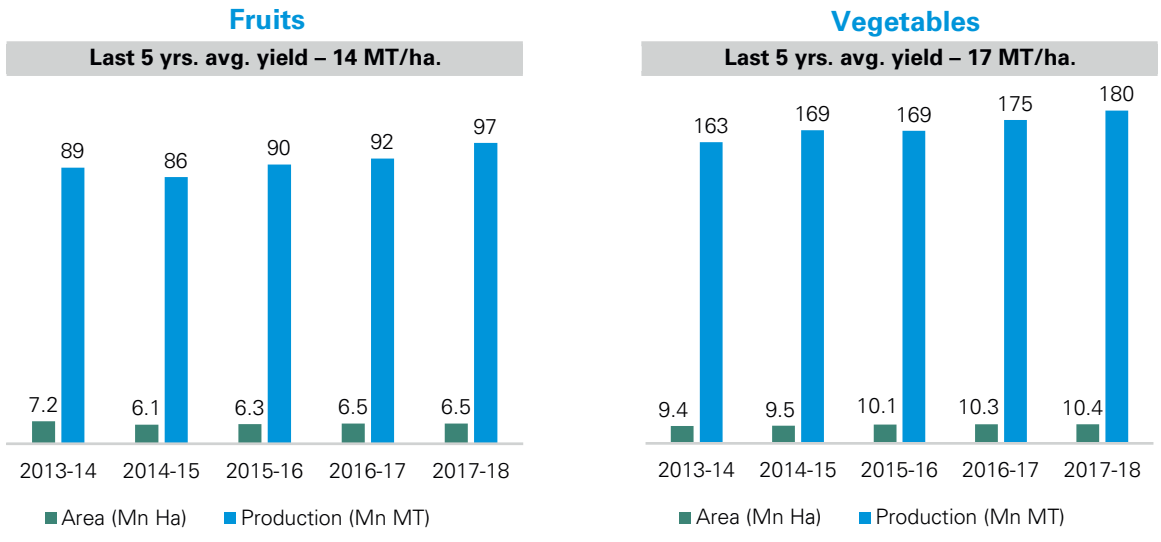
- ✓ Subsidy of 25% to 40% of air freight paid subject to maximum INR 10 Lakhs per year per unit granted for export of any fresh or processed products from cargo complex at Ahmedabad International Airport. If samples are required to be sent then the subsidy would be 25% of freight capped at INR 5 lakhs per annum. Subsidy of 25%-40% of actual Sea freight pegged at maximum of INR 15 lakhs a year, for a maximum period of 5 years.
- ✓ Back ended interest subsidy @ 7.5% on the term loan with maximum amount of INR 1.5 Crores for a period of 5 years for setting up/expansion/diversification.
- ✓ Stamp duty & registration fee exemption: 50% reimbursement of stamp duty/registration fee paid on sale/lease/transfer of land and 100% reimbursement of 100% of stamp duty/registration fee for setting of agro infrastructure projects.

2.2. Fruits & Vegetables Sector

2.2.1. Overview of F&V industry in India

India's diverse agro-climatic zones ensure availability of various fruits and vegetables round the year. India is the second largest producer of Fruits and Vegetables in the world with a production of 277 Mn MT. According to the 3rd advance estimates 2017-18 of National Horticulture Board, India produced ~97 Mn MT of fruits (with an area of ~6.5 Mn Ha) and ~180 Mn MT of vegetables (with an area of ~10.4 Mn Ha). India is the world's largest producer of banana, papaya, mango and guava; second largest producer of potato, green peas, tomato, cabbage and cauliflower.

Exhibit 13: Area, Production & Productivity of Fruits & Vegetables in India 2013-14-2017-18

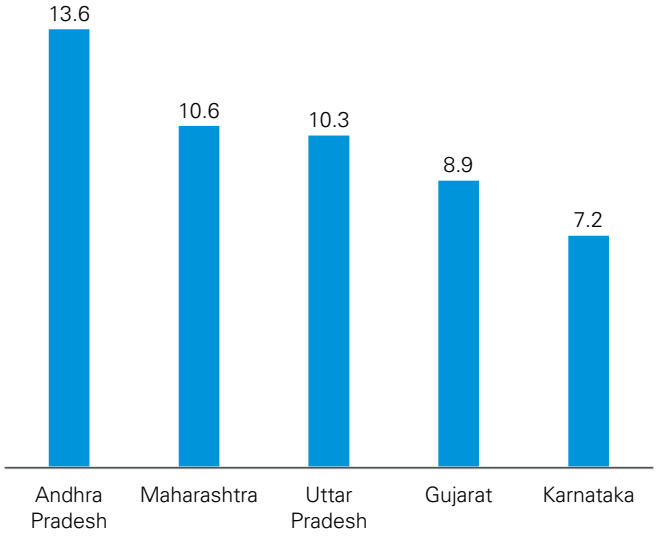


Source: Horticultural Statistics at a Glance (2017), National Horticulture Board

Despite being a leading producer, the processing levels for fruits & vegetables in India are at a meagre 2% with a 5-16% wastage loss across different crops. Such high level of wastage is primarily due to inefficient storage, inadequate logistics and poor post-harvest management. Of the 2% processing, about 40-50% is carried out through the organised segment, which in turn is dominated by small scale industries (around 85%). This offers an opportunity to invest in initiatives that help increase processing levels, reduce wastages, R&D for development of processable varieties, packaging, innovative on farm preservation systems and skill development.

Andhra Pradesh, Maharashtra, Uttar Pradesh, Gujarat and Karnataka constitute about 47% of total fruit production in India.

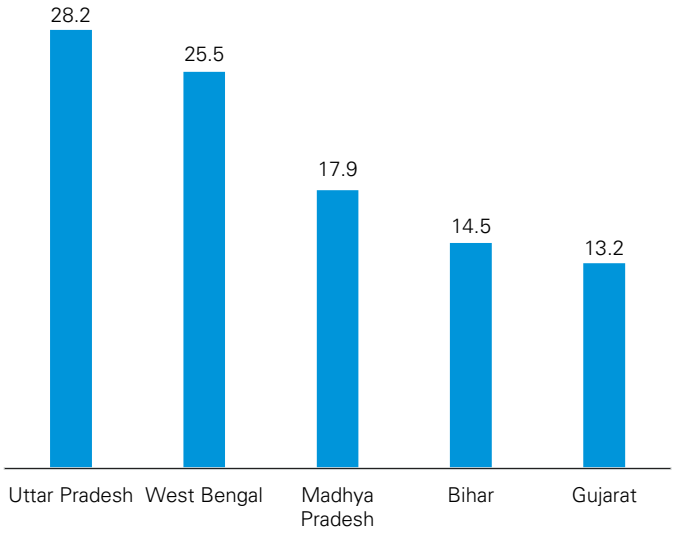
Exhibit 14: Top 5 Fruit Producing States (Mn MT)



Source: National Horticulture Board

In terms of vegetable production, Uttar Pradesh, West Bengal, Madhya Pradesh, Bihar and Gujarat contributes around 56% of the total production in India.

Exhibit 15: Top 5 Vegetable Producing States (Mn MT)



Source: National Horticulture Board

India exported fresh Fruits and Vegetables worth USD 1.46 Bn during the year 2017-18. Vegetables contributed around 55% of the total Fruits & Vegetables export basket while the remaining 45% consisted of fruits. Mangoes, Grapes, Bananas and Pomegranates account for bulk of the fruits exported from the country while Onion, Okra, Bitter Gourd, Green Chillies, Mushrooms and Potatoes contribute largely to the vegetable export basket. The major destinations for Indian fruits and vegetables are UAE, Sri Lanka, Netherland, Bangladesh, Malaysia, Nepal, UK, Saudi Arabia and Qatar. Exports of processed Fruits and Vegetables from India was around USD 4.23 Bn in 2017-18, which mainly included Mango Pulp, Dried and Preserved Vegetables and Other Processed Fruits and Vegetables.

2.2.2. Existing F&V Supply Chain

The supply chain of fruits and vegetables is complex as compared to other commodities due to perishable nature of the produce, high fluctuations in prices, increasing consumer awareness with respect to food safety and quality and dependence on climatic conditions. The supply chain constitutes the process from production to delivery of the fresh produce to the end consumers (food processor, organized retailer, traditional retailer).

There are several stakeholders involved in the supply chain of fruits and vegetables which mainly includes farmers, local traders/wholesalers, transporters, processors, retailers etc. Supply chain for fruits and vegetables is depicted in the diagrams below.

Exhibit 16: Common Supply chain of fruits in India

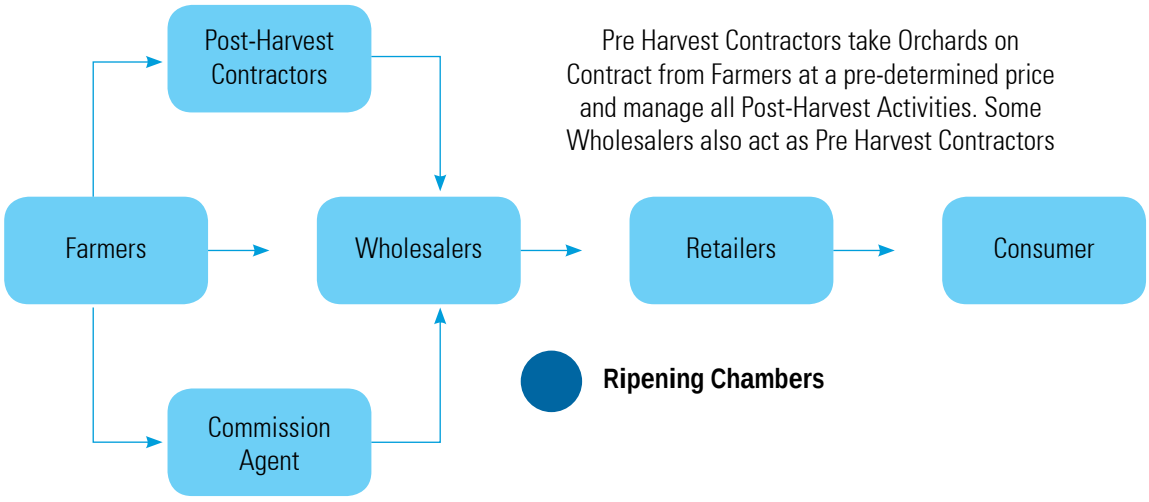
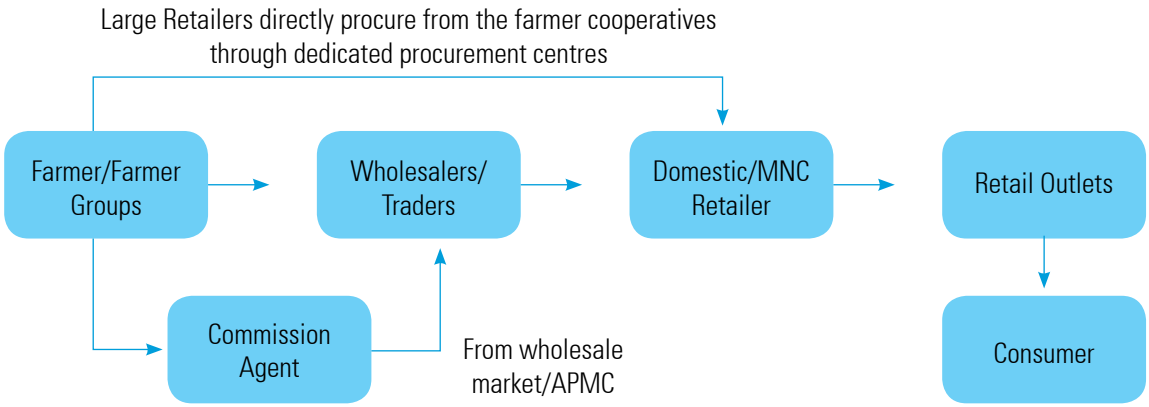


