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Identification of Potential Areas of Cold Storage Sites in & Around of Khammam Cluster: A GIS Approach

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Abstract:

Agriculture paly an important role in economic development of country since it ages. It contributes 20 percent of the GDP of the country and more than 2/3 rd of population is directly or indirectly depend on agriculture. India has shifted from traditional agriculture to a capital-intensive agriculture. Noteworthy, the significant attention and several resources were allocated to increase the food production i.e., 95 % was allocated for increasing production and were resources allocated for 5 % for reducing losses (Kader 2005). However, the concern of production scale that meets growing demand is important. The attention has moved to maximizing the returns to farmers by developing the resources interms of infrastructure facilities, Mininmum Support Price MSP and etc and providing easy and affordable access to farmers. Though the production has been increased post independence period, due to lack of post-harvest management resulted in huge loss to farmers i.e. food loss or wastage. Hence, there is a need of systematic management for post-harvest process which helps us to maximize the farmer's returns and ensuring the food safety. In this context Cold storage plays a vital role in Post harvest management where not only various commodities like Horticulture crops (Vegetables, Fruits, Spices), Diary products, seafoood are stored but also seedlingand pharmaceuticals Raw material etc will also be stored to improve shelf life and can sell the product when there is a demand or in unseason period, So that the farmers can get economic benefit. In this paper an attempt has been made to study the distributional pattern of cold storages and reasons thereof, Gap Analysis and identification of potential areas of cold storages in Khammam Chilli Cluster. In this study ODK (Open Data Kit) mobile GIS was used for geotagging and Time series analysis method was adopted to find out the gap of Production of commodities, finally Geo Arbitrage method was adopted to find the potential areas. It has been found that Cold storages are located at stratigically on Point of Produce (POP), Point of Market (POM), Transportation & road network and Shadow impact of Guntur Market. It is Identified that Madhira and Tallada and Mahubabad are the potential areas to establish the cold storages. Apart from above it is also suggested to develop the cold chain system to further development of sustainable network system.

Keywords: *Post harvest management, Cold Storages, Cold chain System, Point of Produce(POP) , Point of Market(POM) and Sustainable network system.*

Introduction :

Agriculture paly an important role in economic development of country since it ages. It contributes 20 percent of the GDP of the country and more than 2/3 rd of population is directly or indirectly depend on agriculture. India has shifted from traditional agriculture to a capital-intensive agriculture . Noteworthy, the significant attention and several resources were allocated to increase the food production i.e., 95 % was allocated for increasing production and were resources allocated for 5 % for reducing losses (Kader 2005). However, the concern of

production scale that meets growing demand is important. The attention has moved to maximizing the returns to farmers by developing the resources interms of infrastructure facilities, Mininmum Support Price MSP and etc and providing easy and affordable access to farmers. Though the production has been increased post independence period, due to lack of post-harvest management resulted in huge loss to farmers i.e. food loss or wastage. Hence, there is a need of systematic management for post-harvest process which helps us to maximize the farmer's returns and ensuring the food safety. In this context Cold storage plays a vital role in Post harvest management where not only various commodities like Horticulture crops (Vegetables, Fruits, Spices), Diary products, seafoood are stored but also seedlingand pharmaceuticals Raw material etc will also be stored to improve shelf life and can sell the product when there is a demand or in unseason period, So that the farmers can get economic benefit. Further cold chain system emerges where its origin and distribution to a consumers. Regardless several other services emerges Ripening Chambers, Packaging and logistics so indirectly benefit the econmic activity of that particulalr region.

For the establishment of cold storages various Schemes are available such as National Horticulture Mission (NHM), National Horticulture Board(NHB), Agriculture and Process food products Export Development Authority (APEDA), National Cooperative Development Corporation (NCDC) and Capital Investment subsidy scheme, for construction, Expansion, Modernization of cold storages. moreover, to add value to agro-products and to maintain and expand the existing strengths as well as to partner with the national Food Processing Mission, there are numerous subsidies, policies and schemes that the state has introduced to support the sector.

The first cold storage in India was established at Calcutta in 1892. However significant progress in the expansion of the cold storage industry in the country has been made only after independence due to self sufficient in crop production. 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 Govt 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 Govt of India is the Licensing Officer.

