

REMOTE SENSING

A PRACTICAL REPORT
ON
REMOTE SENSING

SUBMITTED BY
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UNDER THE GUIDANCE OF
PROF. MEHDI REZAEI

Submitted in fulfillment of the requirements for qualifying
MSc. IT Part II Semester - IV Examination 2022-2023

University of Mumbai
Department of Information Technology

R.D. & S.H National College of Arts, Commerce & S.W.A.
Science College Bandra (West), Mumbai – 400 050



R. D. & S. H. National & S. W. A. Science College

Bandra (W), Mumbai – 400050.

**Department of Information Technology
M.Sc. (IT – SEMESTER IV)**

Certificate

This is to certify that Remote Sensing Practicals performed at R.D & S.H National & S.W.A. Science College by Mr.Sayed Farhan holding Seat No. _____ studying Master of Science in Information Technology Semester – IV has been satisfactorily completed as prescribed by the University of Mumbai, during the year 2022 – 2023.

Subject In-Charge

Coordinator In-Charge

External Examiner

College Stamp

INDEX

Sr. No	Date	Practical	Page No.	Sign
1	01/03/2023	Apply pre-processing techniques on satellite images	1	
2	15/03/2023	Apply geometric correction methods on satellite images	6	
3	29/03/2023	Perform contrast stretching on satellite images	15	
4	05/04/2023	Enhance the satellite image using Pseudocolor image processing	22	
5	12/04/2023	Apply different supervised classification techniques to classify the satellite image	29	
6	03/05/2023	Apply different unsupervised classification techniques to classify the Satellite Image	42	
7	03/05/2023	Apply Principal Component Analysis on satellite images	50	
8	10/05/2023	Apply raster analysis on satellite images	57	

Practical No 1

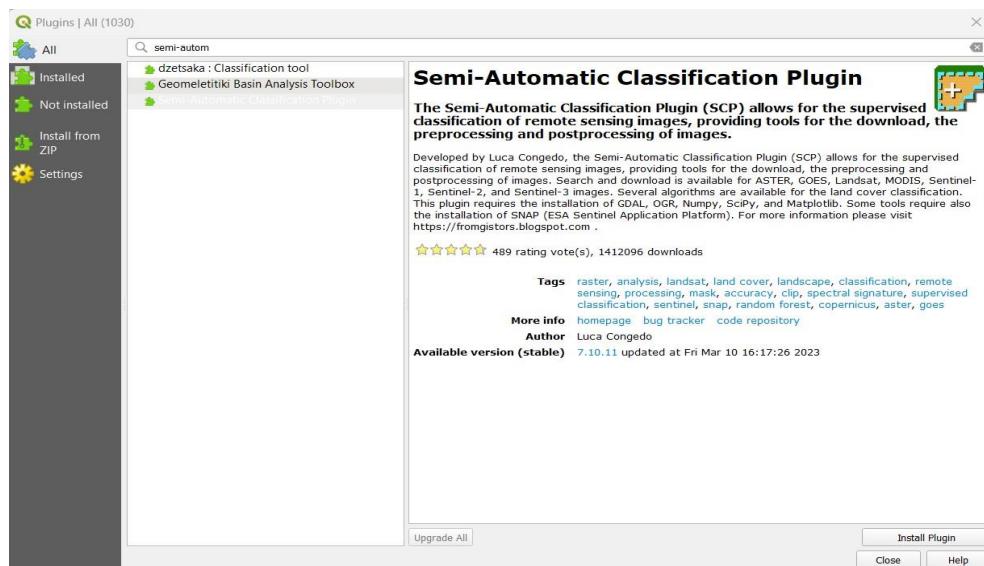
Aim: - Apply pre-processing techniques on satellite images (Using Sentinel-2 Images)

Practical No 1

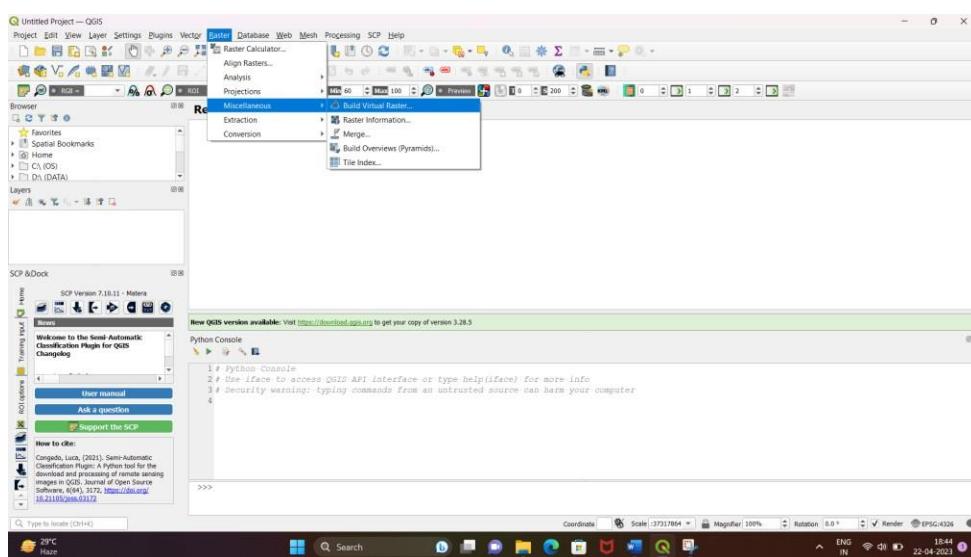
Aim: - Apply pre-processing techniques on satellite images (Using Sentinel-2 Images)

- 1) Download & Install QGIS.
- 2) Launch QGIS & Go to plugin and install semi automated classification plugin

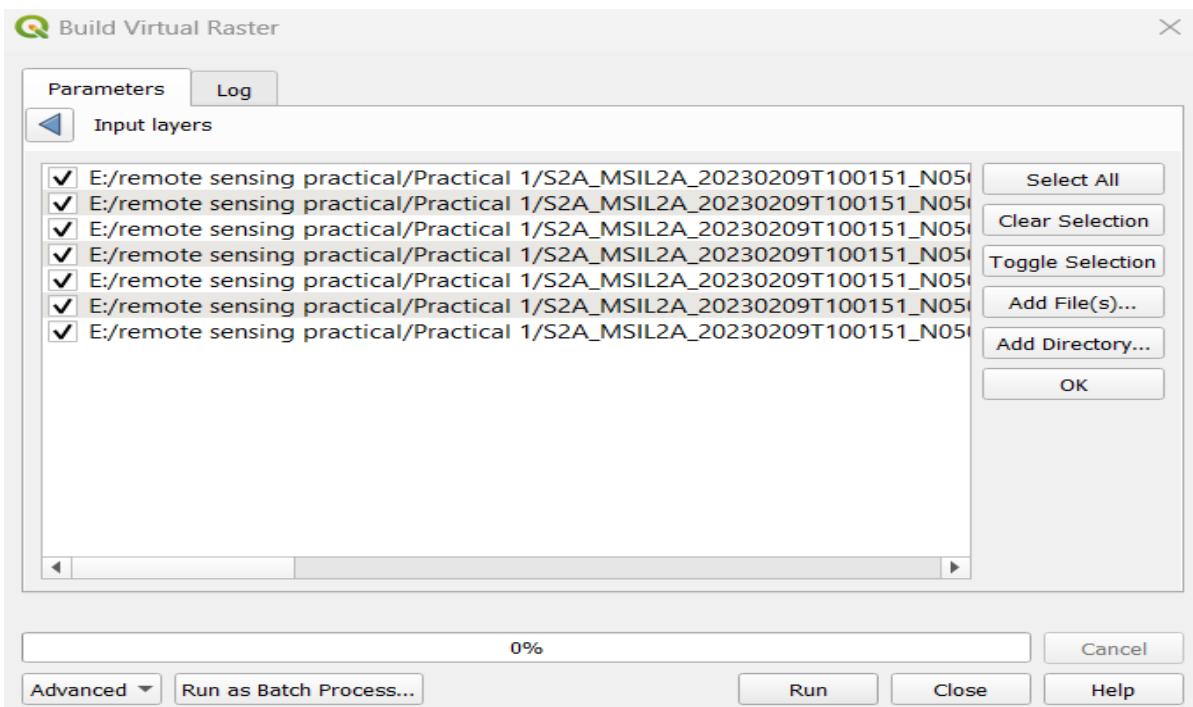
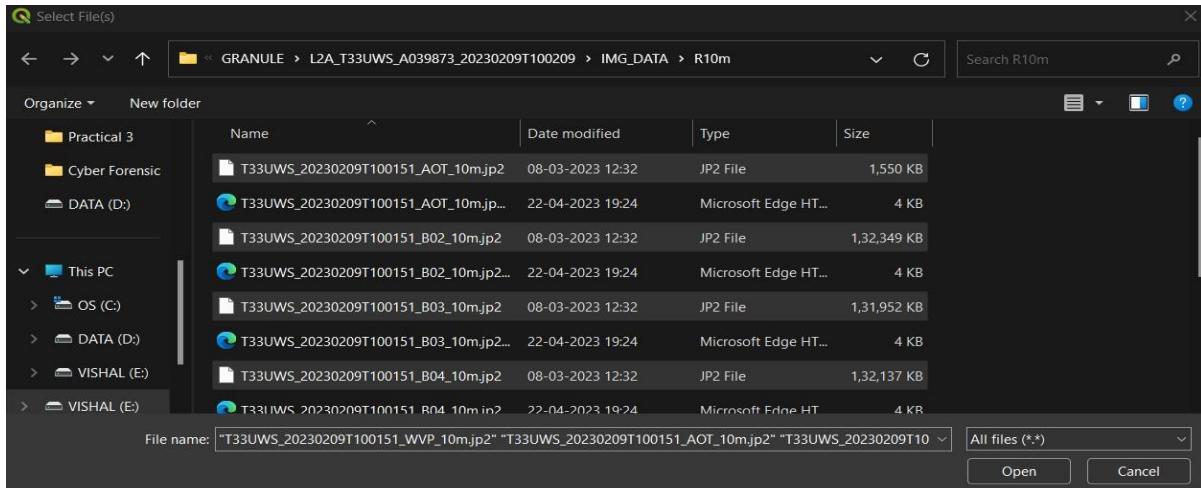
1) Steps with Screenshots



