

Socio-Economic Data Acquisition Using Mobile GIS Technology (EPICOLLECT)

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Abstract- The present study focuses on the socio-economic profiles of households in Rayalaseema region through the collection of sample tanks data using Epicollect (open source mobile GIS software) application. Comprehensive improvement of household's economy was studied by surveying tank systems including restoration, improvement of catchment areas and ground water recharge etc. It considers the farmers and landless households, the socio-economic features such as class and community composition, literacy and employment, income, expenditure and asset structure. Sample tanks data was collected and analyzed using Epicollect, which is the mobile GIS software application compatible with android mobiles. A classification of sample households according to land holding sizes showed that nearly 31% fall in the category of marginal farmers. The small and medium farmers vary from 20% and 6%, respectively. The large farmers are very less in number i.e., 4%. The landless households in the project area constitute nearly 39%. It can be seen that the small and marginal farmers together form a little above 51% of the total farmers in sample tanks, whereas large farmers are less in number. The farmers in the medium class are significant in sample tanks. The ratio of females to males is 0.88.

Keywords- Mobile GIS, Epicollect, Sample Tanks, Rayalaseema, GIS, Farmers

I. INTRODUCTION

In India, tanks/ponds and lakes have traditionally played an important role in irrigation, drinking water supply, hydropower, ecology, tourism/culture and domestic use. Relative importance of some of these water bodies has wanted due to a number of reasons such as shifting away from community based tank system to individual beneficiary oriented ground water dependent system, encroachments, silting, population pressure, multiplicity of agencies responsible for their upkeep, etc. Epicollect is an open source and freely available software based on Android frame work for mobile applications. It provides the data collection facility

from the field through smart phones (Aanensen et al., 2009). The Design of Epicollect is generic and can be used to modify it, according to our own requirements. It communicates with its web application located at Epicollect.net (Epicollect.net) provides a map interface for display and analysis of data, including, Google Maps and Google Earth. Keeping in view of the generic structure, authors encourage to modify the program including the parameters for selected tanks e.g. villages using irrigation tanks, number of people to living and other information about tanks. The study area selected is Rayalaseema region of Andhra Pradesh (India), which is shown in Figure 1. Rayalaseema is a geographic region in the Indian state of Andhra Pradesh. It includes the four southern districts of Ananthapur, Chittoor, Kadapa and Kurnool. As of 2011 census of India, the region with four districts has a total population of 15,184,908 and covers an area of 67,526 km². Interaction among different components of Epicollect is shown in Figure 2. This section explains about the proposed smart phone based solution for post disaster activities. The proposed framework is based on Android operating system, which is open source software from Google (Asif et al., 2012). Open source software (OSS) is technically defined as programs whose licenses give users the freedom to run the program for any purpose, modify the program, and redistribute either the original or modified program without any limitations (www.opensource.org). An increasing number of organizations have chosen and deployed software in order to fill their informational needs (Jing et al., 2008; Adamala et al., 2016).

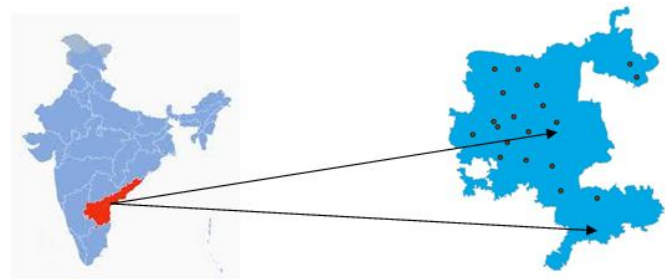


Figure 1 Study area

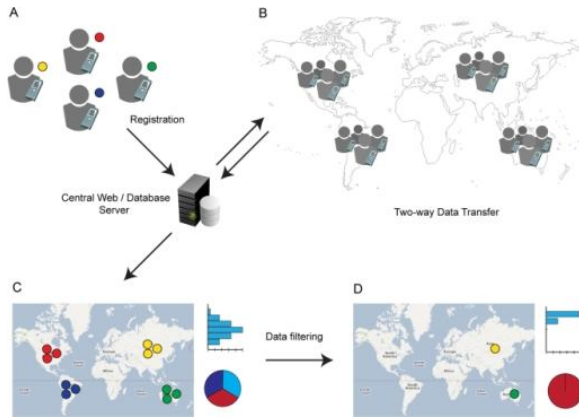


Figure 2 Interconnectivity in Epicollect framework

Methodology

The Epicollect is a free open source software application for collecting, storing, and exporting real-time data from remote rural areas across the globe for monitoring economic profile surveillance of rural people as well as resource mapping. The purposed framework for socio-economic data acquisition consists of smart phone with Android operating system along with basic phone functionalities; this smart phone is Global Positioning System (GPS) enabled and is capable of taking the location of a particular tank. Figure 3 shows the abstract diagram of the proposed frame work and it has the following components. The most important and the key component of framework is the application on the mobile phone with capability of gathering the information related to Households, formers and their economy. This application will be helpful to capture the data about number of households living under the tank, their economy, literacy and other sources of income. The proposed application will have power to get this information and store it into local memory of the smart phone which can be sent to the central server later on when phone get connectivity to the base station. If there is any immediate modifications in the program by higher authorities the modifications can be done immediately in the master station, so the everybody can update their modified application from the server immediately can continue the data collection without any delay. This type of application helpful to get real-time data by reducing cost and time.