Telangana state is having 185 registered cold storages with an installed capacity of 838218 MT till 2021-22. Most of the cold storages are supported by the various central schemes for the infrastructure development, which had some relaxations with respect to rent, licensing etc. Khammam is the largest producer of Teja Variety of Red chillies and Red chillies is dominant crop to store in the vicinity of Kahamam cluster. In this paper an attempt as been made to study the cold storages in and around the Khammam Chilli Cluster of Telangana state.

Objectives : The main objectives of the study is to

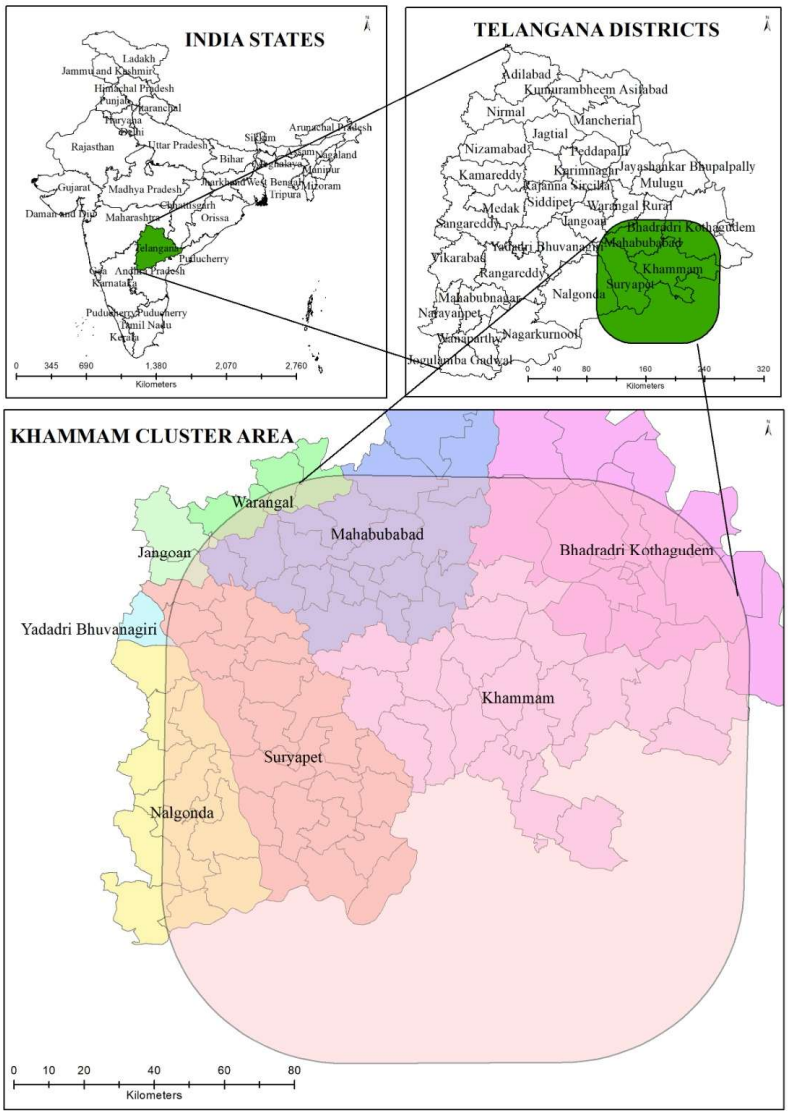
- To map the spatial distribution of cold storages in khammam Chilli cluster.
- To assess the major reasons there of for locating cold storages in study area.
- To study the Gap analysis of cold storages.
- To identify the potential areas of cold storage in the study area.

Study area :

Khammam Chilli cluster comprises of Khammam, Mahubabad, Bhadradrikothagudem, and Suryapet districts of Telangana State with a total land area of 18,328 sq.kms and it lies between 79^0 24'21"E to 80^0 55'51"E and 16^0 15'58"E to 17^0 47' 5" N. The climate is similar to Monsoon climate of India. The Maximum temperature ranges between 29^0C and 39^0C and minimum ranges between 16^0C and 25^0C. The study area predominates red soils and the major crops grown are Rice, Chillies, Cotton, Maize, Oil seeds. Horticultural crops like fruits (specially mango, Banana, vegetables and flowers (Marrigold, jasmin, Chrysanthimumand etc)

will be grown. During the period 2021-22, the total cultivatable area of chillies in the cluster is 2,40, 003 acres with a total production of 2, 55,898 MT.

