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ANALYSIS USING VEGETATION INDEX

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ABSTRACT
Remote sensing data is very useful for many important applications. Mono spectral consists of single band, multispectral of few up to 10 numbers of bands and Hyper spectral bands consist of hundreds of bands. Indices are used to recognize crops or any other material.

INTRODUCTION
Indices play an important role for vegetation analysis and finding stress on a crop. There are different types of indices are available. As per ENVI software, indices are broadly categorised into Broad-band Greenness, Narrow-band Greenness, Light Efficiency, Canopy-Nitrogen, Dry - Carbon, Leaf Pigments, Canopy Water Content index. In this paper few indices have been studied.
In this paper one or two examples of above index types are studied. Normalized Difference Vegetation Index, Simple Ratio Index, Red Edge Normalized Difference Vegetation Index, Red Edge Point Index, Normalized Difference Water Index, Water Band Index and Moisture Stress Index contribute in vegetation analysis.

DIFFERENT VEGETATION INDICES
Different vegetation indices which are directly affect to vegetation analysis are

1. Normalized Difference Vegetation Index

The Normalized Difference Vegetation Index (NDVI) is calculated by taking ratio of difference between near infrared, red band wavelength and addition of these two bands. So it is called normalized difference index. Rouse et al. (1973), Tucker, C.J.(1979) Jackson et al. (1983) Sellers, P.J.(1985) explained this index in their research.

2. Simple Ratio Index

The Simple Ratio (SR) index is the ratio of the maximum reflectance that is wavelength at near infra red band and absorption or wavelength at red bands of chlorophyll. It is simple ratio of index and used by Rouse et al. (1973) Tucker, C.J.(1979) Sellers, P.J.(1985) scientist.

3. Red Edge Normalized Difference Vegetation Index

NDVI is customised into the Red Edge Normalized Difference Vegetation Index and is ratio of normalized difference between wavelength at 750 and 705. These wavelength gives green vegetation red edge significance so can be used to monitor condition of crops, for finding forest stress and monitoring field.

4. Red Edge Point Index

The Red Edge Point (REP) index is a edge shown in reflectance spectrum. If chlorophyll contents are more red edge spread over large wavelength range. Stress condition or less chlorophyll condition can be found from red edge wavelength This edge found from wavelength in the range 690 nm to 740 nm and studied by Curran et al. (1995).
The maximum derivative, Lagrange's interpolation are common method to find REP.

5. Normalized Difference Water Index

The Normalized Difference Water Index (NDWI) is obtained from popular NDVI. Instead of considering index of vegetation water absorption bands are considered. Normalized difference between wavelength in vegetation canopy water content at 857 nm and 1241 nm has considered finding this index.

