METHODOLOGY APPROACH TO DEVELOP GEOINFORMATICS BASED VILLAGE INFORMATION SYSTEM

Dr.Sambhaji D.Shinde
Department of Geography,
Chh. Shivaji College, Satara.
Sambhajishinde3@gmail.com

Pradip Saymote
Department of Geography,
Willingdon College, Sangali.

1. Introduction:

Geoinformatics is having huge range of applications associated with Geography, Geology, Environmental Sciences, Physics, Utilities, Planning and Development, Military, etc. Village Information System is one of small scale application which is integrated part of GIS, GPS and Remote Sensing. This application is designed to store the data in digital format and maintain the database of village. This system is helpful in Administration process and also work as a Decision support system. VIS is a multipurpose system which help local government officers, policy makers, researchers and common person who is associated with the information.

This system contains all informative and important records about the village. The data is related to Agriculture, Land Records, Ownership details, Economic minutes on land parcel, Crop detail, Tax information, Demographic structure, Social information, etc. This type of project is becoming the demand of time hence government is also proceeding in this direction.

In India more than 70% of population is living in village and economy of village is totally depends on agriculture. Like agriculture there are many other important aspects available in village those are also equally important. Hence the information of these features should maintain systematically. The data and methodology is considered as a backbone of all research and planning activities. The development of this system is made by multi-dimensional methodology rather the success of this project is for skilled adopted methodology approach.

2. Study Area

The study region selected for the research work is a village "Savali". This is a small village located in Miraj taluka of Sangli district within coordinates of 16^0 46' 28" to 16^0 53' 45" North Latitude and 74^0 31' 08" to 74^0 40' 51" East Longitudes and coveres 536 hectors area. This village is 7 km's from Sangli and 6 km's from Miraj at triangular location near Maharashtra Industrial Development Corporation (M.I.D.C.) sector.

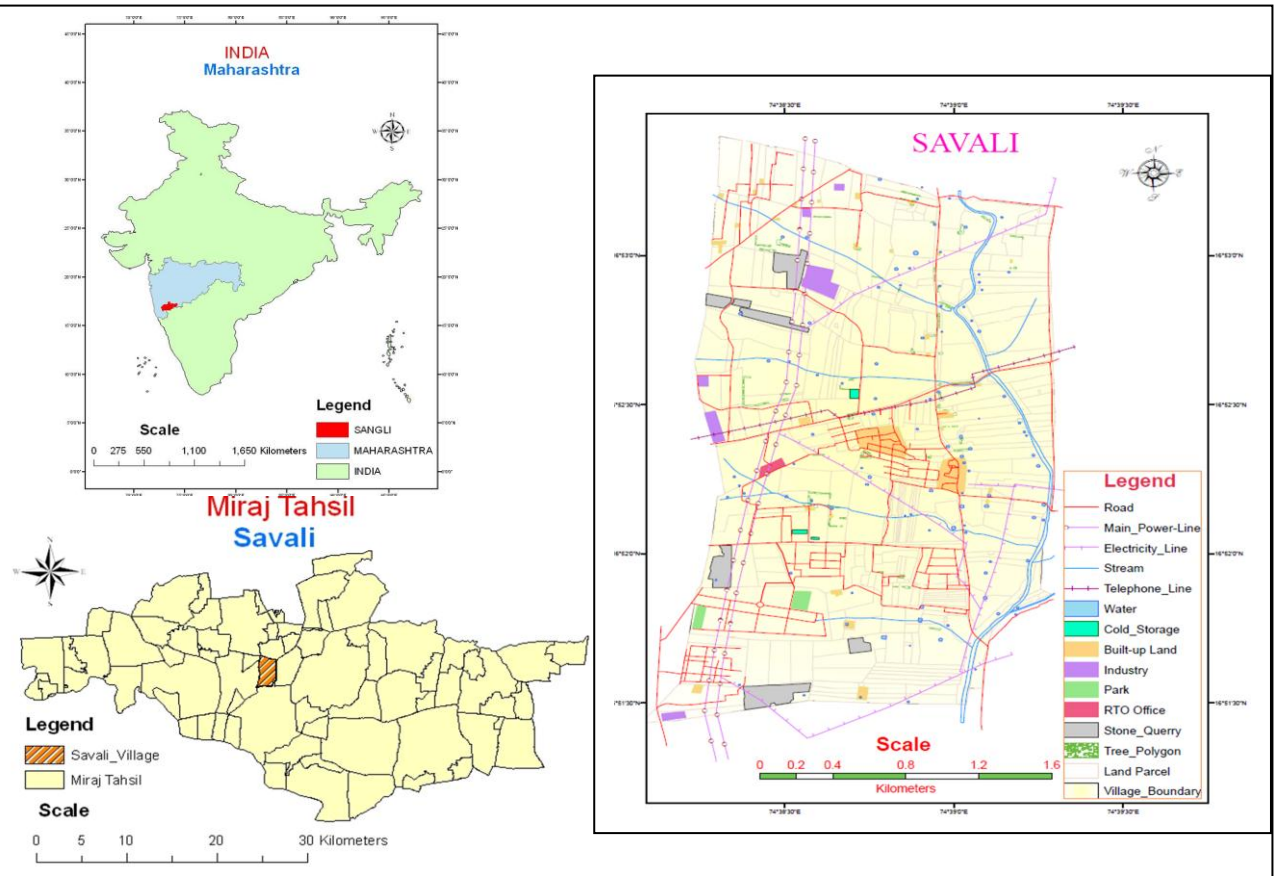


Fig. 1 Location Map of Study Area

The data plays central role in all kind of studies and research activities. This study is carried out with the help of both primary as well as secondary data.