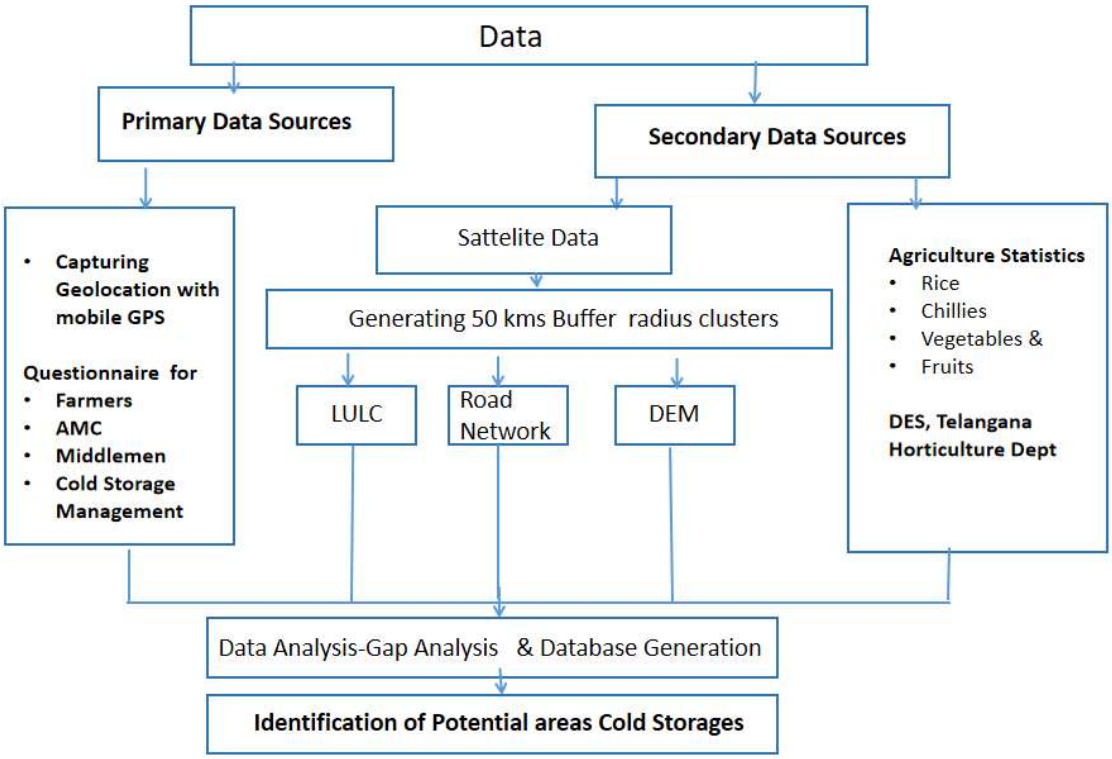
Fig.1 : Location Map - Khammam Red chillies Cluster



Database and Methodology :

The data has been collected from both the sources i.e Primary and secondary. To know the distribution of cold storages in Telangana state, we have collected secondary data from Horticulture Department. The study area is structured into cluster comprises districts Khammam, Mahubabad, Bhadradrikothagudem, Suryapet districts in Telangana State. To get the primary data the district wise field work was executed based on the Multistage sampling in selecting study area at different stages like Telangana with different clusters and within the cluster districts are selected and within the districts regions of cold storages are selected and within cold storages simple random sampling technique was adopted, by applying snow ball technique collected primary data of farmers have been compiled. Further data was collected from variuos resources like cold storage management, agrimarkets and Middlemen in Markets through a structured questionnaire to fulfil the objectives. Researcher geotagged the information with ODK (Open Data Kit) Mobile GPS enabled tablets.