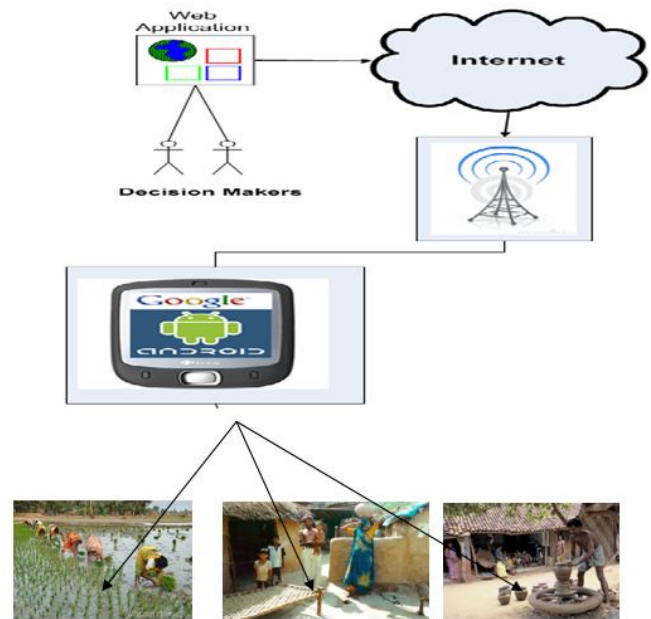


Figure 3 Socio-economic data collection system design diagram

The first thing is you have to create your own project website with an identical name through the link that is free hosting on Epicollect server. Once after creating your own project, you can login using Google mail account on a computer with internet connection. You can design a form/questionnaire for data collection as per research interest. Epicollect entries usually include the GPS location and a photo, however in order to collect text data you should specified them in the form designed. Downloading and installing of Epicollect software onto the mobile handset then the project(s) should be loaded onto the handset. To download Epicollect, visit App Store on the handset and search for Epicollect. To load a project onto handset, it needs to be connected to either a mobile data network or to a wireless network but once after loading not necessarily to be connected during data entry at the field. When Epicollect is launched on the mobile phone three options are initially available, 'New Entry', 'List Entries' and 'Display Map'. By selecting 'New Entry' you can creates a new data record within the phone's on-board database and assigns a unique ID to the record.

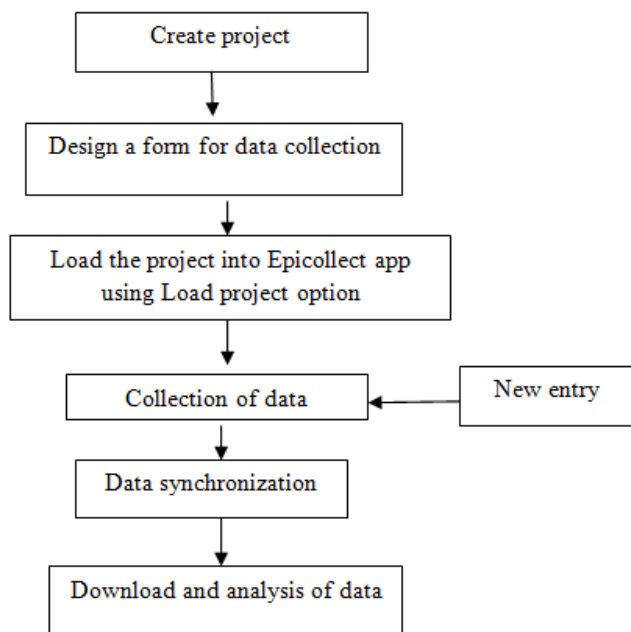


Figure 4 Flowchart of methodology followed for data collection and analysis

After successful entry of necessary data, one can amend the look and feel of his/her homepage by adding some explanatory text about your project and upload an image through login the project website. The data collected can be viewed as plain text which includes a number of options for exploring data synchronized.

II. RESULTS AND DISCUSSIONS

Households were divided into 5 classes (Table 1) based on land holding they were marginal, small, medium, large, and landless in the sample tanks. In this study, the marginal formers are 27.13%, small farmers 17.26%, medium farmers 10.96%, large farmers 10.77% and landless 33.88%. The total numbers of farmers are 2665.

Table 1 Class wise number of farmers

Class	Male Headed Households	Female Headed Households	Total	% to Total
Marginal	699	24	723	27.13
Small	450	10	460	17.26
Medium	287	5	292	10.96
Large	287	0	287	10.77
Landless	824	79	903	33.88

The gender wise break-up of the household heads indicate that the female headed households constitute only five percent of the total sample households. It may be interesting to note that a majority of the female headed households belong to the small and marginal classes and the landless category.