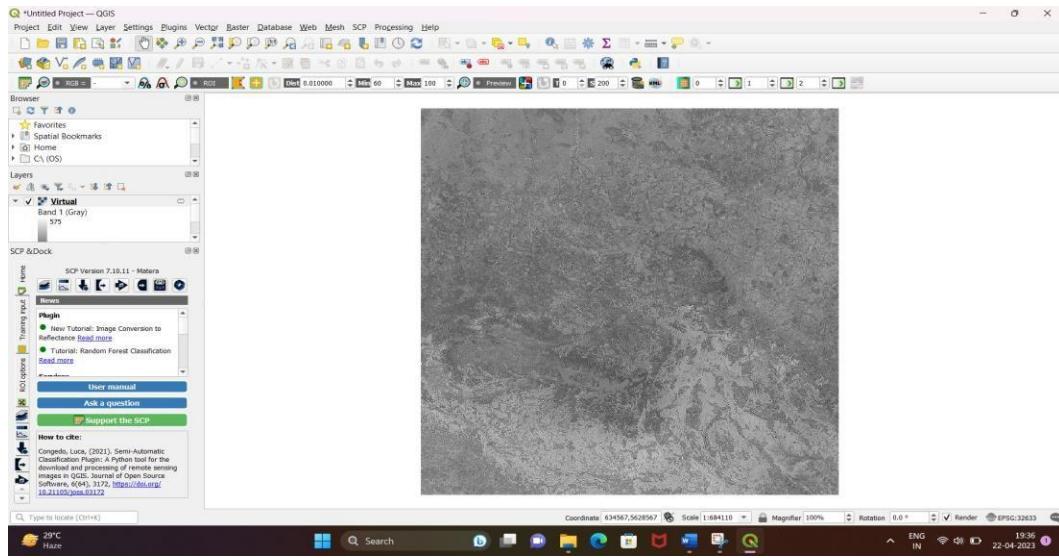
Click on Raster > miscellaneous > Build virtual raster



- In build virtual raster, browse the **input layers** > **Add files** > select your **sentinel 2 map file** > **Granule** > **Img_data** > **R10m** > **Select all JP2 files** > **Run**.

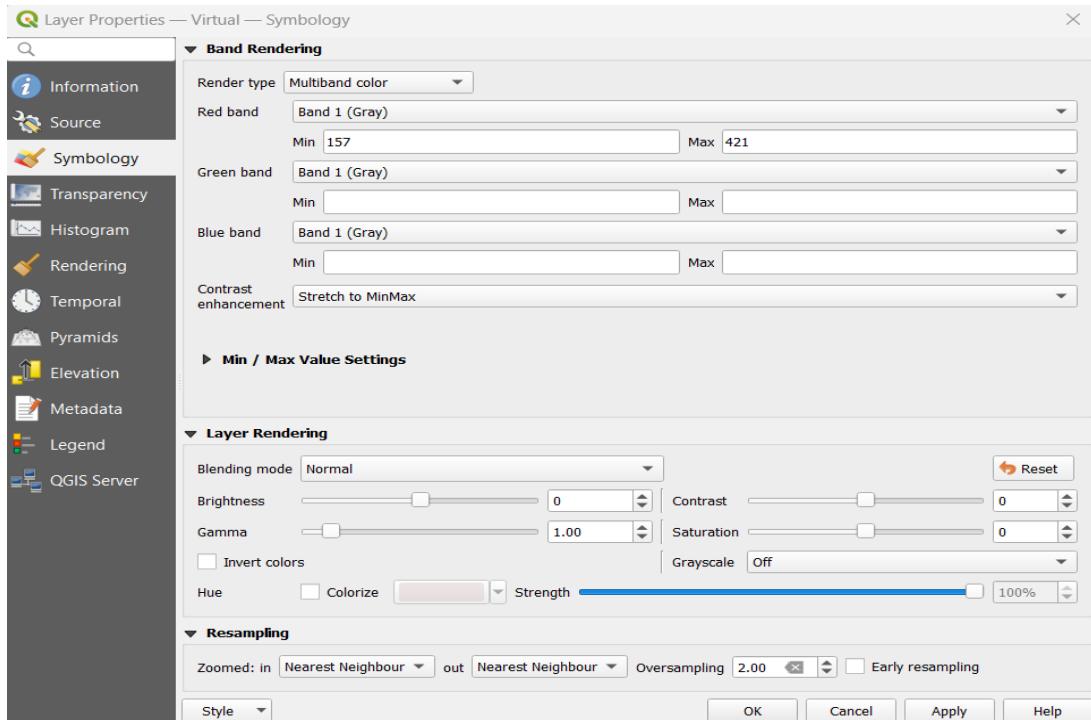


So, Now we have sentinel 2 map.

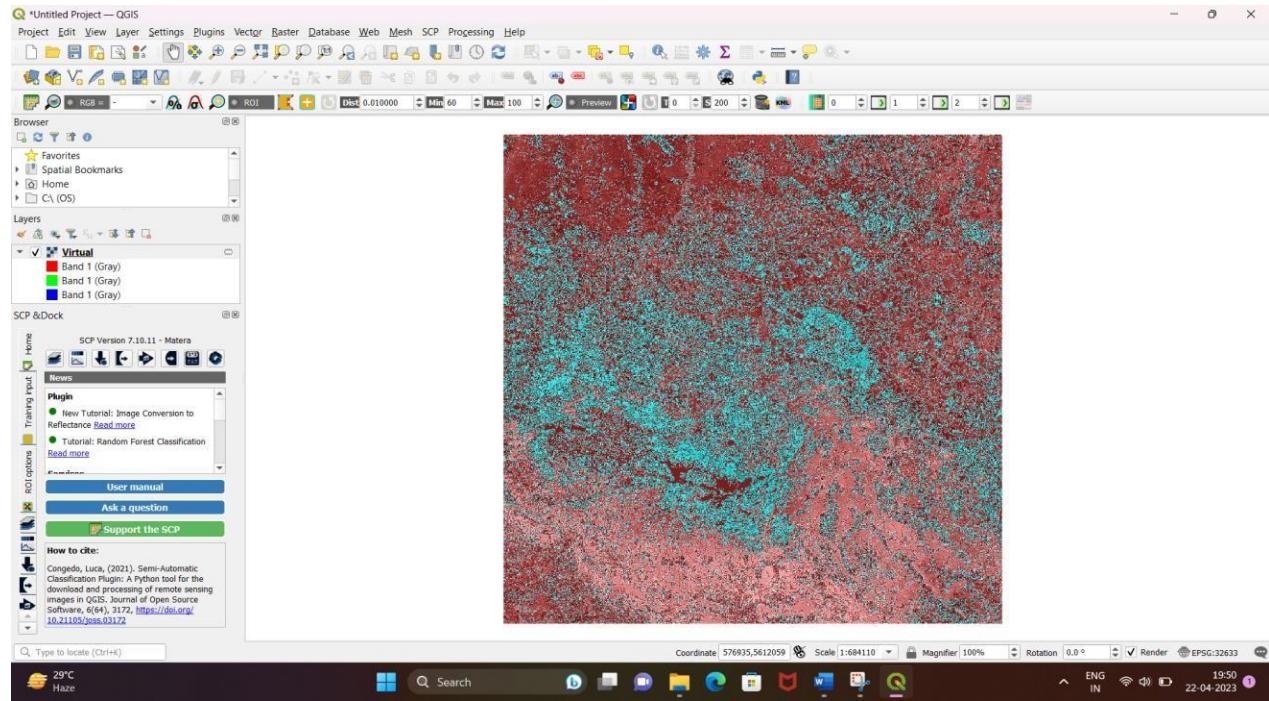


2) Steps with Screenshots

- Go to **Layer** & select **layer properties**, So now we have to change bands and their respective values.