3. Data:

In this study both primary and secondary datasets are used.

3.1 Field Survey

The agricultural landuse survey is conducted to collect crop data. The personal field visits are made to all agricultural land parcels to collect the data.

3.2 Soil and Water Survey

To study the present soil and water condition few sample are collected by conducting a survey. The pH values of soil and pollutant parameters in the water are tested.

3.3 Questionnaire Survey

The information about individual family, demographic structure, educational background, available facilities in village, the problems facing to the society, etc are collected through Questionnaire survey.

3.4 GPS Reading

GPS is used to collect the coordinates for georeferencing of a cadastral map and ground truth verifications.

3.5 Interview

The informal interviews are conducted to get information about the impact of M.I.D.C. on the village and other eco-geographical factors.

4 Secondary Data:

4.1 Survey of India Toposheet

The Survey of India Toposheet is used as a base map for creation of various data layers and information. Toposheet Number 47L9/NE [Quadrangle A-3] and 47L9/SE [Quadrangle A-1] is utilized for this study.

4.2 Satellite Images

The high resolution satellite images are taken from Google Earth and implemented for data generation as well as mapping purpose.

4.3 Cadastral Map of Savali Village

Since study area is small in size Cadastral map is main source for some information. Survey number parcels, Village boundary, Gauthan limit, old housing structure etc information is captured through the cadastral maps.

4.4 Study Reports

The survey reports done on village Savali by department of Geography, Willingdon College Sangli are used as a reference in present study.

4.5 District Census Handbook (1971, 1981, 1991, 2001)

The demographic data of the village is taken from the District Census Handbook. Total population, age structure, male female ratio etc information is taken from the district census handbook.

4.6 Socio-economic Review and District Statistical Abstract of Sangli District

The data related to socio-economic is taken from the Statistical Abstracts. The Sangli District Statistical Abstract is of 2006-07, 2007-08 is also used as source

4.7 महाराष्ट्र भूमि अभिलेख (महाभूलेख) [Web: mahabhulekh.com]

This web site gives information about the dynamic of land information for each land parcels in the village. Website http://164.100.111.5:8080/mahabhulekh/ consist information about ownership, land record details, crop details (for the time of website developed), economic condition etc. This information is fully authentic and reliable.

4.8 Other data

The above mentioned sources are the main data sources. Other than that some other sources like telephone directory, updated election voters list, house ownership record, etc are used, these all are valid sources of information.

5. Methodology

The selected study topic is dynamic and contains variety of data hence this study made by combining many methods together. Some places traditional geographic methods are used and some places help of Geoinformatics is taken to reach the set goals. Following are the flow charts which illustrate the overall methodology of the study.