Exhibit 17: Common Supply chain of vegetables in India



Source: Industry Discussions

Generally, the traditional model in which farmers sell their produce to consumers through wholesalers/ commission agent dominate the fruits & vegetables supply chain with share of around 95-98%. The direct procurement by organized retail chains or processors from the farmers is still miniscule. For organized retail chain like Mother Dairy, Reliance Fresh there are mainly three sources of supply for fresh fruits and vegetables

- ✓ From organized farmers associations located at different states across India. There are retailer staffs located in each of the procurement centers who take care of the quality aspect and ensure that enough supplies are available to meet the demand. Most of the centers are located within 200-250 Km range of the central procurement center (mainly for green & leafy vegetables). The farmer's cooperatives are provided with quality standards which are approved by the retailer. The produce complying with the standards is accepted and farmers are being paid a predetermined price basis prevailing wholesale prices.
- ✓ Procurement is done from wholesale mandis of particular crop to match the demand for the produce in case there is any shortfall in quantity.
- ✓ From Individual farmers/cooperatives: The channel is more prominent in case of crops like apple, banana and other fruits with large individual farmers owning orchards (in case of apple)

2.2.3. Future Trends in the sector

- ✓ Infrastructure & technology development with newer avenues in F&V processing, cold storage, reefers, IQF, packhouses and ripening chambers. New packaging technologies for enhanced shelf life, retaining taste and texture, attractive, easy to handle and space efficient.
- ✓ Development of Fortified products, health food, traditional Indian ethnic foods, convenience food, processed organic food, especially baby food, confectionery and bakery items have an increasing domestic and global demand. Also development of new products in beverages viz. flavored tea, juice variants, health drinks, energy drinks, sports drinks as well as Packaged local drinks like nimbu pani, jaljeera, coconut water etc.

Capturing a flavour of both production as well as consumption centers for regions and an assessment of commodities which are at various stages of development with respect to cold chain usage and where there is a potential to further develop the market, a sample opportunity is represented below:

Potential for cold chain in Uttar Pradesh

Based on the study by NCCD titled 'All India Cold-chain Infrastructure Capacity (Assessment of Status & Gap), the key cold chain requirements in the state of Uttar Pradesh is presented below:

Exhibit 18: Cold Chain infrastructure requirement in Uttar Pradesh

State	Packhouse (Nos.)	CS Bulk (MT)	CS Hub (MT)	Onion Storage (MT)	Ripening Chamber (MT)
Uttar Pradesh	8,206	1,05,65,506	1,09,631	72,945	10,691

Source: NCCD

Uttar Pradesh has favourable agro-climatic conditions with nine agro-climatic zones favouring cultivation of a multitude of agricultural crops, vegetables and fruits round the year. The state has the largest network of railways and 2nd largest network of roads in India. Fulfilling this cold chain deficit can

receive a robust boost owing to leveraging upcoming F&V processing and value addition opportunities in the state. Uttar Pradesh offers tremendous opportunities for investment across the entire value chain in the food processing sector.

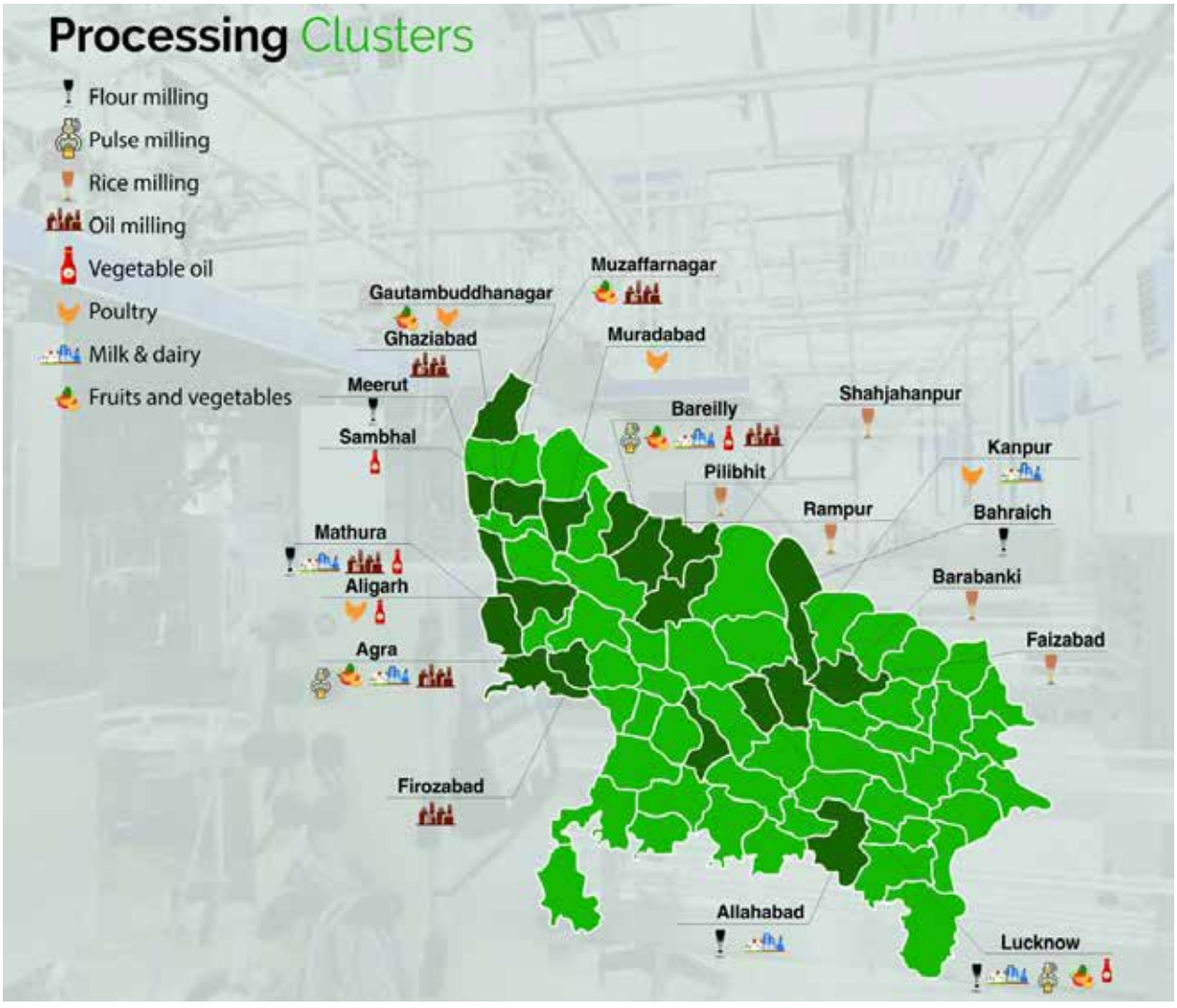
Exhibit 19: Value proposition for key F&V projects in Uttar Pradesh

Project	Processable Products	Value Proposition
Mango Processing	Mango juice, pulp, candy, Leather (mango papad),squash	• The fruit juice market in India is expected to grow at a CAGR of 35%- 40% as compared to 4.1% globally during 2016-2024. • The unpackaged juice business in India is highly dominated by unorganized players, who have a market share of over 75% • This gives a lucrative opportunity for market consolidation for new entrants.
Turmeric processing	Turmeric powder	• Global market size is expected to reach USD 99.3 Mn by 2024 and is expected to grow at a CAGR of over 6% till 2021. • India is the largest producer of turmeric in the world (78%) consuming 80% of overall produce. This bodes a huge opportunity for increasing exports from the country.
Aonla processing	Aonla powder, Juice pickle, preserve, Candy, chutney, sweets, laddoo, flakes	• Aonla is used in value added hair oils whose market is expected to grow at a CAGR of 19.9% during 2014-19 in India. • Aonla extract is useful in various food and beverage applications such as nutritional bars, cereals, jams, powder drink mixes, yogurts and dietary supplements. It also provides skin protection against heavy metals due to its anti-oxidant properties. Thus, offering tremendous opportunities to invest in a fast growing and diverse market.
Breakfast cereal manufacturing	Garlic powder, paste, instant mix, chili paste, sauce	• The revenues in the sauces and condiments subsector were USD 2.4 Bn in 2017 and is expected to grow at a CAGR of 10.7% during 2017-21. The table sauces market in India is expected to grow at a CAGR of 18% till 2022. India's Chinese & hot sauces market is growing with a CAGR of 21.2% from last five years and is projected to grow more than five times by the year 2021. • The rapidly growing market along with a growing trend of international & convenience food, brand awareness, increasing disposable income, growing demand in middle class and increasing international food chains offers an attractive market for investment.

Project	Processable Products	Value Proposition
Potato processing	Chips ,wafers, granules, vodka, sticks, french fries, dehydrated, frozen products, starch, powder, flakes, pellets, liquid glucose	• Rapid urbanization and improving standards of living has led to manifold increase in demand of processed potato products. • Uttar Pradesh is the largest producer of potato in India contributing 32% of the national produce in 2015-16.