Methodology



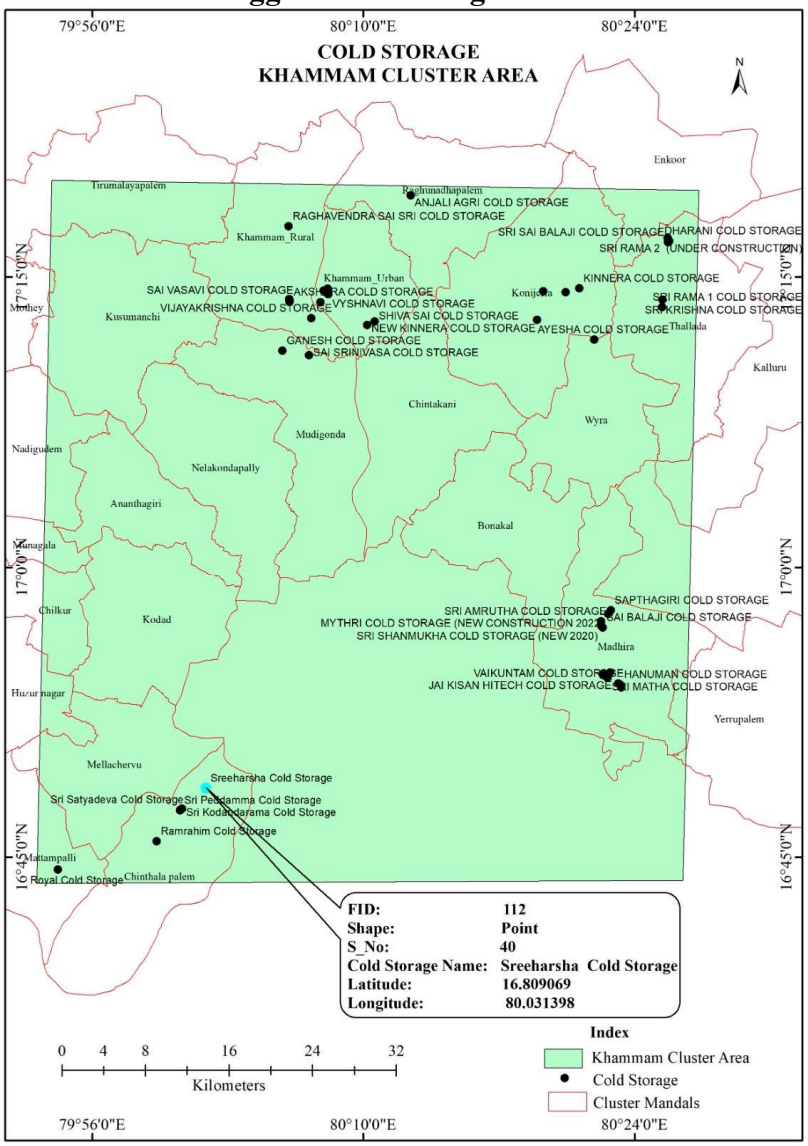
Landuse land cover maps were generated (supervised , unsupervised classification technique with hybrid) pertaining to the year 2021-22 by using landsat 8. From ASTER DEM Digital Elevation Model of the study area has been generated. Spatial data generation like Road network and etc have prepared by using ArcGIS Pro.

From the sattellite data, study area is subsetted and buffered 50 kms radius from selected cold storages in the cluster. Gap analysis was done with the help of Time series analysis technique based on the area and production of chilies in 2018-19 and 2021-22. By applying geographical arbitrage method on the primary data and secondary data, researcher has identified the potential areas of cold storages in khammam chilli cluster.

Discussion & Analysis :

There are approximately 51 cold storages in Khammam chilli cluster comprises of Khammam, Bhadradri Kothagudem, Mahabubabad and Suryapet districts, which constitutes 27.71 percentage of the total cold storages in Telangana state, which can store 2,14,744 Metric tons capacity constituting 26.43 percent of capacity total capacity of the state. though majority (17) of cold storages are located in Khammam district (Madhira and Tallada areas of Khammam) they are spread across the entire cluster especially in, . These Cold storage units were established keeping in view of the feeder zones of the other spice belt of Mahbubabad, Suryapet and Bhadradri Kothagudem districts. Almost all the cold storages utilized for Chillies storage along with other purposes .

Fig. Distribution of Geotagged Cold Storages in Khammam Chilli Cluster



Initially researcher captured photographs of each cold storage, its location(Geo Coordinates, and then accessed and uploaded the information of cold storages in online map through SW Maps(Open source GIS), thereby creating a comprehensive visualization of the all cold storages with attribute data i.e if we click on any cold storages, it gives all information or discription of cold storages such as Name of the cold storage, Capacity, Address as shown in above figure.

