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Development of Uttar Pradesh cold storage information system using remote sensing and GIS technology

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Abstract

The study presents the GIS based Uttar Pradesh Cold Storage Information System for optimally utilizing GIS, web and mobile technology by the growers of Uttar Pradesh which has been developed using android mobile application. Cold Storage Information System has been generated to facilitate the proper allocation of cold storages, whereas the android mobile app facilitates the citizens with authentic & correct Geo information about the cold storages along with relevant details. This user-friendly application has been named as "Sheetgrah" by which user can get the information about all the Cold Storages, located in various districts of Uttar Pradesh state. Sheetgrah application is free of cost for every user and it can be downloaded from the Google Play Store. This study has proven that the techniques of Remote sensing, Geographical Information System (GIS) & Global Positioning System (GPS) can provide amicable solution up to the grass root level and the developed App can be used as a valuable & helping tool for viewing, analyzing, characterizing and making decisions about the cold storages by decision makers, planner and scientific communities as well.

Keywords: Cold Storage, satellite data, GIS, mobile application

Introduction

India is now the second largest producer of fruits and vegetables in the world next only to China and is the leader in several horticultural crops, namely mango, banana, papaya, cashew-nuts, areca nut, potato and okra. Vegetables are short duration crops with high yield per unit area, economically viable and provide nutritional security. The nutritional intake from fruits and vegetables is higher among urban population than that of rural population. Along with the urbanization, people are likely to increase their calorie intake at a higher pace through fruits and vegetables. It is estimated that per capita fruits availability in our country is around 200.6 gms which is far away the recommended quantity of 230 gms. per capita/day (*Horticultural Statistics at a Glance 2017*)^[3]. Total area under horticultural crops was 21.83 million hectare and production was 240.53 million tones in the year (2010-11). Fruits and vegetables together contribute about 92% of the total horticultural production in the country. As per the Indian Institute of Vegetable Research, India produces about 14% (146.55 million tonnes) of world's total vegetables. Productivity of vegetables in India (17.3 tonnes per hectare) is less than the world's average productivity (18.8 tonnes per hectare). Out of total vegetable production in India, Potato (28.9%), tomato (11.3%), onion (10.3%) and Brinjal (8.1%) are the four major vegetables growing in the country which contributes about 58.6% of total vegetable production. Other important vegetables are cabbage (5.4%), cauliflower (4.6%), okra (3.9%) and peas (2.4%), (Snehal Mishra *et al.*, 2014)^[5].

The state of Uttar Pradesh have highest production (26407.3 thousand MT) and share (15.1%) of vegetable crops in the India while the Fruits share has been found 11.2 % of the total production (*Horticultural Statistics at a Glance 2017*)^[3]. Potatoes has been found to be the leading vegetable crop, accounting for 23% of all area planted under vegetables (Kumar, 2009)^[4]. Due to this, most of the cold storages in Uttar Pradesh are mainly used for potato storage. CIP (2006)^[1] estimates that approximately three-fifths of potatoes in cold storages are table potatoes, intended for consumption, while the other two-fifth share used for seed. Potato consumption is widespread in India and it is estimated that it is consumed by 92% of all Indians (Das Gupta *et al.*, 2010)^[2]. Annual consumption was evaluated as 18 kgs per person per year in 2007 (Fao stat).

A major challenge in India is storage of end product of fruits and vegetables as production takes place round the year, right from cold months of October-November to February-

March, followed by hot summer months. This requires proper refrigeration, which is necessary for storage; so, availability of cold storage become it most necessity on a larger scale in order to minimize the losses of vegetables/fruits crop. Considering the increasing production of vegetables/fruits and the requirement of farmers in the state, there is a need for such suggestive mechanism by which the farmers can store their product in cold storage with their convenience; on the basis of easily accessible Geospatial Information System. Currently the cold storage are available in a highly unorganized manner and no consolidated information available about them as far as state of Uttar Pradesh is concerned. Hence present Study was focused to develop the complete farmer level accessible GIS based Cold Storage Information System with navigation for optimally utilizing GIS, web and mobile technology by the storage crops/vegetables growers of Uttar Pradesh.

