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# ADVERTISING AND PROMOTION OF GIS TECHNOLOGY IS A STEP FOR SMART AGRICULTURE PRACTICE IN RURAL AREA

**Kunal[1], Tripta[2], Dr. S. N. Sahdeo[3]**
**E-Mail Id: phdmb10051.13@bitmesra.ac.in**
**[1,2]Research scholar, Department of Physics, Birla Institute of Technology, Jharkhand, India**
**[3]Assistant Professor, Department of Management, Birla Institute of Technology, Jharkhand, India**

**Abstract:** Indian Agriculture sector is waiting for revolutionary change in crop productivity and agriculture related business is looking forward to implement the knowledge of GIS technology. Agriculture and concerned resources had been seen of rare interest of new technical knowledge creators to implement technology in this field though this is main stream line in national level growth of India. There is a widespread belief that information and knowledge are vital for rural agricultural development. To reduce the human dependency on natural resources and to identify an appropriate land for use in suitable crop, it is essential to increase productivity carry out scientific land evaluations. Today, generation of new and various information and knowledge sources need new information and communication channels. Objectives of this study were to develop advertising and promotion of GIS technology based approach for land use suitability assessment which will assist land managers and land use planners to identify areas for suitable crop with physical constraints for a range of nominated land uses. The Researcher would like to focus on advertise and promote of integrating GIS Knowledge Management provide social and national concern for sharing of essential information can help to rural farmers which are handy to use for these techniques, to efficiently get benefited and to avoid risk.

**Key words:** Advertising, Agriculture, GIS, Knowledge Management, promotion.

## 1. INTRODUCTION

Agriculture, farming and husbandry are a vital occupation since the history of mankind is maintained. The term agriculture represents all entities which came under the linear sequence of links of food chain for human beings. Agriculture plays a major contribution to Indian economy. The advancements in agriculture are necessary to balance the demand and supply of population as day by day population is increasing. As compare to the last fifty years and earlier, the demand of agricultural product has accelerated. To overcome the requirements the use of GIS technologies is efficient to improve agricultural industry; there is a widespread belief that information is vital for rural agriculture development (preety, 1994), especially for poor people with limited access to material resources such as land and capital. Knowledge plays an important role in increasing productivity of land among farmers by increasing their ability to use available resource to form sound opinions and make good decisions (molde, 2007).Geographic information system (GIS) is a system designed to capture, store, analyze, manipulate, manage, and present all types of geographical data. GIS can effectively perform complicated analytical functions and then present the results visually as maps, graphs and tables, allowing decision makers to virtually see the issues before an increasing role in agriculture production by helping farmers increase production, reduce costs and manage their land very efficiently (Neelam & Hooda, 2016; Thakur et al., 2016; Khurana et al., 2016). Making decisions based on geography is basic of all development. Where, when and what are all related to the spatial phenomenon. Knowledge plays an important role in increasing productivity of land among farmers by increasing their ability to use available resource to form sound opinions and make good decisions. Smart agriculture is the term used to describe the goal of increased efficiency in the management of agriculture. It is a developing technology that uses to modify existing techniques to produce a new set of tools for the land manager to use. Government needs more advertising and promotion of this technique so that farmers get information about land suitability for agriculture and type of grains which suit more for that agriculture land. The land capability for use evaluation characterizes and appraises land development units from a general point of view without taking consideration of its different kinds of use. There are some defined classes are very useful as some type of soils can be suitable for specific crops and unsuitable for another's; therefore precision of land utilization is necessary. It cloud be expressed not only in terms of types of crop productions, session suitable for these specific crops are produced (lamm et al., 2006). Land suitability refers to the land ability to tolerate the production of certain crops in a sustainable way. Its evaluation provides information on the constraints and opportunities for the use of the land and optimal utilizations of resources, whose knowledge is an essential for land use planning and development. Moreover, such a kind of analysis allows identifying the main limiting factors for the agricultural of certain crop production and enables decision makers such as land users, land use planners, and agricultural support government support department to develop a crop management able to