After applying some new bands Now, we have another transformed map.



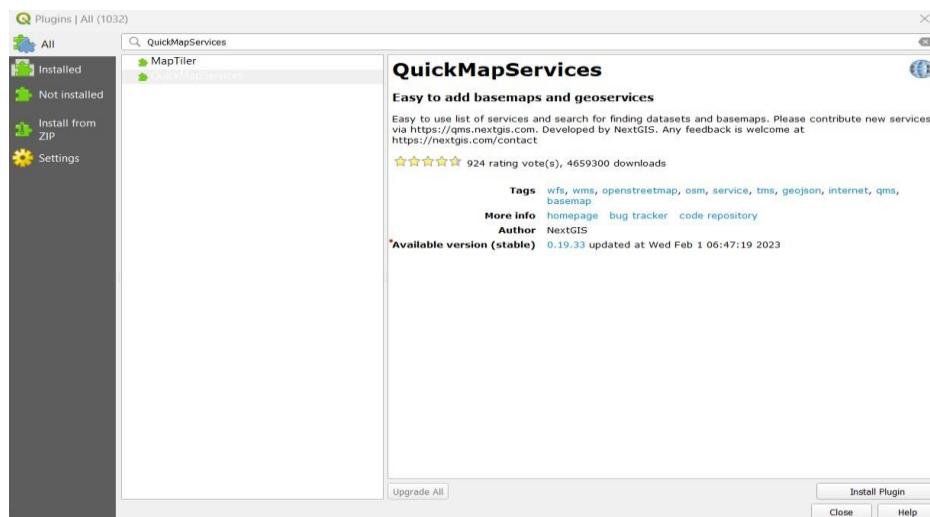
Practical No 2

Aim: - Georeferencing Satellite Images with Maps

Practical No 2

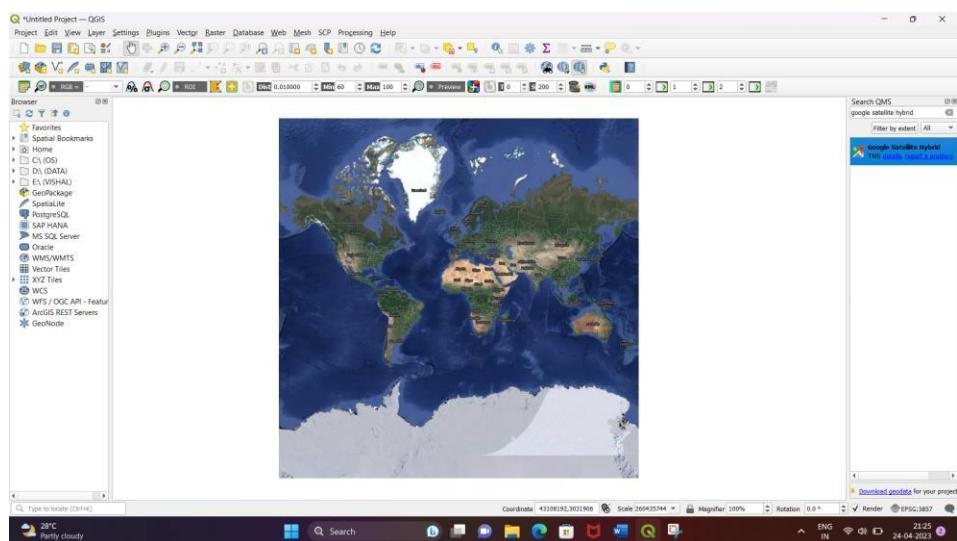
Aim: - Georeferencing Satellite Images with Maps

- 1) Open QGIS.
 - 2) Go to **plugin** and click on **manage & install** and search for **“QuickMapServices”** click on **install plugin**.
 - 3) After installation restart the QGIS.



1) Steps with Screenshots

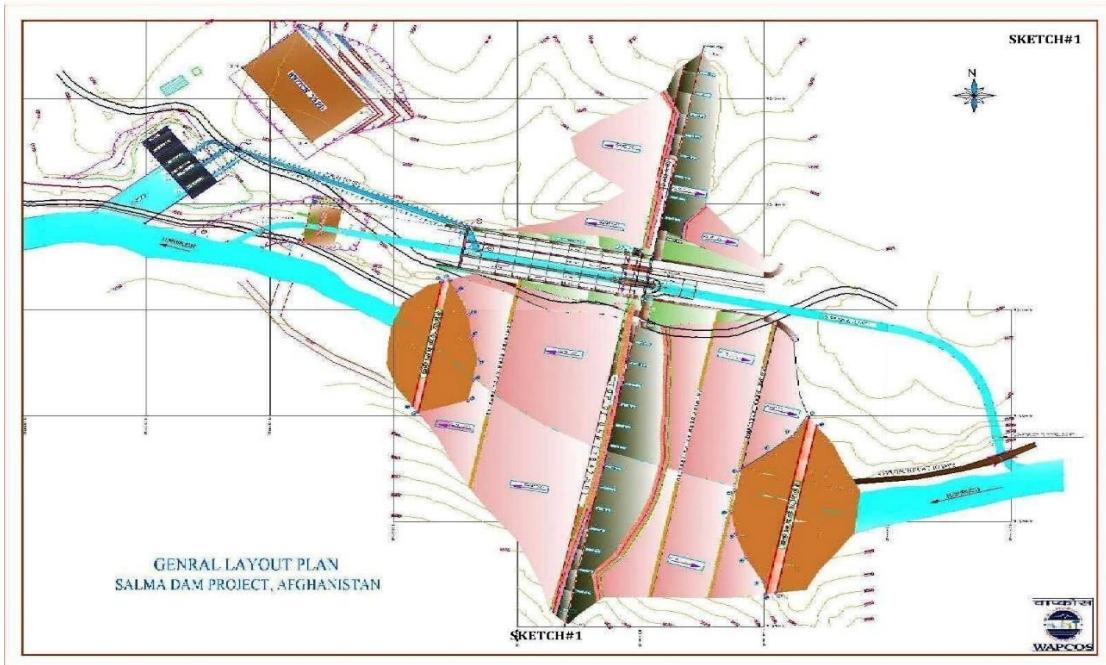
Open QGIS and click on **web menu** and select **quick map services** and you can see on your right side **search bar**, just click on search bar and search “**google satellite hybrid**”, double click to open the google satellite image.



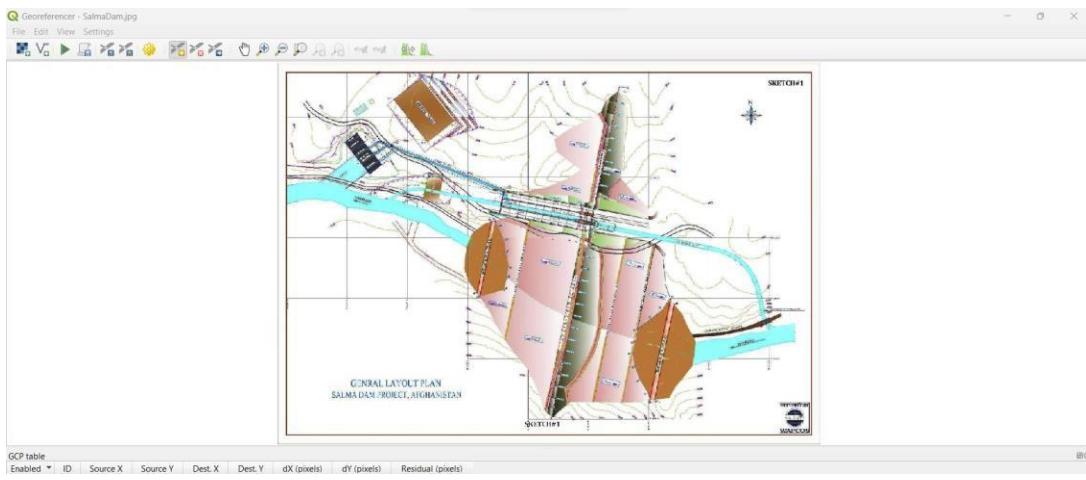
Select the specific area or dam, So we picked “**Salma dam**” from **Afghanistan** for our **georeferencing satellite image**.



