



## APPLICATION OF GIS IN AGRICULTURE

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### Abstract

The present study indent to visualize the application of GIS in agriculture, So as to is the efforts taken to analyse different agriculture problem. A brief literature overview in connection with GIS and agriculture is done. The precision agriculture is included for increasing productivity and minimizes the cost and environmental effect. Application of GIS in agriculture completely not used in India, Therefore its necessary to encourage the agriculturist. To used for precision farming since India is having maximum population dependent on agriculture. Therefore it is necessary to encourage GIS application for analysing climate condition, soil properties, cropping, pattern, and irrigation scheduling etc so as to make our farmer prosper.

**Keywords:** GIS, Agriculture, Precision Agriculture.

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### 1. INTRODUCTION

Geographical Information System (GIS) is a computerized system for input, storage, management, display and analysis of facts that can be precisely linked to geographic location. GIS is used to understand, analyze, and manage spatially distributed data map to a geographical region. GIS is considered to be one of the most important new technologies, with the potential to revolutionize many aspects of society through increased ability to make decisions and solve problems rural development, wooded area management, urban development planning, land information systems and farming development. GIS has been widely accepted by government agencies. The majority of GIS applications are found in areas of natural resources, socio-economic demographics, and urban planning and transportation. However, increasingly applications are found in almost all disciplines including: agriculture production, engineering, environmental sciences, healthcare, and law. The use of Geographical Information Systems (GIS) has recently become popular.

What is Precision Agriculture? It is said, "Precision agriculture is a phrase that captures the thoughts of many concerned with the production of food, feed, and fibres". The concept of precision agriculture offers the promise of increasing productivity while decreasing production rate and minimizing environmental impacts. Precision agriculture conjures up similes of farmers overcoming the elements with computerized machinery that is precisely controlled via satellites and local sensors and using research software that accurately predicts crop development. This image has been called the future of agriculture.

### 2. GIS Application In Agriculture Sector

GIS application in crop growing has been playing an increasingly important role in crop production throughout the world by helping farmers in increasing production, reducing costs, and managing their land resources more efficiently. GIS application in agriculture such as farming mapping plays a vital role in monitoring and management of soil and irrigation of any given farm land. GIS agriculture and agricultural mapping act as an necessary tools for management of agricultural sector by acquiring and implementing the accurate information into a mapping environment. GIS application in agriculture also helps in management and control of agricultural resources. GIS agriculture technology helps in improvement of the present systems of acquire and generating GIS agriculture and resources data.

GIS application in agriculture sector such as:

1. Crop mapping give up estimation.
2. Crop assessment and Crop health.
3. Irrigated landscape mapping.
4. Application development for GIS agriculture.
5. Soil and irrigation amendment analysis.
6. Suitability assessment studies.
7. Erosion identification and remediation.
8. Agricultural mapping for full vegetation cover and monitoring.
9. Change detection study and developing crop models.
10. Damage and land degradation assessment studies.
11. Elevation models for resourceful drainage.

### 3. Information Processing In Precision Agriculture

Precision agriculture is a cyclical process. Of course, the farmer can start farming based on "site specific" information. Farmers generally require once a year planning, data collection and analysis of information in order to complete the cycle of precision agriculture. You should conduct a soil test before planting. Then, data study should be done in order to determine soil profile conditions, so that it can be called at any time and by any method. In crop season, start the work by sowing different values of seeds depending on the data and utilize variable rate of nourishment which are obtained from soil tests. Crop growth is performed for research on issues such as weeds, pests or diseases. At harvest time, when the crop is harvested, the crop monitor which is embedded.

### 4. Technologies In Precision Agriculture

#### 4.1. Map

Map generation for crop and soil character is the most and the first important move in precision agriculture. These maps provide the base of spatial variability control. Data collection was performed both before and during production and can be implemented by means of GPS coordinates. Data collection technology generally includes network soil sampling, performance monitor, satellite images and farm measurements. Assessment tools such as soil pipes are used to collect food condition and hydraulic conductivity of the earth and optical scanners are used to detect and identify weeds outside organic materials. Then, these data will be imported into computer systems and stored in a map. The generated maps are used to obtain information and operate it in strategic decision-making to control variability.