overcome such constraints, increasing the productivity. Land could be categorized into occupying distributed agriculture potential zones based on the soil properties, terrain characteristics and present land use analysis (Bandyopadhyay et al., 2009). Production could be met through systematic survey of the soils quality, evaluating their potentials for land use options and formulating land use plans which were economically viable, socially acceptable and environmentally sound (fresco, 1990). Remote sensing (RS) data are used for estimating the biophysical parameters and indices besides cropping systems analysis, and land-use and land-cover estimations during different seasons (lambin et .al., 2003). However, RS data alone cannot suggest crop suitability for a certain area unless the data are integrated with the site-specific soil and climate data. RS data can be used to delineate various physiographic units besides deriving ancillary information about site characteristics, viz. direction, slope and aspect of the study area. However, detailed information of soil profile properties is essential for initiating crop suitability evaluation. Thus, soil survey data are indispensable for generating a soil map of certain region, which helps in deriving crop suitability and cropping system analysis. RS data coupled with soil survey information can be integrated in the geographical information system (GIS) to assess crop suitability for various soil and biophysical conditions. The present study was undertaken to demonstrate the usefulness of RS and GIS technologies coupled with soil data to assess crop suitability in order to implement sustainability for crops in the study area. The potential of the integrated approach in using GIS and RS data for quantitative land evaluation has been demonstrated earlier by several researchers (Malczewski, 2004). Therefore, the objective of this study was assessment of land evaluation using RS and GIS environments.

### 1.1 Role of GIS in Agriculture

Researchers believe that GIS plays an important role in forming global agricultural policy as discuss in (Roling,2003) GIS and related technologies monitoring crop yield and from these yield monitors farmers could yield maps of every 10 meters for example. The researchers also discuss Agronomic, logistic and marketing applications of GIS in agriculture. GIS plays an important role in agriculture along with other walk of life. In agriculture GIS plays role in policy making, soil erosion mapping applications, decision making applications, prediction applications, simulate climate change applications, cropping pattern analysis, pest management, nitrogen management, using historical management to reduce soil sampling errors, yield data and its monitoring, weed management, fertility management and soil Salinity mapping etc.. GIS tools are enabling agricultural users to handle their agricultural spatial data from collection through mobile devices or tablets to analyses of remote-sensing data at their office and helping farmers expand production, reduce overall farming costs, and manage their land more efficiently along with analytical support, better handling of risk factors and resource management, generating higher revenue, greater saving and timely decision making etc (Brugger, 2011).

The GIS is a transverse information system that helps the farmers by:

- Instantaneously locating of plots for cultivation.
- Obtaining measurements of the perimeter lengths and surface areas of plots.
- Drawing new plots, in a manner that is integrated with the making of requests and declarations.
- Performing of editing operations on existing plots (new arrangements, segregation, modification of vertices, etc.).
- Performing of comparative studies of the plots in a specific area, based on their variety, year of planting or condition. Groups with similar characteristics are visually identified by means of different colours.

The attribute data is maintained through a set of database, that permit to update information related to farmer's field integrated with the cartography. Producers should use GIS to better manage their farms by creating information-dense reports and maps that give them a unique perspective of their operations. The powerful analytical capabilities of GIS offer an array of options for visualizing farming conditions, as well as measuring and monitoring the effects of farm management practices.

## 2. MATERIALS AND METHODS

The district –wise and crop-wise secondary data on rice, other crops like millets, chilli, vegetables ground nut and fruits, from 2010-11 to 2016-17 have been collected from published information. Minimum maximum suitable lands for selected crops are shown through highlighted colour in map prepared by GIS.

### 2.1 Generating of Thematic Maps Using Geo-Statistics Techniques

Jharkhand has 24 districts and each district soil quality is specified for certain corps. This study focus to find suitable area for rice and others crops like millets, chilli, Vegetables, ground nuts and fruits. Highlighted colours are showing suitable area for each crop. This technology support farmers to select area for certain crop which support crop for better production.

