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A study on status and performance of cold storage in Assam

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Abstract
This paper is concerned with Assam's cold storage status and performance and provides a useful insight into it. The study relied on secondary data to support the investigation's numerous objectives. The information on Assam Cold Storage Units was gathered from a variety of secondary sources, including websites, government offices, and study reports, among others. According to the Directorate of Agriculture, Assam has 40 cold storage spread around the state, with a total installed capacity of 1,98,871 metric tonnes (MT). This covers cold storage installed by the public, commercial, and cooperative sectors combined. Despite Assam's installed cold storage capacity of 1.98 lakh MT, the performance of existing cold storage is inadequate. Farmers in Assam are experiencing a problem as a result of the state's lack of cold storage facilities. Due to the global pandemic the farmers were unable to keep their agricultural produce and this resulted in post-harvest loss.

Keywords: Cold storage, status, performance, farmers, cold storage capacity

1. Introduction
Agriculture plays a significant role in India’s economy. About 58 per cent of India’s population and the majority of the rural households depend on agriculture as the primary source of livelihood. India is the largest producer of fruits and second largest producer of vegetables in the world. In spite of that per capita availability of fruits and vegetables is quite low because of post-harvest losses which account for about 25% to 30% of production. Most of the problems relating to the marketing of fruits and vegetables can be traced to their perishability. Degradation of quality is primarily due to respiration and ripening process which eventually resulted in subsequent tissue senescence as energy stores are depleted, water loss via transpiration, decay and mould growth and mechanical damage (Marita 1996) [1]. All minimally processed products are highly perishable and demonstrate rapid postharvest quality degradation over time under ambient storage (Shewfelt, 1987) [2] 4. Perishability is responsible for high marketing costs, market gluts, price fluctuations and other similar problems. At low temperature, perishability is considerably reduced and the shelf life is increased and thus the importance of cold storage or refrigeration. Booth (1985) [3] has analyzed that production was lost due to poor post-harvest handling and storage. He concluded that beyond the pure physical losses, the marketing losses also occurred because a producer did not have storage and he had a forced sell at harvest for whatever price the market paid. With a view to ensuring the observance of proper conditions in the cold stores and to providing for development of the industry in a scientific manner, the Government of India and the ministry of agriculture promulgated an order known as "Cold Storage Order, 1964" under Section 3 of the Essential Commodities Act,1955. The Agricultural Marketing Advisor to the Government of India is the Licensing Officer. A cold storage facility accessible to them will go a long way in removing the risk of distress sale to ensure better returns. Although, there is a vast scope for increasing the production, the lack of cold storage and cold chain facilities are becoming major bottlenecks in tapping the potential. The cold storage facilities now available are mostly for a single commodity like potato, orange, apple, grapes, pomegranates, flowers, etc. which results in poor capacity utilization.
Agriculture plays a vital role in the economy of Assam as 4174023 hectares area is under cropping representing 56.84% of the geographical area of the state. Post-harvest losses and inadequate processing facilities for fruits and vegetables are some of the very critical problems for the agricultural sector in Assam.

Table 1: State-wise breakup of Cold Storage in India

S. No.	Name of the State	Total	
		No.	Capacity (MT)
1	Andaman & Nicobar Islands (UT)	3	810
2	Andhra Pradesh & Telangana	405	1567664
3	Arunachal Pradesh	2	6000
4	Assam	39	178096
5	Bihar	311	1479122
6	Chandigarh (UT)	7	12462
7	Chhattisgarh	99	487292
8	Delhi	97	129857
9	Goa	29	7705
10	Gujarat	969	3822112
11	Haryana	359	819809
12	Himachal Pradesh	76	146769
13	Jammu & Kashmir	69	250169
14	Jharkhand	58	236680
15	Karnataka	223	676832
16	Kerala	199	81705
17	Lakshadweep (UT)	1	15
18	Madhya Pradesh	302	1293574
19	Maharashtra	619	1009693
20	Manipur	2	4500
21	Meghalaya	4	8200
22	Mizoram	3	4001
23	Nagaland	3	7150
24	Orissa	179	572966
25	Pondicherry (UT)	3	85
26	Punjab	697	2315096
27	Rajasthan	180	611831
28	Sikkim	2	2100
29	Tamil Nadu	183	382683
30	Telangana	74	410905
31	Tripura	14	46354
32	Uttar Pradesh	2406	14714235
33	Uttarakhand	55	191314
34	West Bengal	514	5947311
		8186	37425097