Source: Investment Environment & Opportunities in Food Processing in Uttar Pradesh, WFI 2017, MoFPI

Key processing clusters in Uttar Pradesh is depicted below



Source: MoFPI, World Food India 2017

State Incentives: Uttar Pradesh Warehousing and Logistics Policy 2018

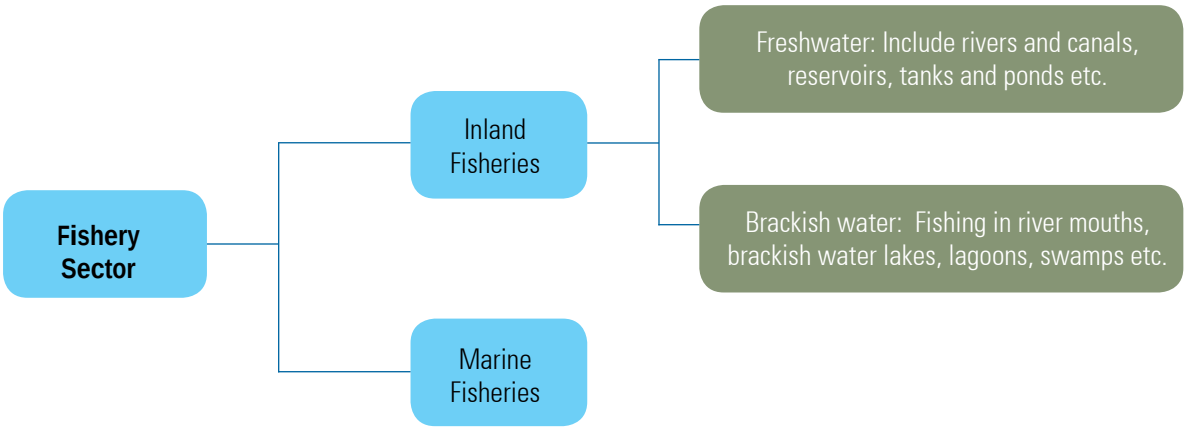
- ✓ Several investment zones and logistics hubs being developed in the state, namely Logistics hub at Meerut along Delhi-Meerut Expressway, Azamgarh alongside the Purvanchal Expressway near the upcoming Mughalsarai- Varanasi Mirzapur Investment Zone & Jhansi National Investment & Manufacturing Zone (NIMZ) alongside NH 44.
- ✓ Infrastructure Interest Subsidy in form of reimbursement to logistics units to the extent of 5% per annum for 5 years on loan taken for development of infrastructural amenities.
- ✓ 2% exemption in vehicle registration fee on purchase of minimum fleet of 50 vehicles with minimum load capacity of at least 10 MT per vehicle, 50% exemption on road tax on purchase of fleet & in case of purchase of at least 50 Hybrid or Electric Cargo Vehicles of minimum load capacity of at least 1 MT per vehicle, 100% road tax exemption.
- ✓ 10% subsidy for setting up Logistics Innovation Centres (LICs) at or in proximity to Multimodal Transport and Logistics Park in the State, upto maximum INR 10 crore per centre .

2.3. Seafood Sector

2.3.1. Overview of seafood industry in India

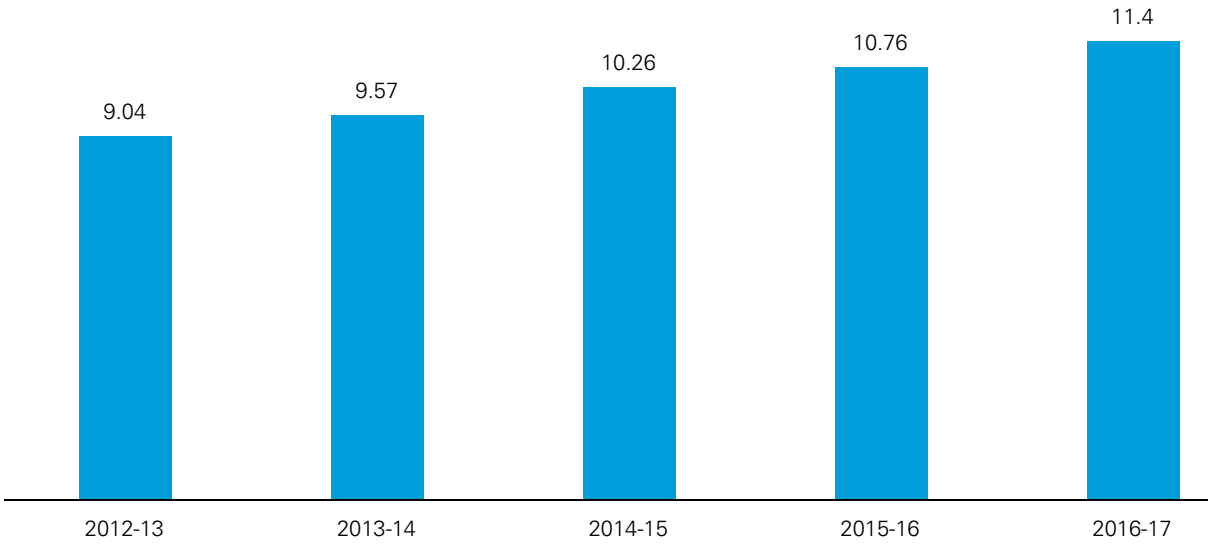
The Indian Fisheries Sector, currently valued at around USD 15 Bn, is presently at the cusp of change, with the fisheries sector growing at over 5-6% in recent years. India, being the second largest fish producer in the world contributes significantly to the global trade; with annual exports of seafood valued at around USD 7 Bn (2017-18). The sector employs a large section of population, around 14 Mn fishermen, thereby contributing to the livelihoods for a vast population along the coastline. The Indian offers an array of opportunities across its value chain and additionally other industries dependent on this sector, viz. feed industry and cold chain, will continue to grow riding on the growth of this sector.

Exhibit 20: Fisheries Sector in India



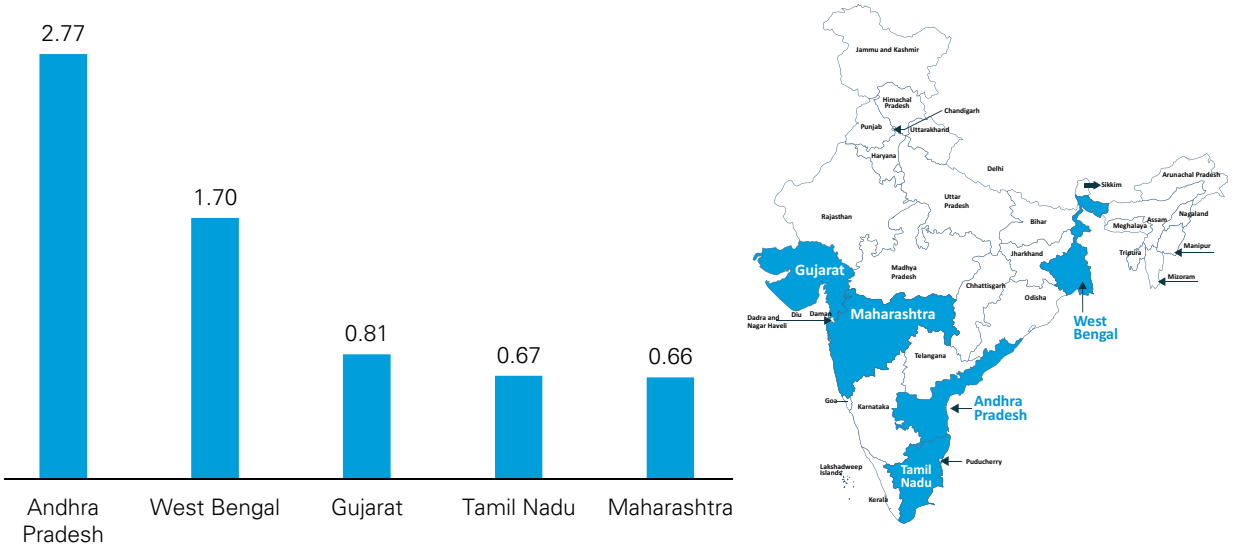
India is the second largest fish producing nation in the world. India is also a major producer of fish through aquaculture and ranks second in the world after China. The total fish production during 2016-17 (provisional) is at 11.41 Mn MT with a contribution of 7.77 Mn MT from inland sector and 3.64 Mn MT from marine sector. Inland fish production constitutes 68% of the total fish production of the country and annual growth rate of production has also been high.

Exhibit 21: Fish Production in India: 2012-13 to 2016-17 (Mn MT)



Source: IndiaStat

Exhibit 22: Top 5 states in Fish Production in India (Mn MT)



Source: Animal Husbandry & Fisheries Statistics 2017

During 2017-18, exports of marine products reached an all-time high of around USD 7.08 Bn, exports aggregated to around INR 45,106 crore. Frozen shrimp continued to be the major export item in the export basket in terms of quantity and value, accounting for a share of around 41.10 % in quantity and around 68.46 % of the total USD earnings. The overall shrimp exported for the year 2017-18 was 5,65,980 MT worth USD 4,848.19 Mn. In the volume terms (MT), frozen shrimp with a share of 41% is followed by frozen fish (25%), frozen cuttle fish (5%), frozen squid (7%) and others. In value terms (USD), frozen shrimp has the major share i.e. 68.5% followed by frozen fish (10.4%), Cuttle fish (5.2%), frozen Squid (5.4%), dried items (2.3%), chilled items (1.4%), live items (1%), and others (6.14%). USA, South East Asia, the European Union & Japan are the major exports markets.

2.3.2. Existing Seafood Supply Chain

Fishery is a state subject under the Constitution of India but very few states have dedicated bodies for the development and marketing of fish produced in the state. Domestic market has the bulk share in context to the marketing of the fish produced in the country i.e. 85% of the produce which is highly unorganized and scattered. About, 70% of the fish harvested is marketed fresh and rest is consumed in the form of smoked, dried, processed fish meal and others. There is a need for balanced system of distribution to make fish available in the interior areas at reasonable rates. The annual per capita consumption of fish in India is 2.85 kg. The existing per capita availability of fish is 6.5 kg and is expected to reach 9.0 kg by 2030. The domestic fish marketing is primarily dominated by the private players with the involvement of different stakeholders across the hierarchy thereby reducing the fishermen's profit margin. Bulkiness, perishable nature, poor handling, heterogeneity, high transportation and storage costs are the major constraints faced by this sector. The different stakeholders involved in the value chain include:

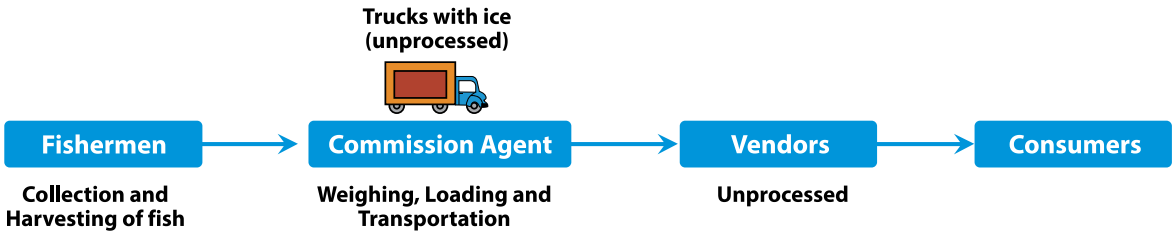
Exhibit 23: Supply chain for fish and fish products in India

Auctioneer	They are the first point of contact for the fishermen. In freshwater marketing, auctioneer source through a commission agent who charges 5-10% of the total sales value. Charge of the auctioneers ranges between 5-10%.
↓	
Wholesaler	They buy in bulk and sell further in the chain. Value addition is done in terms of sorting, grading, cleaning, icing and packaging. The profit margin depends upon the demand in the markets and supply of the species. .
↓	
Wholesaler	They directly sell to the consumers and are engaged in the maximum value addition in terms of grading, cleaning, icing, packing and dressing of the fishes. The profit margin extends upto 20%. Sometime, a group of retailers directly purchase from the auctioneer.
↓	
Vendor	They are involved in door to door selling and value addition in terms of sorting, grading, cleaning and icing is done. Lack of storage facility is a critical issue.