Table 2 indicates that majority of the farmers belonging to marginal and small farmers (83%) followed by medium farmers (10%), whereas large farmers are at 7% and they spread over all the reaches. Large farmers in the tail end area are nearly same as head and middle reach.

Table 2 Reach wise and class wise farmer’s constitution

Reach	Marginal	Small	Medium	Large	Total
Head	248	156	41	31	476
Middle	246	143	55	33	477
Tail	229	161	48	29	467
Total	723	460	144	93	1420
% to Total	50.92	32.39	10.14	6.55	100

A look at the classification of sample households according to caste/community (Table 3) reveals that the backward communities form the majority in sample tanks at the aggregate level. The BC households form nearly 63% sample tanks. The SC and ST households are 11.3% and 6.7%, respectively. The forward communities (OC) constitute nearly 19% in the project area.

Table 3 Community-wise distribution of sample households

Sl. No.	Communities	Percentage
1	SC	11.3
2	ST	6.7
3	BC	63
4	OC	18.9

That is to say that a large majority of the project beneficiaries belong to the vulnerable sections of the society. The population data of the sample households (Table 4) indicate an average household size of 5.0. The male population is 53.1% and female population is 46.9% in sample tanks.

Table 4 Population of households

Sl. No.	Particulars	Total number
1	No. of households	2323
2	Males	5516
3	Females	4866
4	Total population	10382
5	Male (%)	53.1
	Female (%)	46.9

The level of literacy of the population (Table 5) shows that 34% of males and 53% of females are illiterates. Among the males, 18% have dropped out after primary

education, 16% have reached up to middle level, 14.1% reached up to SSC level, only 8% males studied up to intermediate and 10% males are over graduates. Among the female population, a little above 16% had primary education and 14% had middle school education. Those who reached secondary school are only 9%, and studied up to intermediate only 5%. Among women, 3.5% are graduates. It is found that females also reached up to primary level nearly same as males.

Table 5 Literacy status of sample population

Sl. No.	Literacy Level	Male (%)	Female (%)
1	Illiterates	34.1	53.11
2	Upto Primary	18.34	15.93
3	Upto Middle	15.74	13.9
4	Upto SSC	14.16	8.59
5	Intermediate	8.06	4.93
6	Graduation and Above	9.59	3.56

The annual incomes of households show that among the farmers, medium class has the highest income and the small farmers have the lowest income. The medium households in the tank areas have an annual income of Rs. 336255/- and the small farmers have an income of Rs. 89729/- per annum. The income of the land less households was found to be lowest with an average annual income of Rs. 62351/- per household (Table 6).

Table 6 Annual household and per capita income class wise

Sl. No.	Size - class	Population	
		Per Household	Per Capita
1	Marginal farmers	273356	51043
2	Small farmers	89729	22829
3	Medium farmers	336255	80034
4	Large farmers	136910	36800
5	Landless	62,351	15010
	All	898601	205716

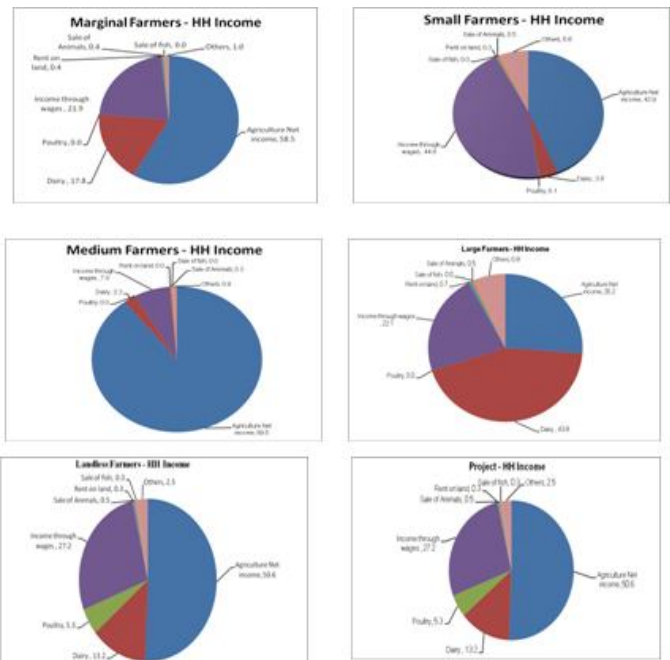


Figure 5 Income class wise through various means

III. CONCLUSIONS

Socio-economic study of households in Rayalaseema region is studied by using open source mobile GIS software called 'Epicollect'. Various data such as catchment areas, tank systems, landless households, socio-economic features such as class and community composition, literacy and employment, income, expenditure and asset structure was fed into the system to categorize the status of farmers. The survey indicated that there are 31%, 20%, 6%, 4% and 39% farmers fall under marginal, small, medium, large, and landless household's classes, respectively as per land holding sizes. Further, male and female ratio and annual income of different classified farmers is analyzed in this study.

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