

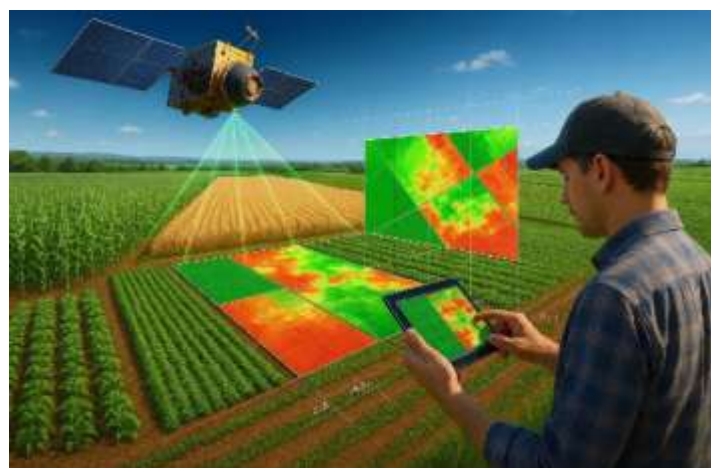
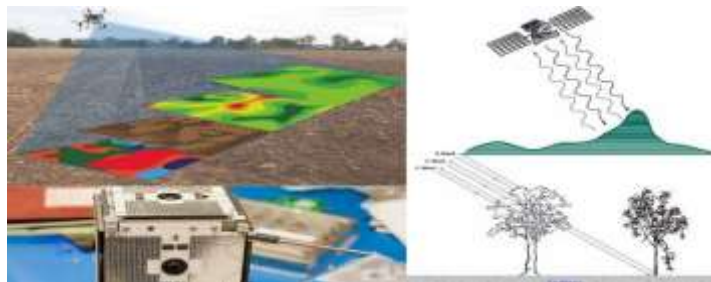
## Remote Sensing in Agriculture: Revolutionizing Modern Farming

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Remote sensing in agriculture involves collecting information about the Earth's surface from a distance, typically using sensors on satellites, drones, or aircraft. This technology provides invaluable insights that empower farmers to make well-informed decisions, ultimately enhancing agricultural efficiency, sustainability, and yield. Here's a breakdown of how remote sensing is used in agriculture, its benefits, and its relevance in India:



### Remote Sensing is Used in Agriculture

- **Crop Health Monitoring:** Sensors capture data on vegetation indices (like NDVI), chlorophyll content, and other biophysical indicators to assess crop vigor, identify areas of stress (nutrient deficiency, water stress), and detect early signs of diseases or pest infestations. This allows for targeted intervention, reducing the need for widespread pesticide use.

Satellites and drones can detect crop stress - like drought, disease, or nutrient deficiencies - before it becomes visible to the human eye. By analyzing light reflected from plants (especially near-infrared), farmers can assess of Chlorophyll content, Growth stage, Water stress, Disease outbreaks

- **Soil Mapping and Analysis:** Remote sensing can help map soil properties, including moisture levels, organic matter content, and nutrient distribution. This information guides precision fertilizer application and irrigation scheduling.

Soil moisture is crucial for plant growth. Using microwave or thermal sensors, remote sensing helps create moisture maps, guiding irrigation schedules and reducing water waste. It also helps maps of Soil type, Texture, Organic matter content.

- **Yield Prediction and Estimation:** By monitoring crop growth and health throughout the season, remote sensing data can be used to develop predictive models for crop yields, aiding in market planning and resource allocation.

Government agencies and agribusinesses use remote sensing for yield forecasting, helping in market planning and food security. It also supports policy-making by tracking area under cultivation and crop productivity.

- **Irrigation Management:** Satellite images provide data on water requirements and water stress, allowing farmers to optimize irrigation schedules and minimize water waste.

- **Weed Detection and Management:** Remote sensing can identify weeds based on their spectral reflectance properties, enabling site-specific herbicide application.

- **Land Use and Land Cover Mapping:** Accurate mapping of agricultural land and identification of different crop types are crucial for land use planning and resource allocation. Remote sensing helps in land classification - telling us what land is under forest, crops, water bodies, or wasteland. This supports government schemes like PM-Kisan, crop insurance, and land use regulation.

- **Drought Monitoring and Assessment:** Remote sensing plays a significant role in identifying drought conditions and assessing their impact on crops, helping governments and farmers plan relief measures.

- **Crop Acreage Estimation:** Remote sensing helps determine crop acreage more accurately in real-time, aiding in better planning and market preparedness.

- **Damage Assessment:** In cases of natural disasters like floods, remote sensing provides quick and precise assessment of crop damage.

### Benefits of Remote Sensing in Agriculture:

- **Precision Farming:** Enables site-specific management of inputs (water, fertilizers, pesticides), leading to optimized resource use and reduced waste.

- **Increased Efficiency:** Automates data collection over large areas, saving time and labor compared to traditional field surveys.

- **Early Problem Detection:** Allows for early identification of issues like pest infestations, diseases, or nutrient deficiencies, enabling timely intervention before widespread damage occurs.

- **Improved Decision-Making:** Provides data-driven insights for better management of farm operations, from planting to harvesting.

- **Cost Savings:** Optimizes input use, reduces unnecessary applications, and minimizes crop losses, leading to significant cost savings for farmers.

- **Enhanced Sustainability:** Contributes to more sustainable farming practices by reducing chemical inputs, conserving water, and improving soil health.

- **Risk Assessment:** Helps assess risks associated with new farmland or potential environmental challenges. Remote Sensing in Indian Agriculture: India, with its vast and diverse agricultural landscape, is increasingly adopting remote sensing technology to address various challenges and enhance productivity. The Indian Space

Research Organisation (ISRO) and other government agencies, along with private companies, are actively involved in utilizing space-based observations for agricultural applications.

#### Key initiatives and applications in India include:

- **FASAL (Forecasting Agricultural Output using Space, Agro-meteorology and Land**

based Observations) program: Conceptualized by ISRO, this program provides multiple in-season forecasts of nine major field crops at a national scale.

- **Mahalanobis National Crop Forecast Centre (MNCFC):** Established by the Ministry of Agriculture & Farmers' Welfare, MNCFC operationally uses space-based observations for pre-harvest crop production forecasts and drought assessment.

- **Crop Insurance:** Remote sensing data is used to assess crop damage and support crop insurance schemes, ensuring proper compensation for farmers in case of crop failure.

- **Precision Farming Adoption:** Growing awareness and government policies are

promoting the adoption of precision farming techniques, heavily reliant on remote sensing, to optimize fertilizer use, water management, and pest control.

- **Startups and Innovation:** Several Indian startups are leveraging satellite-based farm management solutions and AI-driven advisory services to provide personalized insights to farmers.

#### Conclusion

Overall, remote sensing is revolutionizing agriculture by providing farmers with the tools to manage their fields more effectively, sustainably, and profitably. In a country like India, where agriculture is a backbone of the economy, this technology holds immense potential for boosting food production and ensuring food security.

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