Applications of Remote Sensing in Agriculture

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SUMMARY

Remote sensing is the acquisition of information about an object or any phenomenon without making any physical contact with the object. It is a phenomenon that has numerous applications including photography, surveying, geology, forestry and many more. But it is in the field of agriculture that remote sensing has found significant use. There are very many applications of remote sensing in the agricultural sector.

INTRODUCTION

Remote sensing is the process of acquiring information about the Earth''s surface by measuring its reflected and emitted radiation without coming into direct contact with the object. In much of remote sensing, the process involves an interaction between incident radiation and the targets of interest .The most useful electromagnetic radiation in remote sensing includes visible light (VIS), near infrared (NIR) and shortwave infrared (SWIR), 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. During the last two decades, remote sensing techniques are applied to explore agricultural applications such as crop discrimination, crop acreage estimation, crop condition assessment, soil moisture estimation, yield estimation, precision agriculture, soil survey, agriculture water management, agro meteorological and agro advisories. The application of remote sensing in agriculture, i.e. in crops and soils is extremely complex because of highly dynamic and inherent complexity of biological materials and soils. However, remote-sensing technology provides many advantages over the traditional methods in agricultural resources survey. The advantages include (a) capability of synoptic view, (b) potential for fast survey, (c) capability of repetitive coverage to detect the changes, (d)low cost involvement, (e) higher accuracy, and, (f) use of hyper spectral data for increased information. As mentioned, there are many applications of remote sensing in the agricultural sector. Below is a summary of these applications.

- **Crop production forecasting**: Remote sensing is used to forecast the expected crop production and yield over a given area and determine how much of the crop will be harvested under specific conditions. Researchers can be able to predict the quantity of crop that will be produced in a given farmland over a given period of time.
- **Horticulture, Cropping Systems Analysis**: Remote sensing technology has also been instrumental in the analysis of various crop planting systems. This technology has mainly been in use in the horticulture industry where flower growth patterns can be analysed and a prediction made out of the analysis.
- **Assessment of crop damage and crop progress**: In the event of crop damage or crop progress, remote sensing technology can be used to penetrate the farmland and determine exactly how much of a given crop has been damaged and the progress of the remaining crop in the farm.
- **Crop Identification**: Remote sensing has also played an important role in crop identification especially in cases where the crop under observation is mysterious or shows some mysterious characteristics. The data from the crop is collected and taken to the labs where various aspects of the crop including the crop culture are studied.
- **Crop acreage estimation**: Remote sensing has also played a very important role in the estimation of the farmland on which a crop has been planted. This is usually a cumbersome procedure if it is carried out manually because of the vast sizes of the lands being estimated.
- **Crop condition assessment and stress detection**: Remote sensing technology plays an important role in the assessment of the health condition of each crop and the extent to which the crop has withstood stress. This data is then used to determine the quality of the crop.
- **Identification of planting and harvesting dates**: Because of the predictive nature of the remote sensing technology, farmers can now use remote sensing to observe a variety of factors including the weather patterns and the soil types to predict the planting and harvesting seasons of each crop.
- **Crop yield modelling and estimation**: Remote sensing also allows farmers and experts to predict the expected crop yield from a given farmland by estimating the quality of the crop and the extent of the farmland. This is then used to determine the overall expected yield of the crop.

