GPS/GIS Mapping of Farmer Land Records

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Abstract:- GPS/GIS technology is being used in various sectors, but less implemented in agriculture sector. The main purpose of this project is to focus on methods and concerns to identify farmer land records from GPS/GIS maps. This technology can assist the authorities to refer and track geographical structure of land lot for various uses. The present study consists of the survey on the present sectors where this technology is widely used, existing land record system in APMC and the project planning.

The system is developed with test server for land and owner details. If the system is approved by the government eventually it can access the API to communicate with Bhoomi system - RTC. So that the application can work with the live data to validate all the data generated by the system. This is useful during the loan disbursal or repayment process in APMC.

Keywords: APMC,GIS, GPS Technology, Land Record.

I. INTRODUCTION

"GPS/GIS Mapping of farmer land records" is an android/web application that enables APMC (Agricultural produce market committee) authorities to gather and organise the farmer land records such as boundary, name of the land owner, survey number etc. This system helps the authorities during loan sanction, when the loan must be waived off, or at the time of loan clearance authority must able to gather all the land records of the farmer by giving geographical layout for each farmer land.

GIS/GPS is a widely-used technology in various sector such as supply chain management, urban planning, forestry, banking etc. However, there is a minimal usage of the technology in agricultural sector. Presently there are lots of special device used for GIS mapping, however this technology would be handy if it is used in mobile devices.

Geographical Information System (GIS) is an integrated tool, that has the capacity to map, analyse, manipulate and store the geographical data to solve the real-world problems by providing standard solutions and also useful for the future planning [2].

➢ *Problem Definition*
GPS/GIS technology is being used in various sectors, but less implemented in agriculture sector. This technology can be used to simplify the maintenance of land records during loan sanction for agricultural purpose by the APMC authorities. The existing land record system is processed manually. "GPS/GIS Mapping of farmer land records" simplifies the problems such as paper loss, data conflicts and other problems by avoiding the paper work. It also enables easy management of land records.

II. LITERATURE SURVEY

In this study related to GPS/GIS Mapping of land records, I have done the research and found that there are few papers on similar systems being used. "*GPS-based system for handling information*" is a system published by United States of America [3]. The system maps agricultural field and divides the map into management zones. The GPS coordinates are used to define the boundaries of the management zones. With respect to each management, GIS record is created.

Another paper that is published by Z Ahmed on "*Smart land record application using web GIS and GPS*" [4] to avoid duplication. Existing land record management is manual process running under supervision of Board of Revenue.

The survey also includes the study of Bhoomi - Karnataka Land Records (RTC) [5] by revenue department of Karnataka government. And the study of android application "DISHAANK" [6] launched by revenue department of Karnataka government.

A. GPS-based system for handling information:
The system organizes and combines the land information and GPS map. The system designed to map agricultural fields and analyse the crop. It first designs the map and divides the map field into management zones. Geographic Positioning System (GPS) coordinates are used to define the management zones. Monoculture risk factored lands are put under management zone with respect to crop failure. For each management zone GIS record is created and relevant agronomic information is associated with the record. These GIS records are useful in verifying and accumulating carbon credits.

➢ *Review*
The system gathers and organises the information related to a parcel of land, creates a map for land parcel by connecting GPS coordinates of its boundary. Then creates a GIS record with fields to input information related to the land parcel and inserts information to the identified fields of land parcel.

This invention helped insurance providers who provide crop insurance. The system gathers information form farmer land and provides accurate risk rate to evaluate the risks associated with each insurance policy. So that it increased the profitability of insurance providers. It also helps to encourage the farmers to practice cultural farming

to reduce the crop failure risk. The system is useful for farmers to succeed with reporting requirements.

B. Smart land record application with web GPS/GIS

The application makes use of internet to send information. Iinitially the Smart Land app brings data from manual to digital. GPS, GIS and Database indexing is used to manage the land resource data. The system generates GPS coordinates based on boundary of a patch of any size and shape while walking along the boundary by holding active GPS device. The application helps to control illegal land expansions and shrinkages by moving physical boundaries (more often the case in agricultural land, rural areas etc.). This Smart Land app helps users by giving more accuracy, accessibility and portability. The advantages of the land record management system are identifying unallocated land, detection of duplicate ownership, allocation of resources, reducing corruption and centralized database for the system.