Source: Press information bureau, 2020

Additionally, socio-economic factors, the lack of marketing systems, poor transportation facilities are some of the key hindering factors. Increase in both frequency and intensity of high temperature is emerging as a potential threat to production levels of crops. Changes in climate would normally shift the host pattern and life cycles of various insects, pests and pathogens and this would lead to the emergence of new pests and pathogens. The state also suffers from erratic flood and drought conditions which not only results in annual havoc but the accompanying uncertainty prevents farmers from taking risks and making investments in land improvement. To tackle all these challenges this is where the importance of cold storage comes into the picture. Generally a good inventory control system result in minimized inventory investment, appropriate customer service level, balanced supply and demand, minimized ordering cost and holding cost; also preservation of inventory control system. Cold storage is key requirement in the post-harvest storage and distribution function of perishable commodities and food products. Cold storage ensures a continuous flow of goods in the market from the time of production to the time of consumption since agricultural products are seasonally produced and required for consumption throughout the year. Therefore, it becomes imperative to protect the quality of perishable and semi-perishable products from deterioration. Arivazhagan *et al*., (2012) [4] concluded many reasons for food waste and loss, out of which, lack of cold storage was considered as primary reason for maximum wastage. Cold storage is important to maintain the quality and extend the shelf-life, if consumption is not meant immediately after harvest. Low temperature in cold storage units helps lower the rate of chemical changes in perishable products which helps to protect the agricultural produce from the infestation of pests and diseases. Additionally the controlled moisture levels extend the life of fresh produce such as fruits, vegetables and canned goods by keeping them away from direct sunlight and erratic rainfall. As cold storage units are temperature adjustable, and airtight they help to protect the produce from extreme temperature and weather changes that will happen outside of the unit. Cold storage facility accessible to the farmers will go a long way in removing the risk of distress sale and ensure better returns because it helps in the stabilization of prices by adjusting the demand and supply thus improving the economy of the state. The availability of cold storages in the farmers market helped them to stock their produce that might otherwise be deemed as unfit for sale (S. Moghana Lavanya, *et al.* 2020) [5] Cold storage provides vital link between production and consumption of perishable products. It will facilitate the delivery of perishable agricultural products like fruits, vegetables, meat, fish, poultry, milk and milk-based products from production centres to consumption centres. Rathinam (2015) [6] had concluded from his research that local administration should also enlighten the farmers to acquaint themselves with the latest marketing strategies and help them become efficient and self-sufficient farmers. Also, the farmers should be trained to preserve their product to keep it fresh. Hybrid varieties introduced will increase the productivity.

2. Methodology

The study was based on the secondary data for substantiating the various objectives of the investigation. The information on Cold Storage units of Assam was collected from various secondary sources like websites, government offices, and study reports etc.

3. Results and Discussion

According to the Directorate of Agriculture, Assam has 40 col d storages distributed over the different districts of the state with a total install capacity of 1,98,871 metric tonnes (MT). This includes the cold storage installed under the public sector, private sector and cooperative sectors combined. Another three cold storages with a total capacity of 15, 000 MT are under construction at Karimganj, Cachar and Tinsukia.

3.1 Ownership of Cold storage in Assam

AssamWare Housing Corporation, Assam State Agricultural Marketing Board, Bodoland Territorial Council and District Rural Development Agencies own the cold storage facilities in Assam.

Assam are Housing Corporation owns 3 cold storages, Assam State Agricultural Marketing Board has 6 and Bodoland Territorial Council has 2 numbers of cold storages under their control. District Rural Development Agencies has 29 cold storages which are leased out to private companies.

Table 1: Cold storage ownership in Assam

Cold Storage set up by	No of cold storage owned
Assam Ware Housing Corporation	3
Assam State Agriculture Marketing Board	6
DRDA	29
The Bodoland Territorial Council	2

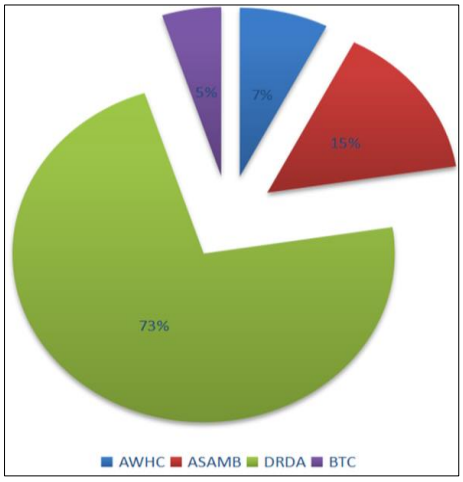

Fig 1: Pie chart representation of cold storage ownership in Assam

3.2 Spatial distribution of Cold storage

All the 40 numbers of cold storages in the state are distributed over the different districts of Assam.