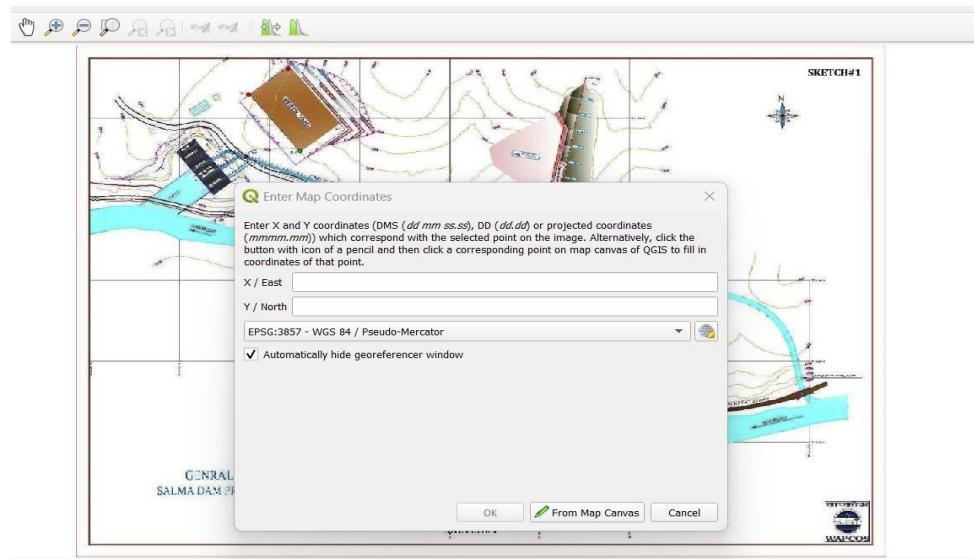
For georeferencing we have to download the scanned image of our “Salma dam” or the specific area we chose.



Click on **Raster** and select **georeferencing**, In georeferencing go to **file menu** and select **open raster** and open the scanned image.

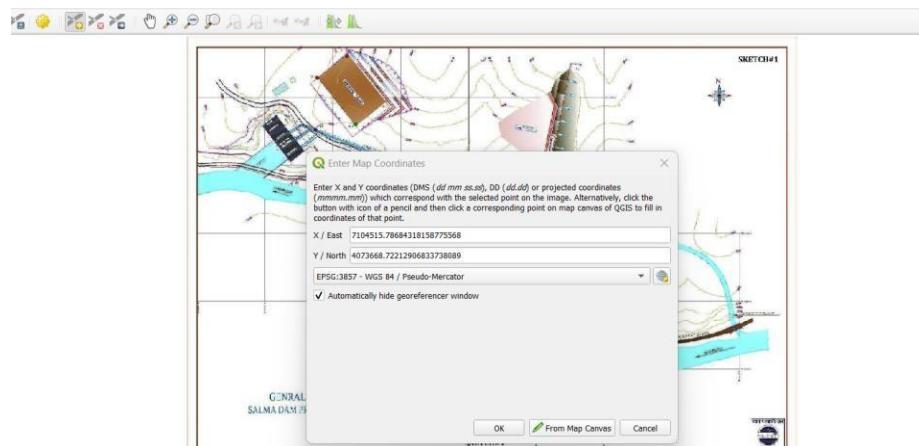


Select the coordinates in scanned image and click on **from map canvas** and the coordinate which was taken in the scanned image should be the same in satellite image.

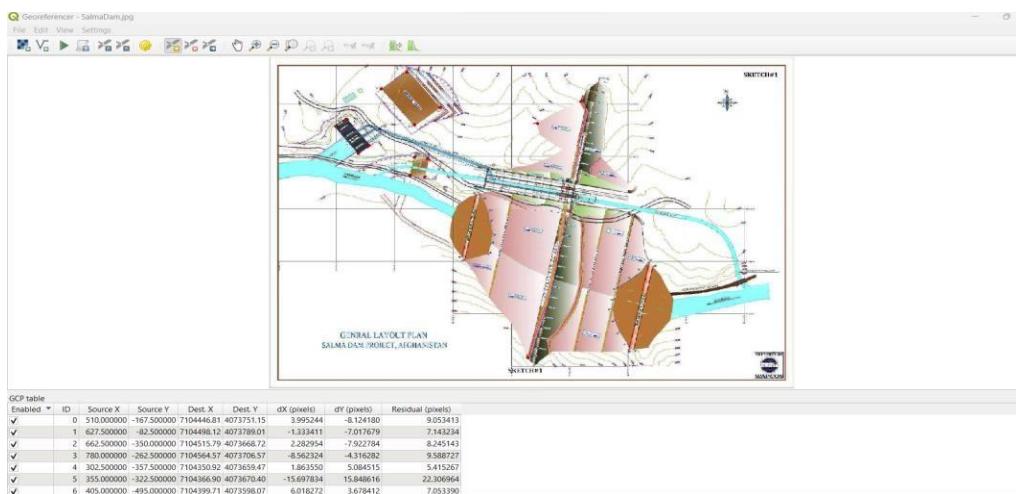




After selecting coordinates from satellite image, Click on **OK**.

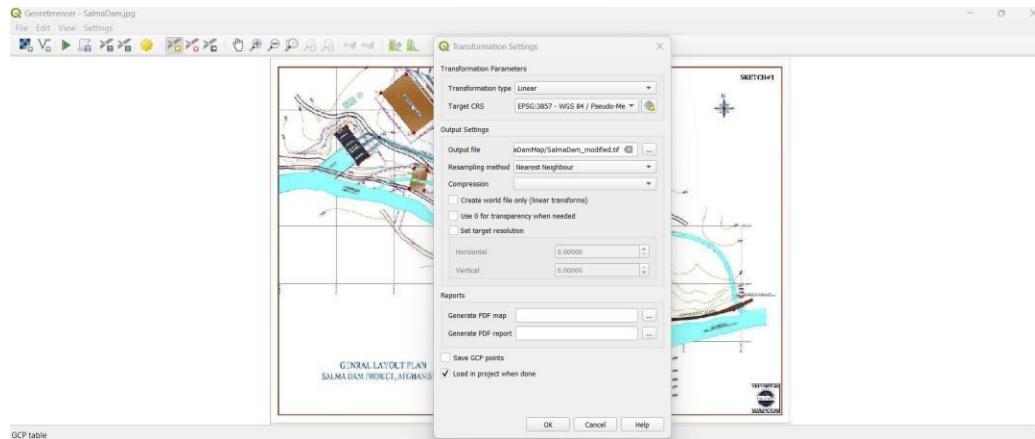


So all the coordinates have been taken from the scanned image as well as from the satellite image.