6. Water Band Index

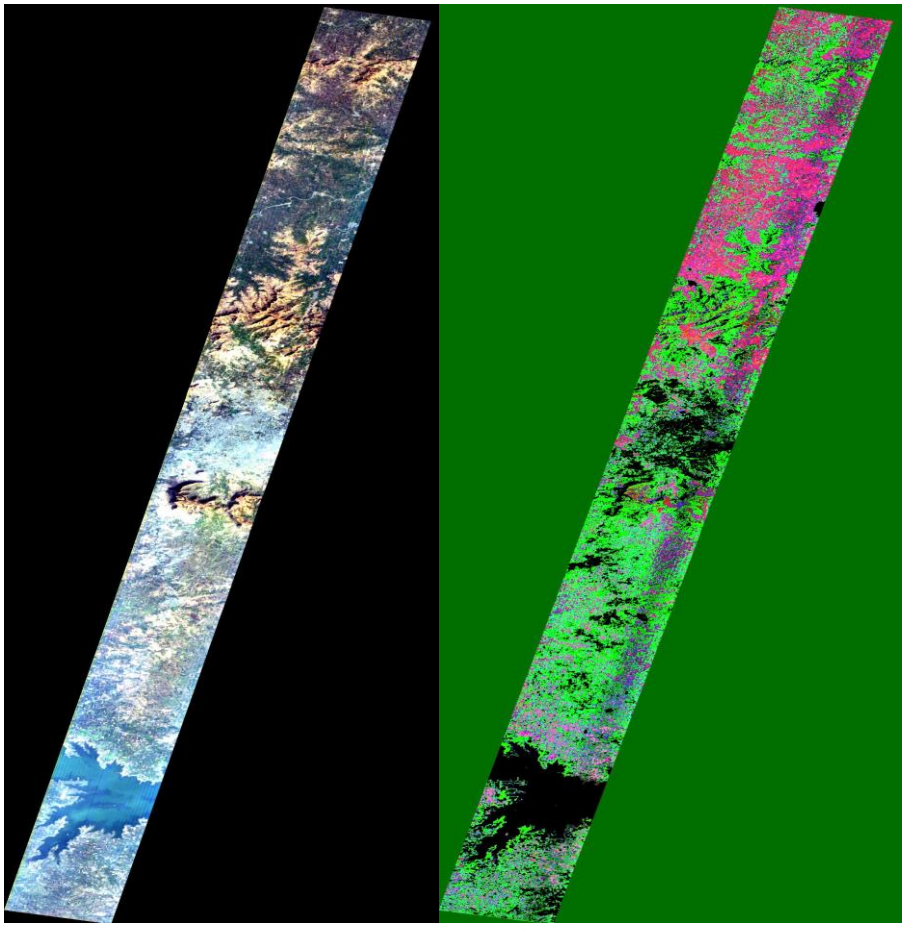
The Water Band Index (WBI) is a ratio of wavelength at 900 and 970.It can be used to find fire vulnerability condition, cropland analysis. WBI is studied by Penuelas et al. (1995) Champagne et al. (2001) scientists.

7. Moisture Stress Index

The Moisture Stress Index (MSI) is a ratio of reflectance at wavelength 1599 and 819. These wavelengths indicate that moisture contents are more or less. Depending upon that moisture stress of vegetation can be analysed.

Table 1. Formulae and references of indices

Sr. No	Index of Vegetation	Equation
1	Normalized Difference Index of Vegetation (NDVI)	$\text{NDVI} = \frac{\rho\text{nir} - \rho\text{red}}{\rho\text{nir} + \rho\text{red}}$
2	Simple Ratio Index (SRI)	$\text{SRI} = \frac{\rho\text{nir}}{\rho\text{red}}$
3	Red Edge Normalized Difference Index of Vegetation (RENDVI)	$\text{NDWI} = \frac{\rho 750 - \rho 705}{\rho 750 + \rho 705}$
4	Red Edge Point Index (REPI)	The wavelength of maximum derivative of reflectance in the vegetation red edge region of the spectrum in microns from 0.69 microns to 0.74 microns is called REPI
5	Normalized Difference Water Index (NDWI)	$\text{NDWI} = \frac{\rho 857 - \rho 1241}{\rho 857 + \rho 1241}$
6	Water Band Index (WBI)	$\text{WBI} = \frac{\rho 900}{\rho 970}$
7	Moisture Stress Index (MSI)	$\text{MSI} = \frac{\rho 1599}{\rho 819}$



(a) (b)

Figure 1 (a) Original Image (b) Image containing index of vegetation.

CONCLUSIONS

In this paper, we have studied different vegetation indices. Broadband Greenness, Narrowband Greenness, Light Use Efficiency, Canopy Nitrogen, Dry or Senescent Carbon, Leaf Pigments, Canopy Water Content index are different types of indices. We have studied Normalized Difference Vegetation Index, Simple Ratio Index, Red Edge Normalized Difference Vegetation Index, Red Edge Point Index, Normalized Difference Water Index, Water Band Index and Moisture Stress Index indices which plays important role in monitoring crop condition.

It has been observed that using vegetation indices we can analyse crop stress, forest health, forest fire hazard, moisture available in crop. In future, these indices can be studied more to monitor vegetation and for suggesting preventing action.

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