Calculation of Spectral Indices

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Normalized Difference Vegetation Index (NDVI)

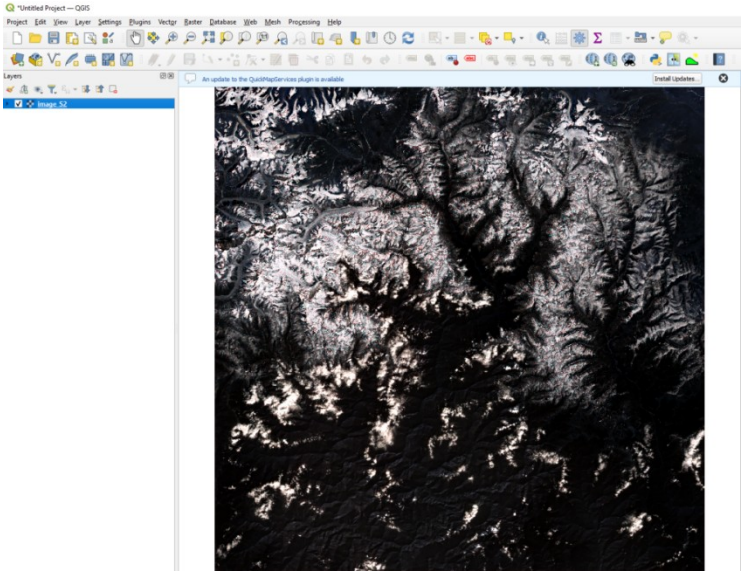
NDVI is vegetation index , widely used in remote sensing to assess the vegetation health and density. It is calculated as the normalized difference between the Near Infra-Red band and the Red band of a multi spectral imagery given by the following expression:

$$NDVI = \frac{NIR - Red}{NIR + Red}$$

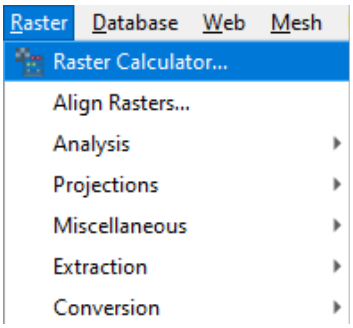
Here, NIR is the reflectance in near infra red band and red is the reflectance in the red band.

To generate NDVI image in QGIS the steps followed are:

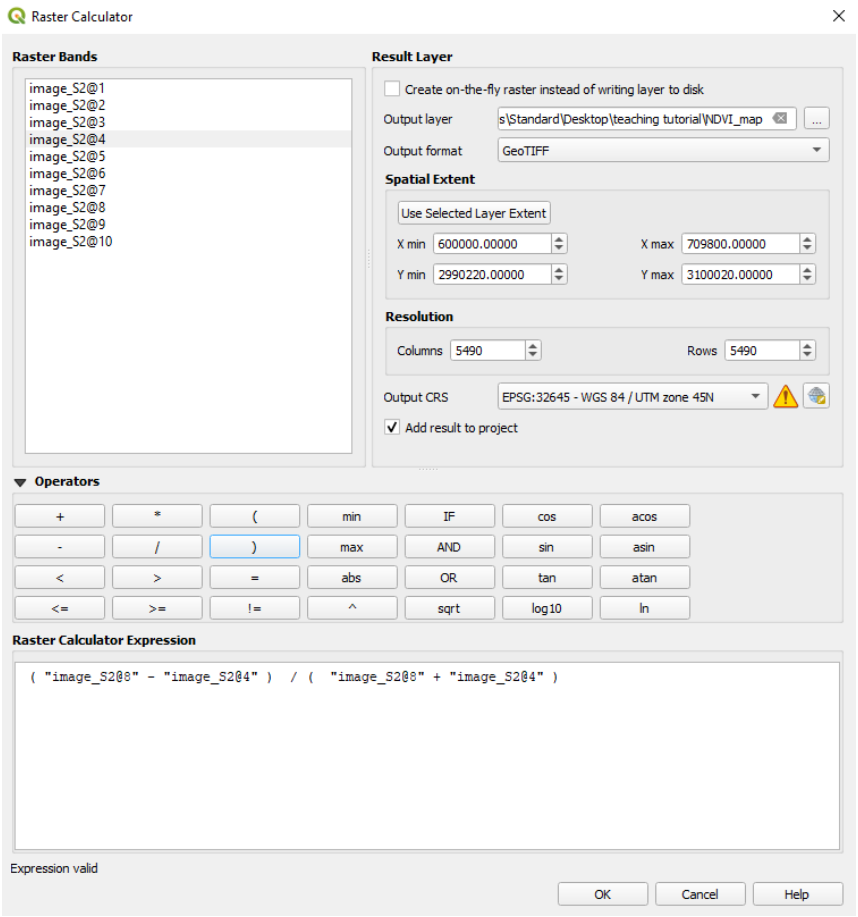
1. Open QGIS
2. Load the raw multi spectral satellite imagery.