The district with the highest number of cold storages is Kamrup (10) followed by Nagaon (6) and Tinsukia (5) Karimganj and Sonitpur have 3 cold storages each while in Cahar and Hailakandi have 2 cold storages each. Each of the district Dhemaji, Kokrajhar, Jorhat, Darrang, Baksa, Udalguri, and Goalpara have one cold storage. The district Barpeta, Biswanath, Bongaigaon, Charaideo, Dhubri, Dibrugarh, Dima Hasao, Golaghat, Karbi Anglong, Lakhimpur, Majuli, Morigaon, Nalbari, Sivasagr, South Salamara and Mankachar, West Karbi Anglong do not have any cold storage unit.

Table 2: Distribution of cold storage in different districts of Assam

Name of the district	No of cold storage
Kamrup	10
Nagaon	6
Tinsukia	5
Karimganj	3
Sonitpur	3
Cachar	2
Hailakandi	2
Goalpara	2
Kokrajhar	1
Jorhat	1
Darrang	1
Dhemaji	1
Chirang	1
Baksa	1
Udalguri	1

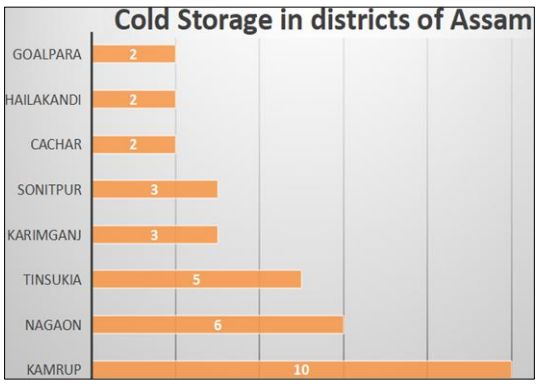

Fig 2: Bar graph representation of cold storage in districts of Assam

3.3 Cold Storage Capacity in Assam

India currently has a total cold storage capacity of 22.67 lakh tons as against the required capacity of 35.0 lakh tons. Of this, a capacity of 53.55 lakh tons was created under different schemes since 2014-15. India's cold storage capacity is likely to reach 40.7 million metric tons by 2023, rising 8.2% from 2020. Total cold storage capacity in Assam is 1.98 lakh MT. Table 3.4 shows the storage capacity (MT) of different cold storages operative in Assam.

Table 3: Storage capacity of cold storage (MT) in Assam

Sl. No	Name & Location	Capacity of storage (MT)
1.	Kamrup Cold Storage	12222
2.	Sri Shyam Cold Stoarge, Palashbari Road, Vill: Saopara, Kamrup	11800
3.	Dharampal Satyapal Ltd, Vill: Mizapur, Ramcharani, Azara, Guwahati	8141
4.	Assam Valley Cold Storage Pvt. Ltd, Nagaon	8000
5.	M/s Chirang Logistics Co. Ltd PO-Kajalgaon-783385	7500
6.	M/s Mahabir Cold Storage Pvt. Ltd. Silchar	7000
7.	Krishna Cold Storage, Goalpara	6165
8.	Maa Tara Cold Storage, Crop Office: Nahata Bld., Dewan Ji Bazar, Silchar, Cachar Ph.9435071250	5600
9.	Assam Valley Cold Storage Pvt. Ltd, Jogijan Road, Hojai	5400
10.	Hojai Cold Storage, Nagaon	5371
11.	Sonitiprava Cold Storage, Bihali	5300
12.	Geen Field Cold Storage, Panitola	5285
13.	Riddhi Siddhi Frezzing & Storage, Tinsukia	5200
14.	M/s Dey's Cold Storage, Unit 2,Hailakandi	5100
15.	Karimganj (Dey's Cold Storage)	5000
16.	Kharupetia, Darrang	5000
17.	Chhaygaon, Kamrup	5000
18.	N.E. Cold Storage Pvt. Ltd, Lokhora	5000
19.	M/s Reliable Cold Storage, Pvt. Ltd, Changsari, Guwahati	5000
20.	M/s Key Dee Cold Storage Pvt. Ltd, Silchar	5000
21.	M/s Mahabir Cold Storage Pvt. Ltd. Unit 2, Tinsukia	5000
22.	Karnitara Cold Storage Pvt. Ltd, Makum Road, Tinsukia	5000
23.	M/s Dey Cold Storage Pvt. Ltd, Hailakandi	5000
24.	Hojai Cold Storage	5000
25.	Musalpur Cold Storage	5000
26.	Routa Cold Storage	5000
27.	M/s Barak Cold Storage, Karimganj	5000
28.	Rajasree Cold Storage, Nagaon	4817
29.	M/s North East Cold Storage, Goalpara	4420
30.	Shubham Himghar, chhaygaon, Kamrup	4150
31.	Indra Prasthad Cold Storage Pvt. Ltd, Tezpur	4000
32.	Gingia Cold Storage, Sonitpur	2500
33.	M/s Eden Cold Storage, Khanapara	2400
34.	Raha, Nagaon	2000
35.	Chilpathar, Dhemaji	2000
36.	Singimari, Kamrup	2000
37.	Joyma, Kokrajhar	2000
38.	Chenijan, Jorhat	2000
39.	Sutarkandi, karimganj	2000
40.	Horizon Progressive Agro Pvt. Ltd, Azara	1500