Based on the questionnnaire survey conducted regarding the location factors of cold storages it is found that the distribution of cold storages is located at strategic locations and is flexible enough for the storage of different nature of products. The main reasons for the location of cold storages are as ollows :

1. As the study area is locating factor, Soil, Climate are also favourable for cultivation of Chillies. (Fig.) .
2. It is evidenced from the collected data that production of crops neighboring states will also be stored when there is a no space in their respective cold storages.
3. This cluster is well connected with the market and transportation facilities leading to development of cold storages.

4. When there is a shortage of space in cold storages of GUNTUR cluster, which is famous for exporting the chilli to the other countries and also to maintain the quality of the crop, the cold storages are located in an around the Khammam cluster as it is near to Guntur Market.

In order to know the demand i.e to find out the gap between existing cold storages and required cold storages. The area and production of crops of Khammam Chilli cluster have been assessed based on the Time series analysis for the year 2018-19 and 2021-22.

Table 1

Area and production of Chillies - Khammam chilli cluster (2018-19 and 2021-22)

District	Area of acreage		Gap	Production		Gap
	2018-19	2021-22		2018-19	2021-22	
Khammam	59533	103540	44007	107101	102044	-5057
Mahabubabad	30244	82447	52203	46976	69105	22129
Bhadradri Kothagudem	11968	32338	20370	28402	52478	24076
Suryapet	11506	21678	10172	23023	32271	9248
Total	113251	240003	126752	205502	255898	50396

Gazing the data in the above table shows that the change of area and production of chilli crop for the year 2018-19 and 2021-22. among the khammam cluster it is found that Khammam district has the both highest cultivable area and highest production of chilli crop in the year 2018-19 and 2021-22. it is found that there is a increasing trend is observed in terms of area (113251 acres in 2018-19 to 240003 acres in 2021-22.) and production (205502 MT in 2018-19 to 255898 MT in 2021-22**)** in khammam chilli cluster.

The sattellite data of Land sat 8 was subsetted and buffered with with 50 kms radius and the landuse/cover classification was derived. The landuse and land cover layerd and road network layer overlaid then it was witnessed that the entire study area (Khammam cluster) dominated by monocropping pattern i.e chilli crop (as shown in Table and figure no).

Fig. : Land use and Land Cover Map - Khammam Chilli Cluster

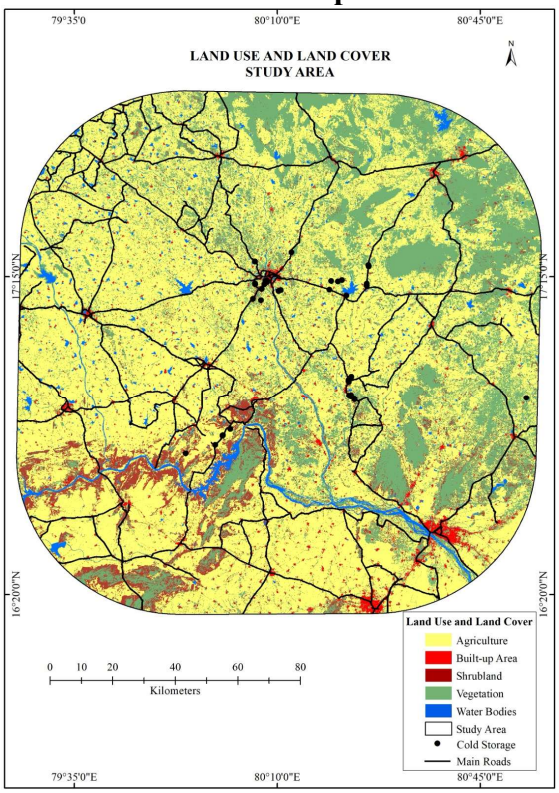
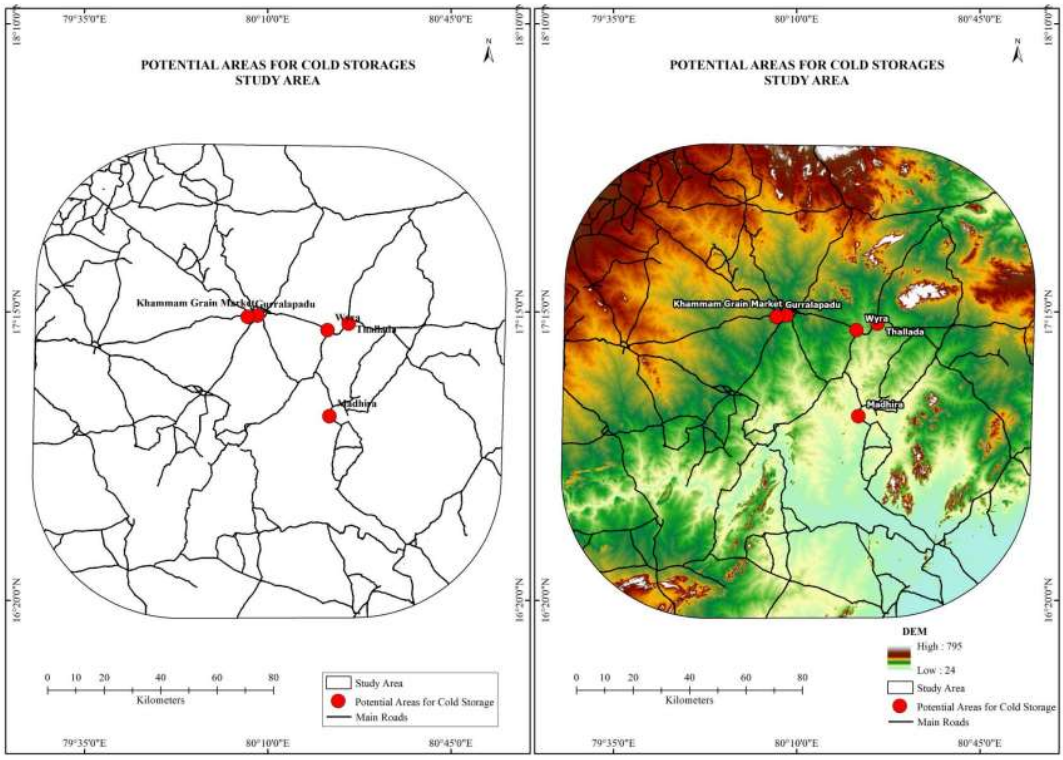


