NEW ERA AGRICULTURE MAGAZINE

REMOTE SENSING CONCEPTS AND APPLICATION IN HORTICULTURE

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Introduction:

Remote sensing is the acquisition of information about an object without making physical contact with the object.

Remote sensing is the science and art of acquiring information (spectral, spatial, and temporal) about material objects, area, or phenomenon, without coming into physical contact with the objects, or phenomenon under investigation. Remote Sensing means sensing of the earth‘s surface from space by making use of the properties of electromagnetic wave emitted, reflected, or diffracted by the sensed objects for the purpose of improving natural resource management land and the protection of the environment. Without direct contact, some means of transferring information through space must be utilized. In remote sensing information transfer is accomplished by use of electromagnetic radiation (EMR).

Remote sensing in the broad sense, the measurement or acquisition of information of some property of an object or phenomenon, by a recording device that is not in physical or intimate contact with the object or phenomenon under study; e.g., the utilization at a distance (as from aircraft, spacecraft, or ship) of any device and its attendant display for gathering information pertinent to the environment, such as measurements of force fields, electromagnetic radiation, or acoustic energy. The technique employs such devices as the camera, lasers, and radio frequency receivers, radar systems, sonar, seismographs, gravimeters, magnetometers, and scintillation counters.

Remote sensing is a technique to observe the earth surface or the atmosphere using airborne or space borne platforms. It uses several parts of the electromagnetic spectrum. It records the electromagnetic energy reflected or emitted by the earth‘s surface.

Concept of remote sensing

Remote sensing is technique of deriving information about objects on the surface of the earth without physically contact into them. This process involves making observations using sensors mounted on platforms (aircrafts and satellites) which are at

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considerable height from earth surface and recording the observations on suitable medium.

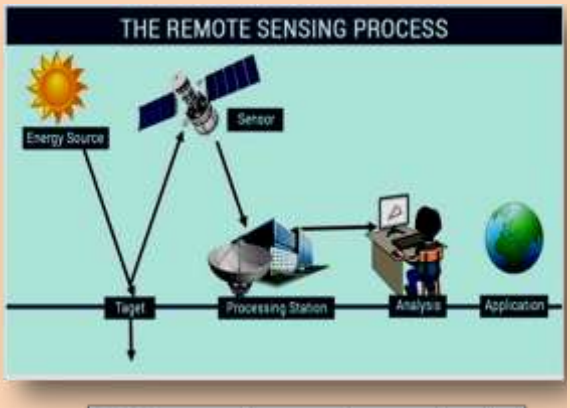


Fig.1: Remote sensing process (source to ultimate)

Target → Processing station → Analysis → Application

Electro-magnetic radiation which is reflected or emitted from an object is the usual source of remote sensing data. However any media such as gravity or magnetic fields can be utilized in remote sensing.

MILESTONES IN HISTORY OF REMOTE SENSING

Year	Milestone achieved
1800	Discovery of Infrared by Sir W. Herchel
1839	Beginning of Practice of Photography
1847	infrared Spectrum Shown by J.B.L. Foucault
1859	Photography from Balloons
1873	Theory of electromagnetic spectrum by J.C. Maxwell
1909	Photography from Airplanes
1916	World War I: Aerial Reconnaissance
1935	Development of Radar in Germany
1940	World War II: Application of Non-Visible parts of electromagnetic radiation
1950	Military Research and Development
1959	First Space Photograph of the earth(xplorer-6)
1960	First Meteorological Satellite launched
1970	Skylab Remote sensing Observations from space
1972	Launch LANDSAT-I and rapid advancement in digital image processing
1982	Launch od LANDSAT-4 with new generations 0f sensors (TM)
1986	French Commercial Earth observational Satellite SPOT
1986	Development of hyperspectral sensors
1990	Developing high resolution space borne systems and first commercial developments in remote sensing.

A device to detect the electro-magnetic radiation reflected or emitted from an object is called a "remote sensor" or "sensor" Cameras or scanners are examples of remote sensors.

A vehicle to carry the sensor is called a "platform Aircraft or satellites are used as platforms.

Working Principle: Different objects return different amount and kind of energy in different bands of EM spectrum (Electromagnetic radiations) Incident upon it. This property of the object depends on the structural, physical and chemical composition surface roughness, intensity and wavelength of radiant energy, hence we can identify objects by collecting and analyzing returned energy.

The remote sensing data will be processed automatically by computer and/or manually interpreted by humans, and finally utilized in agriculture, land use. forestry, geology, hydrology, oceanography, meteorology, environment, etc.

TYPES OF REMOTESENSING:

There are basically two types of remote sensing

1. Active remote sensing
2. passive remote sensing

1. Active remote sensing

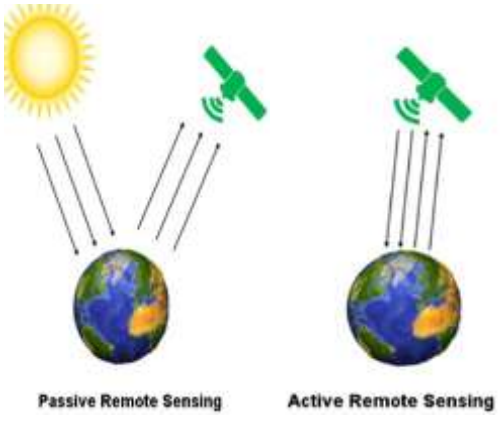
In this type, sensors emit (generates) and uses their own source of energy

Example:

- LIDAR (Light Detection and Ranging)
- RADAR (Radio Detection and Ranging)
- ❖ On the other hand, emits energy in order to scan objects and areas where upon a sensor then detects and measures the radiation that is reflected or backscattered from the target
- ❖ RADAR is an example of active remote sensing where the time delay between emission and return is measured, establishing the location, height speeds and direction of an object

2. Passive remote sensing

- ❖ Detect natural radiation that is emitted or reflected by the object or surrounding area being observed.
- ❖ Reflected sunlight is the most common source of radiation measured by passive sensors
- Examples of radiometers passive remote sensors include film photography, infrared, and radiometers.



Passive and Active remote sensing

Application of remote sensing in horticulture:

1. Crop production forecasting.
2. Assessment of crop damage and crop progress
3. Horticulture cropping system analysis
4. Crop identification
5. Crop acreage estimation
6. Crop condition assessment and stress detection
7. Identification of planting and harvesting dates
8. Crop yield modeling and estimation
9. Identification of pest and disease infestation
10. Soil moisture estimation
11. Irrigation monitoring and management
12. Soil mapping
13. Drought monitoring
14. Land cover and land degradation mapping
15. Identification of problematic soils
16. Crop nutrient deficiency detection
17. Determination of water contents of field crops
18. Crop yield forecasting
19. Flood mapping and monitoring
20. Water resources mapping
21. Collection of pests and current weather data
22. Precision farming
23. Climate change monitoring
24. Soil management practices
25. Air moisture estimation
26. Crop health analysis
27. Land mapping

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