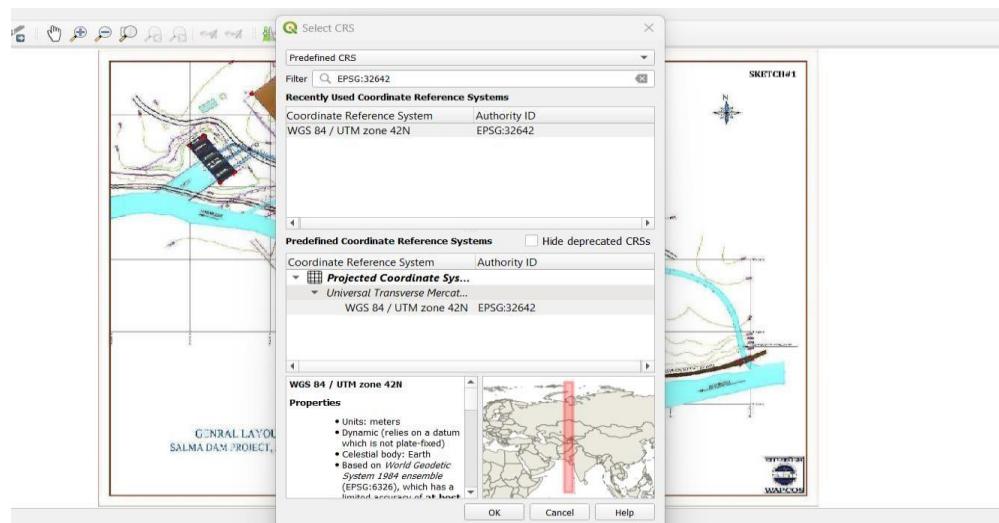




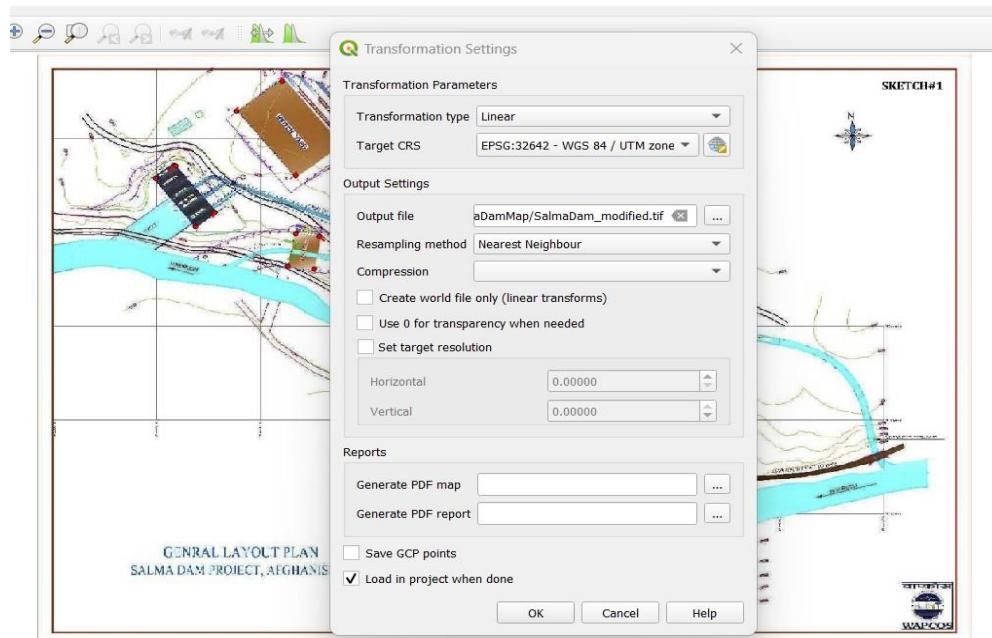
Now, go to **georeferencer** and go to **setting** and click on **transformation setting**.



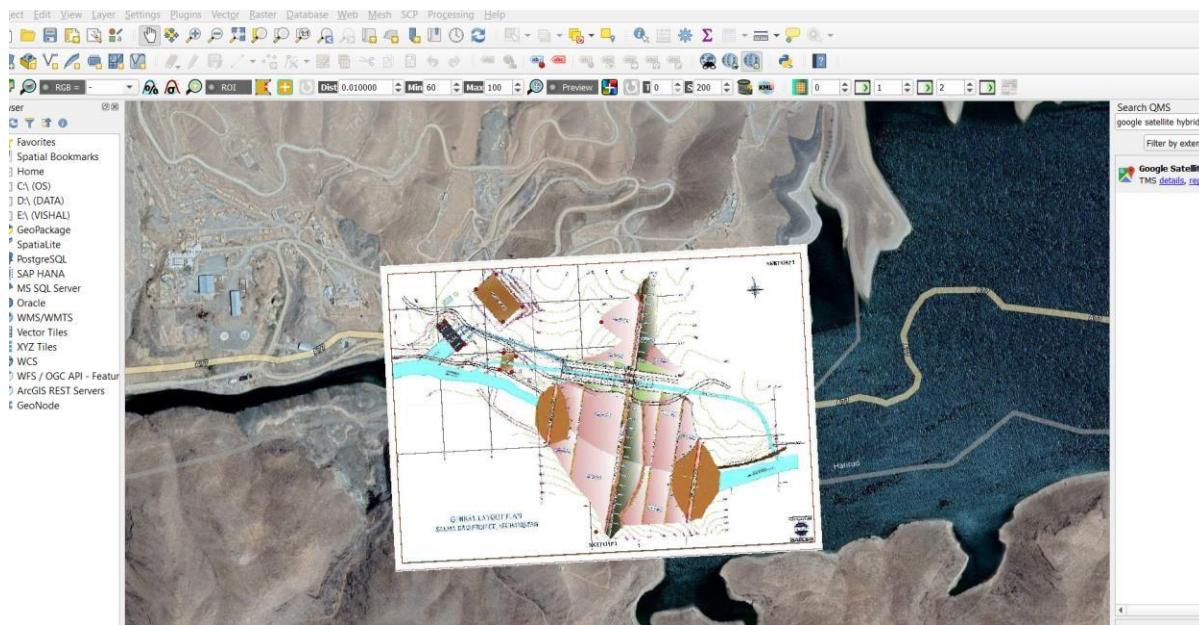
In transformation setting, Go to **Target CRS** and select “**EPSG:32642**”.



Click on **OK**, and go to file menu & start the georeferencing.

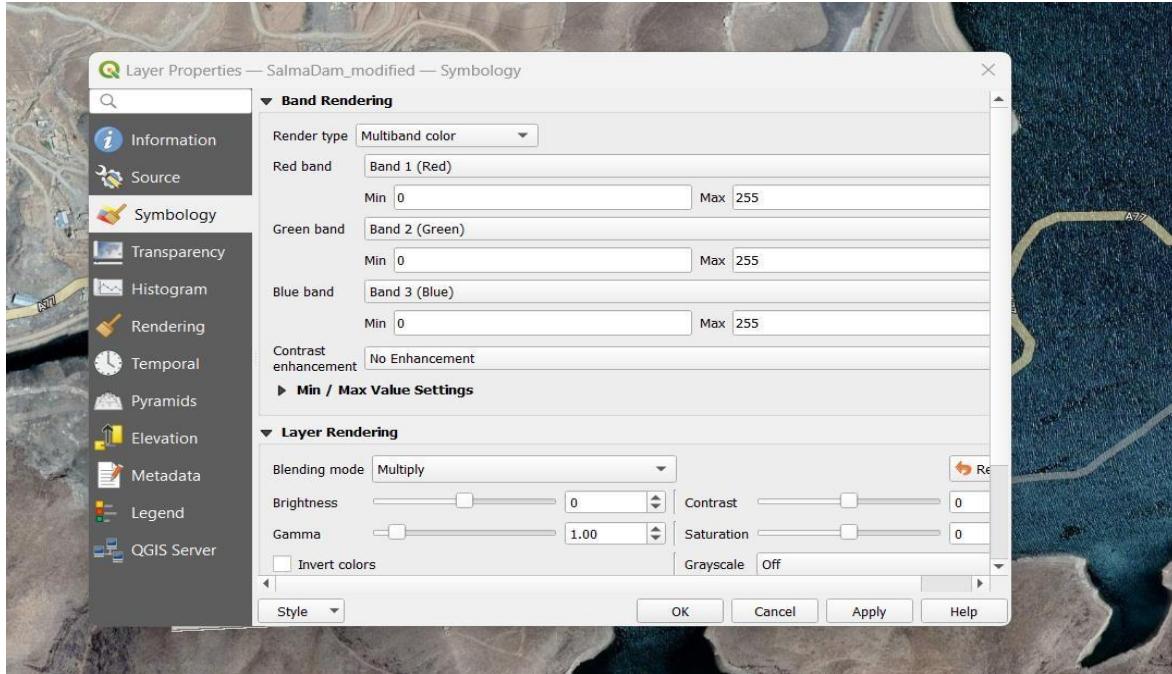


Then after starting georeferencing, our scanned image is overlapped with satellite image.

