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Remote Sensing in Fruit Crops

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SUMMARY

Horticultural crops particularly fruit crops play a significant role in the country food and nutritional security, and this is especially true in the developing world. Thus, it is necessary to increase both production and product quality simultaneously. In order to increase fruit production, it is necessary to monitor the orchard on a regular basis, which is extremely difficult due to the large area covered. When it comes to gathering accurate information on many parameters required for the horticultural sector, particularly fruit crops over a large area, remote sensing is one of the most advanced technologies currently available.

INTRODUCTION

To make sure the country has enough food and nutrients, it's important to grow more fruit crops and make them better. Fruit output can be improved by frequent orchard monitoring, which is difficult due to the enormous area covered. Remote sensing is a rapidly developing advanced technology that enables the accurate collection of data on a variety of parameters essential for the horticultural sector, particularly fruit crops, over a vast area (Pujar *et al.,* 2017). GIS is used to apply site-specific crop management (SSCM) to fruit and nut crops in order to get the best results. This is done by combining aerial or satellite images with GPS data. The use of SSCM in the case of fruit and nuts can boost productivity and optimize resource consumption. Spatial technology can be used to make decisions about things like when and how much irrigation is needed, when and how much pesticides should be used, how much fertilizer should be used and how much fruit will be produced (Deb *et al.,* 2018).

With a digital camera, segmentation technique and Principal Component Analysis (PCA), we can detect and classify citrus diseases in citrus fruits. We can also use these techniques to choose the best features. The proposed technique is tested on Citrus Disease Image Gallery Dataset, Combined dataset (Plant Village and Citrus Images Database of Infested with Scale), and our own collected images database. We used these datasets for detection and classification of citrus diseases namely anthracnose, black spot, canker, scab, greening, and melanose (Sharif *et al.,* 2018). Recently, with the development of optical sensing technology, hyperspectral imaging has been applied as one of the powerful tool to non contact detect the fruits quality including the ripeness for many fruits, such as persimmon (Munera *et al.,* 2017a), olive (Cabrera *et al.,* 2018), nectarine (Munera*et al.,* 2017b), strawberry (Zhang *et al.,* 2016), bananito (*Musa acuminata*, AA) (Pu*et al.,* 2019) etc. While it is still challenging to employ the hyperspectral imaging in field, with limitations in light source, winds, and crops overlapping etc. Furthermore, combined with hyperspectral imaging and deep learning is worth of exploration for detailed information extraction and information understanding with large amounts of dataset.

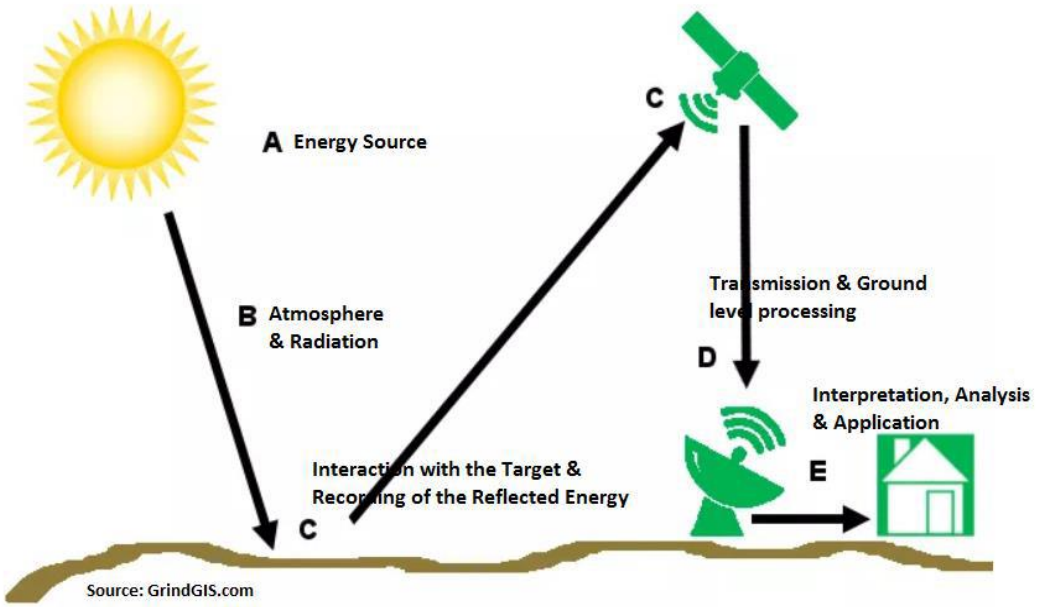
Remote sensing using an unmanned aerial vehicle (UAV) fitted with a sensor system to map spatial patterns of photosynthetic activity in banana plantations to aid in the analysis of spatial patterns of underlying factors impacting productivity and thus help to boost agricultural efficiency (Machovina *et al.,* 2016). Remote sensing is a tried and true method that can help you achieve your aim. Remote sensing is used in a lot of different fields of science, like geography, land surveying, different earth science fields, and fruit science.

