



# Application Of Remote Sensing And GIS For Agriculture.

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## Abstract:

Today, Science and Technology made significant role in development of country, different types of satellite working in geostationary orbit to collect the data from atmosphere, Earth. From the last year, India celebrates 23<sup>rd</sup> August as Astronomical year, to remember the Great and first visionary Scientists Aryabhata for his great contribution in the field astronomy. Nowadays, his contribution in the field of science and technology is very useful for mankind to uplift his lifestyle in all the fields such as research and development, education sector, communication technology, space technology etc. To observe the crops and fertilize land using remote sensing and GIS technology is very essential and helpful for the farmers. Traditional farming was depended only on the observation and conclusions made by old farmers which has many boundaries and limitations. Every farmer has made his own personalized views, how to cultivate and which types of crops to be taken during the season. In this paper we are going to discuss use of smart technology -remote sensing and geographical information system which is very needful to the farmers. What is the benefit to the farmers by using smart technology? What is mean by Remote Sensing? What is the Geographical Information System, How the Information is process and how does it works, Data Collection and processing of different geographical areas, Classification of crops, development area of new cities, danger situation of the floods, Use of GIS to measure pH level of soil, types of soil in different areas, direction and flow of rivers, direction and flow of air, drone technology for cultivation of crops, to measure growth of crops, increasing yields of crops, knowledge of metrological analysis is useful to the farmers for this purpose this topic is taken for development and technology awareness to the farmers.

**Key Words:** RST, GIS, Science and Technology, Data collection and processing, Agriculture

## A) Remote Sensing Technology (RST):

Remote sensing technology involves gathering information about an object or area from a distance, typically using sensors on satellites or aircraft, without physical contact. It's a science and an art that uses recorded reflected or emitted energy to analyze and understand various phenomena on Earth's surface, in the atmosphere, and in oceans. It relies on detecting and measuring electromagnetic radiation (like light, infrared, and microwaves) emitted or reflected by the object.

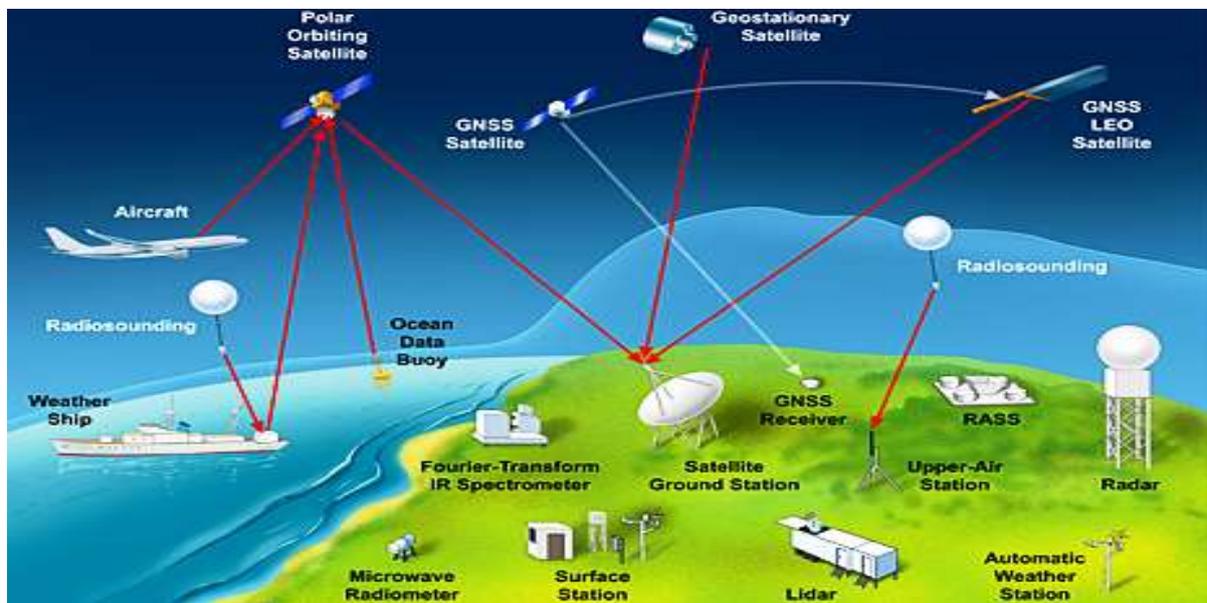


Figure 1 : Remote sensing and GIS in various fields.

Remote sensing is used in various fields like geography, hydrology, ecology, geology, and disaster management, providing valuable to the farmers insights for different applications.

Several other examples of remote sensing systems such as, photograph taken from metrological satellite, measurement of land, observation of crops, temperature measurements of sea water etc. Remote sensing system process satellite images, aerial images and other sensing such as Lidar, thermal, Infrared and multispectral for storage the information.