Study area

The present investigation area comprises entire state of Uttar

Pradesh covering all seventy-five districts(fig-1)under eighteen revenue divisions(Meerut, Saharanpur, Moradabad, Bareilly, Agra, Aligarh, Kanpur, Allahabad, Jhansi, Chitrakoot, Varanasi, Mirzapur, Azamgarh, Gorakhpur, Basti, Devipatan, Lucknow and Faizabad division)of the state. The Ganga, the Yamuna and their tributaries are major rivers, flowing through the major districts of the state. The state is bordered by Rajasthan in the West, Haryana, Himachal Pradesh & Delhi states in the North West, Uttarakhand state and neighboring country Nepal in the North, Bihar in the East, Madhya Pradesh in the South, and touches the states of Jharkhand & Chhattisgarh to the South East. It covers about 243,290 square Kilometers (93,933 Sq mile), equal to 7.33% of the total area of India, and is the fourth-largest Indian state by area. The latitudinal extent of Uttar Pradesh, India is lies between 23°52'N and 31°28'N latitudes and the longitude extent lies between 77°3' and 84°39'E longitudes. There are about one thousand seven hundred fifty-three (1753) cold storage reported from the state of Uttar Pradesh in the year 2017-18.

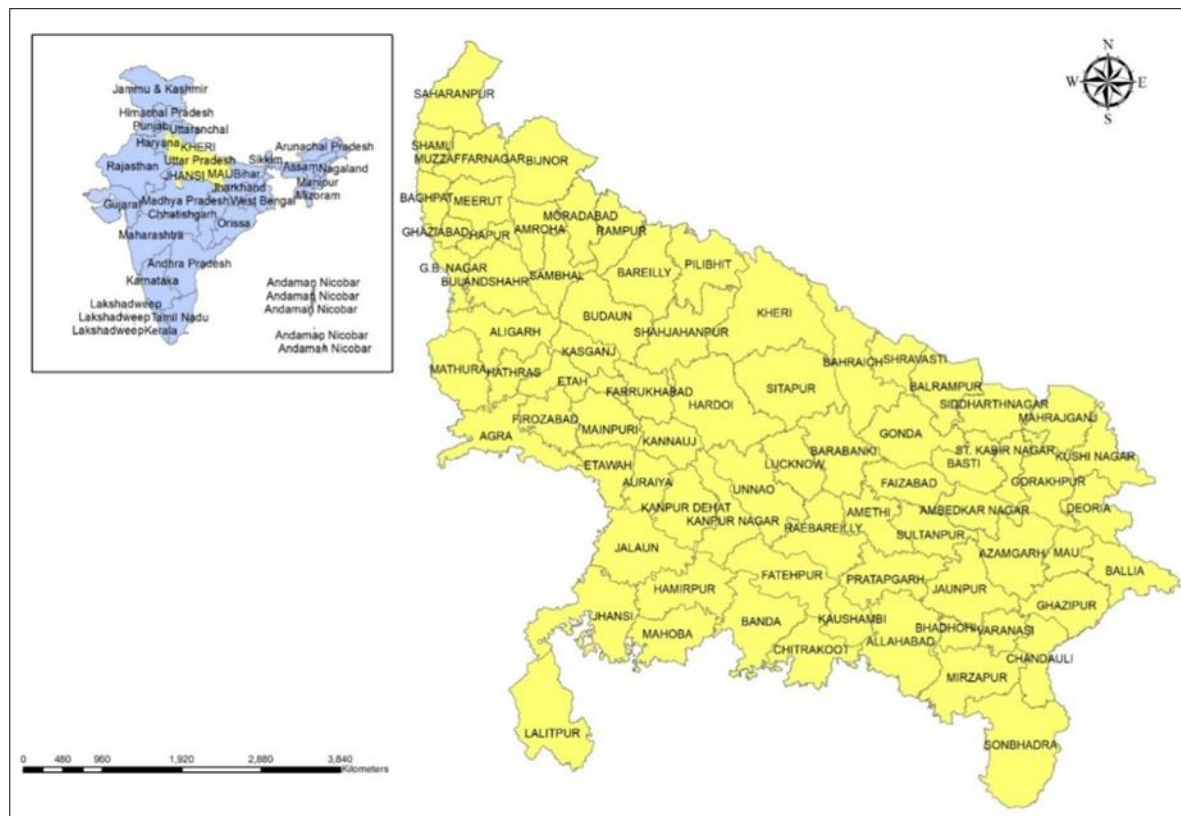


Fig 1: Location Map of Uttar Pradesh for Cold storage GIS Database

Materials and Methods

Data used

Department of Horticulture, Government of Uttar Pradesh has provided all relevant basic information related to cold storages of U.P. The Geo tagging of these cold storages have been completed through hand held Spectra Mobile Mapper GPS (GLOBAL POSITIONING SYSTEM).

System Requirement

Operating system Android 4.4 (KITKAT VERSION) has been used for the development of the mobile application for Cold Storage Information System Database used for storing Cold Storage details was SQLite (Android Local Database)

and for showing location, Google Maps(V2) suffice the need but 1 GB RAM internet connectivity is required.