Source: Industry Discussions

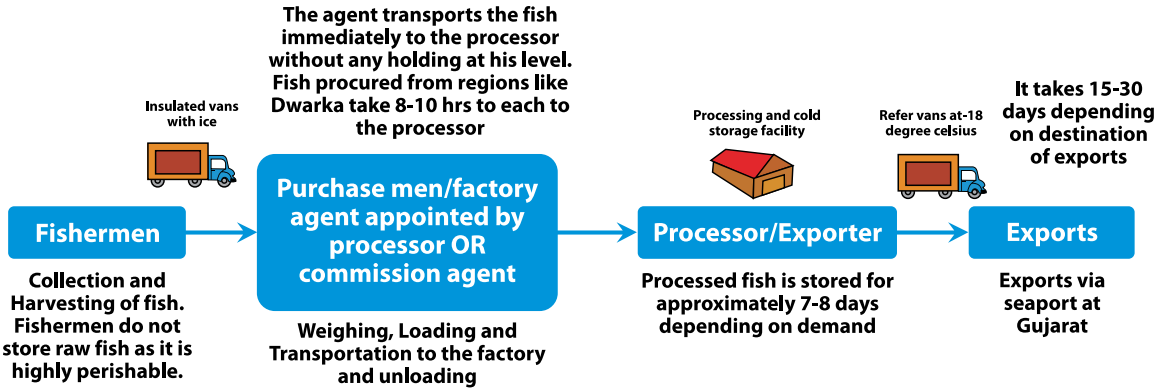
Based on industry discussions in Gujarat and in house studies, YES BANK has been able to deduce the supply chain for fisheries for domestic and export purposes as depicted below:

Exhibit 24: Value Chain for Fisheries in Gujarat (Domestic)



Source: YES Bank analysis (The value chain study was done for Gujarat)

Exhibit 25: Value Chain for Fisheries in Gujarat (Exports)



Source: YES Bank analysis (The value chain study was done for exports taking place from Gujarat)

2.3.3. Future Trends in the Sector

- ✓ The domestic fishery market is expected to grow at a CAGR of 12-14% to reach USD 17.6 Bn by the year 2018-19. Seasonal availability of marine and inland catch and higher demand for these products compared to supply, will drive realizations growth. The growth of high value aquaculture products will also boost average realizations.
- ✓ The export market is expected to grow at a CAGR of 14-16% driven by strong volume growth. However, recovery of South–East Asian market from white spot disease and improvement of global supply situation will adversely affect the overall realization from exports.

Capturing a flavour of both production as well as consumption centers for regions and an assessment of commodities which are at various stages of development with respect to cold chain usage and where there is a potential to further develop the market, a sample opportunity is represented below:

Potential for cold chain in Andhra Pradesh

Based on the study by NCCD titled 'All India Cold-chain Infrastructure Capacity (Assessment of Status & Gap), the key cold chain requirements in the state of Andhra Pradesh is presented below:

Exhibit 26: Cold Chain infrastructure requirement in Andhra Pradesh

State	Packhouse (Nos.)	CS Bulk (MT)	CS Hub (MT)	Onion Storage (MT)	Ripening Chamber (MT)
Andhra Pradesh	3,124	4,88,185	41,730	5,51,273	4,070

Source: NCCD

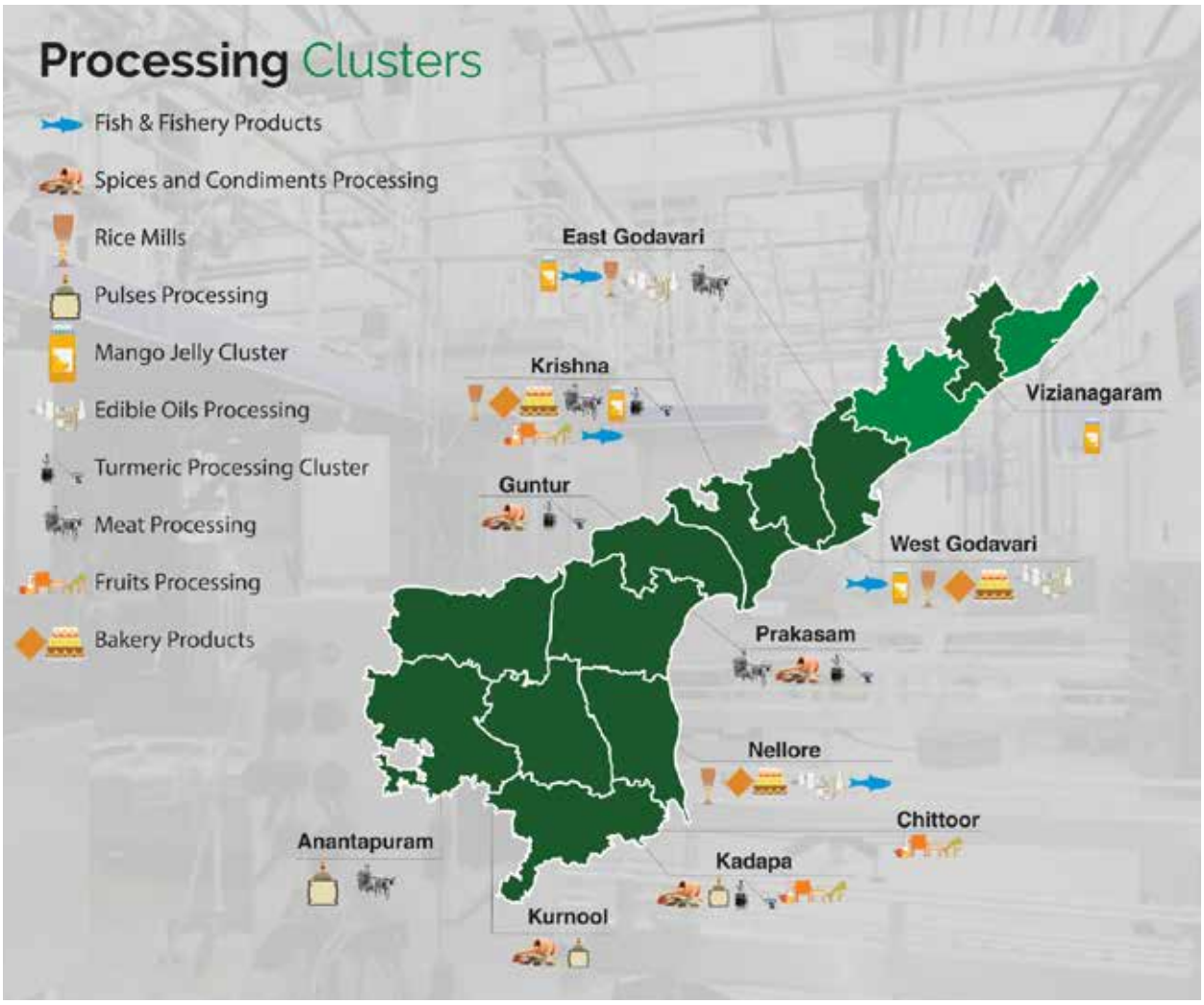
Andhra Pradesh is a major contributor of marine exports accounting for a 70% share of the total marine exports. AP is the major sea food exporting state of India with its 35-40% of the produce being exported to highly remunerative markets like EU, Japan and USA. The state has cultured shrimp production of Vanamei variety of which approximately 80-90% is exported after being processed. There is a potential to intervene at all levels of value chain from grading/sorting at farm level to final processed product due to the expansion of the industry. Technology interventions in cold storage, transportation, ice making plants-flake and tube ice, freezing units- IQF, plate freezers, blast freezer, freezer cold storages etc. can be utilized for inducing efficiencies.

Exhibit 27: Value proposition for dairy sector projects in Andhra Pradesh

Project	Processable Products	Value Proposition
Development of IQF for fish & Shrimp	Fish & Shrimp	• In order to create new infrastructure and projects for increasing the fish and shrimp production, such a facility is of vital importance. As the production increases there will be need for processing facilities and IQF is one of the basic processes required for the same.

Source: Investment Environment and Opportunities in Food Processing: Andhra Pradesh, WFI 2017, MoFPI

Key processing clusters in Andhra Pradesh is depicted below:



Source: MoFPI, World Food India 2017

State Incentives: Andhra Pradesh Food Processing Policy 2015-2020

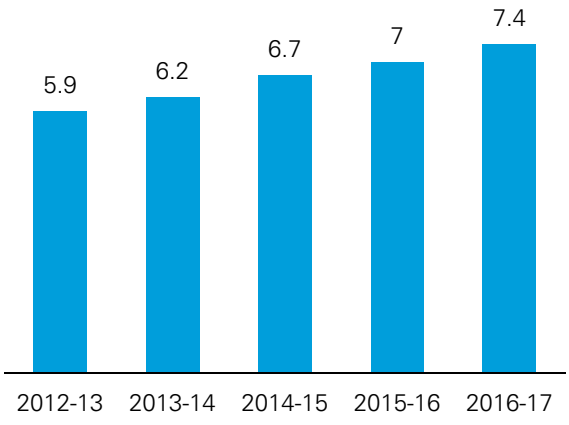
- ✓ Capital Subsidy to an extent of 50% for setting up Primary Processing Centers (PPCs) and Primary Collection Centers (PCCs) limited to INR 2.5 Crores Subsidy to an extent of 35% for setting up of cold chain for agriculture/horticulture /dairy /meat produce, limited to INR 5 Crores.
- ✓ Interest subsidy of 7% on the term loan taken for fixed capital investment for food processing units and cold chain infrastructure for a period of 5 years from commencement of commercial operations limited to INR 2 Crores.
- ✓ Capital Subsidy to an extent of 25% of project cost for setting up new food processing units limited to INR 5 Crores Subsidy to an extent of 25% of equipment cost for technology up-gradation of existing food processing units limited to INR 1 Crore.
- ✓ Reimbursement of Power consumption charges @1.50 per unit for 5 years / INR1.00 per unit for Fish & Shrimp Processing units.