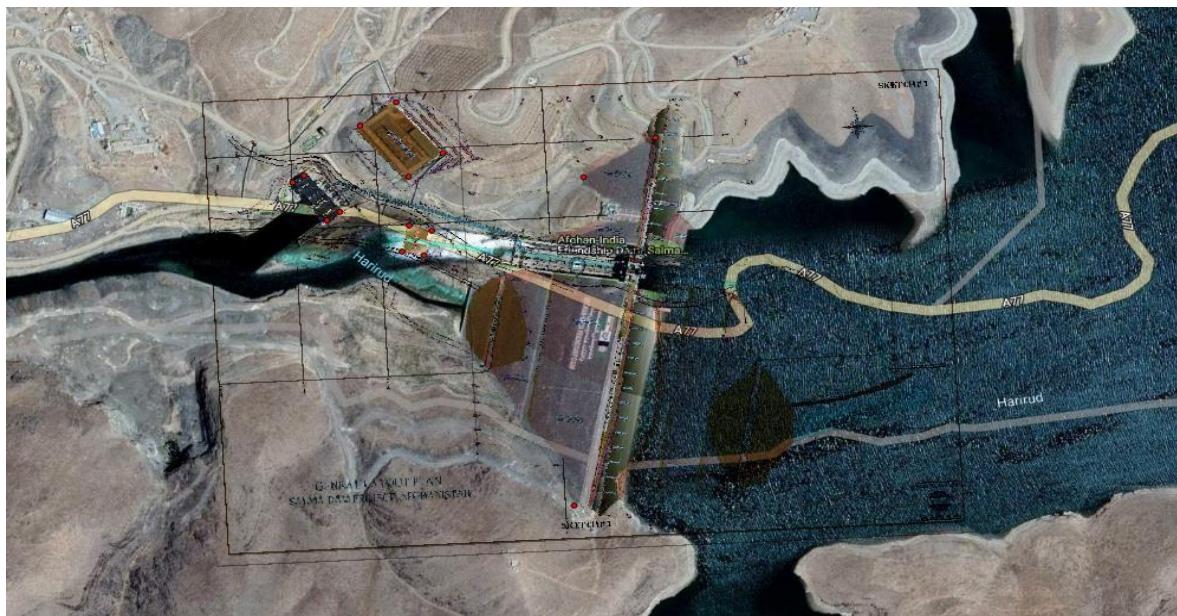


2) Steps with Screenshots

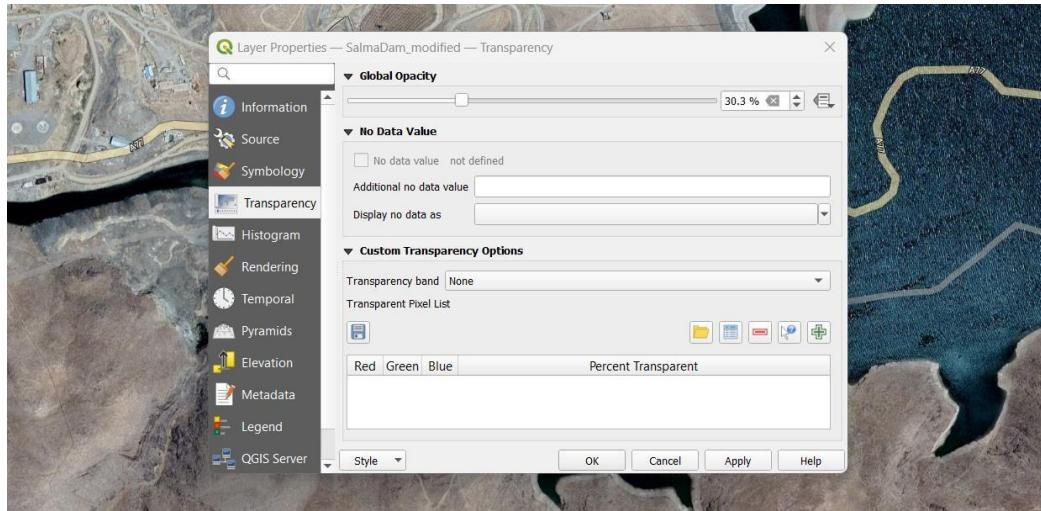
Now, go to **layer menu** and click on **layer properties** and in **symbology** set the **blending mode** to “**multiply**” and click on **apply**.



After all, the scanned image overlaps well with the satellite image.



For more enhancement, again click on **layer menu** and select **layer properties** and in **transparency** set global opacity to **less than 50%** and click on **apply**.



So the overlapping is done with scanned image on satellite image.



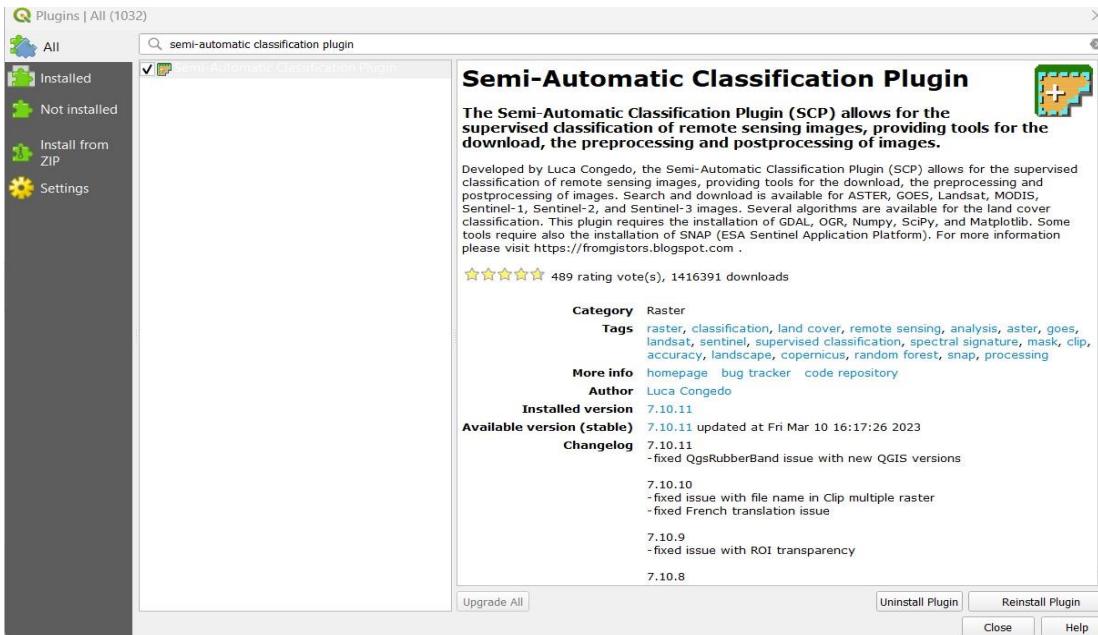
Practical No 3

Aim: - Perform contrast stretching on satellite images

Practical No 3

Aim: - Perform contrast stretching on satellite images

- 1) Download any **Landsat 8** satellite image from earth explorer.
- 2) Open **QGIS** and go to **plugin > manage and install > search for semi-automatic classification plugin and install.**

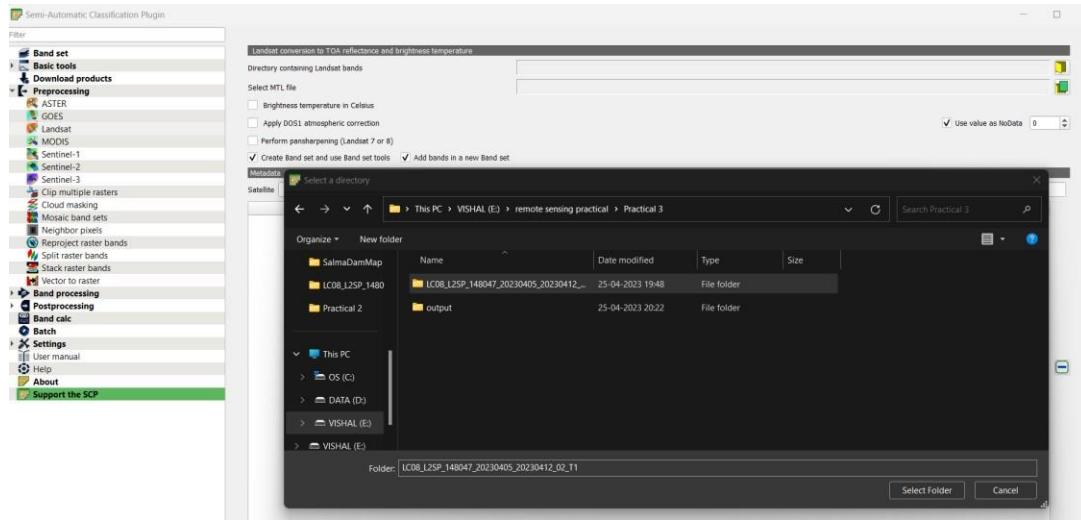


1) Steps with Screenshots

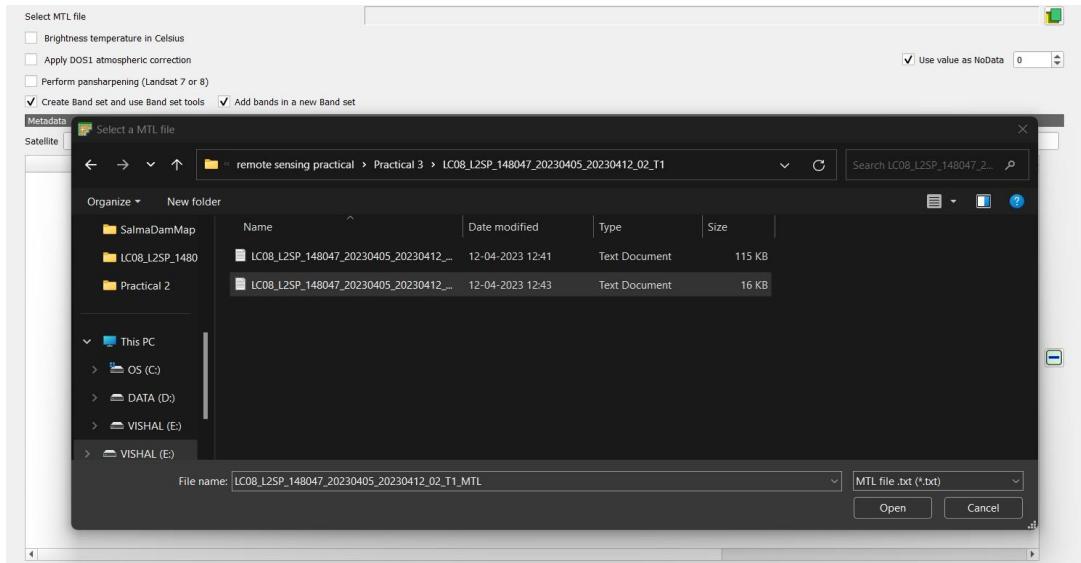
Click on SCP menu and go to preprocessing > landsat.

