Estimating and Identifying Area of Cropland of Prayagraj Region

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Problem Statement- Estimating and Identifying Area of Cropland of Prayagraj Region

- Using NDVI method to identifying the area of vegetation area.

Introduction:

* Due to rapid growth of population, urbanization, industry, the agricultural land is decreasing day by day.
In small & large area in agriculture the information about Land cover cover/ use play are play an important role and predicting the future demand.

* So In order to predict the agriculture land and the type of crop from the derived data set of satellite images with the help of some set of tools in order to get good results.

*The entire project demonstrate how could we achieve this.

DATASET:

1- Dataset taken for this project is taken from - https://earthexplorer.usgs.gov/

2- LANDSAT 8 satellite images are used for this problem. Landsat 8 satellite consist of two science instrument operation land Imager (OLI) and Thermal Infrared sensor (TIS). These two sensor provide seasonal coverage of the global landmass at spatial resolution of 30 m

3-The area of Interest

Corner Upper Left Lat 25°35'54.92"N Corner Upper Left Long 80°19'54.41" E

Corner Upper Right Lat 25°35'28.68"N Corner Upper Right Long 8

To explore more about LAndsat 8 :

https://livingatlas2.arcgis.com/landsatexplorer/

LANDSAT 8 BANDS:

Band Number	Description	Wavelength	Resolution
Band 1	Coastal / Aerosol	0.433 to 0.453 µm	30meter r
Band 2	Visible blue	0.450 to 0.515 µm	30 meter
Band 3	Visible green	0.525 to 0.600 µm	30 meter
Band 4	Visible red	0.630 to 0.680 µm	30 meter
Band 5	Near-infrared	0.845 to 0.885 µm	30 meter
Band 6	Short wavelength infrared	1.56 to 1.66 µm	30 meter
Band 7	Short wavelength infrared	2.10 to 2.30 µm	60 meter
Band 8	Panchromatic	0.50 to 0.68 µm	15 meter
Band 9	Cirrus	1.36 to 1.39 µm	30 meter
Band 10	Long wavelength infrared	10.3 to 11.3 µm	100 meter
Band 11	Long wavelength infrared	11.5 to 12.5 µm	100 meter

For Agriculture Purpose:
We use Band no(6,5,2),SWIR-6, Near Infrared, Blue respectively.

For Natural Color Composition:
We use Band no(4,3,2) Red, Green & Blue respectively.

Proposed Methodology:

NDVI is measure of the state of plant health based on how the plant reflects light at certain frequencies (some wave are absorbed and other are reflected)

