Agriculture Crop Monitoring And Management Using Satellite And Remote Sensing

Abstract:

Remote sensing is a method of reading objects and data from remote platforms like ground-based sensors, aircraft, or satellites is a probably necessary supply of knowledge for in-field crop management, providing each necessary information. Our objective was to use remotely perceived imagery data to match completely different vegetation index as a method of assessing cover variation and its resulting impact on crop grain yield. Treatments consisted of 5 N rates and 4 hybrids, that were big beneath irrigation close to Shelton, NE on a Hord silt dirt in 1997 and 1998. mental imagery information with 0.5-m the spatial resolution for collecting data from the craft on many dates throughout each season employing multiple ways, four-filters [blue, green, red, and near-infrared reflectance] camera system. imagery data was fitted into a geographical data system (GIS) and so registered, introduction to coefficient, and accustomed 3 vegetation index. Grain yield for every plot was firm at maturity. Results showed that inexperienced normalized distinction vegetation index (NDVI) values derived from pictures non-inheritable throughout mid-grain filling were the foremost extremely correlative with grain yield, most correlations were 0.7 and 0.92 in 1997 and 1998, mostly. Normalizing NDVI and grain yield variability among hybrids improved the correlations each year, however, a lot of drama will increase were determined in 1997 (0.7 to 0.82) than in 1998 (0.92 to 0.95). This advised NDVI non-inheritable throughout mid-grain filling might be accustomed to turning out relative yield maps portraying spatial variability in fields, giving a probably enticing various to use of a mix yield monitor.

Keywords—Remote sensing, Agriculture monitoring, Agriculture Management, Data Mining, image processing.

Introduction

India ranked 2nd worldwide in the agriculture Production. Agriculture is demographically the broadest economic sector and plays a important role in the overall social-economic fabric of any country. Agriculture may be a distinctive business crop production that depends on many climate and economic factors. The number of the factors that affect agriculture are area soil type, climate condition, cultivation time, irrigation, use of fertilizers, temperature, amount of rainfall, use of pesticide weeds, and different factors. Historical crop yield info is additionally necessary for the supply chain operation of corporations engaged in industries. These industries use agricultural merchandise as material, livestock, food, animal feed, chemical, poultry, fertilizer, pesticides, seed, and paper. an accurate estimate of crop production and risk helps these corporations in planning supply chain calls like production coming up with. Businesses like seed, fertilizer, agrochemical, and agricultural machinery industries arrange production and selling activities supported crop production estimates [1, 2]. There area unit a pair of factors that area unit useful for the farmers and therefore the government in deciding namely:

1. A. It helps farmers to chose the write crop to plant to get more productio9n using the historical data.
2. B. It helps the government in making more reliable policy for our farmers.

The observance of crop growth in every stage throughout biological process stages is a plays a important role in agricultural management. It helps the farmer to interventions on time that guarantee optimum yields at the tip of the season.

Stress factors often prevent crops from developing at the rate they are capable of. Examples include:

- The water availability issues.
- The Temperatures.
- Competition among plants for sunlight, nutrients, water, or space
- The Nutrient deficiency.
- Attack from insects or other organisms, above and below the ground.
- Some of the above arise from shortcomings in labor investment on the plot

The satellite crop observance system may be a system that enables the farmer to perform time period crop vegetation index observance by analyzing satellite pictures of various crops and fields thus confirming each negative and positive development of the crops. By obtaining the various vegetation index of a firm over an amount of your time the farmer is in a position to work out whether or not there's Associate in Nursing improvement within the farm or whether there's a deterioration within the farm. From this analysis, the farmer is in a position to require any corrective life that will be required within the farm.

Related work

The intrinsic characteristics of agriculture produce remote sensing ideal technique for its observation and management (chen et al., 2004). These characteristics include: (a) agricultural activities unit of measurement typically distributed in huge spacial regions, that creates the normal field survey or census long and usually costly; (b) the per-unit-area economic output from agriculture is not so vital as compared with totally {different|completely different} industries; (c) most of the crops unit of measurement annual herbs having fully different growth and development stages in various seasons which suggests that agricultural activities have obvious descriptive linguistic rhythms and so the infra-annual modification may even be very drastic; (d) agriculture is powerfully laid low with human activities and management where timely and proper observation information is required. These intrinsic characteristics of agriculture demand novel techniques at intervals the observation of crop growth and agricultural productions. Remote sensing technology meets these wants by its rapidness, accuracy, economy, timing, dynamic and repetitive observation capability. Remote sensing technology has been applied in agriculture extensively since its early stages at intervals the sixties. Currently, several worlds and national operational systems of observation agriculture with remote sensing square measure operated. The number of comparable operational systems at a regional scale is much extra. These systems provide timely and valuable information for agricultural production, management, and affairs of state. On the opposite hand, the strain arising from the applications in agricultural sectors have together exaggerated the progress and innovation in remote sensing technology.