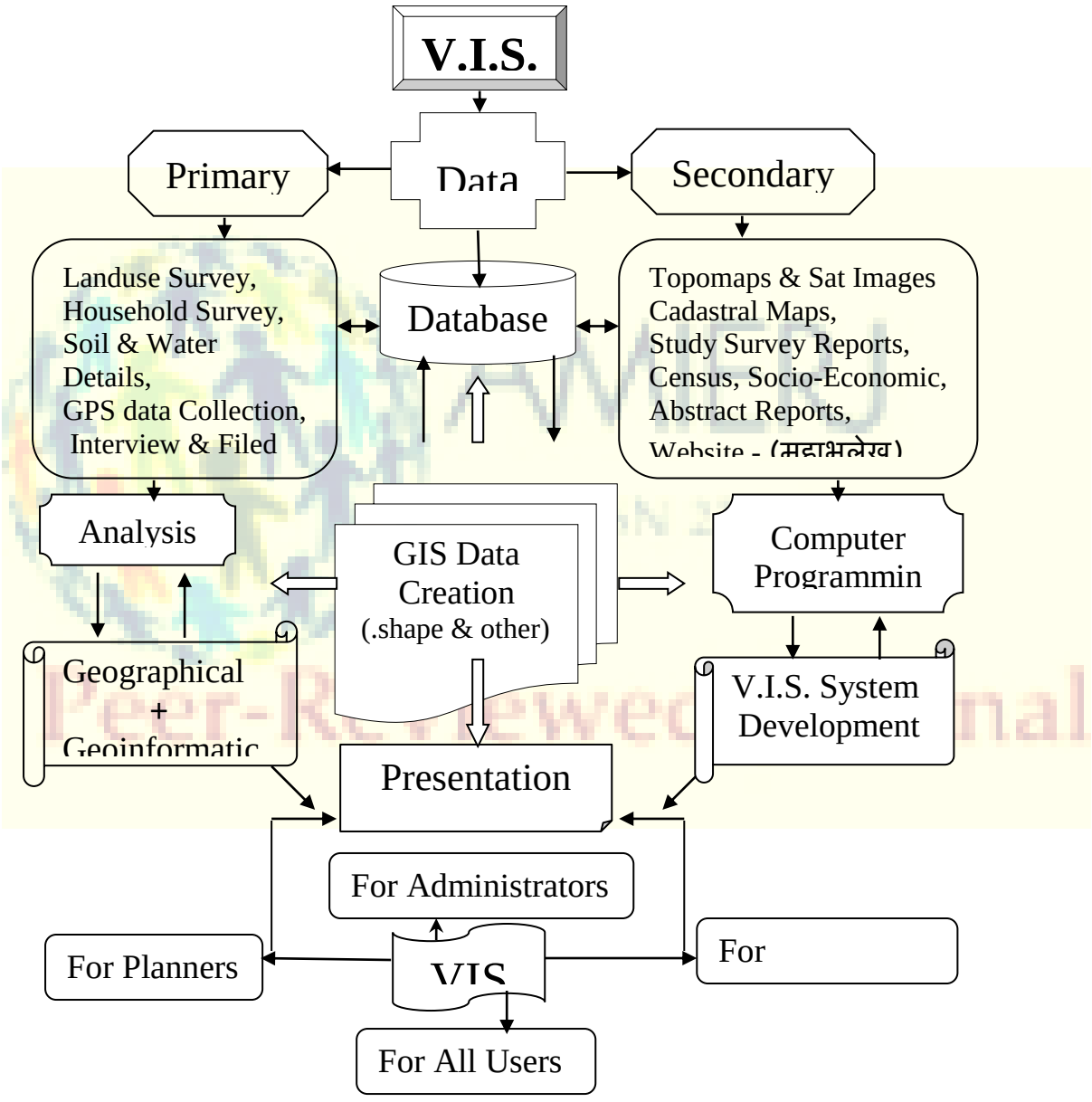


Fig. 2 Methodology and Work process

5.1 Field Work

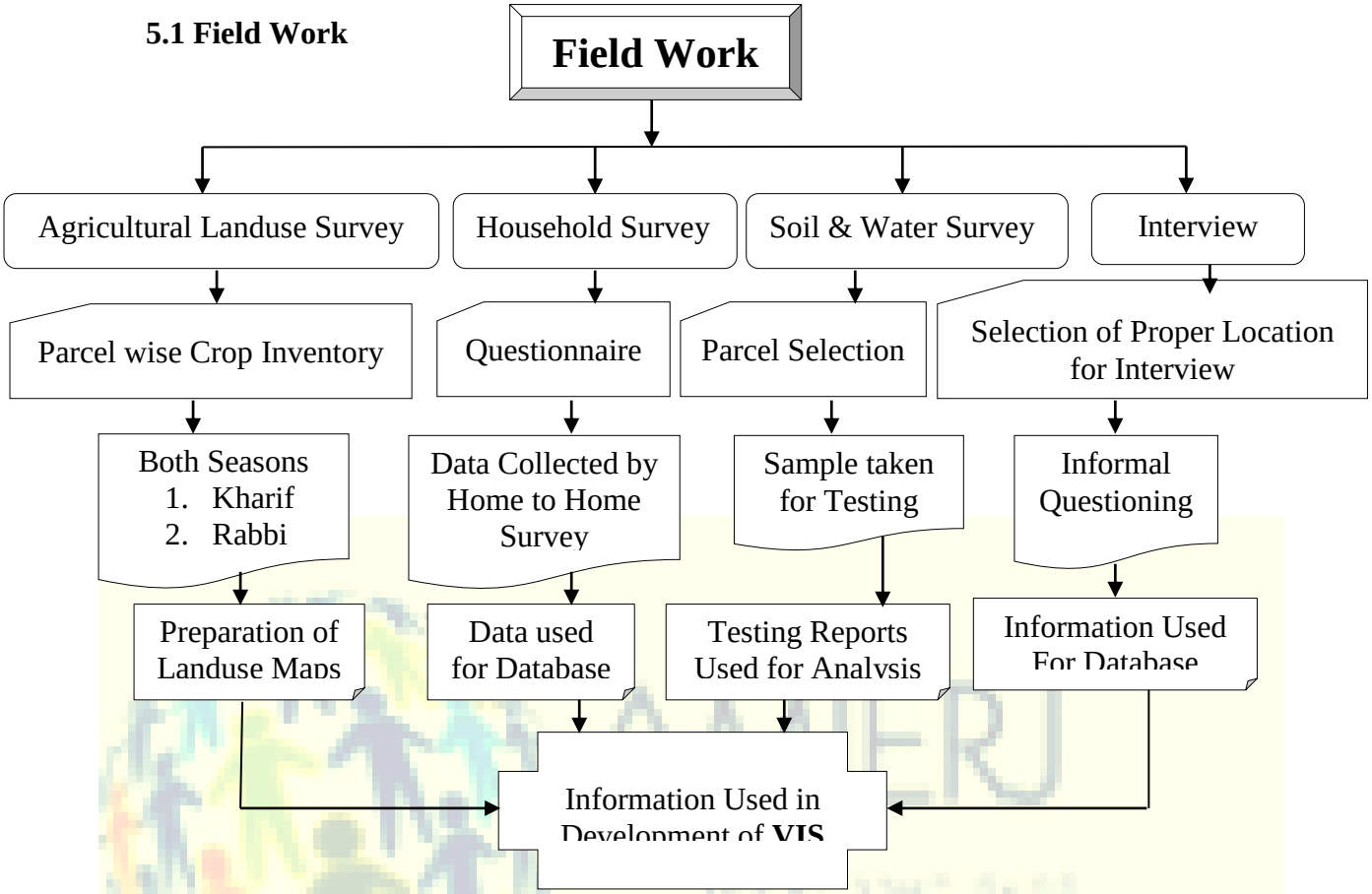


Fig. 3 Field work and Primary data collection

The field work is having central position in the development of information system. Hence intensive field work is carried out to fulfill this study. Fig. 3 depicts the methodology adopted for collecting primary data.

