© INNOVATIVE RESEARCH THOUGHTS | Refereed | Peer Reviewed | Indexed
ISSN : 2454 – 308X | Volume : 07 , Issue : 04 | October - December 2021

Application of Remote Sensing in Geographical Studies for Agricultural Production

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Summary

Remote Sensing (RS) is the science and art of obtaining information about an object without touching or changing the object, specifically, the Earth's surface or atmosphere. Remote Sensing is basically used by the scientific community for mapping and monitoring of natural resources on the surface of the earth. Remote sensing images provide reliable surface information for large spatial areas. The satellite images of an area are records of its changing hydro-geomorphology over time. advances in satellite, airborne and ground based remote sensing, reflectance data are increasingly being used in agriculture. This paper reviews various remote sensing methods designed to optimize profitability of agricultural crop production and protect the environment. The paper presents examples of the use of remote sensing data in weather and climate change, geomorphology, hydrology and water , forest and biodiversity, land use planning, monitoring of natural hazards and disasters, Determining Soil for Agricultural planning, Determining Soil for Agricultural planning**,** Determining Soil for Agricultural planning and Oceans and Coastal Monitoring which help for crop yield forecasting, assessing nutritional requirements of plants and nutrient content in soil, determining plant water demand and weed control.

Introduction

Application of Remote Sensing and GIS in geographical is emerging scenarios in geography which have been transformed in data collection techniques. The following points highlight the top fifty applications of remote sensing Remote sensing is the process of obtaining information about objects without coming into direct contact with the object. The carrier of information in remote sensing iselectromagnetic radiation, which travels in vacuum at the speed of light in the form of wavesof different lengths. The most useful wavelengths in remote sensing cover visible light (VIS), and extends through the near (NIR) and shortwave (SWIR) infrared, to thermal infrared (TIR) and microwave bands. Passive remote sensing sensors record incident radiation reflected or emitted from the objects

while active sensors emit their own radiation, which interacts with the target to be investigated and returns to the measuring instrument. The following points highlight the applications of remote sensing.

Weather and Climate Change:

Every aspect of weather and climate change is affected or affects geography. The remote sensing technique helps estimate sea surface temperature, which closely monitors weather changes. Information collected from the satellite signalling and imageries is used for developing early warning and forecasting systems to reduce climate change-related risks. GIS tools for statistical analysis and monitor climate change's impacts. Estimating sea surface temperature and modelling the methane emission using MODIS, the multipurpose INSAT 3A provides vital information for a detailed monitoring of the weather and an accurate forecasting.

Geomorphology:

Geomorphology is the study of landforms, their processes, and their evolution. In geomorphology, remote sensors help scientists understand deforestation, soil properties, and precipitation issues. Remote sensing techniques in geomorphology use in land mapping, earth's surface, and identifying wind erosion areas and also used for mapping potential glacier lake outburst floods in the Himalayas. The most frequent applied areas of remote sensing in India is the study of Earth's subsurface and surface features. Aerial photographs are an effective tool for geological, geomorphological, relief and hydrological studies and land-use mapping. These geomorphic units have different physical potential and provide a sound base for land-use planning. GIS has been used for soil productivity assessment and mapping.

Hydrology and Water

Targeting ground water in hard rock, using remote sensing and GIS, is a recent phenomenon in hydrological science. Use of remote sensing for monitoring the of evapo-transpiration, measurement of water surface roughness, rainfall distribution and infiltration, ground water discharge and salt content of water and light absorption etc.

Aerial photography is to collect information regarding water storage, season and long-term fluctuations of lake and river surface aerial extent, assessment of underground and soil moisture. The weather satellite imagery is usually used to monitor ice and snow cover conditions providing important inputs for water management and flood prediction.

OCEANSAT-1 satellite has brought in significant improvement in remote sensing for ocean monitoring improvement because the coastal marine resources require considerable improvement to improve both utilisation and management of these resources.

Forest and Biodiversity:

Forests are the most diverse ecosystems since they carry many terrestrial species. However, forest biodiversity is threatened by issues like deforestation, degradation, hunting, and forest fragmentation. Assessment of grassland and their changes with time has been greatly facilitated by using remote sensing and GIS technology. It is through remote sensing that the actual forest covers of India were known through findings of satellite data analysis. Through remote sensing, the assessment of forests and their changes with time have been monitored appropriately. Remote sensing has greatly facilitated forest land classification, fire detection, and mapping to manage forests. Apart from forest land classification, stock mapping and volume estimation, remote sensing is also used for damage assessment and fire detection, which is a common feature of Indian forests. GIS is used in biodiversity conservation plan.

Land-Use planning:

Remote sensing data from thematic maps provide the baseline for monitoring activities to perform viz. land use and land cover mapping study land utilization, planning, and the management of the available natural resources. Using IRS-LISS-1 data in 274 districts through visual interpretation and 168 selected districts through digital techniques, agro climatic zones are being analysed for Kharif and Rabi seasons to precisely estimate the agricultural land. The arid zone monitoring includes agricultural improvement and desertification study. The land-use land cover change through GIS technique is very significant in analysing the dynamics of land-use change. Various remote sensing and GIS layers are also being used for mapping urban heat islands.

Urban Development:

Applications of remote sensing in urban development include urban sprawl planning, regional planning for air and noise monitoring, landfill and road monitoring systems. Increasing demands in urban planning and management sectors call for coordinate application of remote sensing and GIS for sustainable development of urban area. Availability of high resolution data form IRS-1C and ID satellite has revolutionised the process of thematic

mapping and spatial- data base creation, especially in the context of urban sprawl and regional planning.

Monitoring of Natural Hazards and Disasters:

The remote sensing data, particularly from satellites, can monitor the condition of the earth's surface and predict any threats. The sensors are also used to manage and control disasters and prevent them from happening again. The images from an environmental satellite in conjunction with the conventional data help in monitoring severe connective situations, e.g. cyclones and storms, responsible for large-scale destruction. The visible, infra-red and enhanced infra-red images are utilised to estimate rainfall in sensitive areas. The hydrological and meteorological data transmission from the data collection platform system is valuable input for planning flood control and protection measure. In the year 1986, the NSRA completed the survey and mapping of wastelands in India using Landsat satellite data. Flood plain zonation is a key tool in managing the disaster in the various parts of India.

Determining Soil for Agricultural planning

In Geography, soil moisture contributes to understanding the earth's water cycle, drought, floods, and weather forecasting in general. Active and passive sensors, i.e., Radarsat-2 and SMOS, measure soil moisture content in remote sensing. Remote sensors have been relatively successful in measuring the water content in soil up to a depth of 5cm from the ground. Soil mapping is done to provide important information about the characteristics and the conditions of a given land. Since all soils are not the same, accurate soil information is necessary globally. The remote sensing technique is employed in soil mapping to analyze and evaluate soil survey data to identify the most potent type of soil.

Oceans and Coastal Monitoring

Applications of remote sensing technology to both oceans and coastal monitoring in geography include; storm forecasting, water temperature monitoring, and ocean pattern identification. Oceans serve as transportation routes and are crucial in weather system formation and CO_2 storage. They are also an essential link in the earth's hydrological balance. On the other hand, Coastlines are environmentally sensitive interfaces between the ocean and land.

Conclusion

Use of remote sensing in precision agriculture, which has been developing rapidly, help to monitor the above mentioned factors affecting can be used in precision agriculture require constant access to detailed information characterizing the environmental conditions under which this production takes place. Such information may be obtained from airborne and satellite images at the field scale. The ability to use remote sensing data to determine to increase the agriculture production.

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