➢ *Review*

Smart land application is designed with user friendly features. The application converts the land data into digital form, so that data can be stored and indexed in database. GPS coordinates for respective land is captured by the GPS device for any shape on behalf of physical location of device while moving along the boundary.

This programme can be utilized by the government to identify fake/duplicate land ownership, assessment of resource, taxation history, geographical structure of land with the help of centralized database structure. This information is useful during the management of illegal land property and unused land area.

i. Digitization and Data Storage:

Land records can be digitized of done in two phases. In the first phase land data is inserted. In the second phase, land map needs to be captured. The handmade map in the current system can be digitized with the help of GPS mapping and GIS techniques. The GPS coordinates are captured to measure the patch boundaries during physical survey. These boundaries are stored in the form of GPS coordinates and centroid for each patch is calculated, stored and indexed in spatial database.

In order to get accurate boundary, surveyor needs to move along the boundary of land area by holding GPS device in hands. GPS device stores the coordinates in sequence. After the verification data moved to spatial database. It generates a warning message to surveyor if any boundary overlap with neighbour land.

ii. Searching:

Searching is performed according to the centroid indexing. To search any patch user needs to enter or select the patch manually. According to the search, the system finds accurate value of a centroid and sends coordinates of patch to the application. Map is drawn with respect to received coordinates along with the owner details.

C. Bhoomi – Karnataka Land Records (RTC)

"Revenue Department of Karnataka Government" has made all the land record details online through "Bhoomi" portal in the year 2000. All land papers such as Record of Rights, Mutation Report, Tenancy and Crops (RTC) or Pahani were digitized and made accessible to citizen/farmer through "Kiosk Centres". All lands can be digitally mapped using Revenue Maps exists in "Bhoomi" Portal.

➢ *Review*

The "Bhoomi" (meaning land) is an online portal to get land records in Karnataka. Preface of "Bhoomi" making the Govt land records more exposed to citizens of India. The "Revenue Department of Karnataka" has digitized land possession of farmers in this portal.

The following documents are given to the citizen/ farmers through "Kiosk Centers".
- RTC
- Mutation Extract
- Mutation Status
- Tippan

i. Bhoomi Portal for Farmers:

"Bhoomi" system is very usefull for farmers in Karnataka. A farmer can now avail following facilities from Bhoomi.
- Apply for loans or any other purpose a farmer can easily get a copy of land records through "Bhoomi".
- Can get printed copy of the Record of Rights, Tenancy and Crops (RTC) can be obtained online by giving the name of the land owner or plot# number.
- Farmer can access modification request to alter land records or check request status (during sale or inheritance of land) in "Bhoomi".
- If the revenue superintendent does not complete the modification within 50 days, a farmer can request another officer at the Taluk level to complete the modification request.
- Insuring, claim purposes became easy due to the availability of crop details online.
- Bhoomi enables quicker decision for land disputes essential by courts such as notices issued for mutation to affected parties.

ii. RTC-Record of Rights, Tenancy and Crops:

RTC stands for "Record of Rights, Tenancy and Crop Information". RTC/Pahani has details of land (farming land).The following details are available on "Bhoomi portal".
- Land owner details
- Land type
- Area of land
- Water rate
- Soil type
- Agricultural, commercial, non-agricultural residential flood area
- Nature of ownership of the Land
- Liabilities
- Tenancy

- Crops grown

iii. Mutation of Property in Karnataka:

Mutation or Modification is a process of changing the possession of a land from one person to another when the property needs to be transferred. To apply mutation the citizen / farmer has to visit "Kiosk centre" & apply for mutation by giving an application and documents of land. Acknowledgement number will be given by Kiosk. The citizen/farmer can get the status of mutation with the help of acknowledgement number.

D. DISHAANK app

"DISHAANK" is a new application launched by the revenue department of Karnataka. This application offers survey information related to any land asset existing in the Karnataka government's records. Any person who belongs to Karnataka can find the particulars of land asset in the Karnataka State using this survey app. It allows to find whether a patch of land is a dry land, wetland, lake or drain or a government land. It is said that almost 70 lakhs survey numbers are collected and about 2.5 million assets are translated wherein the type of land has been clearly marked.

III. EXISTING SYSTEM

Existing system to manage farmer land records in APMC is manual process. Which involves traditional land record management process. At the time of applying for loan, the land for gage is manually verified by the authority and paper records are maintained.

➢ *Limitations of existing system:*
- Paper records may damage due to insect infestations, fires, floods and many other reasons.
- Difficult to manage the record folders, may lead to loss of record or may be difficult to find documents.
- Less secured.