5.1.1 Agricultural landuse survey: The parcel wise crop inventory is carried out to check the crops produced in Kharif and Rabi season. Based on this data detail agricultural map is prepared which is further used in analysis.

5.1.2 Household Survey: The detail information of individual house is collected through systematic schedule and same information is stored in database for its use.

5.1.3 Soil and Water Survey: The soil and water are the important aspect so this information is collected from few samples. In this connection filed visits are made and data is collected.

5.1.4 Interview: The information which is needed but can not be collected directly is gathered by informal interview.

5.2 Data Generation from Google Earth

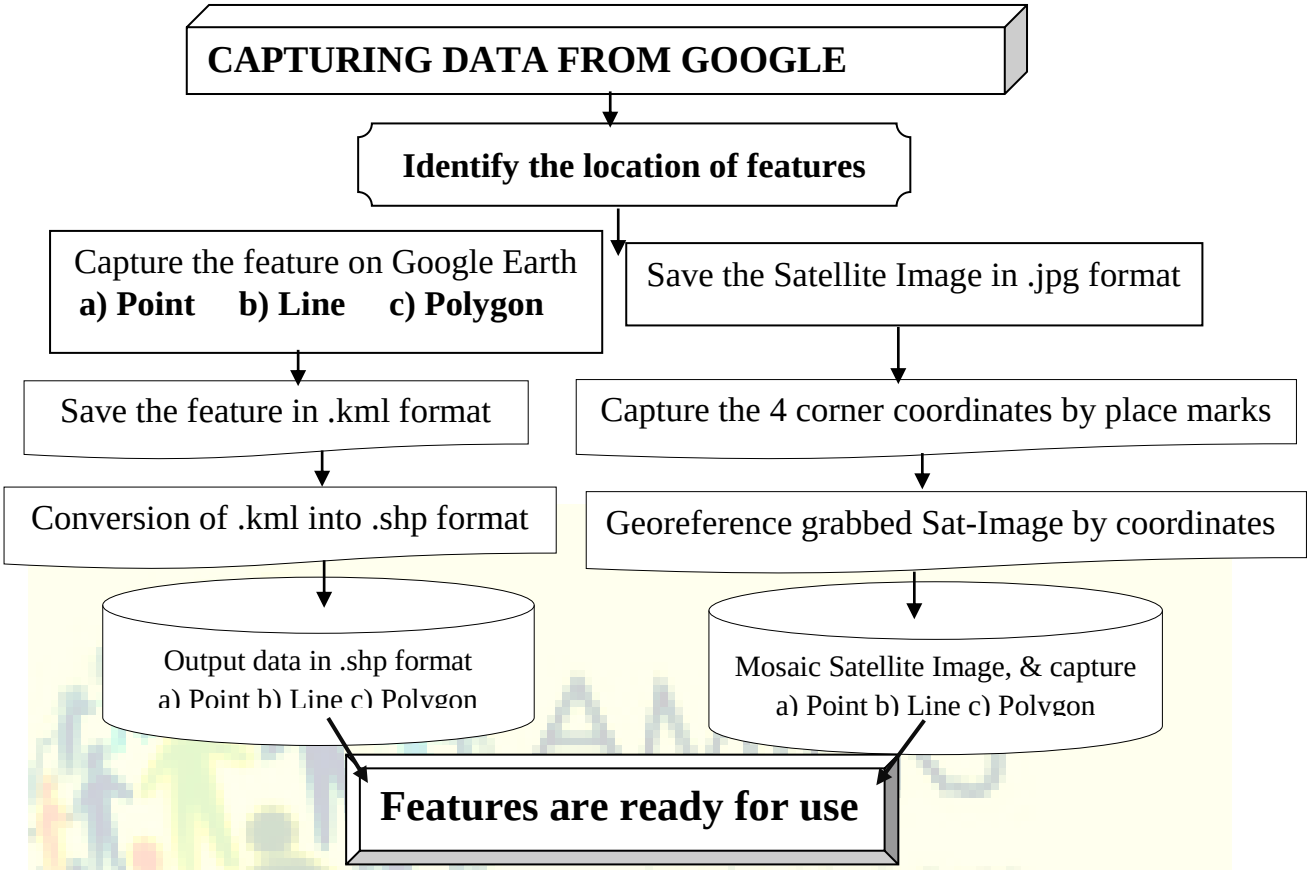


Fig. 4 Google Earth Work Flow

Google Earth is an application developed by Google which is having Satellite image view for the user. This application is very much useful for generating a spatial data of earth surface. In this study this application is used for two purposes i.e. online work and image preparation of offline task.

The spatial features are captured in the form of point, line and polygon. The individual houses, roads, open land, water tank, etc features are digitized from this source. The features are stored in its internal format i.e. kml (Key whole Markup Language) which is further converted in to shape and finally used in the system development.

Same time for offline task the satellite image needs to be prepared. The satellite image is prepared by combining several patches of images. In this concern individual snaps are taken thereafter coordinates of four corners for each image are collected. Using these coordinates individual snaps are georefernced. All georefernced snaps are mosaic into one image which represents the entire area of village Savali. This image is further used wherever offline digitization was needed.