Remote sensing and Geographic Information System analysis

The cold storage data were collected through detailed ground survey with the help of hand-held GPS (GLOBAL POSITIONING SYSTEM) on the basis of cold storage details provided by Department of Horticulture, Govt. of U.P. The cold storage GIS database was generated using Arc/Info GIS software, whereas the statistics of cold storages were also linked to the spatial data generated. Methodology flow chart for Cold Storage Information System generation in fig-2.

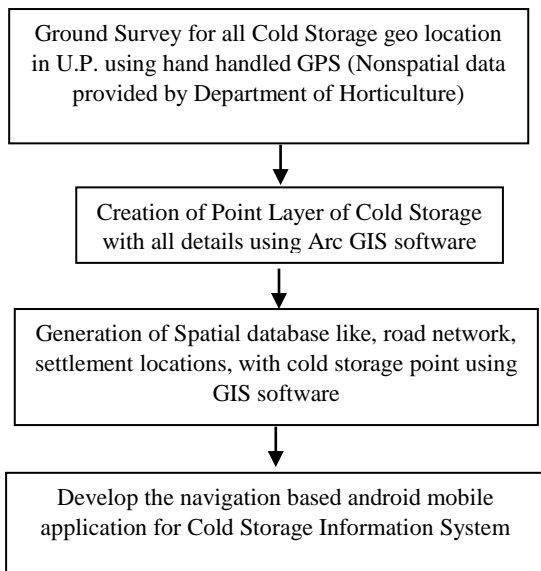


Fig 2: Methodology flow chart for Cold Storage Information System generation.

Steps involved in Cold Storage Information System

Android Studio: In order to develop any application on Android operative system, one needs to install the latest version of Android Studio IDE. In addition to this, there is also need for installing an extra plug-in to connect the IDE to the Android SDK. This plug-in is called ADT plug-in for android studio developed by Android SDK.

Steps to create android Application:

- Create A project in android studio
- Add splash activity
- Add activity to show the content
- Add xml file for design
- Add libraries for getting various permissions in device like internet, call, storage etc.

Emulator

In computing, an emulator is hardware or software that enables one computer system to behave like another computer system (called the guest). An emulator typically enables the

host system to run software or use peripheral devices designed for the guest system. 2.3 Database (SQLITE) SQLite is an in-process library that implements a locally, zero-configuration, transactional SQL database engine. It is a database, which is zero-configured, which means like other databases you do not need to configure in system.

Programming Language (JAVA/XML)

The official language for Android development is Java. Large parts of Android are written in Java and its APIs are designed to be called primarily from Java.