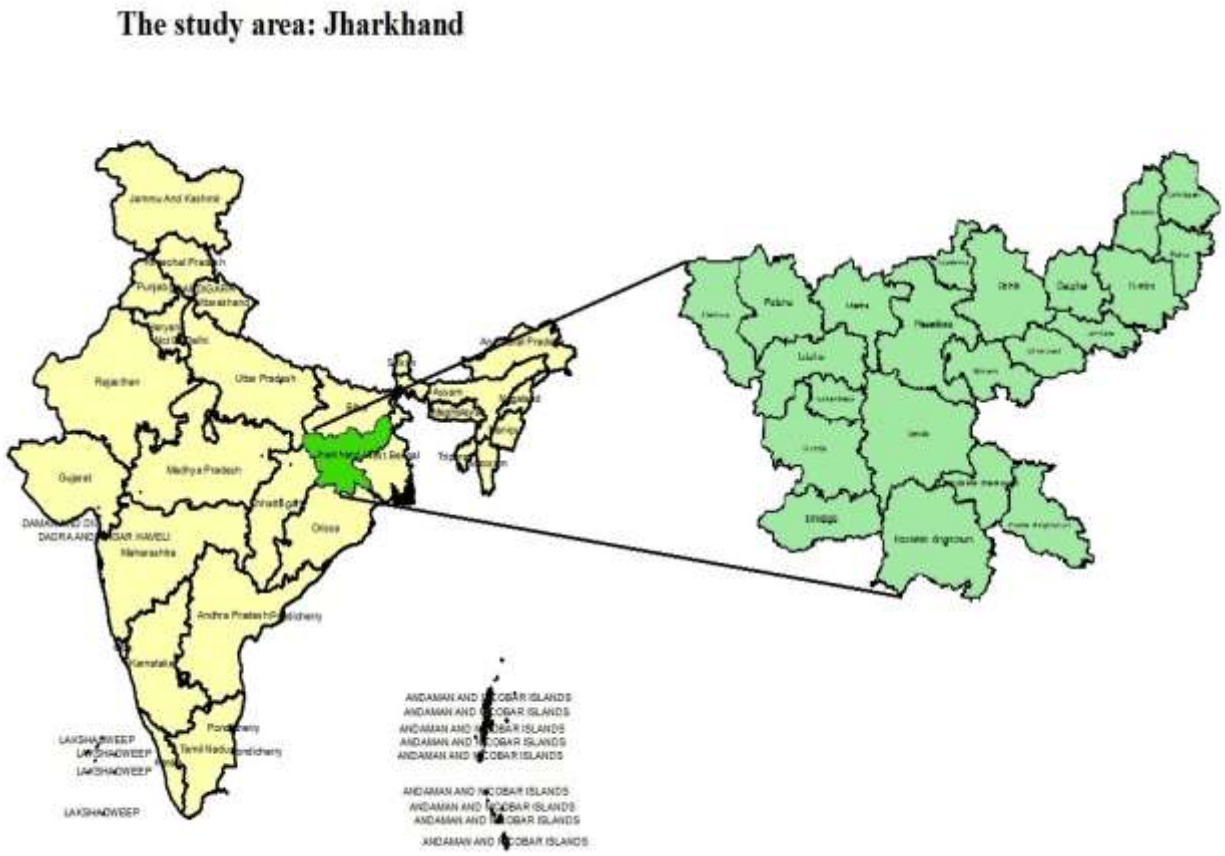


**Fig. 1.1 Study Area Jharkhand**


(Source;Google Map)