5.3 Database Generation

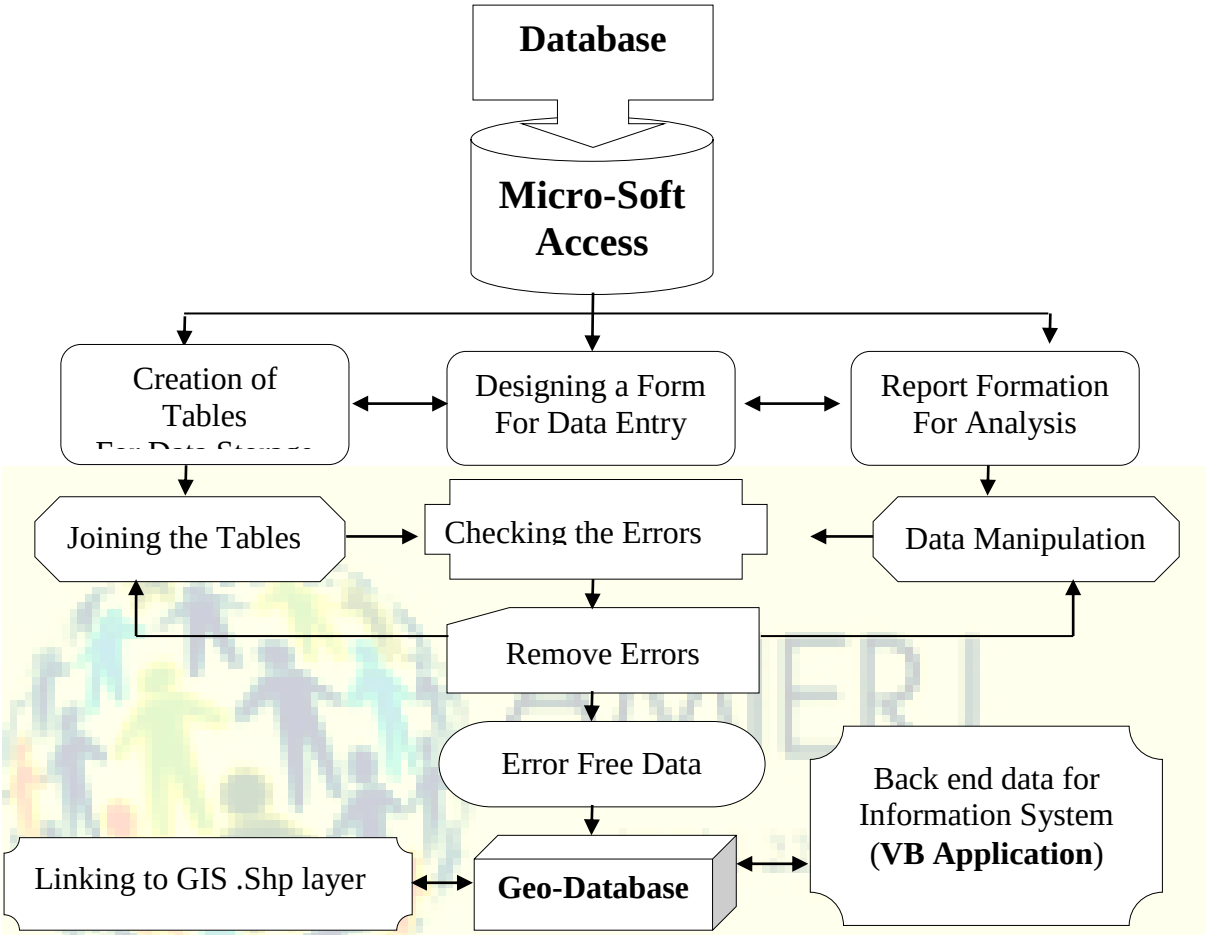


Fig. 5 Development of Database

In development of VIS, database is playing a central role hence one complete Geo-Database is generated. There are several database software are available in market and user can choose according to need of project. In this study Microsoft Access is used to store the database. Initially structured tables are prepared to store the data and for data entry related forms are designed. The tables are linked to forms and data entries of few aspects are made through forms. The occurred errors are checked and solved accordingly. The access is also used for generating several reports. The error free data is further supplied for Geo-Database formation. In this process the spatial features available in shape format are also utilized. In the back end computer programming language i.e. Visual Basic is applied to develop and application. This application is linked with the database developed in MS-Access. In short the database is generated with the support of attributes available in shape file, data stored in Microsoft access and these are linked each other by customization carried out by applying

Visual Basic. The prepared dataset becomes very strong and contains the information about spatial and non-spatial attributes related to village Savali.