Results and Discussion

Potato Crop and cold storage Map Generation of Uttar Pradesh

The information on cold storage existing in all 75 districts of Uttar Pradesh (the Cold Storage are available in only 65 districts of the state out of 75 districts) has been generated through conjunctive use of Remote Sensing GIS and GPS techniques, where GPS provides actual location (Global position system coordinates) on GIS provides maps of cold storage envisaging cold storage address, owners mobile no., license no, capacity, year of establishment, distance from districts headquarter, storage capacity, current status of building information, owner’s name, their telephone numbers, and road condition information. This data provides the spatial extent of cold storage & facilitate the planning about storage crops/vegetables for better supply during off season. Whereas, an example (shown in fig-3) demonstrate the spatial distribution of potato crop along with cold storage actual location data, in two districts of U.P.(Kannauj and Etawah) by super imposing maps of potato acreage and cold storage. It refers that the cold storages have not been established according the potato crop in both districts. It means the farmers invest extra money and time for transporting the crop. It would be better, if the cold storages established in northern and southern part of both districts, where potato crop already grown in major parts as shown in the map. So, the correlation of potato crop map with cold storage map, facilitate better cold storage allocation, planning about storage of potato in order to provides better supply during off-season.

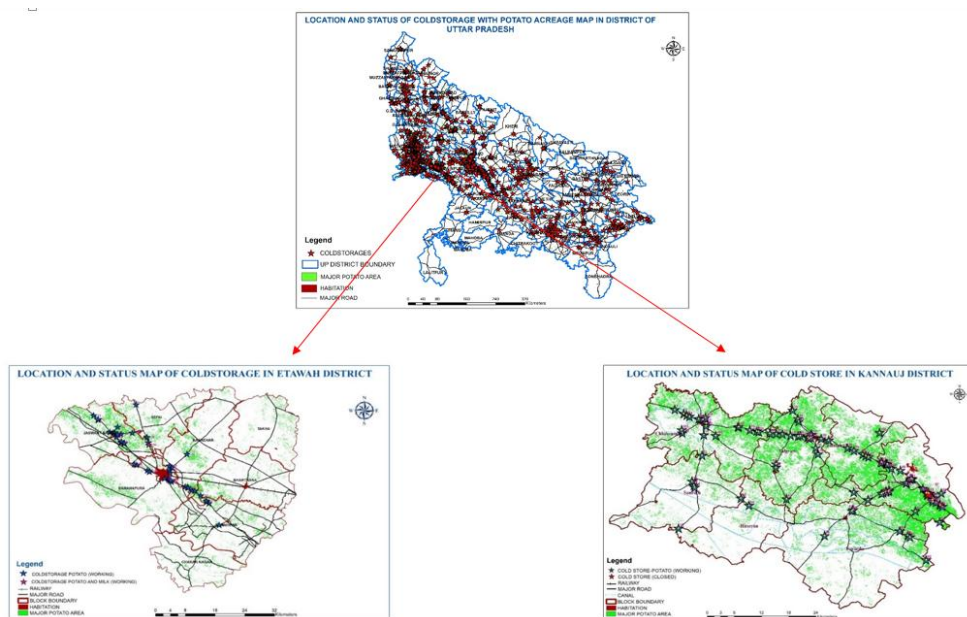


Fig 3: Location and status map of cold storage map with potato acreage in Uttar Pradesh along with examples of two district Etawah & Kannauj example

Uttar Pradesh Cold Storage Information System (UP-CSIS)

The mobile application has been designed to develop the Uttar Pradesh Cold Storage Information System for providing sustainable information in hands about cold storages to famers/citizens. The beneficiaries want to store their product in available cold storage, located logically near to their own location in the state of Uttar Pradesh. It would facilitate the products to provide better supply during the off season. This android mobile app facilitates the citizens with the authentic & correct Geo information about the nearest cold storage along with all details of cold storage. Through this, one can plan about storage of vegetable/other products to provide better supply during the off-season. Application Modules for Cold Storage Information System Application (shown in fig-4) has the following activities-