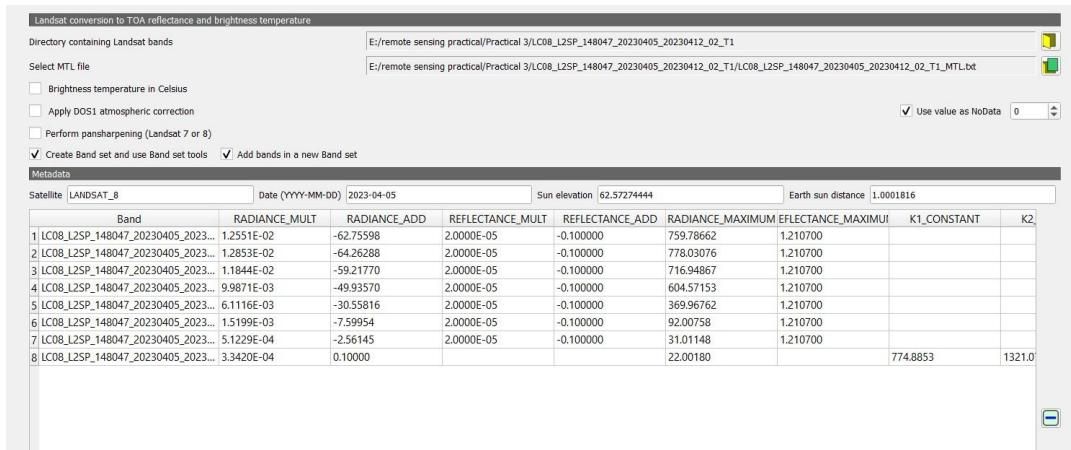


Click on **directory** in directory containing landsat bands & select your downloaded **landsat 8 satellite image folder**.

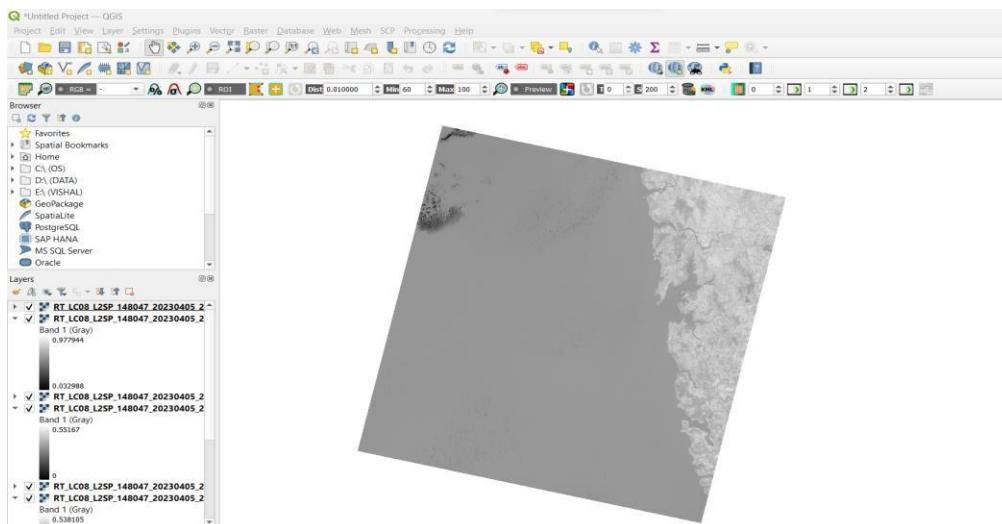
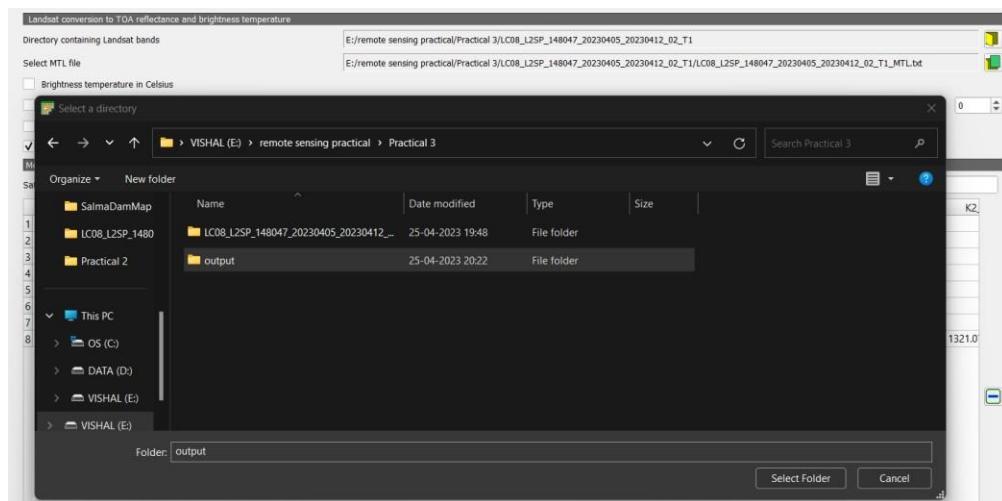


Now go to select **MTL file** and browse your downloaded **landsat 8 satellite image folder** and open second text document.



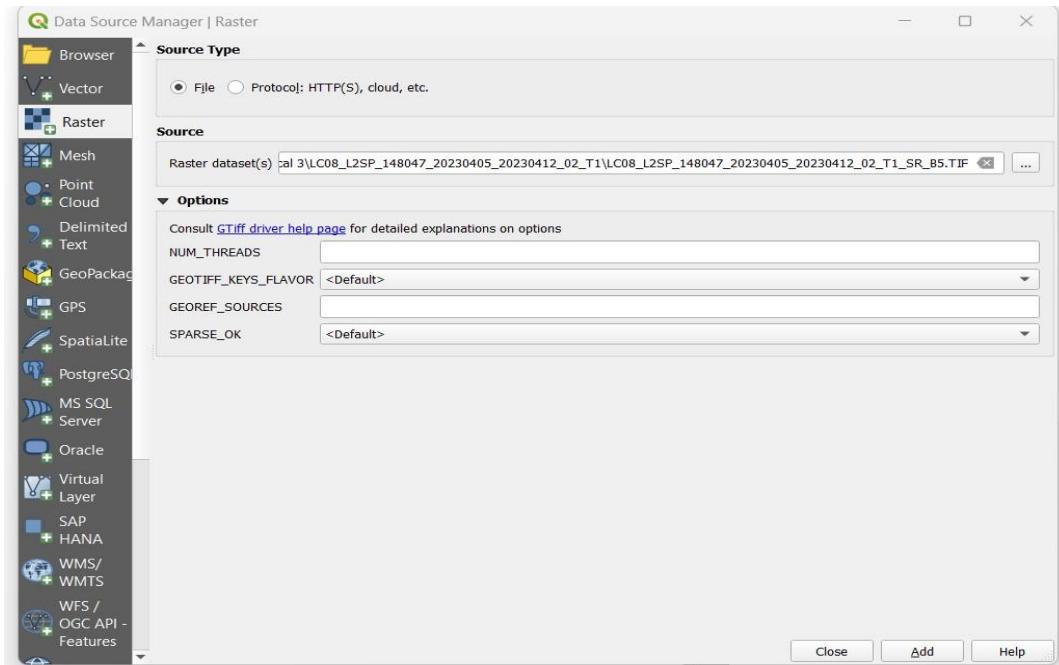
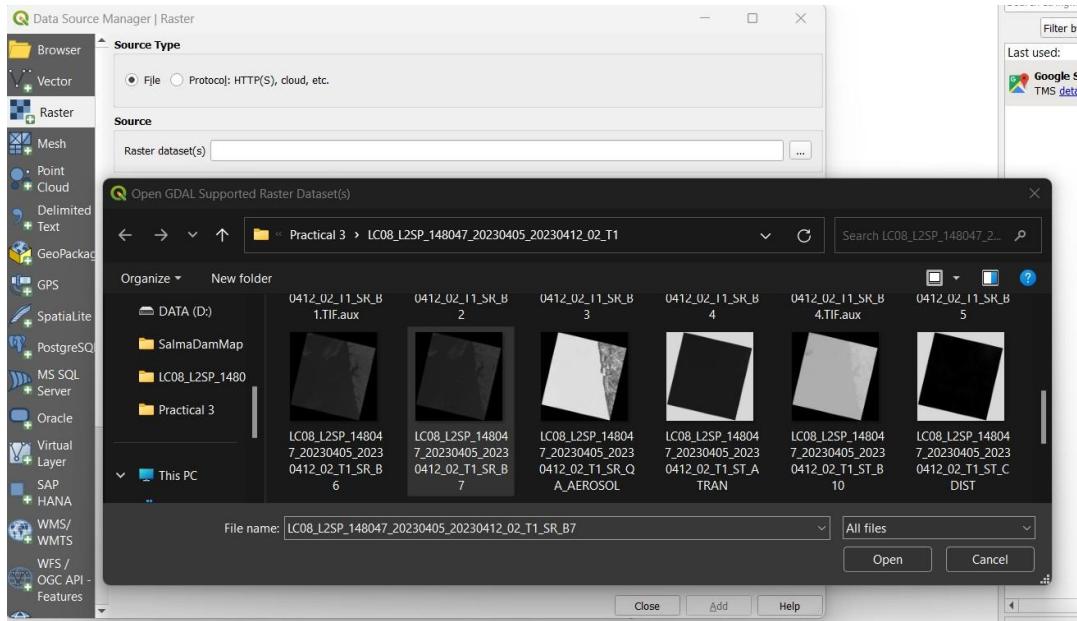