**Fig. 1.2 Crop Map of Jharkhand**

**2.2 GIS Tools for Smart Agriculture**

Environmental System Research Institute (ESRI) is the largest research and development organization, which mainly support GIS tools. ESRI provides several GIS products in various categories, for example, desktop GIS, server GIS, mobile GIS, Developer GIS and online GIS. ArcGIS is ESRI suite of GIS products (Huang, 2001). The main tools in desktop GIS of ESRI's suits are Arc Map, Arc Catalog and Arc Toolbox - allowing users to create, analyze, map, manage, share and published GIS information. ArcGIS Explorer, Arc Reader and Arc Explorer are freeware products of ESRI. The main tool for Web GIS is ArcGIS for Server, an internal application service, extending the functionality of ArcGIS for desktop. The main tools of mobile GIS are ArcPad, ArcGIS for Mobile, and ArcGIS for Server and Arc Web Services. The main tools of developer GIS tools are Arc engine, ArcGIS for Server and Arc Web services. The main tool for online GIS is ArcGIS online (lu,2013).Other prominent tools are Google Earth Pro, Rhino Terrain , Global Mapper, Microdem , Microsoft Virtual Earth, Map Window, Manifold GIS and others. According to ESRI ArcGIS (available in two flavor desktop and server) is working with geographic data. It is used for creating and using maps; analyzing mapped information; compiling geographic data discovering and distributing geographic data; managing geographic information in a database and using maps and geographic data in variety of applications, such as helping farmers getting greater profits in harvest; identifying priority the main component of ESRI's Arc GIS suite of geospatial processing programs, and is used primarily to analyze, create, edit and view geospatial data. Arc Map allows the user to explore data within a data set, symbolize features accordingly, and create maps. Arc Catalog is a module of ArcGIS Desktop that allows user to manage GIS and related data sets. Using Arc Catalog, user can view available GIS data sets in a catalog tree similar to Windows Explorer, see what the data looks like (Preview tab), and read any available documentation that comes with the data (Metadata tab). Arc Toolbox is an integrated application developed by ESRI. It provides a reference to the toolboxes to facilitate user interface in ArcGIS for accessing and organizing a collection of geo-processing tools, models and scripts. ArcGIS Explorer is GIS software. It can be used to draw digital maps and store geographic data and analyze the content of the maps based on attribution data associated with the objects which make up the map. Arc Reader is a basic data viewer for maps and spatially oriented data published in the proprietary Esri data format using ArcGIS Publisher. This software also provides some basic tools for map viewing, printing and querying of spatial data. Arc Explorer is a lightweight data viewer from ESRI for maps and GIS data only in the ESRI Shape file (shp) file format of data. Arc Pad is mobile field mapping and data collection software designed for GIS professionals. It includes advanced GIS and GPS capabilities for capturing, displaying and editing geographic information efficiently and quickly. ArcGIS for Mobile helps organizations deliver GIS capabilities and data from centralized servers to a range of mobile devices. User can use ArcGIS for Windows Mobile to deploy intuitive and productive mobile GIS applications to increase the accuracy and improve the currency of GIS data across user's organization. Arc Web Services is one of the ESRI's GIS product to provide Web-oriented spatial data services. Arc Web Services is a Hosted GIS that provides geographic web services (W3C/SOAP and others) to web browsers and other Internet-enabled technology. ArcGIS Engine is a complete library of embeddable GIS components for developers to build custom applications. Using ArcGIS Engine, developers can embed ArcGIS functions into other information tools and build custom applications that deliver advanced GIS solutions. ArcGIS Online is a collaborative, cloud-based platform that allows members of an organization to creat, share and use maps, apps, and data, including authoritative base-maps published only by ESRI. In general ESRI's GIS tools are helping farmers to improve business practices, increase yields, manage resources, predict outcomes, reduce input costs and more. Users of agricultural field are getting help from these tools to visualize agricultural-environments and workflow; also helping the farmers to examine their farm conditions and measure and monitor the effects of their farm. Some other areas of agriculture where these tools play an important role are analyses of soil amendment; estimation of crop yield; identification and remediation of erosion and reduction of farm input cost etc. According to Google Earth Pro is a 3D interactive globe that can be used to aid planning, analysis and decision making. Businesses, governments and professional users from around the world use Google Earth Pro data visualization, site planning and information sharing tools. Rhino Terrain (plugin) is a powerful tool used to easily create digital terrain models. It is based on a robust and reliable constrained triangulation algorithm, able to handle huge data volumes. It uses all the geometric and graphical computing capabilities of this free-form modeler and is suitable to anyone who may have an interest for realistic 3D visualization of Digital Elevation Models (DEM) or engineering works, i.e. architects, surveyors, offices study, local authorities, designers, etc. According to Global Mapper is an affordable and easy-to-use GIS Data processing application that offers access to an unparalleled variety of spatial datasets and provides just the right level of GIS functionality to satisfy both experienced GIS professionals and mapping novices. Microdem is a freeware microcomputer mapping program written b Professor Peter Guth of the Oceanography Department, U.S. Naval Academy. User may freely use it with no restrictions. It displays and merges digital elevation models; satellite imagery; scanned maps; vector map data and GIS databases. According to Microsoft Virtual Earth (currently known as Bing Maps Platform) is a geospatial mapping platform produced by Microsoft. It allows developers to create

applications that layer location-relevant data on top of licensed map imagery. The imagery includes samples taken by satellite sensors, aerial cameras, Street-side imagery, 3D city models and terrain. Map Window is an Open Source Users and Developers Group GIS tool. This group includes developers and users of the Map Window GIS open source mapping and geospatial data analysis software. Manifold GIS is a combination of mapping, CAD, DBMS and image processing. The hallmark of GIS is the power of using a visual interface to view, grab, analyze, manipulate and transform data that would not be comprehensible in classic row and column DBMS text presentations. areas for Crops and improving Pest Inspection and Suppression etc. Arc Map is