Remote Sensing (RS)

Remote Sensing (RS) 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.

What is Remote Sensing then?

"Remote Sensing is the art and science of acquiring information about the earth surface without having any physical contact with it. This is done by sensing and recording of reflected and emitted energy."



Applications of Remote Sensing in Fruit Crops:

Crop Identification: Remote sensing has also been critical for crop identification, particularly when the crop being observed is strange or has certain unexplained characteristics. The crops data is collected and taken to the labs where many components of the crop including crop culture are investigated.

Crop Acreage Estimation: Remote sensing has also proved highly useful in estimating the amount of farmland that has been planted with a crop. Because of the huge extent of the lands being evaluated, this is usually a time-consuming task if done manually.

Identification of Planting and Harvesting Dates: Because the remote sensing technology is so accurate, farmers can now use it to look at things like the weather and soil types to figure out when each crop should be planted and harvested.

Crop Condition Assessment and Stress Detection: Remote sensing technology acting a significant role in the evaluation of the health condition of every crop and the amount to which the crop has withstood stress. This data is then used to figure out how good the crop is.

Monitoring of Droughts: Weather patterns, especially drought patterns, are monitored using remote sensing equipment over a given area. The information can be used to predict how much rain an area will get and also how long it will be before the next rain. This helps people keep track of the drought.

Crop Yield Modelling and Estimation: By assessing the quality and extent of the farmland, remote sensing can help farmers and experts anticipate the potential production from a specific farmland. This is then used to determine the overall expected yield of the crop.

Crop Production Forecasting: Remote sensing is used to predict agricultural production and yield across a specified area and determine how much of the crop will be harvested under specific conditions. Researchers can forecast the amount of crop that will be produced in certain acreage over a specific time period.

Assessment of Crop Damage and Crop Progress: A farmer can utilize remote sensing equipment to see how much of a crop has been damaged and how much development has been made on the rest of the farms crops if damage or progress has occurred.

Cropping Systems Analysis: The use of remote sensing technologies has also aided in the evaluation of various crop planting strategies. This technology has been primarily applied in the horticultural industry, where flower growth patterns may be examined and predictions produced.

Soil Moisture Estimation: Without the use of remote sensing equipment, measuring soil moisture can be challenging. Soil moisture data is provided through remote sensing, which aids in identifying the amount of moisture in the soil and, as a result, the type of crop that may be produced there.

Irrigation Monitoring and Management: Soil moisture content can be determined using remote sensing. This information is utilized to assess if a particular soil is moisture deficient or not, and it aids in the planning of the soils irrigation demands.

Soil Mapping: There are many common and important ways to use remote sensing. Soil mapping is one of the most common, but most important. Maps help farmers figure out which soils are good for what plants and how much water they need. This helps with precision farming.

Identification of Problematic Soils: Remote sensing has also been useful in identifying problematic soils that have a hard time maintaining optimal agricultural output throughout the planting season.

Crop Nutrient Deficiency Detection: Farmers and other agricultural professionals have also used remote sensing technology to detect the extent of crop nutrient deficit and devise solutions to improve the nutrients level in crops, hence enhancing overall crop production.

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.

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.

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.

Satellite meteorology: Remote sensing technology is useful for generating different weather data products. Satellite derived rainfall products are being used widely for various land and water management applications.

Water Resources Mapping: The mapping of water resources that can be utilized for agriculture over a given farmland is made possible by remote sensing. Farmers can utilize remote sensing to determine what water resources are available for use on a given piece of land and whether they are adequate.

Climate Change Monitoring: Remote sensing technology is critical for monitoring climate change and keeping track of climatic conditions, which play a part in determining what crops can be cultivated where.

Compliance Monitoring: Remote sensing is useful for agricultural professionals and other farmers in keeping track of all farmers farming operations and assuring compliance by all farmers. This contributes to ensuring that all farmers follow the proper processes when planting and harvesting crops.

Soil Management Practices: Remote sensing technology is useful in determining soil management strategies based on data collected from farms.

Air Moisture Estimation: The humidity of a location can be estimated using remote sensing methods. The type of crops that can be cultivated in the location is determined by the level of humidity.

Land Mapping: Remote sensing aids in the mapping of land for a variety of uses, including crop production and landscaping. Using mapping technology, precise farming can be achieved by using specific land soils for a certain task.

CONCLUSION

Remote sensing is a significant technique for monitoring orchards at high spatial resolution on a regular basis, allowing for site-specific, cost-effective management plans. Reduces monitoring costs, improves resource use efficiency, lowers total production costs, and increases profit. Remote sensing can aid in the reduction of biotic and abiotic stress conditions. Land fragmentation is the most significant impediment to large-scale agricultural mechanization in India. Given the constraints, remote sensing is still a long way off in India. Need-based and appropriate changes must be worked out. Local technological expertise must be advanced.

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