Proposed work

The proposed system is to using Satellite data for crop monitoring and crop management to reduce the cost of using infield sensors. By using the public use Satellite image data we can build a system that can be used by our farmers almost free of cost. The proposed system can be divided into 3 parts first crop recommendation, second crop monitoring, and third crop management.

1. Crop Production Prediction For Crop Recommendation:

All the process of crop management is to gain more and more production. And to get more production first we have to select the right crop to plant best on your location. there different parameters that affect crop production, the parameters like temperature, soil condition, and weather.

For crop Recommendation, we can we the multilinear regression-model. for the different crops, we have to collect the different parameter value which affects the production and the crop production respectively for at least the last 10-15 years of data.

For collection the data we can we satellite-like open weather map API(like:https://openweathermap.org/api) to get the weather-related data. open weather map can provide you the last 50 years of data with the 1-year weather forecast report.

Agromonitoring(link:https://agromonitoring.com/): Agromonitoring allows you to create 50hectaresof area to inspect it can give you all the information about soil within the 50 hectares area you selected.

And for the crop production report, we can use our gov official website(http://agricoop.nic.in/) which can give you year wise and area wise production report.

Now we can use the multiple-linear-regression to get the equation for better crop production.

Multiple-linear-regression equation formulae:

$Y = b0+b1*x1+b2*x2+\ldots..+bn*xn$

Sample multiple linear regression equation for better production with 6 different crops:

How can farmers use it?

Nowadays almost everyone has a smartphone. We can build a web application or an android application. where we can take the Farmer location latitude and longitude based on the latitude and longitude we will create the 50hectares of area and all the information we needed to recommend the crop.

After collecting all the information of the Farmer field we will use the machine learning model to recommend a crop to get better production.

1. 2. Crop Field Monitoring:

After Farmer chooses the crop to plant currently the time is to watch the expansion of the crop. And watching if any sudden issue happens with the crop.

Here we are able to use NDVI(Normalized distinction vegetation index) to quantify vegetation by measure the distinction between near-infrared (which vegetation powerfully reflects) and red light-weight (which vegetation absorbs).NDVI uses the NIR and red channels in its formula

NDVI =(NIR - Red)/(NIR+Red)

This is why our eyes see vegetation as the color inexperienced. If you may see near-infrared, then it might be sturdy for vegetation too. Satellite sensors like Landsat and Sentinel-2 both have the required bands with NIR and red.

(image courtesy of NASA)

Overall, NDVI could be standardized thanks to live healthy vegetation. When you have high NDVI values, you've got healthier vegetation. When you have low NDVI, you've got less or no vegetation.

To get the NDVI data we can use the agromonitoring((link:https://agromonitoring.com/) which also can give you the soil data and weather data.

Sample area NDVI data:

(image source:https://wp.agromonitoring.com/dashboard/)

Sample Area Weather and Soil data:

(image source :https://wp.agromonitoring.com/dashboard/)

How can Farmer use it ?

In the crop recommendation process we already know the area where the Farmer planting his crop we will use the latitude and longitude of the Farmer to create a Polygons in agromonitoring to get all the data then we can use the alert function to give information to the Farmer if anything unexpected is happening to his crops.

1. 3. Crop Yield Management:

Crop yield is refers to the crop harvesting. crop yield simply represents the harvested crop. here we can help the farmers in different ways

- Help farmers to reach his nearest cold storage.
- Help farmers to sell their crops directly in the market without any third party interference to get more money.
- Educate the farmers about our govt new policiesss.

result and conclusion

If we are able to build the the proposed system where we used the Satellite data for crop monitoring and Management it can reduce the cost of the system which exist today where we used infield sensors for crop monition. this can be build and make available for farmers for free of cost with the help of government.

Future work

Future work is to collect the data from the satellite and store it in the cloud and verify the data accuracy with some government agency who have the accurate data. After we get the correct data, the next work is to build the web application or the android application which can be used by our farmers.

References

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