- 1. Splash Activity:** -This is the First Activity of the application which is seen by the user, when user opens the application.
- 2. Dashboard Activity:** -Here, user selects the search option by selecting "Search by Name" or "Search by District". Also, user has option to see information about the Cold Storage by selecting the "menus" provided in the application.
- 3. Search by Name:** -Here user can search cold storage by entering the Cold Storage name into the given search box in the application. (fig-5). After clicking the cold storage, (which is shown on the map), next page will be open and this page contains all the information about that particular cold storage, which is searched by the user.
- 4. Search by District:** -Here, user can search cold storage by selecting the district from given dropdown in the application. After selecting the district, user can see the all cold storage names on Google map. After clicking the cold storage which is shown into the map, a next page will

be open and this page contains the all the information about that particular cold storage which is searched by the user. User has option to get direction on Google Map between user current locations to that particular cold storage location, which is selected by the user.

- 5. Cold Storage Details:** -Here, user can get the Cold Storage details by District Name, Number of Cold Storages in a particular district and Total capacity of all Cold Storage of each District
- 6. Contact Details:** -Here, if user has any other queries regarding the Cold Storage details then user can visit the given address or directly contacted on given phone numbers in the application.

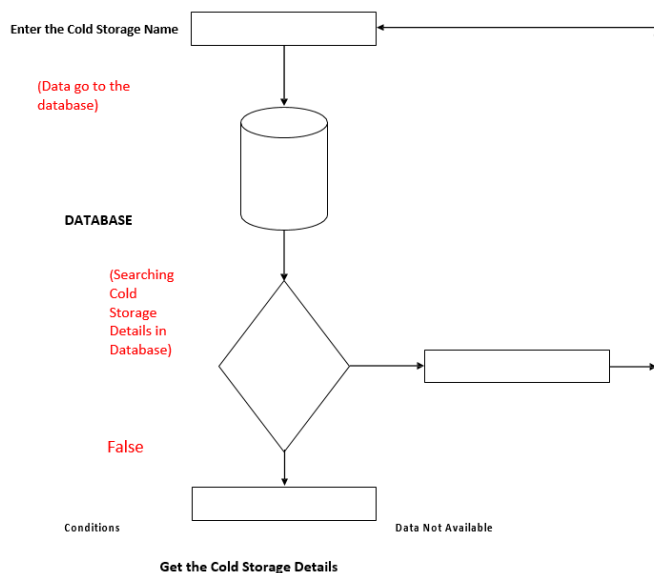


Fig 4: Flow Diagram for Cold Storage Searching



Fig 5: Application Modules for Cold Storage Information System

Conclusion

The present study was mainly focused on the best possible use of Remote sensing, GIS & GPS technology at grass root level by development of Uttar Pradesh Cold Storage Information System. This type of information system can play an important role for taking short term decisions such as procurement, storage and pricing, as it provides the spatial extent of cold storage & related information which in turn

facilitate the planers about storage of storage crops & vegetables for better supply during off-season. With the help of generated App "Sheetgrah" user can get the information about all the Cold Storages which are available in Uttar Pradesh. Through "Sheetgrah" user can also get the route direction on Google map of every particular cold storage with full address and contact number along with all relevant information of every Cold Storage. Sheetgrah is free for every

user and it may be downloaded from the Google Play Store.

Download Link: https://play.google.com/store/apps/details?id=soft.gen.rsac_

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References

1. CIP (International Potato Center). India, World Potato Atlas, (Lima: CIP), 2006.
2. Das Gupta, Reardon ST, Minten B, Singh S. The Transforming Potato Value Chain in India: Potato Pathways from a Commercialized-Agriculture zone (Agra) to Delhi, IFPRIADB, mimeo, 2010.
3. Horticultural Statistics at a Glance 2017, Horticulture Statistics Division Department of Agriculture, Cooperation & Farmers Welfare Ministry of Agriculture & Farmers Welfare Government of India, New Delhi, Publication no-PDES – 256 (E), 500 -2017 – (DSK-III).
4. Kumar B. Indian Horticulture Database 2008, (New Delhi: National Horticulture Board), 2009.
5. Snehal Mishra, Rakesh Singh, Singh OP. Economic analysis of marketing of major vegetables in Varanasi district of Uttar Pradesh, India, Economic Affairs, 2014; 59(4):649-652.