3.4 Specific details of the total cold storage capacity (MT) with ownership in the study area

India currently has a total cold storage capacity of 22.67 lakh tons as against the required capacity of 35.0 lakh tons. Total cold storage capacity in Assam is 1.98 lakh MT. The different types of ownership governing in Assam are DRDA, Assam Ware Housing Corporation, ASAMB and BTC. The cold storage capacity in Assam start with 12222 MT under the ownership of DRDA which is the highest located in Kamrup district of Guwahati, Assam. Horizon Progressive Agro Pvt. Ltd, Azara have the least capacity of storage 1500 MT. Table 3.5 shows the different ownership for cold storage total capacity in the study area.

Table 4: Table for different ownership for total cold storage capacity (MT) in the study area

Sl. No	Ownership	Total Capacity(MT)
1.	DRDA	1.66 lakh
2.	ASAMB	18,000
3.	AWHC	9000
4.	BTC	10,000

3.5 Capacity utilization

In Assam, out of total installed storage capacity of 1.98 lakh MT, 1.37 lakh MT is being utilized which accounts for 69 per cent of the total storage capacity. Less than 10 per cent of storage capacity is utilized by the local growers while more

than 90 per cent of storage capacity is mostly occupied with the stock of imported fruits and vegetables from other states. Around 90 per cent of the spaces in the cold storages are utilized for storing potato. Other crops generally stored in cold storage are lemon, chilli, tomato, brinjal, cauliflower, cabbage, fresh turmeric.

Table 5: Total percentage of capacity installed by the cold storages in Assam

Sl. No	Total Capacity (MT)	Utilized Capacity (MT)	Percentage of capacity (Utilized capacity/total capacity)
1.	1.98	1.37	69%

3.6 Performance of Cold Storage in Assam

Though Assam has an install cold storage capacity of 1.98 lakh MT, the performance of existing cold storages are not satisfactory. Assam's farmers are facing a crisis due to a lack of cold storage facilities in the state. Due to the lack of cold storage facilities during the COVID-19 lockdown, many local farmers were unable to store their agricultural produce for future sale. According to an Assam State Agricultural Marketing Board (ASAMB) official, the board operates only one cold storage facility in the state. According to the official, the only operational cold storage facility with a capacity of 2,000 metric tons is located in Singimari and is operated on a lease basis. Since 2014, a 500-tonne capacity cold storage facility in Byrnihat has been closed. Another 2,000 metric tons cold storage facility is being use for other purposes in Gossaigaon, Kokrajhar.

4. Conclusion

Assam has 40 cold storages distributed over the different districts of the state with a total install capacity of 1,98,871 metric tons (MT) according to Directorate of Agriculture. This comprises of cold storages installed under public sector, private sector and cooperative sector combined. The ownership of cold storages in Assam is mainly under the hands of District Rural Development Agencies, Assam State Agricultural Marketing Board, Assam Ware Housing Corporation and Bodoland Territorial Council. District Rural Development Agencies has 29 cold storages which are leased out to private companies, Assam State Agricultural Marketing Board has 6 cold storages under its control, Assam Ware Housing Corporation has 3 cold storages and Bodoland Territorial Council has ownership of 2 cold storages. The district with the highest number of cold storages is Kamrup (10) followed by Nagaon (6) and Tinsukia (5). District Karimganj and Sonitpur have 3 cold storages each while in Cahar and Hailakandi have 2 cold storages each. Each of the districts Dhemaji, Kokrajhar, Jorhat, Darrang, Baksa, Udalguri, and Goalpara has one cold storage. In Assam, out of total installed storage capacity of 1.98 lakh MT, 1.37 lakh MT is being utilized which accounts for 69 per cent of the total storage capacity. Less than 10 per cent of storage capacity is utilized by the local growers while more than 90 per cent of storage capacity is mostly occupied with the stock of imported fruits and vegetables from other states.

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