

IMPACT OF GIS ON INDIAN AGRICULTURE

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ABSTRACT

Indian agriculture which mainly depends upon monsoonal rainfall, have get into greater influenced under the several developed techniques and methods. There are number of techniques which come out of the blessings of 21st century like Remote Sensing, GPS, GIS, Computer assisted technologies etc. In this paper we will discuss about the impact of GIS (Geographic Information System) on Indian agriculture. Agriculture and concerned resources had been seen of rare interest of technical knowledge creators to implement technology in this field though this is main stream line in national level growth of India. The ability and usability of both Geographic Information System and Mobile computing has become unavoidable part of Indian life system. Young farmers need proper guidance, frequent knowledge and direction to increase their agricultural productivity, reduce cost, and to get control on hazardous risks. GIS technology is gaining importance as useful tools in sustainable agricultural management and development. The Researcher would like to explore that by integrating GIS, Knowledge Management and Mobile Computing Services to provide social and national concern for sharing of information can help to these farmers which are handy to use for these techniques, to efficiently get benefited and to avoid risk. Geographic Information System Interface will sense the information for need, availability, quality, quantity and same related to their atmosphere, water, soil, land, air, topography, market, transportation, labor, capital, fertilizer, pesticides. Based on data collected as real time data, by using application tier this data will be mapped and modeled to analyze for cost and risk factors. GIS Applications in Agriculture examines ways that this powerful technology can help farmers produce a greater abundance of crops with more efficiency and at lower costs. Each concept in this paper is thoroughly explained the influence of GIS technology on agriculture.

Keywords: Agriculture, Farmers, GPS, Technology

I. INTRODUCTION

The increased efficiency and profitability that the proper application of technology can provide has made precision agriculture the hottest developing area within traditional agriculture. GIS Applications in Agriculture examines ways that this powerful technology can help farmers produce a greater abundance of crops with more efficiency and at lower costs. Agriculture in India exists since ancient times and has been referenced in Vedic literature called Rig-Veda. It has been claimed that agriculture in India started 9000 years ago with cultivation of plants, domestication of crops and animals. Indian agriculture has since then evolved with various influences around the world, especially

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during British occupation of India for 150 years. Since independence, over the last 67 years, India has made significant progress and modernized the agriculture sector. India ranks second in agricultural output in the world. Indian Agriculture which is waiting for revolutionary growth in crop productivity and agriculture related business is looking forward to implement the knowledge by next generation youth handy for computerized technology. Agriculture and concerned resources had been seen of rare interest of technical knowledge creators to implement technology in this field though this is main stream line in national level growth of India. The solution for providing food security to all people of the world without affecting the agro-ecological balance lies in the adaptation of new research tools, particularly which is easily conventional to them and as well as frontier technologies like Geographic Information Systems (GIS).

Methodology:

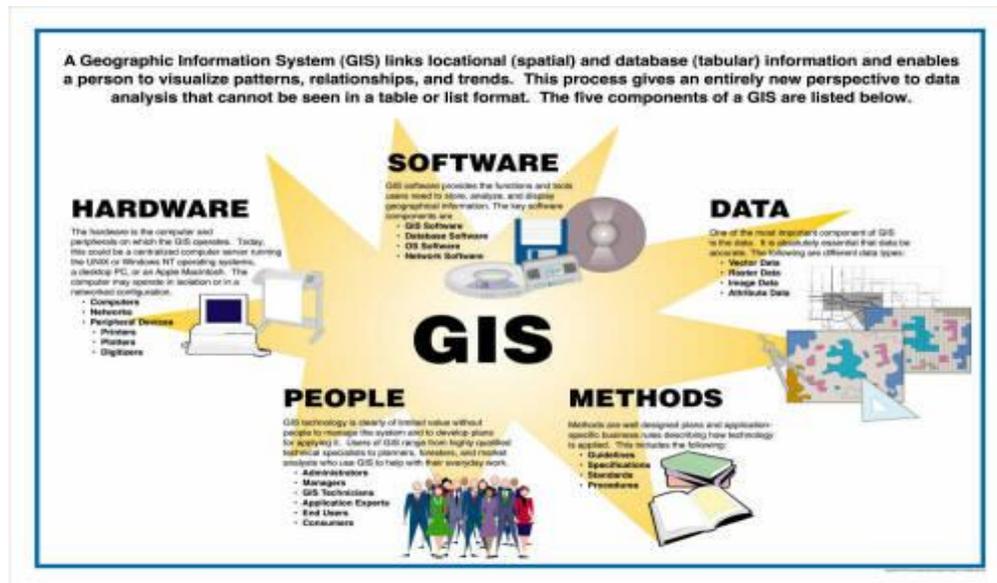
The study has been done through secondary source of data. The use of books, articles, newspapers and magazines has been done. To explain in proper way the use of diagrams and tables have been made to clearly explain the concept.