5.4 Application Development through Programming

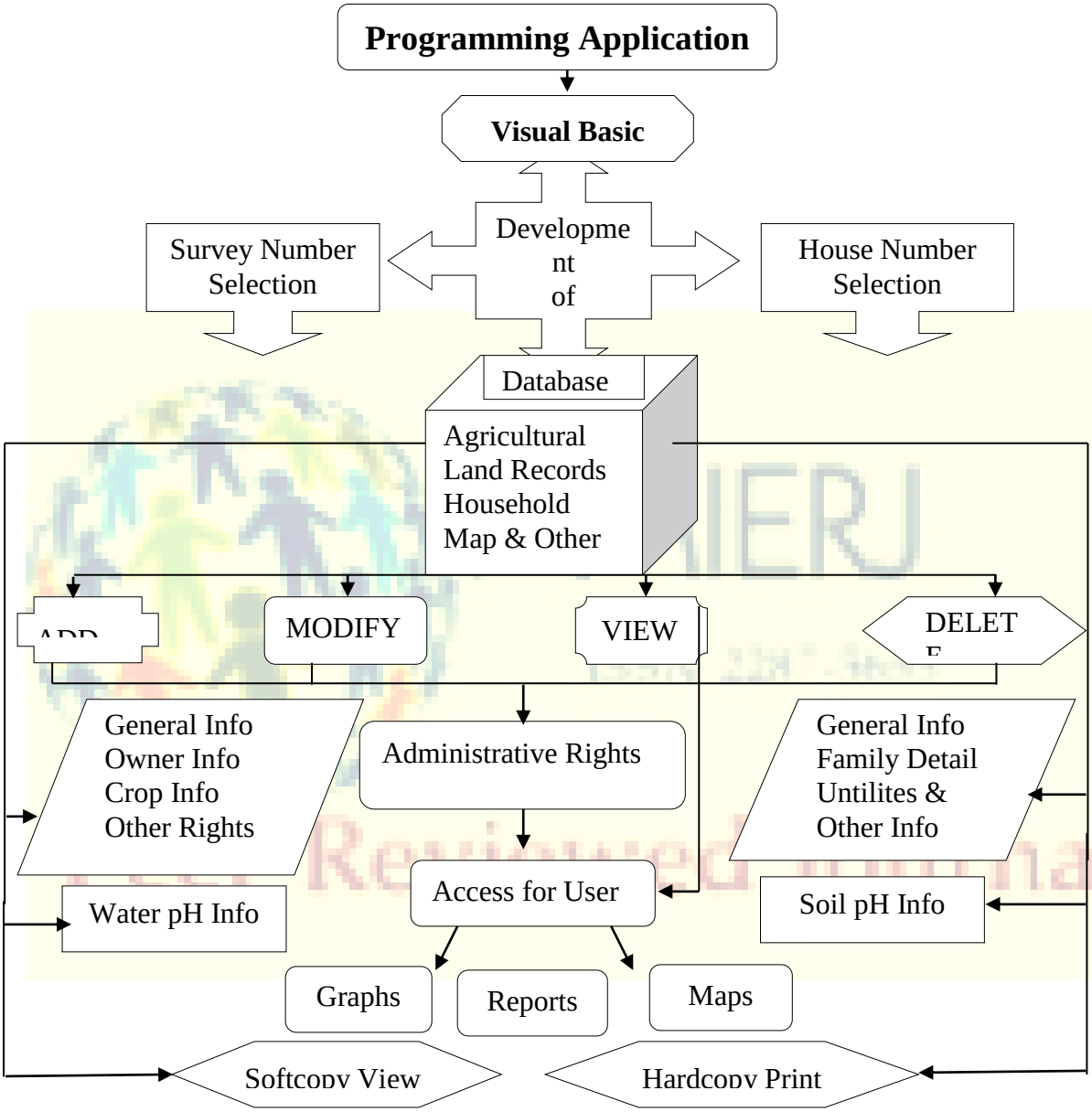


Fig. 6 Development of VIS application using Computer Programming

The final output for real use is prepared through customization for that Visual Basic is used for developing this application. This is one kind of small software which handle, store and represent the information of entire Village. The user can view and modify the records as the updations are occurring in it. The analytical reports like graphs, maps and specific reports are available in it which can be referred by user. There is privilege to take hard copy print out of necessary information or user can just view the details as per specific requirement.

6. What is the data Contents in VIS?

VIS contains variety of data i.e. data of various categories will be arranged and presented in VIS. Some of the aspects are given below.

Sr No	Main Category	Sub-Class	
1	**Agriculture Data**	Year and Season-wise Crops	Kharif & Rabbi crops
			Crop Production, Disease
2	**Land Records**	Ownership Detail	Main Owner
			Common Owner
			Other Owner, etc.
3	**Land Measurements**	Total Area	
		Area Under Cultivation	
		Waste Land, etc.	
4	**Physical Data**	Soil Information i.e. Colour, texture, pH Value.	
		Slope, Rock structure, etc.	
5	**Climatic Data**	Rainfall and Temperature	
		Humidity and Wind information	
6	**Water**	Sources of Water, Water Availability	
		Water Condition, Pollution, etc.	
7	**Demographic**	Birth and Death record	
		Sex and Age ratio	
		Family Particulars, etc	
8	**Economical**	Income group and economic condition	
		Income source and poverty, etc	

9	**Social and Cultural**	Social structure of village	
		Settlement / House pattern, Built up area	
		Custom and tradition of village	
10	**Communication**	Electricity network	
		Telephone network	
		Road network	
11	**Maps**	Thematic Maps	Land Parcel Map
			Settlement Map
			Other Maps like Soil, Slope, etc

6.Use of VIS:

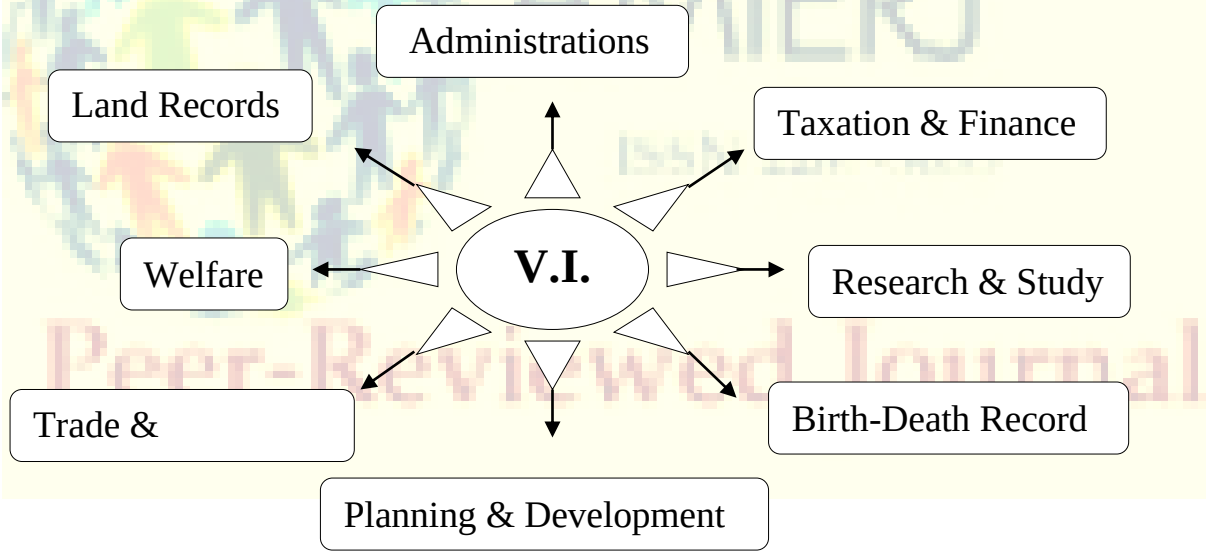


Fig. 7 Aspects of VIS

i) First and most important use of VIS is, it contains variety of database about the village and user can access it as per the requirement.

ii) The database related to various aspects like agriculture, socio-economic, physical, climatic, economic and demographic etc is stored year wise which can be used in future for planning or other activities.

iii) Various kinds of analysis can be done with help of VIS like buffer, networking, DEM, spatial analysis etc.

iv) VIS is having present map of village, which contains new updations and changes occurred in village which are not available in old maps (Live Map).

v) Digital maps of various themes can be produced i.e. hundreds of copies of any theme can be printed in very few time e.g. Agriculture Landuse Map.

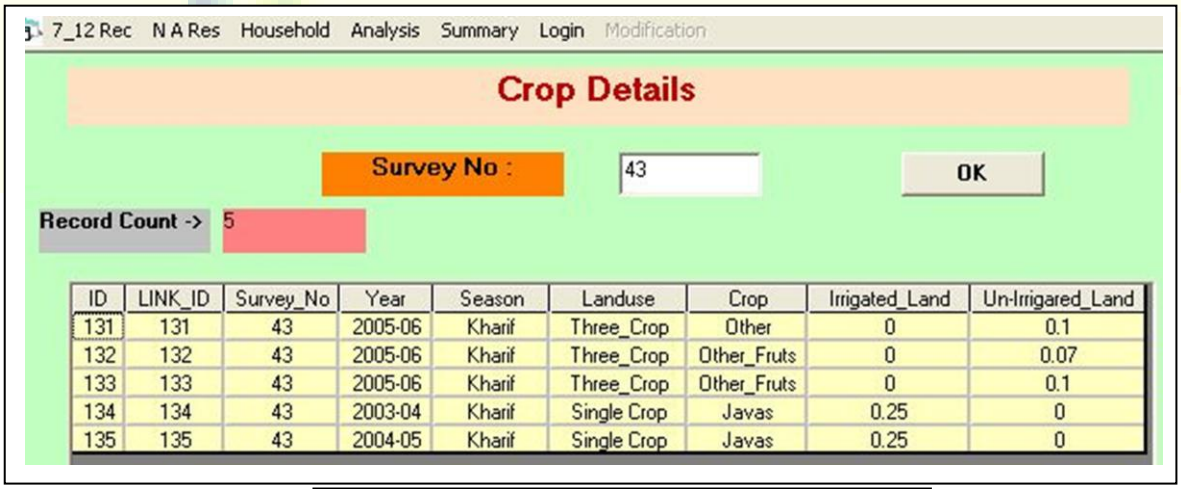
vi) The query is most useful feature of analysis. If simple or complex query perform on data then it will show the results quickly.

vii) VIS is useful to various users like government officers, planners, researchers, students, common layman at various levels.