3. Click on Raster tab >> Raster Calculator window , enter the NDVI formula.



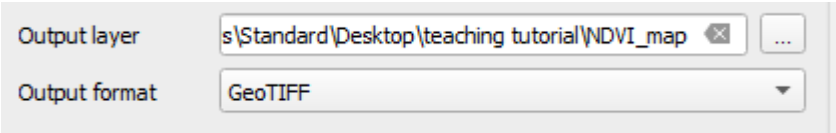
4. For sentinel-2 dataset, the NIR band is Band 8 and the Red band is Band 4. Adjust the formula accordingly



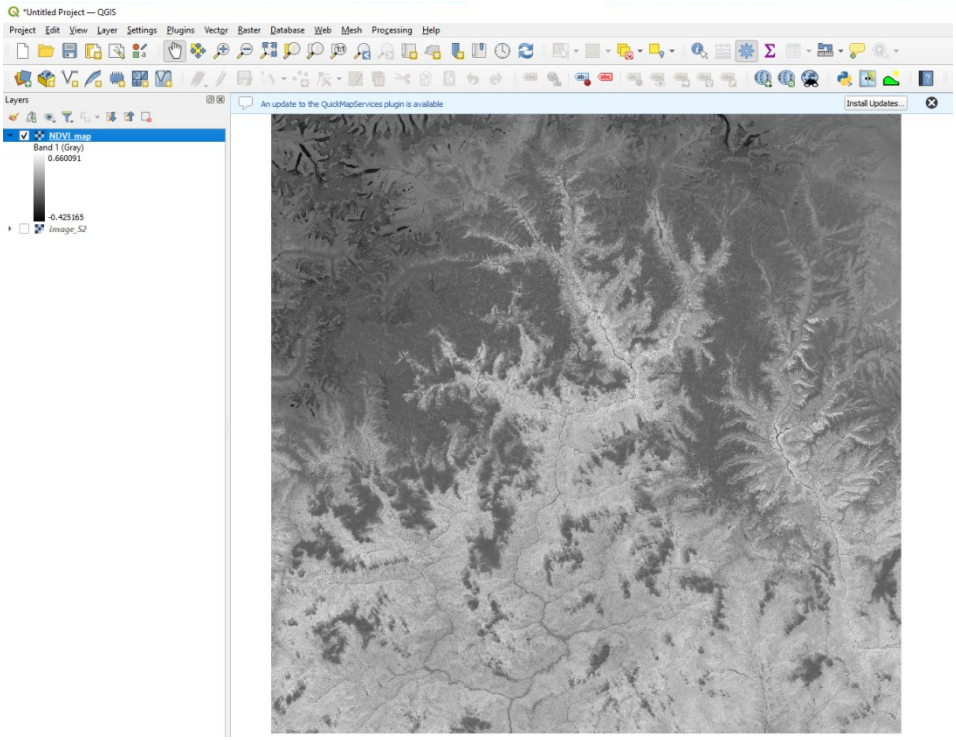
Here is a list of Sentinel-2 bands for reference.