Objective of Study:

The main objective of this study is to analysis the changing impacts on Indian agriculture comes due to the use of GIS techniques. The study includes the measures adopt by the government to develop this technique and make the nation a developing one. This also concerned the important concept of GIS in enhancing the productivity of food crops production.

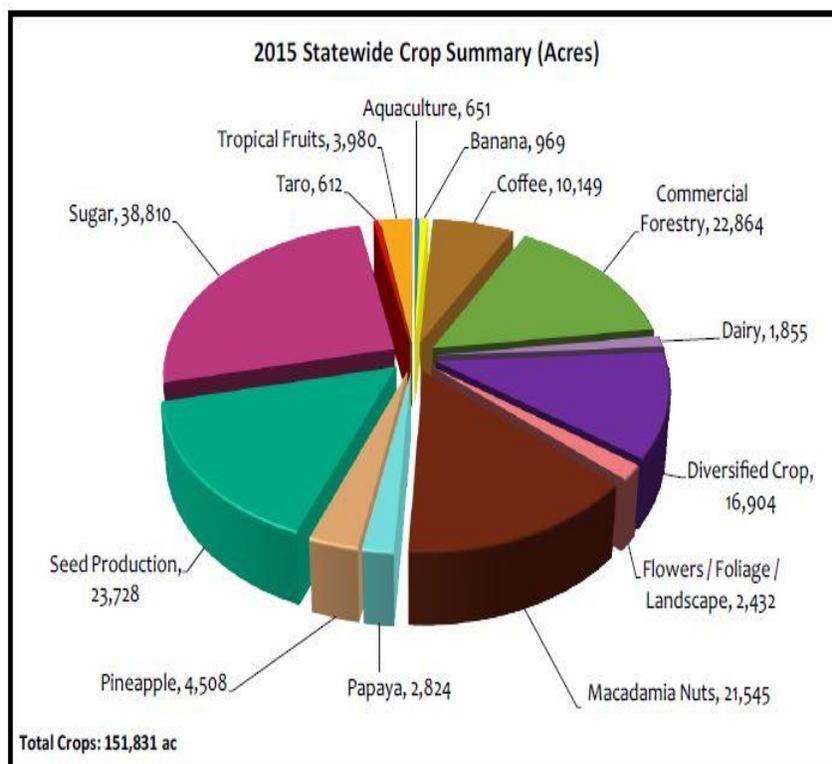
Understanding the concept of GIS:

Geographic Information Technology has developed at a remarkable pace over the past two decades and will play a key role in development of nations in the 21st Century. Geographic information system (GIS) is a system designed to capture, store, manipulate, analyze, manage, and present all types of geographical data. The acronym GIS is sometimes used for geographical information science or geospatial information studies to refer to the academic discipline or career of working with geographic information systems. In the simplest terms, GIS is the merging of cartography, statistical analysis, and database technology. A GIS can be thought of as a system—it digitally creates and "manipulates" spatial areas that may be jurisdictional, purpose, or application-oriented. Generally, a GIS is custom-designed for an organization.