Fig. 1: Vegetation Map

#### 4.2. Remote Sensing Technique (RS)

RS measures the visible and invisible features of a farm or a group of farms and also it converts point measurements of continuous spatial data. This technique monitors the dynamic conditions of the soil and the plant in glancing form. Visual observations are recorded through a digitization device which is geo-referenced and they are entered into the GIS database. Aerial photos and video camcorders also can be used in precision agriculture. Satellite images are a powerful tool for estimating the area under farming within a month with 95% accuracy and estimating performance during 10 days for the single crop cultivation area with 90% accuracy.

### GIS In PF (GIS)

GIS is a helpful tool for the assessment and management of agricultural resources. GIS plays an important role in the development of expert systems in different fields of agriculture as an essential technology for the decision support system. Submission of GIS generally includes various types of spatial and descriptive data. Maps are in both raster and vector formats and descriptive data are preserved in the database layout. GIS bounds for the interest variables



Fig.: 2 Application of GIS

#### 4.3. GIS And Farming System Analysis

Rural project study strain a precise local socio-financial and agro-ecological assessment for extended regions. GIS allows combining local data with remote sensing for agro-ecological land-use modelling over broad areas. Farm system analysis supplies socioeconomic indicators at local and at regional level. general data is included as quantitative and qualitative constraint. union both sources in a spatial database enables to spatially model the crop growing system. Quantification is possible of both, the socio economic performance of the individual farming unit as a component of a farming system as well as its reciprocal influence with the natural environment. The spatial distribution of the individual farming units shows that middle-size farms are located on the most suitable soils. There is no distinction per classes in respect to the distance to the urban centre.

#### 5. Methodology

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

##### A) Data Collection :

1. Location map of a region.
2. Land use information from Nagar Nigam.
3. GPS reading of the Study area.
4. Road network information.
5. Field survey: This included extensive interviewing of farmers, manual survey, field photographs.

##### B) Data Processing :

1. Scanning the map containing the desired road network.
2. Geo-referencing of the scanned map.
3. Import the geo-referenced map to "Arc View GIS" for Digitalisation.

4. Digitize the road network and market locations and enter their attribute data.
5. The layers were thus formed and suitable markets as well as location of facilities viewed suitably in the map.

### 6. Issues

“India has a well-documented history of maps but the rigid framework of restriction of map data policy has tied down GIS players within India. In addition, there is no ‘quality standard’ or certification standard for GIS data produced, and end users are unable to evaluate the quality of data supplied by GIS players. The other real obstacles are low awareness of the benefits of GIS, no clearly outlined government policy in this area, and the lack of finance to support GIS solutions, especially at the state and local government level”. Precision farming, though in many cases a proven skill is still mostly limited to developed (American and European) countries. The reasons for limited implementation of PF in Asian country (India) are following:

- Small land holdings.
- Cost/benefit aspect of PF system Heterogeneity of crop systems.
- Lack of local technical skill.
- Knowledge and technological gap.

Out of these, the two major problems for implementing PF in Indian agriculture are small land holdings and cost of PF system. We shall discuss these two and see how remote sensing can help. In India additional 57.8 per cent of operational holdings has size less than 1 ha. With this field size, and the farming being mostly subsistent farming, it is difficult task to adopt the techniques PF at individual field level. However, for adoption of PF, one can consider, in its place of individual fields, contiguous fields, with same crop, under similar organization practices. Since, organization practices, like seed rate, fertilizer rate etc.

are mostly based upon the agro-ecological units, they remain parallel for a large area.

### 7. CONCLUSION

- 1) Precision agriculture offers the promise of increasing productivity while decreasing production cost and minimizing environmental impacts.
- 2) A broad overview of the functioning of GIS & current trends in agriculture. This article highlighted traditional agriculture tools & GIS as new instrument for precision farming in India.
- 3) 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.
- 4) The GIS-based agriculture expert system is studied by combining network knowledge with ES and GIS technology together, which can provide the networking, sharp, magic and visual information and decision service for agriculture manufacturer and the decision making for the precision agriculture practice.

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