Sentinel-2 Bands	Central Wavelength (µm)	Resolution (m)
Band 1 - Coastal aerosol	0.443	60
Band 2 - Blue	0.490	10
Band 3 - Green	0.560	10
Band 4 - Red	0.665	10
Band 5 - Vegetation Red Edge	0.705	20
Band 6 - Vegetation Red Edge	0.740	20
Band 7 - Vegetation Red Edge	0.783	20
Band 8 - NIR	0.842	10
Band 8A - Vegetation Red Edge	0.865	20
Band 9 - Water vapour	0.945	60
Band 10 - SWIR - Cirrus	1.375	60
Band 11 - SWIR	1.610	20
Band 12 - SWIR	2.190	20

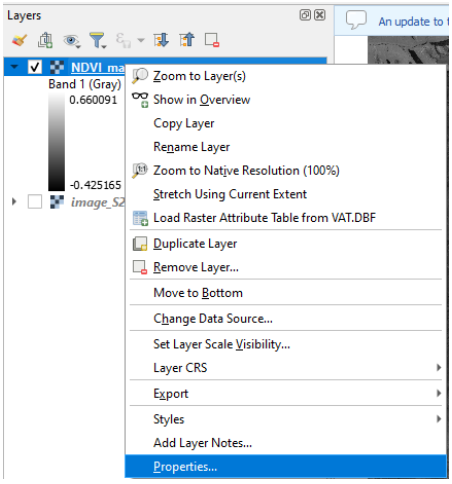
5. Specify the output layer name and location where the NDVI rater is to be saved. Click on the OK button to execute the operation.



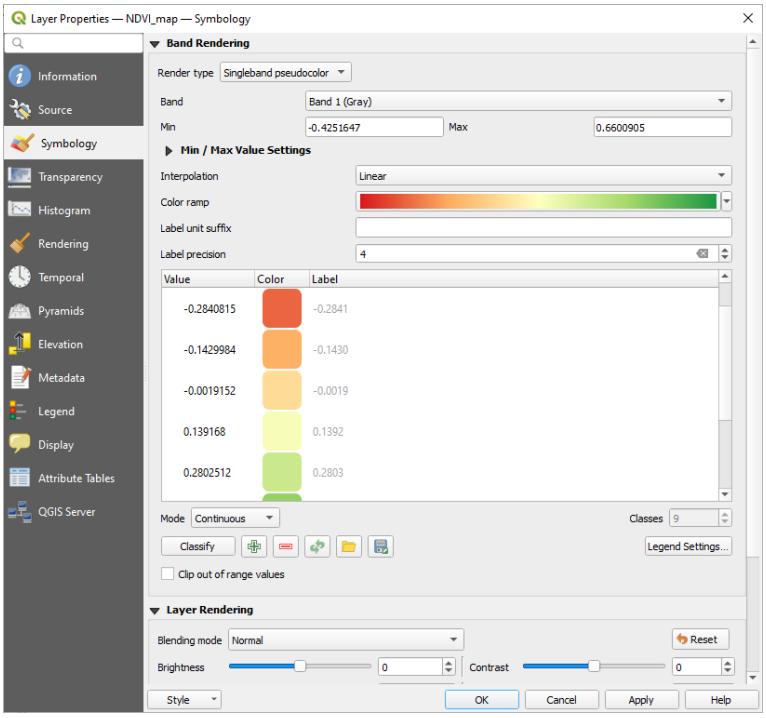
6. Once the calculation is completed , add the NDVI raster layer to the map.