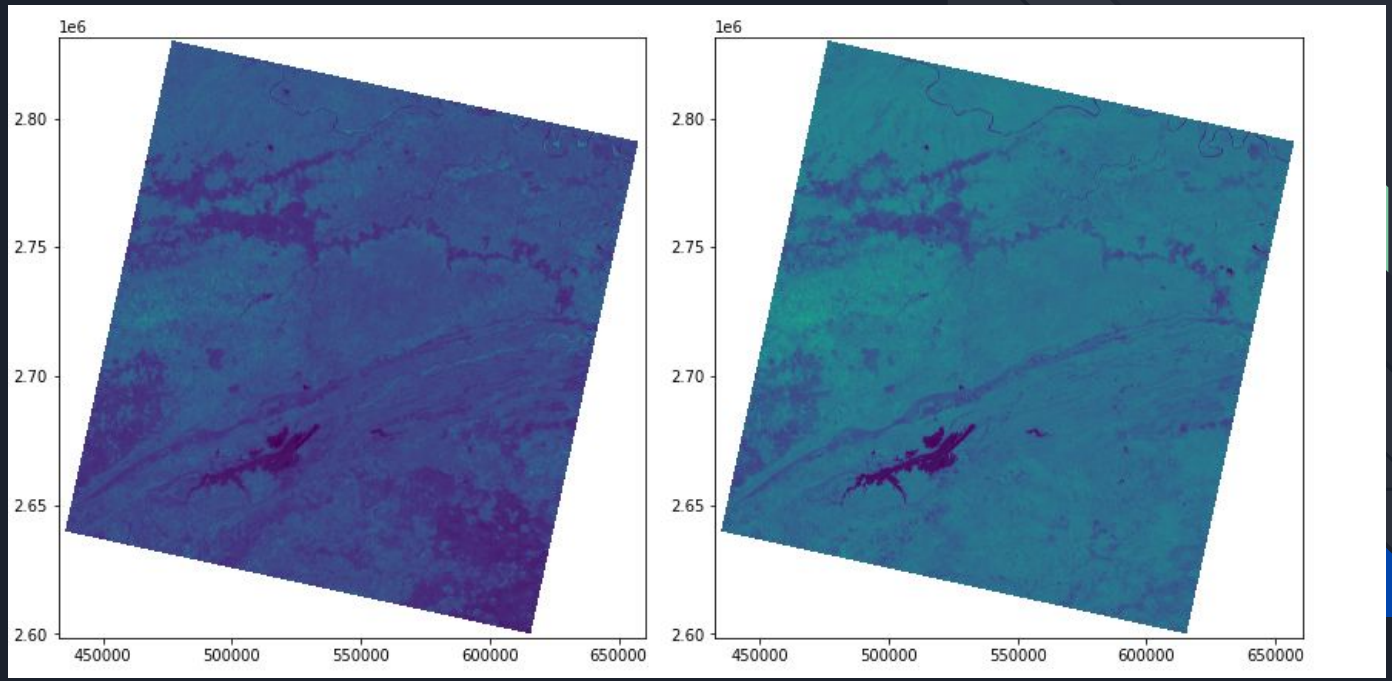
The satellite data produces were geometrically correct data set.The DN(Digital Number) values were converted to at-sensor spectral reflectance of each band for landsat using

$$L_\lambda = \frac{(L_{max} - L_{min}) * Q_{cal}}{(Q_{calmax} - Q_{calmin})} + L_{min}$$

*Lmax is the minimum at-sensor spectral radiance (Wm^-2sr^-1um^-1)
*Lmin is the minimum at-sensor spectral radiance (Wm^-2sr^-1um^-1)
*Qcal is the Dn value of the pixel
*Qcalmax is the maximum DN value of pixel
*Qcalmin is the minimum DN value of pixel.

Methodology:

*Now the pre processing part to get the refined output is done by converting the digital number to at spectral reflectance value



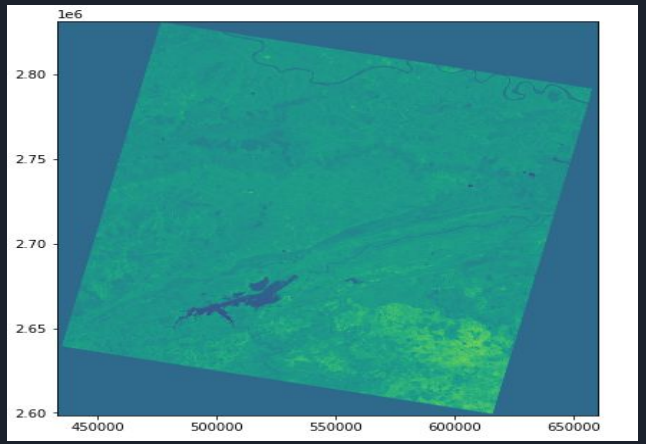
Methodology

*Now NDVi can be calculated from visible and infrared bands of LAndsat 8 spectral bands. NDVi be calculated per pixel as the normalised difference between the red band and the near infrared band of image using :