IV. PROPOSED SYSTEM

The proposed system makes use of information technology. Which is easy to manage and maintain the information with the help of computerised records. It enables APMC authorities to gather and organise the land records including the geographical layout for each farmer land.

- The GPS/GIS Mapping of land record application should fetch the farmer details and must able to record the GPS co-ordinates of land.
- The GPS co-ordinates of land must be captured by the authorised person from the authority and verified map will be stored in database.
- The records must be accessible as required with easy search methods.

V. SYSTEM ANALYSIS

A. Interfaces required
- *Login*: Authentication must be provided for authorised access.
- *Fetch farmer details:* The user must able to fetch the farmer details with the help of unique identity (Aadhar number).
- *Get co-ordinates:* If the land mapping is not available, user must able to get the GPS co-ordinates of land with the help of android smartphone by moving throughout the border to capture the co-ordinates.
- *Start/Pause/Resume buttons:* Application must provide an interface to capture the co-ordinate when the location is changed. User must able to stop getting co-ordinates temporarily and resume where previously stopped as required.
- *Update co-ordinates:* After finalising the captured land co-ordinates, the mapping must be updated to the server.
- *Map:* Co-ordinates of land lot mapped with the help of google API.
- *Web page:* The updated co-ordinates and land details must be available in web page.
- *Logout:* After using the application user must able to logout.

B. Module Specification

➢ *Login*

Authentication process must be done before using the application. User must able to use the application only after the successful login with username and password. This module is required in both android application and web application.

➢ *Search Land Lot*

To search any land lot# user must enter unique lot number assigned to land. Searching needs to be done to view existing land map or to add new map. In android application search options for view record and add record are required. In the web application only view record option must be designed.

➢ *Land Mapping*

This module must be designed only for android app to capture the GPS co-ordinates of land while adding new land mapping. The various options required in this module are specified in the functional requirements. The co-ordinates must be verified and uploaded to the server.

➢ *View Map*

This module is required in android and web application. The land mapping captured must able to view when required along with other details of land and detail of owner.

➢ *Delete Record*

Deleting the existing land map needs to be performed as required.

C. Feasibility Report

According to the study on GPS/GIS mapping system in different sectors, it is possible to understand the benefits of this technology to avoid the problems faced during the traditional land record mapping system. With the help of remote servers, it is possible to store the information reliably secured and consistent.

On behalf of users (APMC), "GPS/GIS mapping of farmer land records" application will be very fast compared to traditional mapping system. With the help of an android smart phone, user can capture the GPS co-ordinates continuously by moving throughout the border. The captured co-ordinates are recorded in the device and mapping of land lot generated automatically. After verifying the map generated, it can be directly uploaded to the remote database along with other details of land and owner. This information should able to retrieve easily as needed.
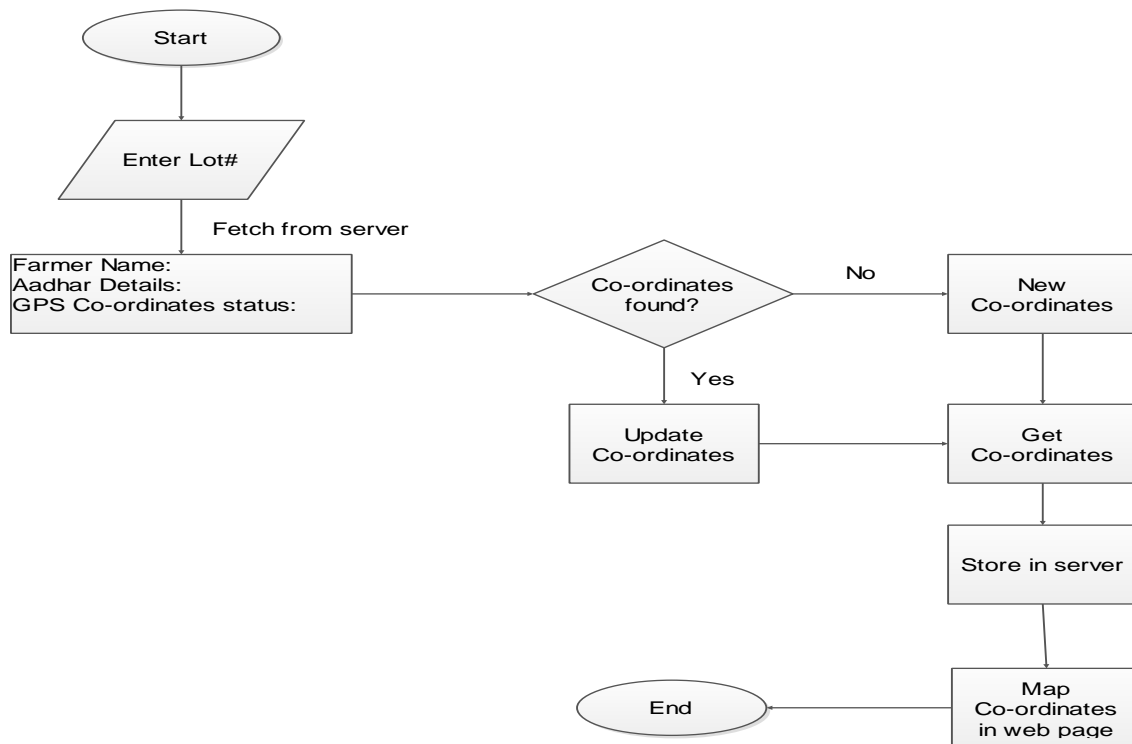