- **Identification of pests and disease infestation**: Remote sensing technology also plays a significant role in the identification of pests in farmland and gives data on the right pests control mechanism to be used to get rid of the pests and diseases on the farm.
- **Soil moisture estimation**: Soil moisture can be difficult to measure without the help of remote sensing technology. Remote sensing gives the soil moisture data and helps in determining the quantity of moisture in the soil and hence the type of crop that can be grown in the soil.
- **Irrigation monitoring and management**: Remote sensing gives information on the moisture quantity of soils. This information is used to determine whether a particular soil is moisture deficient or not and helps in planning the irrigation needs of the soil.
- **Soil mapping**: Soil mapping is one of the most common yet most important uses of remote sensing. Through soil mapping, farmers are able to tell what soils are ideal for which crops and what soil require irrigation and which ones do not. This information helps in precision agriculture.
- **Monitoring of droughts**: Remote sensing technology is used to monitor the weather patterns including the drought patterns over a given area. The information can be used to predict the rainfall patterns of an area and also tell the time difference between the current rainfall and the next rainfall which helps to keep track of the drought.
- **Land cover and land degradation mapping**: Remote sensing has been used by experts to map out the land cover of a given area. Experts can now tell what areas of the land have been degraded and which areas are still intact. This also helps them in implementing measures to curb land degradation.
- **Identification of problematic soils**: Remote sensing has also played a very important role in the identification of problematic soils that have a problem in sustaining optimum crop yield throughout a planting season.
- **Crop nutrient deficiency detection**: Remote sensing technology has also helped farmers and other agricultural experts to determine the extent of crop nutrients deficiency and come up with remedies that would increase the nutrients level in crops hence increasing the overall crop yield.
- **Reflectance modelling**: Remote sensing technology is just about the only technology that can provide data on crop reflectance. Crop reflectance will depend on the amount of moisture in the soil and the nutrients in the crop which may also have a significant impact on the overall crop yield.
- **Determination of water content of field crops**: Apart from determining the soil moisture content, remote sensing also plays an important role in the estimation of the water content in the field crops.
- **Crop yield forecasting**: Remote sensing technology can give accurate estimates of the expected crop yield in a planting season using various crop information such as the crop quality, the moisture level in the soil and in the crop and the crop cover of the land. When all of this data is combined it gives almost accurate estimates of the crop yield.
- **Flood mapping and monitoring**: Using remote sensing technology, farmers and agricultural experts can be able to map out the areas that are likely to be hit by floods and the areas that lack proper drainage. This data can then be used to avert any flood disaster in future.
- **Collection of past and current weather data**: Remote sensing technology is ideal for collection and storing of past and current weather data which can be used for future decision making and prediction.
- **Crop intensification**: Remote sensing can be used for crop intensification that includes collection of important crop data such as the cropping pattern, crop rotation needs and crop diversity over a given soil.
- **Water resources mapping**: Remote sensing is instrumental in the mapping of water resources that can be used for agriculture over a given farmland. Through remote sensing, farmers can tell what water resources are available for use over a given land and whether the resources are adequate.
- **Precision farming**: Remote sensing has played a very vital role in precision agriculture. Precision agriculture has resulted in the cultivation of healthy crops that guarantees farmers optimum harvests over a given period of time.
- **Climate change monitoring**: Remote sensing technology is important in monitoring of climate change and keeping track of the climatic conditions which play an important role in the determination of what crops can be grown where.

- **Compliance monitoring**: For the agricultural experts and other farmers, remote sensing is important in keeping track of the farming practices by all farmers and ensuring compliance by all farmers. This helps in ensuring that all farmers follow the correct procedures when planting and when harvesting crops.
- **Soil management practices**: Remote sensing technology is important in the determination of soil management practices based on the data collected from the farms.
- **Air moisture estimation**: Remote sensing technology is used in the estimation of air moisture which determines the humidity of the area. The level of humidity determines the type of crops to be grown within the area.
- **Crop health analysis**: Remote sensing technology plays an important role in the analysis of crop health which determines the overall crop yield.
- **Land mapping**: Remote sensing helps in mapping land for use for various purposes such as crop growing and landscaping. The mapping technology used helps in precision agriculture where specific land soils are used for specific purposes.

CONCLUSION

From the above information, we have concluded a brief idea about how remote sensing is going to help the humans in the field of agriculture. Besides all of the points mentioned above remote sensing services like land viewer can help farmers monitor any green biomass changes within their farmlands, thus help them improve productivity. It's just a matter of fact that we have taken baby steps towards the methods and make it carry forward to the next generation so that it would be treated as unseparated tool in the field of agriculture.

REFERENCES

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