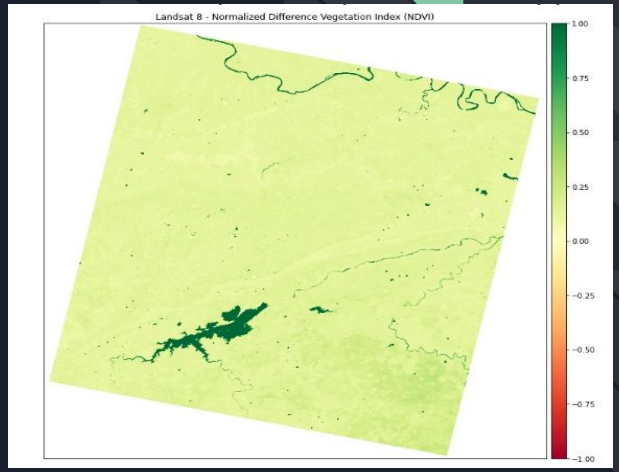
NDVI = (NIR-RED) / (NIR+RED)

* A mask is used to over the NDVi result

*NDVI value ranges from(-1 to +1) for vegetation the value is above 0 and a healthy good vegetation cover (>0.5).



Before Applying MAsk

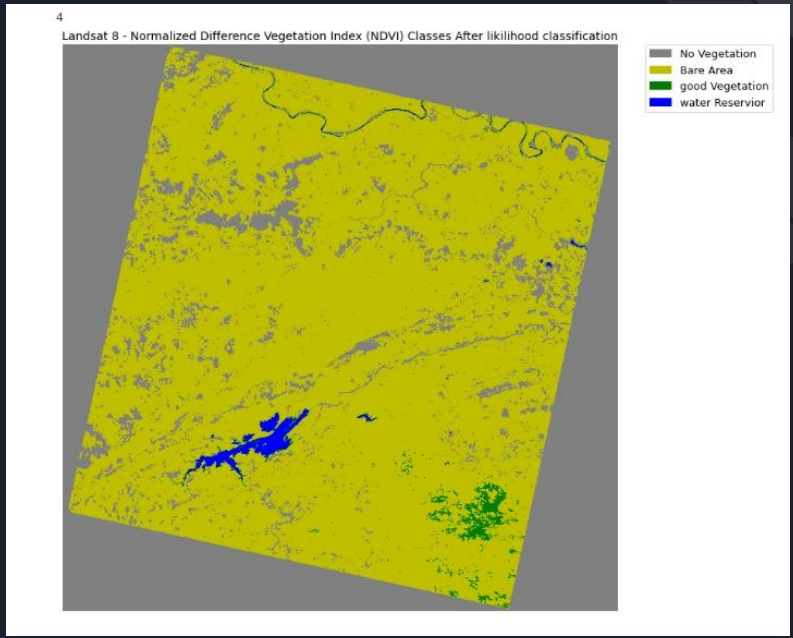


After Applying MAsk

- Using threshold NDVi to create different classes of vegetation, -1,0,0.25,0.4,+1 are threshold values.

- Next we can categorise (classify) the NDVI results into useful classes. Value Under 0 will be classified together as a no vegetation area.Additional classes will be created for bare area and low,moderate and high vegetation

Results Obtained :



In Continuation:

After having hands on with the real satellite data and a knowledge On working with geospatial images ,I will further in continuation with this work where I will able to differentiate the crops

Tool used-Python(language), Colab(online IDE),earthpy, rasterio

Reference:

[1] D. Jeevalakshmi, S. N. Reddy and B. Manikiam, "Land cover classification based on NDVI using LANDSAT8 time series: A case study Tirupati region," *2016 International Conference on Communication and Signal Processing (ICCSP)*, 2016, pp. 1332-1335, doi: 10.1109/ICCSP.2016.7754369.

[2] C. J. Chen and Z. Zhang, “GRID: A Python Package for Field Plot Phenotyping Using Aerial Images,” *Remote Sensing*, vol. 12, no. 11, p. 1697, May 2020.

[3] Mariana Belgiu, Ovidiu Csillik, “Sentinel-2 cropland mapping using pixel-based and object-based time-weighted dynamic time warping analysis”,Remote Sensing of Environment,Vol. 204,P 509-523, 2018, ,

THANK YOU