Fig 1:- System flowchart

So, the system can be implemented practically, worth of time and fast processing. The system can be implemented easily with simple execution methods.

Following steps describes how to use the system.
Step 1: Login.
Step 2: Fetch the details from server.
Step 3: GPS Co-ordinates are fetched with the following interface:
- *Start Button* - to get the co-ordinates as location changed.
- *Pause button* - to temporarily stop getting the co-ordinates.
- *Resume button* - to start getting the co-ordinates where previously stopped.
- *Clear button*- to delete all coordinates captured.
- Upload button- to upload mapping to the server after manual verification.

Step 4: Update the co-ordinates to the server using upload button.

VI. IMPLEMENTATION

The below diagram shows the implementation of interface to capture the land map and to view the land details along with the mapping.
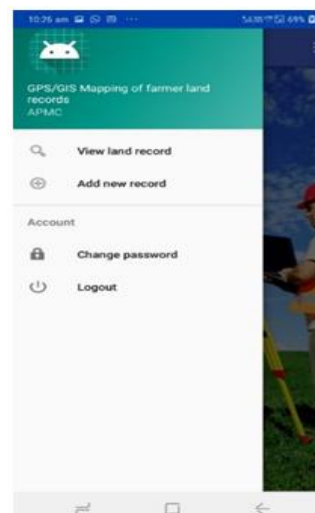
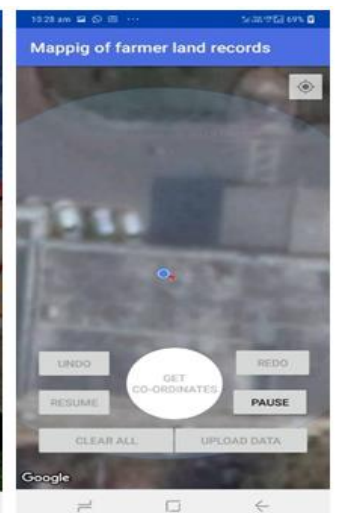

Fig 2:- Dashboard

Fig 3:- Capture land map

Fig 4:- View land details(Map)

Fig 5:- View land details(Land)

Fig 6:- View Land details(Owner)

Along with the android application developed a web application to view the land records.

This programme can be utilized by the government to identify land ownership, geographical structure and other details of farmer land with the help of centralized database structure. This information is useful during the loan disbursal or repayment process in APMC.

VII. CONCLUSIONS

GPS/GIS mapping of farmer land records" application will be fast compared to traditional land mapping system. With the help of an android smart phone, user can capture the GPS co-ordinates continuously by moving throughout the border. The captured co-ordinates are recorded in the device and mapping of land lot generated automatically. After verifying the map generated, it can be directly uploaded to the remote database indexed with the other details of land and owner. This information is able to retrieve easily as needed.

A. Limitations:
- The system gives accuracy problem because of signal degradation due to disruptions such as trees, buildings, bridges, etc.
- Manual verification is must to ensure that the captured land map is accurate.

B. Future Scope:
- "Triangulation algorithm" will be used to solve the accuracy problem.
- Automatically validating the captured map to avoid boundary overlap with neighbor land by using RTC records.

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