GIS and Agriculture:

Since independence, over the last 70 years, India has made significant progress and modernized the agriculture sector. India ranks second in agricultural output in the world. More than 60% of Indian population depends upon it for its survival and to meet the basic needs. As we know that Indian agriculture is monsoonal dependent so mainly farmers depends upon the subsistence techniques though the government has developed many developed machineries for bringing more GDP ratio and food production. The GIS is the blessing of 21st century which helps in achieving the desirable growth rate. GIS technology are being effectively utilized in India in several areas for sustainable agricultural development and management. The areas of sustainable agricultural development/management include cropping system analysis; agro-ecological zonation; quantitative assessment of soil carbon dynamics and land productivity; soil erosion inventory; integrated agricultural drought assessment and management and Integrated Mission for Sustainable Development (IMSD). As following diagram shows the production of various crops in india in different states 2015:



The spatial distribution of various cropping systems/ sequential cropping pattern, which is the final result of a cropping system analysis case study carried out in Southern India which shows in the table(1):

Major cropping systems and their areal distribution in the watershed

Cropping System	% of Watershed Area	Agricultural Productivity
Single Season Crop (Rice/Sorghum/ Rainfed crops)	52	LOW
Two seasons crop (Rice, Sunflower, Rainfed crops)	6	MEDIUM
Three seasons crop (Sugarcane, Cotton, Rainfed crops)	4	HIGH
Non-agriculture (Wasteland, Forest,	38	—

Water Bodies)

Source: Stastical abstract of india

THE ECONOMIC TIMES | KOLKATA | WEDNESDAY | 17 JUNE 2015

FEARS OF INFLATION AND RURAL DISTRESS RISE A rapidly warming Indian Ocean is weakening the monsoon, particularly over central India where agriculture is still mostly rain-fed, according to IMD. But the erratic weather is driving more traffic towards websites of forecasting services

As Indian Ocean Warms Up, Agri and Fin Sectors Sweat

FOOD SECURITY
The critical role of the warm Indian Ocean deserves special attention for its decisive effect on the food security of a large fraction of the world's population

MATHEW KOLL
Indian Institute of Tropical Meteorology

projection," says Koll who worked on dynamic models. The statistical model generates a forecast based on historical data while the dynamic one involves three-dimensional mathematical simulation of the atmosphere and the ocean.

Koll also feels that extreme rainfall events, along with dry spells, will be more in the monsoon months owing to the increased moisture holding capacity of the atmosphere under increased temperature. "The critical role of the warm Indian Ocean deserves special attention for its decisive effect on the food security of a large fraction of the world's population, and its role in inducing a drought over the Indian sub-continent," he said.

According to the study, the land-sea temperature difference between the Indian sub-continent and the Indian ocean has reduced in the past 7 decades. This reduction in land-sea temperature is primarily contributed by a strong warming in the Indian Ocean. Further, the study says the warming Indian Ocean also plays a role in weakening the monsoon circulation.

Weather is no Plain Jane, Forecasters See Surge in Curiosity

Number of clients who want tips on monsoon this season on the rise

Madhvi Saity
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New Delhi: The weather offices and private weather forecasters from Skymet to Weather Express are seeing a jump in traffic on their websites, apart from increase in user base of their mobile apps. Simultaneously they expect revenues to increase with a rising number of clients who are hungry for clues about the monsoon this season.

Aviation, energy, insurance, banking, agriculture, traders remain the key growth drivers for news and weather forecasts

the increase in number of users assessing weather sites early this month," says Manav Singh Gohlot, chief of digital media, Skymet which has clients from ITC to Indian Oil.

Skymet saw a 600% increase in page views and the number of users accessing their website since March. "Over a million users come to our websites for weather information and on an average I get about 15-16 million page hits. The average time spent by visitors is 2-3 minutes," he says.

The greater the traffic, the higher the advertising revenues. Each click on the advertisement on the website earns the companies anywhere around 8 cents to 82.



The Indian agriculture mainly depends upon many socio-economic factors. The main challenges faced by of Indian agriculture are:

- Government policies for funding, crops specific programmers, Education and awareness for Farmers.
- Farming and Crop Technologies, Cropping pattern for profitability
- Environmental factors such as water availability, soil degradation and climate change
- Infrastructure such as irrigation, electricity, storage and raw materials such as seeds
- Improper land use as there is huge fragmentation of land due to traditional land holding pattern
- Suitable agricultural skills development and Availability of labour

So to overcome such problems the GIS introduce by our government.