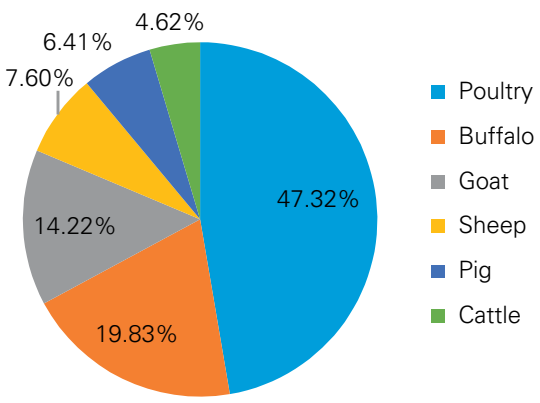
2.4. Meat & Poultry Sector

2.4.1. Overview of Meat & Poultry industry in India

India has the world's largest population of livestock which plays a vital role in the agricultural economy and is a key contributor to the socioeconomic well-being of rural masses. According to the 19th livestock census, there are about 300 Mn bovines (cattle, buffalo, yaks, and mithun), 65 Mn sheep, 135 Mn goats and about 10 Mn pigs in India. The livestock sector accounts for approximately 4% of the total GDP and 27% of agricultural GDP. The total meat production in India currently stands at about 7.4 Mn MT (2016-17) and has witnessed a growth of 5% in the last five years (2012-12 to 2016-17).

Exhibit 28: Meat Production in India from 2012-13 to 2016-17 (Mn MT) and species wise meat production

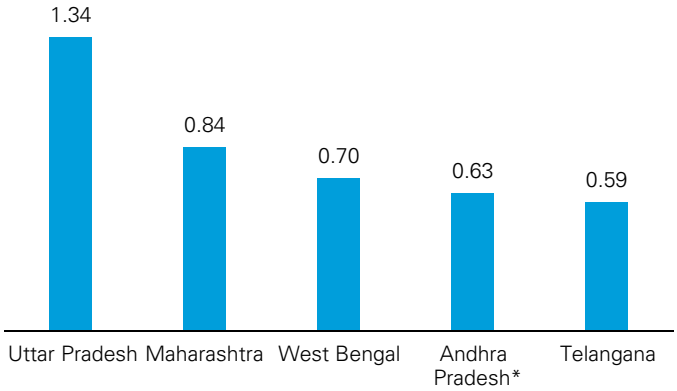




Source: Department of Animal Husbandry, Dairying and Fisheries

The meat industry in India can be broadly classified into 2 segments: poultry (47.3%) and meat from other animals such as buffalo (19.8%), Goat (14.2%), Sheep (7.6%), Pig (6.4%) and Cattle (4.6%). Uttar Pradesh is the largest producer followed by Maharashtra & West Bengal.

Exhibit 29: Top 5 meat producing states – 2016-17 (Mn MT)



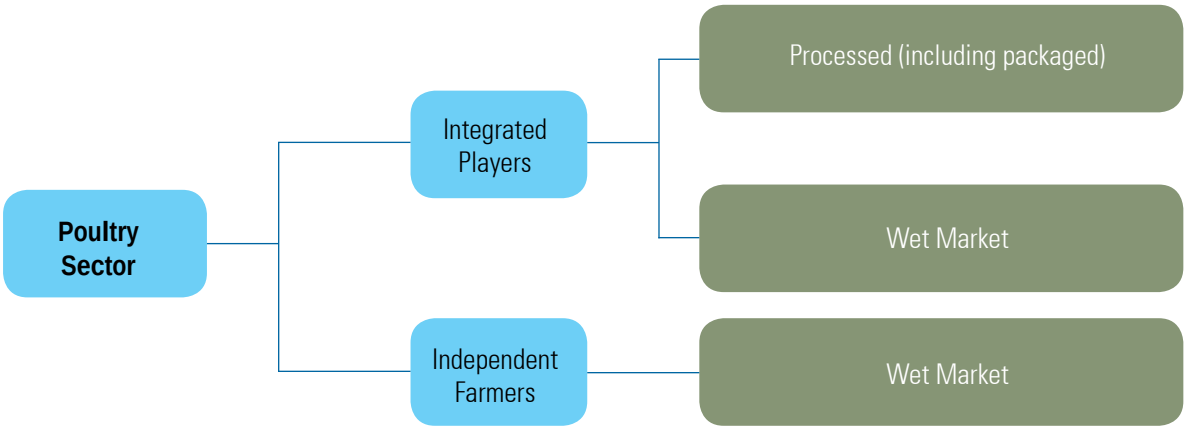
*Source: Basic Animal Husbandry & Fisheries Statistics – 2017. *incl. Telangana till 2013-14*

India permits exports of buffalo, goat, sheep and birds while cow meat export is prohibited due to religious and cultural sensitivities. Rising demand for low-cost meat from developing nations over the last decade has propelled India's growth in the meat segment. It exported meat worth USD 4 Bn in 2016, led by Bovine exports worth USD 3.8 Bn followed by Sheep carcasses worth USD 104 Mn. India is currently the leading exporter of water-buffalo beef and sheep carcass, capturing more than 20% and 40% of the world export market respectively.

Poultry Meat Segment

India is the second largest poultry market in the world. Commercialization has been seen following participation of big players and the development of the contract farming business model on a large scale. The poultry industry accounts for around 5% of agricultural GDP. The value of the broiler segment is estimated to have grown by around 14% Y-o-Y to INR 743 Bn in 2016-17. The size of the layer segment is estimated to have grown by around 12% on-year to INR 315 Bn in 2016-17. On an average, the broiler segment comprises around 70% of the industry with a trend of steadily increasing proportion over the past three years.

Exhibit 30: Poultry Sector in India



Source: Crisil Research

The current processing levels in poultry is merely 6%. Due to high preference for fresh meat, the domestic industry is highly dominated by wet market and unorganized players. However, a changing trend towards hygienic/clean, safe meat can be observed in the country. Wet market sales in term of volume continue to be more than 90% as people prefer consuming freshly slaughtered chicken meat than processed chicken meat, which constitutes 5-7% of total chicken production as per industry sources. The poultry meat industry in India is highly integrated with organized players capturing 70% of the market. Organized players consist of integrators present across the value chain from poultry feed and farming to processing and packaging. However, the largely credit-driven market remains volatile and replete with disease outbreaks and overuse of antibiotics.

Buffalo Meat Segment

Buffalo & cattle meat constitutes around 28% of the total national meat production. A major amount of this buffalo meat is exported. The major production centres for exports are Aurangabad, Nanded, Mumbai & Satara in Maharashtra; Goa; Zaheerabad and Medak in Telangana; Derabassi in Punjab; Barabanki, Unnao, Aligarh, Meerut, Saharanpur, Noida and Ghaziabad in Uttar Pradesh; Mourigram in West Bengal; and Gurgaon in Haryana. The major organized players are typically large exporters namely Allana Sons Ltd, Al Kabeer and Hind Agro Industries.

Sheep & Goat Meat Segment

The USD 9 Bn mutton industry largely consists of sheep and goat meat. The market is highly fragmented and dominated by small farmers who sell their animals in the live market to local traders and butchers.

Pork Meat Segment

The Indian pork market comprises of two main segments –wet and processed. Around 95% of pork is available in fresh form in the wet market while processed and packaged pork constitutes less than 5% of the total market. The current market size is estimated at about USD 0.89 Bn. The processed sector mainly caters to institutional demand from the HORECA segment (60%) comprising of high end hotels and restaurants in India which serve pork products such as ham, bacon, chops and sausages to their customers. Pig rearing remains largely unorganized under free range conditions carried out by the poorer sections of the society. The per capita consumption of pork meat in India is negligible at about

0.1 kg/annum owing to socio-cultural and religious predispositions of the population. However, the Eastern & North Eastern regions of the country stands as an exception which together account for 67% of India's pig livestock (2012) and around 66% of the total pigs slaughtered in the country (2015-2016). The average meat yield in India is around 40 kg per pig.

2.4.2 Existing Meat & Poultry Supply Chain

Supply Chain for Meat

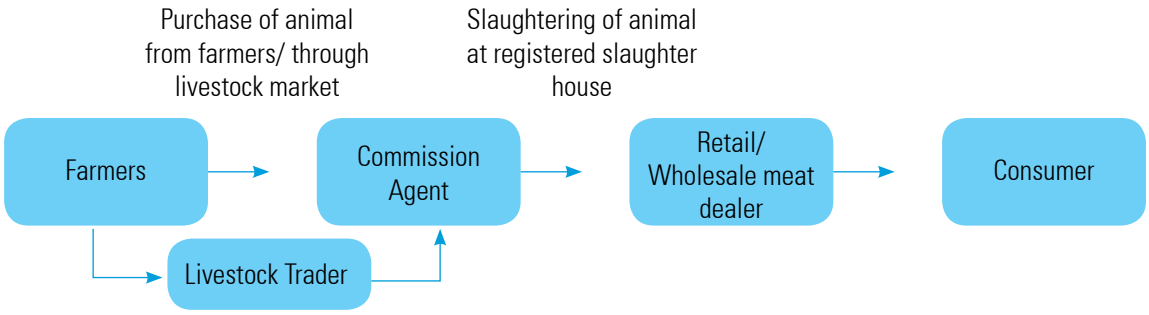
The domestic value chain for buffalo meat production integrates livestock producers, traders, butchers, wholesale meat dealers and retailers. The livestock (buffalo) are moved from farmers to traders, then to butchers who slaughter animals and convert them into marketable products. The products finally reach consumers through wholesale meat dealers and retailers.

- ✓ **Farmers**: Farmers rear buffalo till they reach an unproductive age and thereafter sell them either to traders or at the livestock market.
- ✓ **Traders**: Traders transport the purchased animal to a municipal slaughterhouse for slaughtering. Traders play a very active role in this value chain as intermediary aggregators. Farmers (primary producers) have limited market access and are isolated from major consumers due to logistical and transport costs.
- ✓ **Commission agents:** Facilitate animal transactions between sellers (farmers/livestock traders) and buyers (butchers) and charge a commission on every sale.
- ✓ **Retailers/Wholesalers:** Retailers/wholesale meat dealers purchase buffalo meat from municipal slaughterhouses and sell to consumers.
  - Wholesale meat dealers collect meat from municipal slaughterhouses and resell to retailers in the locality.
  - Retailers buy from wholesalers/slaughterhouses and sell to consumers. However, in few instances retailers perform the function of slaughtering.

Domestic Channel

Wholesale meat dealers and retailers have to obtain licenses from municipal corporations for buying from a slaughterhouse. The Indian buffalo meat industry for domestic consumption is based on production of fresh meat which is processed and sold daily. Retail outlets are generally not equipped with air conditioners, refrigerators or deep freezers.

