**Title: RGB Imaging Based Estimation of Leaf Chlorophyll Content**

The authors have used a RGB camera to capture the images and designed a neural network model with two hidden neurons which uses the pixel values of R,G and B channels as input. They have also concluded that having one camera with two different angles will be giving the best results with the less error rate.

**Title: Assessment of chlorophyll content based on image color analysis, comparison with SPAD-502**

The authors have developed a low-cost and non-destructive method that is easy to use to assess the health status of plants, based on the estimation of chlorophyll content of leaves using a portable digital camera. They have concluded that R, G values had good relationship with chlorophyll content.

**Band Extraction:**

There are different libraries in python to extract color bands from the Image. They are like GDAL/OGR, Pyproj, Rasterio, Geopandas. The multispectral images contains 3 to 10 bands in which Near Infrared, red and green bands are helpful as they are more sensitive for the changes in the plant.

Once the band is extracted we calculate the NDVI, Simple Ratio 1 and Simple Ratio 2. Where

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

SimpleRatio 1=NIR/Red

SimpleRatio 2=NIR/Green

The values having a particular range can be helpful for defining the health of the plant.

\*.jpeg file has thrree bands, each band represent the electromagnetic energy reflected by differnet objects on the ground, in this case mostly soybean leaves and branches.

Bnad 1 = NIR (Near Infrared)

Band 2 = Red

Band 3 = Green

Then we will calcualte vegetation indices based on them;

1. NDVI (Normalized Difference Vegetation Index)

NDVI = (NIR-Red)/(NIR+Red) = ((B1-B2)/(B1+B2)

2. SR1 (Simple ratio 1) = NIR/Red = (B1/B2)

3. SR2 (Simple ratio 2) = NIR/Green = (B1/B3)

For an image acquired at the peak of growing season: (Sept 2nd, 2021)

NDVI

0.0 to 0.35 = shadows, other sides of leaves and branches

0.36 to 0.8 (or 1) = healthy soybean

SR1

0.0 to 3.125 = vegetation

3.126 to 4.8 = healthy vegetation

4.9 to 50 = branches, shadows, spaces between trees

SR2

0.0 to 3.2 = shadow, branches, spaces between trees

3.21 to 12 = healthy vegetation

For an image acquired when closer to the harvesting season: (Sept 18th, 2021)

NDVI

0.0 to 0.4 = vegetation and crop (leaves are turned to orange now)

0.41 to 0.6 = healthy remaining soybean leaves

0.61 to 1 = understory, branches etc

SR1

0.0 to 3.125 = remaining green leaves and branches

3.126 to 4.8 = space between trees

4.9 to 50 = branches, shadows, spaces between trees

SR2

1 to 10 = shadow, branches, spaces between trees

11 to 100 = healthy remaining soybean leaves

>100 green leaves