How GIS and Information Technology can address these challenges:-

Information technology, Geographical information systems and a complete ecosystem of services for agriculture sector can make a big difference in improving the performance of the sector. As we have earlier discussed the challenges of Indian agriculture, so to overcome these challenges following are the ways to overcome these challenges with the help of gis technique as follows:

Government Policies:

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Information technology can enable e-Governance for agriculture, making range of services available to farmers and various stakeholders of the sector. Say for example a web portal at district level for providing eServices to the farmers, a monitoring and tracking application for fund utilizations

Farming and Crop Technologies:

Geographical information and analytics systems can be developed and made available through e-Governance, Public-Private Partnerships and other market forces.

Environmental Factors:

GIS can be used to provide Data Analytics for soil degradation and education on how to take preventive measures to avoid it. Soil Science Experts can provide the required content for this. This would need step-by-step approach as it requires Soil data over the period of time. It can provide information, education, awareness programs for farmers and other stakeholders of the sector about climate change and its impact on them.

Infrastructure:

Information Technology can be used to run awareness programmers about infrastructure for the stakeholders of agriculture sector. GIS can be used to provide analytics for planning of irrigation network across the country. Overall eGov portal can be developed as dashboard to track various infrastructures for particular area and help local authorities take right decisions. Farmers can access these services through eGovernance programmes for agriculture sector. Network of storage for produce can be planned, monitored and made available to farmers by leveraging public private partnership.

Land Use:

GIS can be used to address this challenge and this is being currently used but due lack of support of Government policies and appropriate implementation is not effective. Information technologies can be used to run awareness programmes for stakeholders of the agriculture sector. Land use has to be implemented at the grass root levels or by introducing the western model of corporate farming. The expertise from agriculture discipline can be leveraged for proper crop patterns aligned with land use.

Skills and Labour:

e-Governance at grass root level can be used to run agricultural skills development and creating the pool of labour for particular farming needs. E-Governance can be powered by Information Technology and GIS. Public Private Partnership can be used to make the training programmes available to farmers and stakeholders.

Crop Valuation:

GIS can be used to address this challenge. Appropriate government policies and their implementation with required transparency can be enabled by use of Information Technology. IT application can be developed for supply chain management keeping the beneficiary as farmer. Data analytics can be used to align the crop valuation with quality parameters, national and global demand.

In order to achieve the desired result, a step-by-step procedure as given below is adopted. (a)Data collection

- Location map of a region.

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- Land use information from Nagar Nigam.
 - GPS reading of the Study area (GPS Receiver used:-I Finder, H2O)
 - Road network information
 - Field survey: This included extensive interviewing of farmers, manual survey and field photographs
- (b)Data Processing
- Scanning the map containing the desired road network Georeferencing of the scanned map in “ERDAS Imagine 8.7”.
 - Import the georeferenced map to “Arc View GIS 3.2a” for Digitization. Digitize the road network and market locations and enter their attribute data.
 - The layers were thus formed and suitable markets as well as location of facilities viewed suitably in the map.

II. CONCLUSION

A broad overview of the implementation of GIS & current trends in agriculture. This article highlighted traditional agriculture tools & GIS as new tool for precision farming in India. The article also highlighted utility of the geographic information system methodology to grow up the Indian agriculture market and provide the directions highlighting the need for improved farming in India through GIS. The article also emphasize on unpredictable markets and lack of knowledge, non scientific farming practices do reduce the revenue of the farmers drastically analyzing as well as utilizing the available facilities, exploiting the strategic location of the study area and locating the appropriate markets easily would definitely enhance the output and revenue of the farmers in India. Precision farming is essential for serving dual purpose of enhancing productivity and reducing ecological degradation. Though it is widely practiced for commercial crops in developed countries, it is still at a nascent stage in most of the developing countries. The study on precision agriculture has already been initiated in India, in many research institutes, such as Space Applications Centre (ISRO), MS Swmainathan Research Foundation, Chennai, Indian Agricultural Research Institute, New Delhi, Project Directorate of Cropping Systems Research, Modipuram. In coming few years PF may help the Indian farmers to harvest the fruits of frontier technologies without compromising the quality of land and thereby turning the green revolution into an evergreen revolution. The increased efficiency and profitability that the proper application of technology can provide has made precision agriculture the hottest developing area within traditional agriculture. GIS Applications in Agriculture examines ways that this powerful technology can help farmers produce a greater abundance of crops with more efficiency and at lower costs.

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