7. Role of Geoinformatics in VIS development:

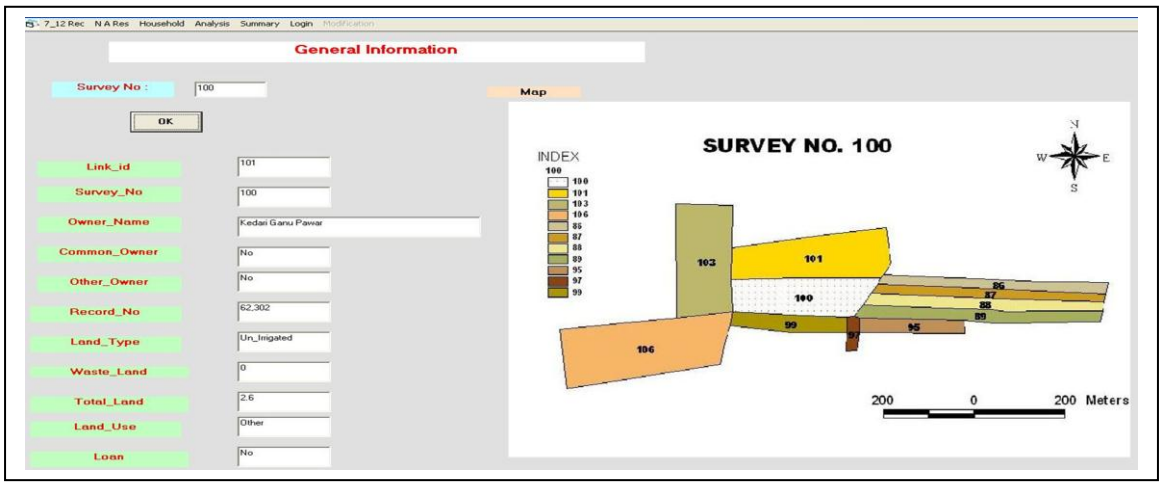
Geoinformatics is a combination of Geo + Infor + Matics. Geo means Earth related sciences; Info=Information and Matics is Mathematical calculations or models. The development of VIS is possible only when, it take help of Geoinformatics i.e. GIS, GPS and Remote Sensing. The development, analysis and presentation is possible by using Geoinformatics. Hence Geoinformatics plays a vital role in the development of Village Information System like a central pillar of system.

8 Snapshots of VIS



ID	LINK_ID	Survey_No	Year	Season	Landuse	Crop	Irrigated_Land	Un-Irrigared_Land
131	131	43	2005-06	Kharif	Three_Crop	Other	0	0.1
132	132	43	2005-06	Kharif	Three_Crop	Other_Fruts	0	0.07
133	133	43	2005-06	Kharif	Three_Crop	Other_Fruts	0	0.1
134	134	43	2003-04	Kharif	Single Crop	Javas	0.25	0
135	135	43	2004-05	Kharif	Single Crop	Javas	0.25	0

Fig. 8 Crop Detail Information View



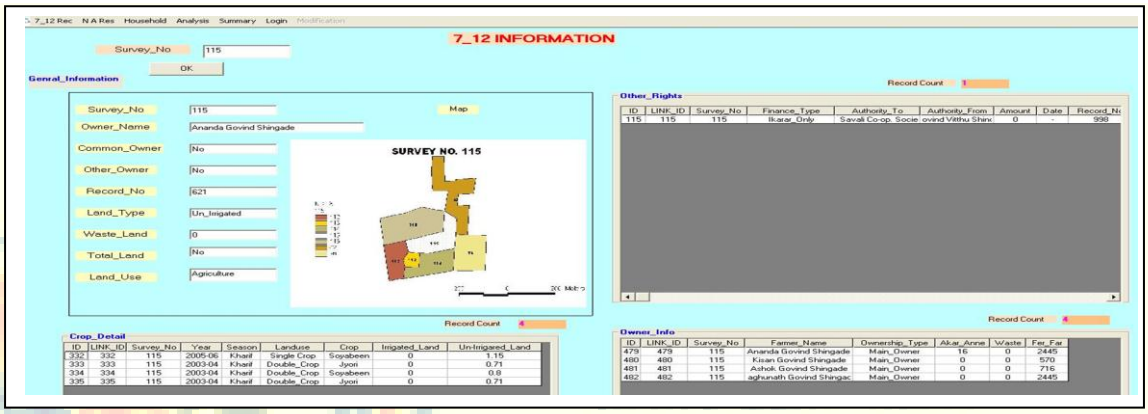
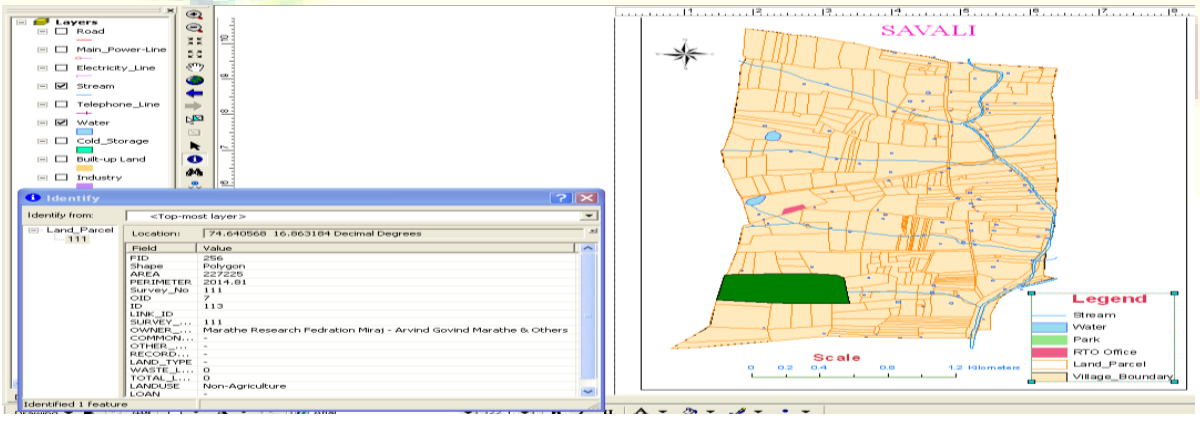


Fig. 10 Entire Land Parcel Information with Map (7/12)



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