Table 2 : Land use Land Land Cover statistics

S.No	Class Name	Area (Units)	Percentage (%)
1	Agriculture	15134.68	61.80
2	Built-up-Area	730.46	2.98
3	Shrubland	1338.45	5.47
4	Vegetation	6729.17	27.48
5	Water Bodies	557.41	2.28
Total		24490.16	100

Further it is observed that Khammam and Mahububabad districts are stands in first and second position in terms of area and production of chilli crop in Telangana state Apart from above, market price of Teja variety has been increased from rs. 10,000 in 2017-18 to RS. 19,000 in 2021-22 where as other varieties of chilli crop have been increased an average of 6300 2017-18 to RS. 8000 in 2021-22(Source: http://tsmarketing.in/) . due to which farmers are showing interest to store the production into the cold storages to get a economic benefit. Not only from our state but also from neighbouring states (Andhra Pradesh State) specially farmers of Guntur district area will also bring the chillies production to the cold storges of Khammam cluster. Besides chilli crop, Horticultural crops like fruits especially Mango and vegetables are also been cultivated. All these combined effect emphasizes the need of the establishment of new cold storages in the study area as there is a gap between production and capacity of existing cold storages(table) . It is supprising to know that most of the farmers are aware the importance of the cold storages and its advantages . and it is also found that new cold storages are established at Khammam cluster and still there demand and potential for the establishment of new cold storages in the outside area of khammam town (Point of Market) like Gurralapadu, Madhira, Tallada and Wyra (Point of Production) , Mahabubabad district(Point of Production) .

Fig. : Potential Area of Cold Storages - Khammam Chilli Cluster



Conclusion :

Cold storages are essential for extending the shelf life and plays a vital role in Post harvest management and can sell the product when there is a demand or in unseason period, So that the farmers can get economic benefit. The highest cultivated area and production of chilli crop of Khammam Chilli cluster and the landuse and land cover layerd witnessed that the entire study area (Khammam cluster) dominated by monocropping pattern i.e chilli crop. There is a gap between production and capacity of existing cold storages. As existing cold storages are having with less capacity. The State Government must make a step to increase its capacity by providing infrastructural facilities like subsidizing the electrical tariffs, encourage use of renewable energies etc., and to established new cold storages in the study area in order to boost the development of cold chain system.

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