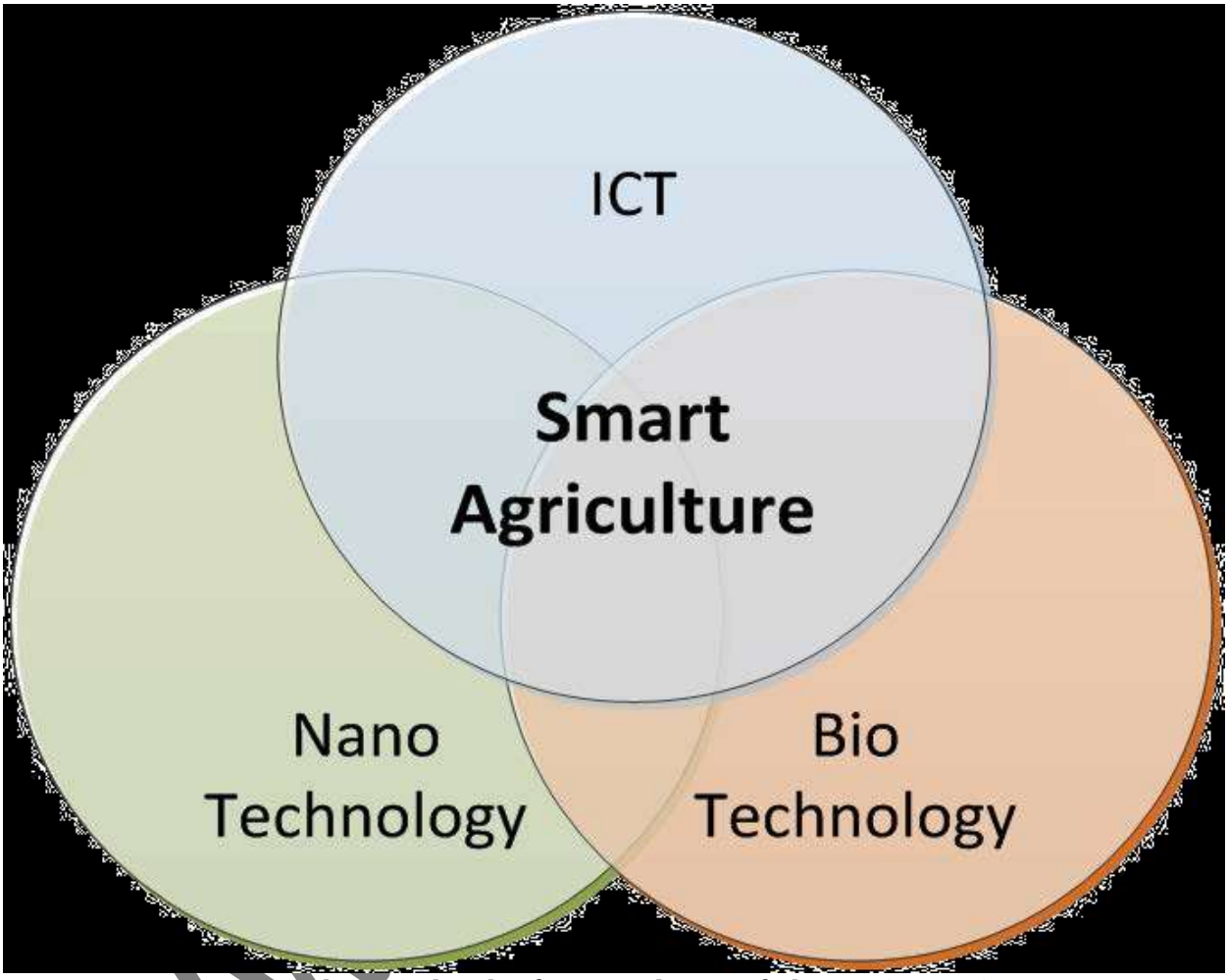


**Fig. 1.3 The Agricultural Reforms are the Sum of Three Main Domains**

**2.3 Geographical Agriculture Information System (GAIS): Future of Agriculture**

Smart Agriculture doesn't mean use of Nanotechnology in agriculture, but smart agriculture means spatial geographical Agriculture Information Systems (GAIS) using computers and GIS applications, for information, together to increase the efficiency of agriculture in all aspects. GAIS here means existing GIS tools, plus set of agricultural applications, enabling agricultural users to get full benefit in the form of reducing and saving the input farming cost, managing the resources in smart way and getting higher profit and productivity with the help of analyses and predictive capabilities of GAIS. GAIS is nothing but the combination of GIS tool or tools and dedicated bundle of apps for agriculture as one package as shown in Figure 2 bellow. It is the responsibility of the developers to choose existing GIS tool or tools and develop dedicated agricultural applications to enable GAIS. The future of GAIS is smart and intelligent agriculture, where capturing of spatial agriculture data is done in smart way, by using smart devices, such as, mobile phone, tablets, and PDAs; processing of agriculture spatial data through smart GAIS tools; and producing results and outcomes in smart forms and formats, such as graphical formats along with traditional tabular