### B) Geographical Information System (GIS):

A Geographical Information System is a computer-based system designed to capture, store, manage, analyse, and display geographical data to reveal patterns, relationships, and trends for better decision-making. It integrates location-based data with descriptive information, using maps and 3D scenes to present complex geographic data in a visual and understandable way. Geographical Information System is a crucial tool used across various fields, including urban planning, environmental management, resource management, and disaster response.



Figure -2: Distribution of collected information using GIS technology.

It transforms various types of data, such as building locations, roads, polygons- land parcels, and raster data-satellite images. It also stores information of different layers such as, village maps, pattern of land, river maps, population density in particular area, different types of crops taken by the farmers all the data can be used for conclusions. GIS software allows users to perform sophisticated spatial analysis, identify patterns, create interactive maps, and generate 3D scenes to visualize data effectively. A complete GIS involves

hardware (computers), software, data (geographic and attribute information), people (users and operators), and standardized methods.

### Working of GIS Technology:

1. **Capture:** Geographic data is collected from various sources, like surveys, GPS, and satellite imagery.
2. **Data store:** This data is stored in a spatial database, which organizes information based on its geographic location.
3. **Analysis of data:** Users can query the data to find specific information and analysis it to uncover trends, relationships, and patterns.
4. **Presentation of data:** The results are displayed visually through interactive maps, 3D scenes, charts, and reports.

### Applications of GIS Technology:

**Urban Planning:** Managing infrastructure, planning new developments, and understanding land use.

- a) **Environmental Monitoring:** Tracking changes in ecosystems, managing natural resources, and assessing environmental impacts.
- b) **Disaster Management:** Predicting flood risks, responding to environmental disasters, and preparing for future events.
- c) **Transportation:** Planning routes, managing logistics, and optimizing supply chains.



**Figure 3: Farmers used drone technology in their field.**

### C) Working of GIS and RS Technology:

GIS and Rs technology related to each other and working simultaneously for the storage of information and processing remote sensing is very effective. It processes the images taken from satellite, drone images, temperature, humidity, moisture content in air, crop productivity, changes in forest areas etc.

**Information Process:** The collected images and data can be processed by using computer systems.

#### 1. Classification of land area:

Land area classification uses remote sensing (RS) to capture data from satellites and Geographic Information Systems (GIS) to process and analyse it, enabling the creation of maps that categorize land into types like forests, agriculture, and urban areas. The process involves acquiring satellite images, performing spectral and digital terrain analysis, applying classification algorithms (supervised or unsupervised), and

integrating with field data within a GIS framework to create accurate, multi-layered land use/land cover maps for monitoring and planning.

### **Effective presentation of Geographical area:**

To effectively present a geographical area using GIS and Remote Sensing (RS), you must integrate visual data with contextual information through clear and audience-specific visualizations. Remote sensing provides the raw imagery, while GIS is used to analyse, manage, and present this data through powerful maps and graphics. The most impactful presentations use storytelling, interactivity, and advanced analysis to reveal hidden patterns

#### **D) Application of GIS for farming:**

GIS (Geographic Information System) provides farmers with accurate cultivation tools to optimize resource use and improve crop yields by analysing spatial data such as soil conditions, weather patterns, and crop health. Applications include detailed soil mapping for targeted fertilization, crop health monitoring to detect diseases or nutrient deficiencies, irrigation management based on soil moisture, and precise pest control. GIS also aids in land use planning, crop suitability assessment, yield prediction, and managing agricultural resources more continue.

By analyzing spatial data, GIS can map soil types, moisture levels, and nutrient contents. This aids in assessing soil health and suitability for various crops, enabling farmers to apply precise amounts of fertilizers and amendments where needed. Land use and crop management.

#### **E) Village Information and GIS level:**

A Village GIS (Geographic Information System) integrates geographical and attribute data to provide spatial information about a village, which farmers can use with GIS-level data to make informed agricultural decisions. This information includes soil types, water resources, topography, climate, infrastructure, and market access, which helps farmers optimize crop choices, plan planting and harvesting, manage inputs, and improve overall farm productivity and resilience. Again, the main thing which we indicate here is Geographical level of village, Utilization of land, Forest information, Waste land, Level of agriculture and types of crops, Irrigation area, Sources of water and dams, Population of village and social level, Fundamental infrastructure of village, Environment and Disaster Management level, these all the information data we can collect using GIS technology. Hence, this technology is very useful for rural areas to uplift their life.

### **Result and Discussions:**

This technology is very useful to the farmers for taking time- to- time decisions about cultivation of land and crops productivity. Using such smart technology farmers can operate long distance river pumps by mobile software which is connected to the satellite and saving their valuable time. Government provided direct subsidy to the farmers to purchase the Solar plates which convert solar energy to electrical energy which save tremendous amount of green electricity. Which is pollution free energy compare to generating from coal,water etc. To control the large amount of chemicals and fertilizers used by the farmers to production of crops can be minimize using this technology. To increase the productivity of crops it is very essential to examine and analyse the soil, water, air using such technology for better yield.

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