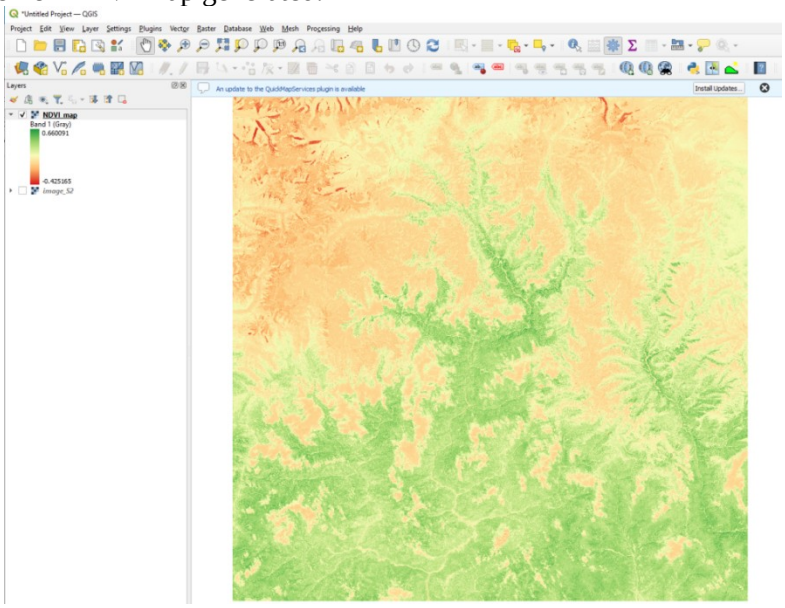
7. This representation of NDVI has low values of NDVI as darker shades of grey and high values as lighter shades of grey. In order to represent is using a color scale, right click on the NDVI layer in the layer panel and select properties



8. In the symbology tab select the render type >> Singleband pseudocolour that represent the NDVI values



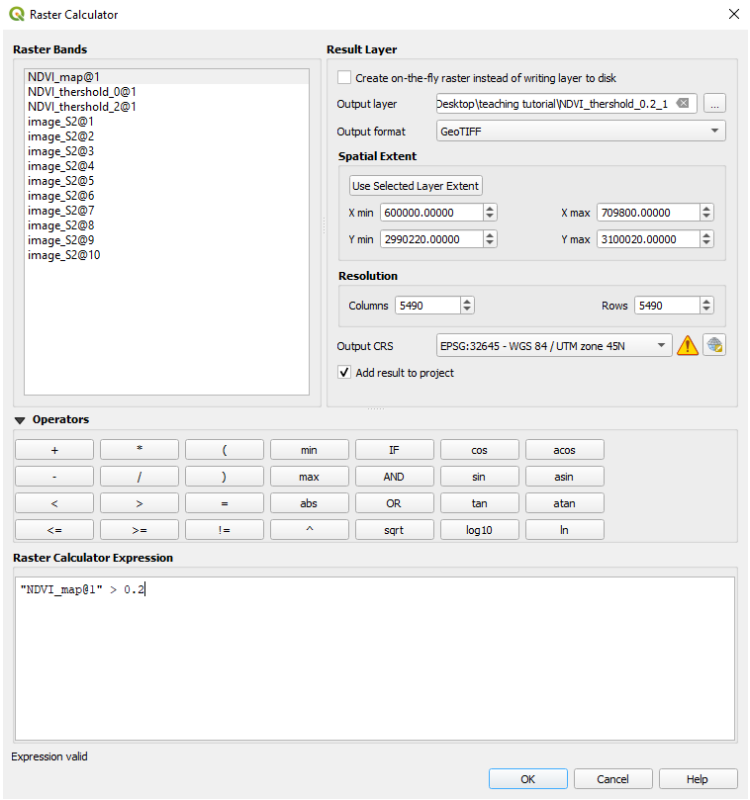
9. Visualization of NDVI map generated.



NDVI value close to +1 indicate healthy vegetation, while NDVI value around 0 represent non vegetated surface. Negative NDVI is water

Highlight the vegetated areas using NDVI Threshold > 0.2

1. Open Raster Calculator >> Select the NDVI map generated >> in the expression tab ‘NDVI > 0.2’ >> Save the output layer >> Click OK



2. Apply suitable colour scheme to visualize the vegetated and non vegetated areas. Here green indicates the value 1 which is vegetated and white indicates 0 which is not vegetated.