formats. In future agricultural machines will also be communicating through GPS devices and controlled by Smartphone's and tablets using GAIS. In this regards the researcher will also focus on developing GAIS mobile apps for Smartphone platforms.

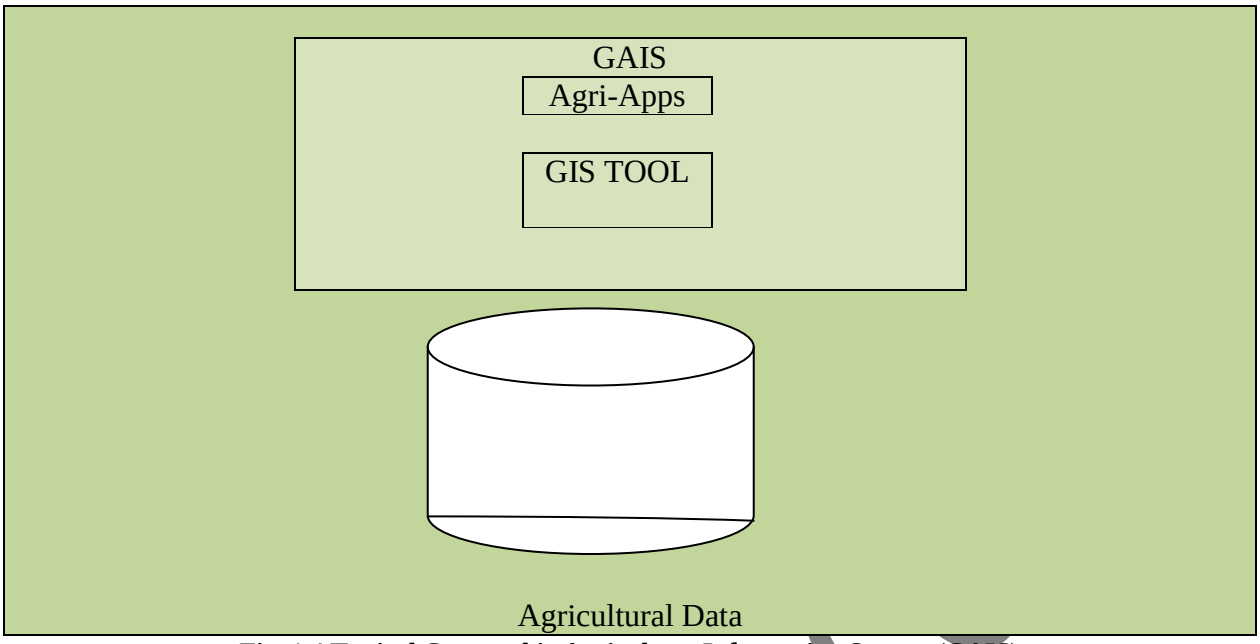


**Fig. 1.4 Typical Geographic Agriculture Information System (GAIS)**

## CONCLUSIONS

All agricultural data can have spatial components from the field research or by Remote Sensing and GIS is the only tool, which allow agriculturist to visualize information that might be difficult to interpret otherwise. The GIS role in agriculture is increasing as technology is advancing for the acquisition, analysis and management of space related data on the agricultural forms. GIS as a technology, is greatly advanced today thus, its users, by sharing their innovations and applications formally and informally, were very consequential to the development of the GIS implements available today. GIS in agriculture recognizes that GIS applications are playing a vital role in this field and making it smart in all aspects. That's why Geographical Agriculture Information System (GAIS) is proposed. GAIS means dedicated GIS tools along with bundle of agricultural applications all together. In this regards more and more focus on dedicated applications for GAIS is also proposed along with Smartphone's apps for all platforms.

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