Exhibit 31: Domestic Channel for supply of meat

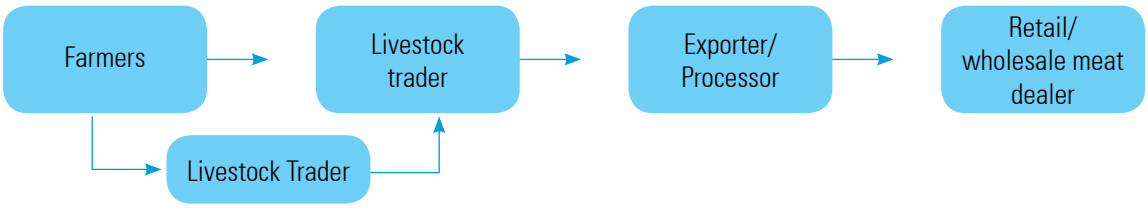


Source: Industry Discussions

The buffalo meat value chain for export has different stakeholders working at several stages of production. Farmers raise the buffalo till they become uneconomical and thereafter sell them to traders. Thereafter traders play the role of aggregators in the value chain and sell the buffalo to exporters for further processing and sale in export markets.

Exports Channel

Exhibit 32: Exports Channel for supply of meat



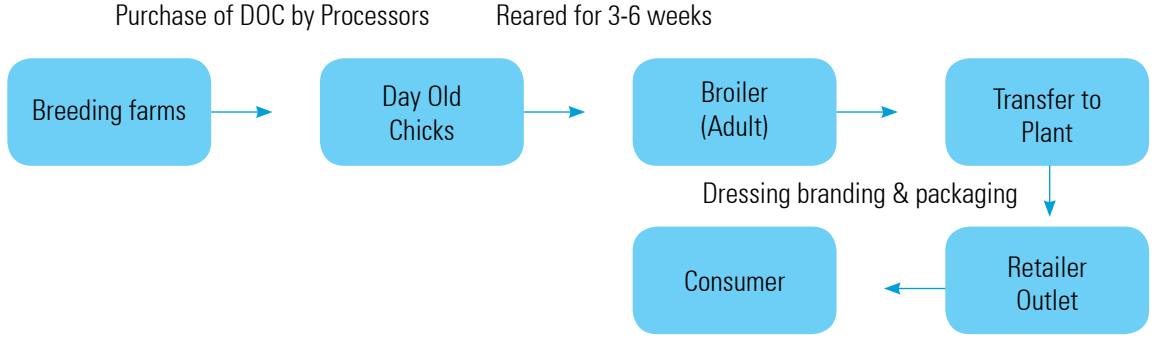
Source: Industry Discussions

- **Farmers**: Farmers rear buffalo for milking and breeding and cull them for meat production when the animals become unproductive.
- **Livestock Traders/Registered Vendors:** Livestock traders play a crucial role as assemblers and suppliers of buffalo to exporters. The traders collect buffalo from different farmers directly or buy animals from livestock markets and sell to exporters. Livestock traders are paid weekly. Players like Al-Kabeer operate through registered vendors (a form of livestock trader). Once animal is purchased, they pay the registered vendor basis carcass weight.
- **Exporter**: After receiving, buffaloes are kept in lairage for 24 hours for inspection by state government veterinary officers. The first processing stage starts with slaughter of the buffalo at an abattoir. The carcass is converted to boneless meat and bones. Boneless meat is packaged in food-grade polythene film, frozen (at -18^{0}C), packed in cartons and kept in cold storage for export. Cartons are dispatched in refrigerated containers for shipment.

Supply Chain for Poultry

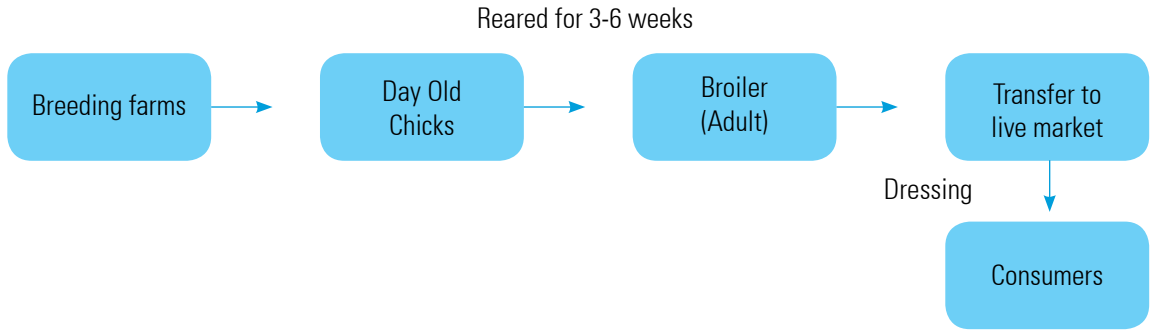
The value chain of the poultry industry starts from the procurement of day-old-chicks (DOCs) and goes down to processed chicken. DOCs are procured from breeding farms. The broiler birds are subsequently either delivered to processing plants or directly sold in the live market.

Exhibit 33: Supply Chain - Integrated Players



Source: Industry Discussions

Exhibit 34: Supply chain- Unorganized



Source: Industry Discussions

2.4.3. Future Trends in the sector

- ✓ The current pork market in India is estimated at about USD 0.9 Bn and is growing at around 5% CAGR. With the increasingly cosmopolitan nature of India's population and their changing dietary preferences for meat and processed food, there is a strong upside to the pork market.
- ✓ Improving avenues for investment in opportunities such as value added products like frozen/ chilled products, RTC/RTE, Indian ethnic products/snacks, Egg powder plants, new feed formulations and manufacturing as well as hatchery facilities.

Uttar Pradesh, being the largest buffalo meat producer in the country as well as being cold storage infrastructure deficit, poses a lucrative opportunity for interventions in the cold chain and processing sector. Cold chain is required in buffalo meat export value chain once the buffalo is slaughtered and converted into boneless meat. Before deboning, the carcass is temporarily stored in chiller. Boneless meat is then packed in food grade polythene film, frozen at -35 to -40 degree Celsius (core temperature inside meat needs to be maintained at -18 degree Celsius), packed in cartons and kept in cold storage for export. Cartons are dispatched in refrigerated containers for shipment. Freezing is done either through blast freezer or plate freezers. For domestic sale, cold chain is not maintained as meat is consumed locally in a short span of time.

The major egg, meat and poultry clusters in Uttar Pradesh include Lucknow, Kanpur, Maharajganj, Saharanpur, Aligarh, Meerut, Agra, Etah and Bulandshahar.

3 KEY CHALLENGES OF THE COLD CHAIN INDUSTRY

1. **Intermittent Power Supply and Overhead Cost:** Cold storages require steady power supply to maintain temperature. As large parts of India face regular power supply cuts, the operations of Temperature Controlled Warehousing players get impacted. Power cost contributes to more than 50% of total cost of operating cold storages

2. **Availability of Skilled Manpower:** The cold chain industry is currently affected by limited availability of trained personnel in cold chain management such as warehouse supervisors/ managers, skilled labour etc. which affects the quality of the end product. This is mainly due to the lack of vocational or other training institutes focused on cold chain logistics in India.

3. **Inefficient handling of Perishables:** Quality of temperature-sensitive products deteriorates, if not handled well. Therefore greater awareness on this aspect is required. In addition appropriate skill building needs to be done on appropriate handling of perishables.

4. **Standards and Protocols:** Lack of adequate standards and protocols including procedures for handling a wide array of raw produce and finished products in cold chain space.

5. **Inadequate farm-gate and mobile infrastructure:** Farm-gate infrastructure including pack-houses, pre-coolers and value adding units, cold chain distribution hubs and mobile infrastructure (including transport units, infrastructure at point of sale etc.)

6. **Technology Availability:** There is limited availability in development of wide range of indigenous refrigeration and temperature control systems. Currently majority of the modern equipment's and technology are imported from foreign countries/suppliers.

7. **Supply Constraint:** Currently very limited OEM Manufacturers are supplying fully built refrigerated vehicles.

8. **Monitoring and Traceability:** Currently there are very limited initiates in monitoring of reefer parameters in vehicles and traceability in cold chain. This results in spoilage in the value chain. There are no incentives for optimizing operational control in Cold storage and reefer vehicles.

9. **Financing Options:** Higher initial capital investments in cold storages and transport infrastructure acts as hindrance to investments in the sector. In addition, the higher payback period and the variability in profitability of the cold chain operators based on location, competition and prices of agriculture produce are few factors which has resulting in limited interest amongst the Banks for financing cold chain projects. Of late however, there has been renewed interest level amongst the banks and private equity ventures due to initiatives from the Govt. in terms of grant and other fiscal incentives to the sector.

4 GOVERNMENT SUPPORT

Name of Scheme	Particulars
Pradhan Mantri Kisan Sampada Yojana: Cold Chain Scheme – Ministry of Food Processing Industries	✓ Financial assistance (grant-in-aid) under the scheme is limited to a maximum of INR 10 crore per project in relation to technical civil works and eligible plant & machinery subject to the following: • For storage infrastructure including Pack House and Pre cooling unit, ripening chamber and transport infrastructure, grant-in-aid @ 35% for General Areas and @ 50% for North East States, Himalayan States, ITDP Areas & Islands, of the total cost of plant & machinery and technical civil works will be provided. • For value addition and processing infrastructure including frozen storage/ deep freezers associated and integral to the processing, grant-in-aid @ 50% for General Areas and @ 75% for North East States, Himalayan States, ITDP Areas & Islands, will be provided. • For irradiation facilities grant-in-aid will be provided @ 50% for General Areas and @ 75% for North East States, Himalayan States, ITDP Areas & Islands.

Name of Scheme	Particulars
National Horticulture Board	✓ Setting up of cold storage (of capacity above 5,000 MT and up to 10,000 MT) and their modernization are eligible for assistance under the NHB Scheme of Capital Investment subsidy for construction/ expansion/ modernization of cold storage for Horticulture Products (a sub scheme under MIDH). It is open ended credit linked scheme with scale of assistance @ 40% of capital cost of project limited INR 30.00 lakhs per project in general area and 50% limited to INR 37.50 lakhs per project in case of NE and Hilly areas
National Horticulture Mission	✓ Cold storage (long term storage and distribution hubs) up to 5,000 MT capacity are eligible for assistance under the open ended scheme of NHM/ HMNEH (a sub scheme of MIDH). The assistance is extended as subsidies to credit linked projects @ 35% of capital cost of project in general area and 50% in case of Hilly & Scheduled area.
Small Farmer Agri-Business Consortium (SFAC) assistance to cold storage	✓ Setting up of cold storage as a part of an integrated value chain project are eligible for subsidy provided the cold storage component is not more than 75% of TFO (Total Financial Outlay). The scale of assistance as subsidy to projects is @ 25% of capital cost and maximum ceiling to INR 2.25 crores in general area and 33.33% and maximum ceiling up to INR 4 crores in case of NE, Hilly & Scheduled area. Integrated Scheme for Agricultural Marketing (ISAM)-Operational Guidelines.
Agricultural and Processed Food Products Export Development Authority (APEDA) assistance for cold chain	✓ Setting up of cold chain are assisted by APEDA as a part of strategy to develop the industries relating to the scheduled products for export. The Scale of assistance as 40% subsidy subject to a limit of INR 75 lakhs for cold chain projects with mechanized handling system.
Venture Capital by Small Farmer Agri-Business Consortium (SFAC)	✓ SFAC extents venture capital assistance in form of equity to agribusiness projects. The quantum of SFAC support is 26% of promoter's equity or amount of INR 50 lakhs whichever is lower in general area and 40% of the promoter equity or amount of INR 50 lakhs whichever is lower in Hilly and NE regions . This venture capital is repayable to SFAC after the repayment of term loan.
Food Processing Unit	✓ Under Horticulture Mission For North Eastern Region and Himalayan States (HMNEH) a sub scheme of MIDH Food processing units for horticulture products are extended credit linked back ended capital investment assistance of 50% of project cost (ceiling amount of project cost is INR 8 crores) in the States of J&K, Himachal and Uttarakhand.
NABARD Warehousing Scheme	✓ Loans will be provided for projects involving creation of storage infrastructure, with a minimum capacity of 5,000 MT, for agricultural and allied produce including construction of Warehouses, Silos, Cold storage, Controlled Atmosphere (CA) stores, other cold chain activities like reefer vans, bulk coolers, Individually Quick Frozen units (IQF), chilling/ freezing infrastructure, etc. Modernization/ improvement of the existing storage infrastructure projects will be considered on merit of each proposal provided it leads to scientific/ additional storage capacity.

Name of Scheme	Particulars
Cold Storage and Fruits & Vegetables Development Program under National Cooperative Development Corporation	✓ NCDC provides financial assistance to the extent of 90% of the block cost to the State Governments for setting up/ modernization/ expansion/ rehabilitation of cold storages and Ice plants by cooperatives. In case of direct funding, assistance to the extent of 75% is provided. ✓ NCDC has also dovetailed its cold storage programme with National Horticulture Board (NHB). In such cases quantum of assistance provided by NCDC is reduced by the subsidy available under the Capital Investment Scheme (CIS) of NHB. The scheme provides enhanced back-ended subsidy @ 40% of the project cost for general and 55% in case of hilly and scheduled areas for maximum storage capacity upto 5,000 ton per project at normative cost @ INR 6,000 / 7,000 / 8,000 per ton as per prescribed standards under the scheme.

Source, MoPFI, NHB, NABARD, NHM, APEDA

FDI in Cold Chain

Foreign Direct Investment (FDI) is allowed under automatic route in cold storage. External Commercial Borrowing (ECB) can be raised for creation of cold storages, cold room including farm level pre-cooling for preservation or storage of agriculture/horticulture produce. For facilitating the growth of cold chain infrastructure in the sector, following additional support components are considered.

- ✓ Reduced excise duty on refrigerated containers, from 12.5% to 6%.
- ✓ Reduction of customs duty from 10% to basic 5%, on imports for cold storage, cold chamber and cold chains including pre-cooling unit, pack house, sorting and grading lines and ripening chambers.
- ✓ Service tax exemption on the operations like pre-conditioning, pre-cooling, packaging, and transportation of milk.
- ✓ Service tax exemption on construction, erection, commissioning or installation of post-harvest storage infrastructure/cold storages

Other Tax incentives:

- ✓ Section 80-IB of the Income Tax Act provides deductions in respect of profits from Industrial undertakings related to Cold Chain. For the first 5 years, the deductions are at 100% and then at 25% for next 5 years.
- ✓ Under Section 35-AD of the Income-tax Act 1961, deduction @ 150% is permitted for expenditure incurred on capital investment in setting up a cold chain facility.
- ✓ Concessional rate of customs duty @ 5% on imported equipment for cold chain facility under the project import benefits.
- ✓ Under Section 35-AD of the Income-tax Act 1961, deduction for expenditure incurred on investment is allowed, if this investment is wholly and exclusively for the purpose of any specified.

5 CASE STUDIES ON SELECT COLD CHAIN INNOVATIONS

To manage various challenges in cold chain many companies have come up with innovative supply chain models, low cost chilling technology, real time temperature monitoring etc. A snapshot of the various innovative solutions provided by some of the companies are given below.

5.1. Milk Chilling Solution by Promethean Power Systems

Promethean Power Systems designs and manufactures refrigeration systems for cold-storage and milk chilling applications in off-grid and partially electrified areas of developing countries. We are based in the United States with a technology research centre in Boston, and manufacturing and testing facilities in Pune, India.

Our products enable our customers to reliably store and preserve perishable food items without requiring the back-up of a Diesel Generator. Our mission is to **"Improve Farmer Livelihoods"** and we believe that our **"Innovative and Cost-Effective Cold Chain Solutions"** enable us to achieve that.

Since commencement of our India operations in 2012, Promethean's Milk Chilling and Cold Storage solutions are successfully running across more than 1000 sites in India, Bangladesh and Sri Lanka. At the heart of our solution is the **"Thermal Storage System (TSS)"** which converts the Electrical or Solar Energy whenever it is available into Cold Energy. This Cold Energy can then be used to chill the fresh produce as and when required.

Conversion of Electrical / Solar Energy into Thermal Energy

The TSS provides both back-up cooling power as well as instant chilling capability which eliminates the Diesel Generators from the Village Level Chilling Centres and helps retain the freshness and quality of perishables.

Promethean's Dairy Solutions

Applying the core technology of Thermal Storage, Promethean has developed 3 different types of solutions for dairies and milk processors:

State	Bulk Milk Cooler	Mobile Milk Chiller
		
Instantly chills milk from 35^0 C to 4^0 C within seconds	Capacity : 500 L/day to 2000 L/day	Chills milk during transit from the village

Use cases:

Application	Rapid Milk Chiller	Rapid Milk Chiller with Storage	Mobile Milk Chiller
Problem	High spoilage of milk during transit in cans to the chilling centre. Travel times of 5-6 hrs. due to poor road conditions.	In order to improve their distribution into rural markets the company would like to sell UHT milk. Current MBRT not enough for production of UHT milk.	High spoilage of milk during transit in cans to the chilling centre. Poor infrastructure and weather conditions can delay the arrival of milk at the chilling centre.
Solution	Rapidly chill the milk in the village itself using the Promethean Rapid Milk Chillers. Transport the chilled milk in cans by rickshaw to the processing centre.	Rapid chill and store the milk to maintain temperature of 4^0C. Chill first to 7^0 C using the Milk Heat Exchanger and then to 4^0C in the storage tank	Chills milk on the go from the first village itself and is chilled when it reaches the centre. The milk temperature is maintained even if the vehicle is delayed.
Impact	90% reduction in spoilage.	MBRT increased from 1.5 hrs to 4.5 hrs.	Spoilage of 5000 litres / month prevented.

5.2 Cold Chain Remote Monitoring by Stellapps Technologies

The focus of Stellapps is leveraging applications using Internet of Things (IoT), Data Analytics & Big Data to improve Dairy -dairy supply chain parameters. Stellapps has applied these technologies to optimize the dairy supply chain. This involves data acquisition via sensors across the dairy farms (including animal wearables), milk procurement and chilling centres. The acquired data is analyzed by the company's Big Data analytics engine which is then disseminated to stakeholders through SMS/ email. With real time information in hand dairy farmers and companies can take corrective action that would help them to prevent loss or to generate more revenue.

Dairy cold chain is a crucial factor for maintaining the quality and improving the shelf life of milk. An unbroken cold chain is an uninterrupted series of storage and distribution activities which maintain a given temperature range. Cold chain must be carefully monitored and managed to maintain high quality milk & dairy products. In-effective cold chain can result in reduced MBRT which has direct impact on milk quality due to increase of bacterial count. Desirable temperature for preserving optimal freshness and taste in milk and dairy products is 4° C. Bulk Milk Coolers (BMC) is an equipment which is utilized to keep the milk at an optimum temperature of 4° C. Size of BMC ranges from 500- 10,000 liters.

Effective cold chain remote monitoring helps in:

- Milk Quality
- Per Litre better price realization
- Optimal BMC utilization
- Cleaning-in Place protocol adherence
- Optimum power consumption
- BMC rating
- Pilferage Control

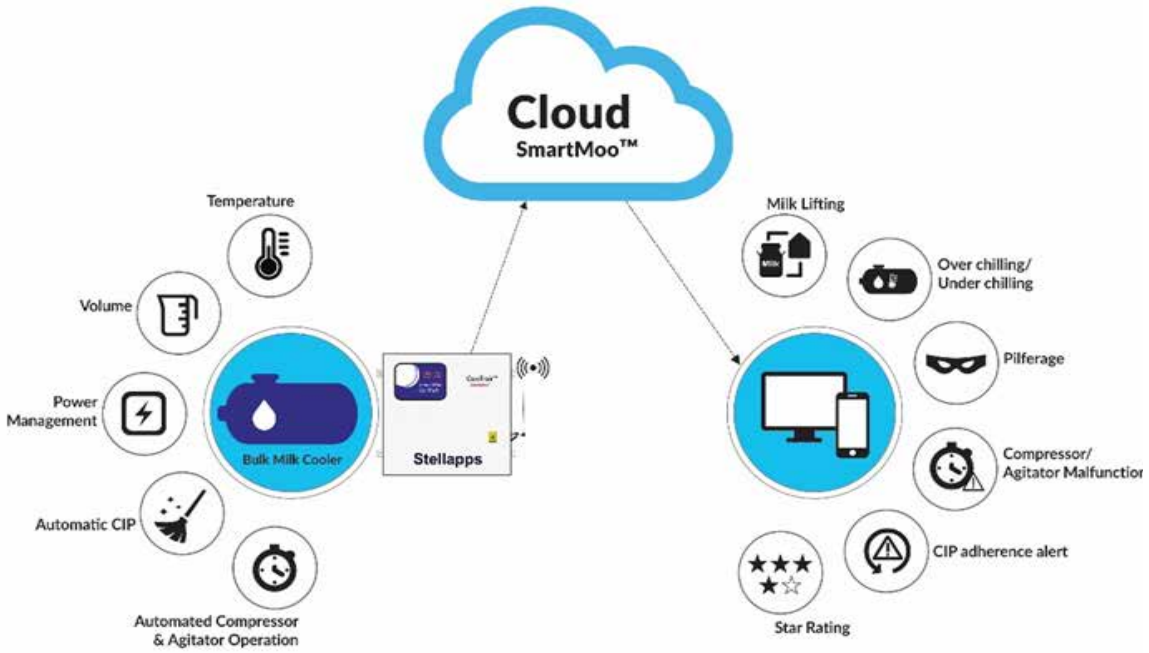
Source: Stellaps

Stellapps has devised SmartMooTM ConTrakTM to enable internet based, real-time management of BMCs with enhanced reporting and pilferage reduction features for improved monitoring and efficiency of BMC. The state of the art, microcontroller-based solution addresses advanced automation and control requirements of BMCs. ConTrak™ ensures for the optimum quality of milk as well as reduce pilferages. ConTrakTM is powered by the cloud-based SmartMooTM platform to enable preventive diagnostics & remote monitoring of various parameters of BMC such as temperature, volume, Cleaning-in-Place (CIP) events, efficiency, malfunctioning and potential misuse. SMS alerts are provided over mobile phone to various stakeholders as critical/informational alerts. Daily/Weekly/Monthly reports of BMC operation and related milk storage data is also available over mobile phone and internet.

As soon as the milk is procured from the farmers it is chilled up to 4°C in BMC to avoid spoilage or to improve shelf life. Dairy companies commonly either over chill or under chill the milk due to lack of constant supervision. Through ConTrak™ milk is monitored continuously which updates the dairy company for corrective action. Thus, the solution improves cold chain efficiency and is beneficial for the farmers as quality milk fetches better price and is beneficial for dairy companies as they get assured quality milk for value added products.

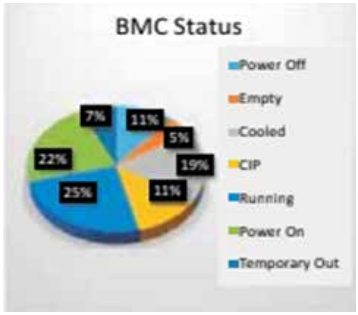
Cold Chain Remote Monitoring System Features

Exhibit 35: ConTrak Features (Source: Stellapps Technologies)



Sensors

- Temperature Sensor
- Volume Sensor
- DG/ Grid Sensor
- Pump Sensor
- Door Sensor
- Humidity Sensor
- Cleaning Sensor



Live Case Study: Amol Khodke, a prosperous farmer in Gandhali village, Nagpur district supply quality milk at a premium price to a private dairy company. Sometimes the company used to reject milk stating the quality terms. He even brought a 2,000 litres BMC to chill the milk to maintain the quality. Even after that the milk was rejected frequently due to curdling because of under chilling. Since the employees of the farm were not able to optimally maintain the milk temperature, Amol decided to buy a monitoring system for the BMC from Stellapps. After installation of ConTrak, he took corrective actions based on alerts about the status of milk. He was also able to set the cut off chilling temperature using his mobile. With ConTrak he was able to ensure no rejection of milk from the company.

With wireless networks already reaching in-roads of rural India aligned with Honorable Prime Minister's Digital drive, remote monitoring and cloud solutions is not a distant dream. In Dairy industry, altogether this technology is still in nascent stage and not being actively deployed. With remote monitoring cold chain solutions, the working capability of entire dairy supply chain can be completely revolutionized to modernize and digitally uplift the rural dairy economy. With continuous up-gradation of chilling centres and many more to be opened in coming time, the challenge of managing these high value assets with associated accessories & parts becomes humungous. There comes the solution of maintaining a futuristic monitoring & controlling cold chain solution which wipes all the operational problems and let entire dairy supply chain start churning huge profits out of it.

5.3. Reefer Transportation by Carrier Transicold

Carrier Transicold is the division of Carrier Corporation, which specializes in transport refrigeration. The company started operations in India in the year 1994 and are today the leader in transport refrigeration offering the latest technology products to the customers backed by a strong Pan India service and parts support network.

Citimax 500

Responding to the growing demand in India for reliable and cost-effective cooling units that also deliver efficient cold chain protection, Carrier India launched the Citimax™ range of light commercial vehicle (LCV) and truck refrigeration units at the India Cold Chain Show 2013 in Mumbai. The Citimax units are ideal for LCVs and trucks carrying loads up to 30 cubic meters.

Advantages of Citimax Reefer

- ✓ Reduction in contamination/spoilage of the product.
- ✓ Increase in product shelf-life
- ✓ Distributors/ dealers and customer receiving the quality product, as the phase and temperature of the product are maintained
- ✓ Higher airflow (2,220 m3/hr) allows usage with longer containers
- ✓ Designed for high ambient conditions
- ✓ Compact microprocessor based controller

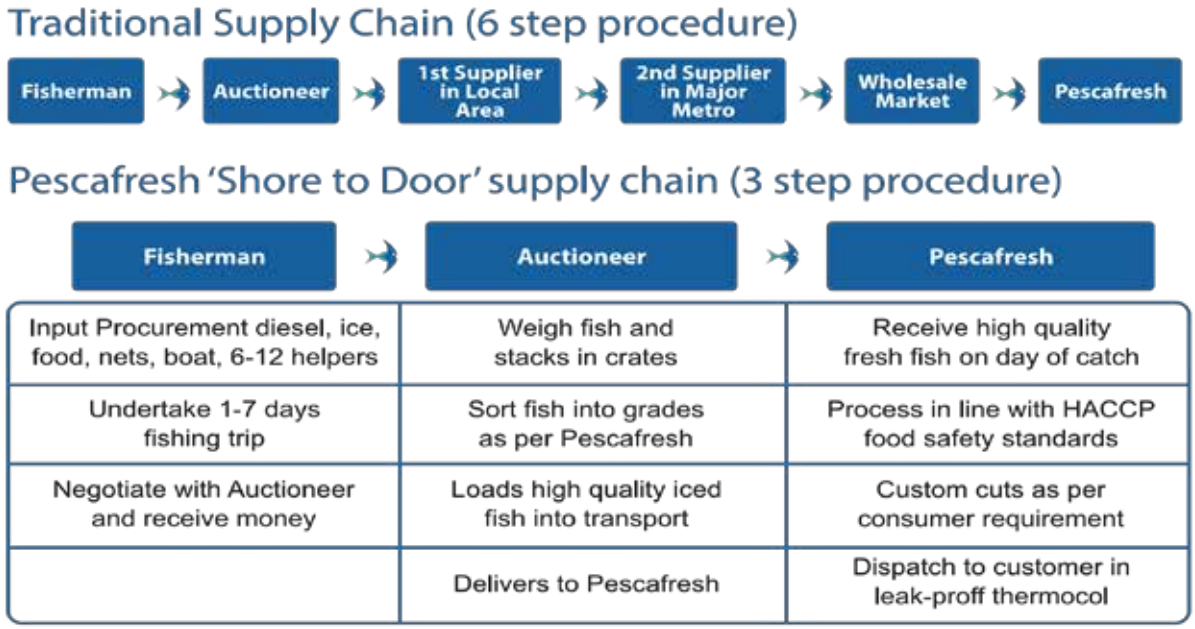
Features	Popular units for large trucks Oasis units	New range for large truck Citimax units	Remarks
Drive	The reefer machine has its own separate diesel engine to run the unit compressor	The compressor of the reefer unit runs on vehicle engine	✓ Absence of engine makes Citimax attractively priced ✓ Absence of separate engine makes maintenance simpler
Application	These units are suitable for frozen & chilled applications on large trucks	Frozen temperature for small vans and only chilled temperature for large trucks	Ideal for milk transportation (+40C) in large trucks

5.4. Case Study on Best Cold Chain Management Practices: Pesca Fresh

Pescafresh is India's first fresh seafood brand conceived in 2004; offering fresh & hygienic seafood cut & cleaned as per the consumers' requirement packaged in world class packaging. Pescafresh is currently servicing over 1, 00,000+ households through their home delivery centers and retail chain across four cities. Strong relations with India's leading retail brands, including Aditya Birla Retail Limited's MORE, Godrej's Nature's Basket, Future Group's Foodhall & Big Bazaar, Tata Trent's Gourmet West, TESCO's Star Bazaar & Le Marche has allowed them to enter into front end retail through SIS arrangements in Mumbai, Bengaluru, Hyderabad & Delhi.

Cold Chain Interventions

Pescafresh reaches its customers through organized retail partnerships as well as directly through Home Delivery. Home Delivery is executed from various satellite units with order fulfillment by delivery bike across Mumbai. The Distribution Centre is designed to perform the following functions:



- Receive Seafood in bulk from landing centers, shipped by the most cost effective means.
- Maintain stock at 1-4^{0}C with the help of ice and stored in assorted insulated boxes under HACCP compliant conditions.
- Serve as a check point for inward movement of product (weight validation, quality testing and entry into the Inventory Management System).
- **Home Delivery** - the product is then wrapped in food-grade plastic packing and placed in a leak-proof, insulated thermocol box pioneered by Pescafresh into which the appropriate quantity of ice is added to keep the temperature of the fish at 1-4^{0}C .
- Inter- state fish distribution: Fish is packed in thermocole box with adequate layers of ice, which is then transferred via Indian Railways
- **Inter-city fish distribution-** Fish is packed in plastic trays with multiple layers of ice which helps to maintain product temperature throughout.

Marketing Channels

Channel	Temperature	Packaging	Delivery
Home Delivery	Product chilled to core temperature 1 to 4^{0}C by keeping it in contact with ice throughout	Wrapped in a polythene paper and arranged on the ice bed in Insulated box	Delivery boy collects the box
Hypermarket	Product chilled to core temperature 1 to 4^{0}C by keeping it in chiller	Wrapped in a 2D & 4D tray with cling film	Delivery experts load the insulated boxes in the vehicle
Gourmet Stores	Product chilled to core temperature 1 to 4^{0}C by keeping it in chiller	Wrapped in a 2D & 4D tray with cling film	Delivery boy collects the box
Supermarket	Product chilled to core temperature 1 to 4^{0}C by keeping it in chiller	Wrapped in a 2D & 4D tray with cling film	Delivery boy collects the box

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- National Dairy Development Board
- National Horticulture Board
- Press Information Bureau

YES BANK, India's fourth largest private sector Bank with a pan India presence across all 29 states and 7 Union Territories of India, headquartered in the Lower Parel Innovation District (LPID) of Mumbai, is the outcome of the professional & entrepreneurial commitment of its Founder Rana Kapoor and its Top Management team, to establish a high quality, customer centric, service driven, private Indian Bank catering to the future businesses of India.

YES BANK has adopted international best practices, the highest standards of service quality and operational excellence, and offers comprehensive banking and financial solutions to all its valued customers.

YES BANK has a knowledge driven approach to banking, and offers a superior customer experience for its retail, corporate and emerging corporate banking clients. YES BANK is steadily evolving as the Professionals' Bank of India with the long term mission of "BUILDING THE FINEST QUALITY LARGE BANK OF THE WORLD IN INDIA".

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