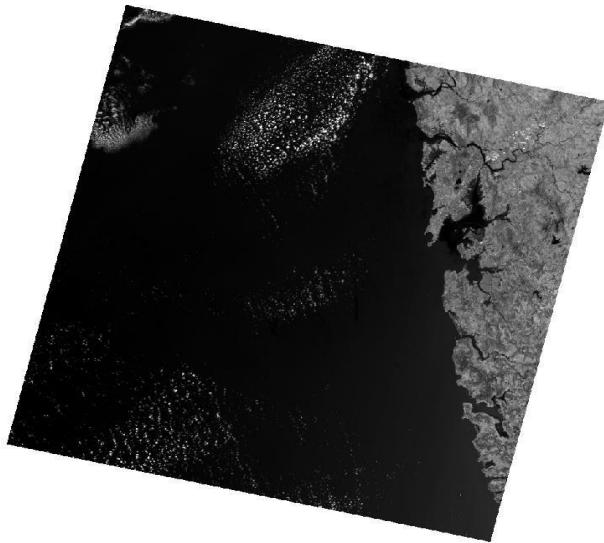
Click on **run** and create one folder of name “**output**” and select that folder and let the conversion complete.



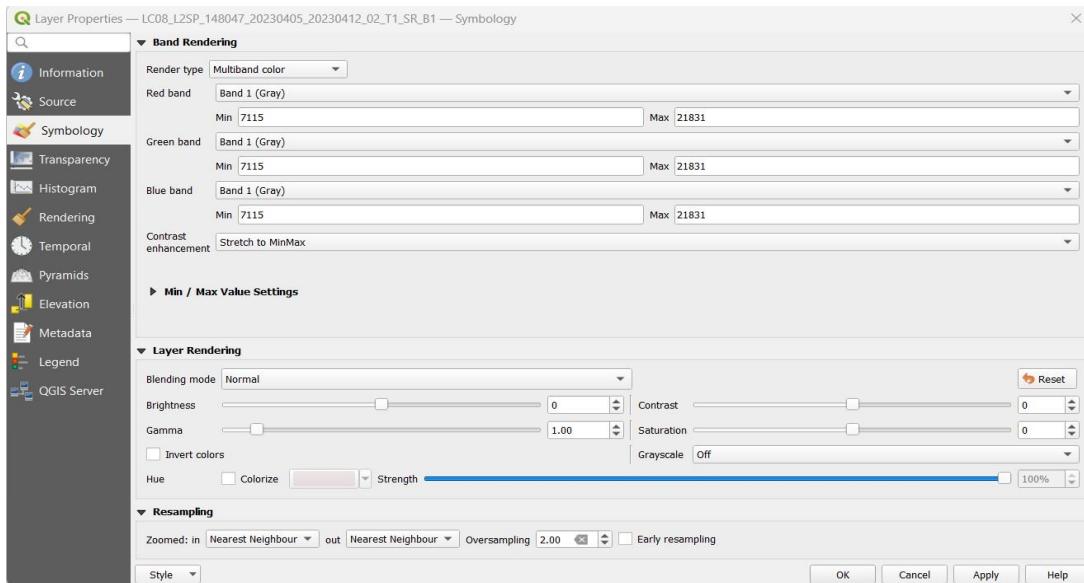
2) Steps with Screenshots

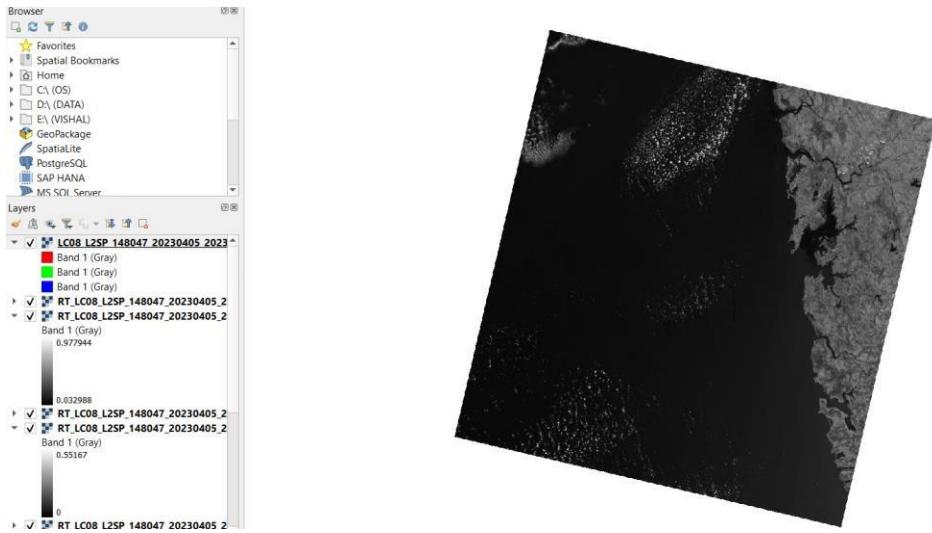
Now go to **layer menu > add layer > add raster layer** and browse the **raster dataset(s)**, and select any “Tif file” from your **landsat 8 satellite image**, click on **add**.



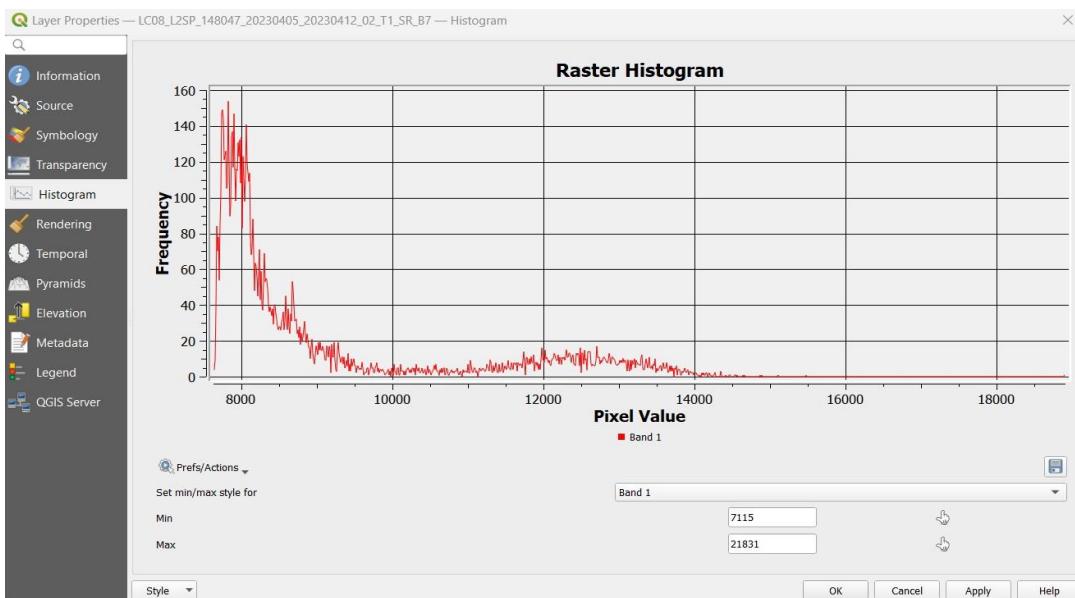


Click on **layer menu > layer properties > symbology** and reset the all bands and their respective values and click on **apply**.





Again, go to **layer menu > layer properties > histogram** and click on **compute histogram** to see the frequency of raster histogram.



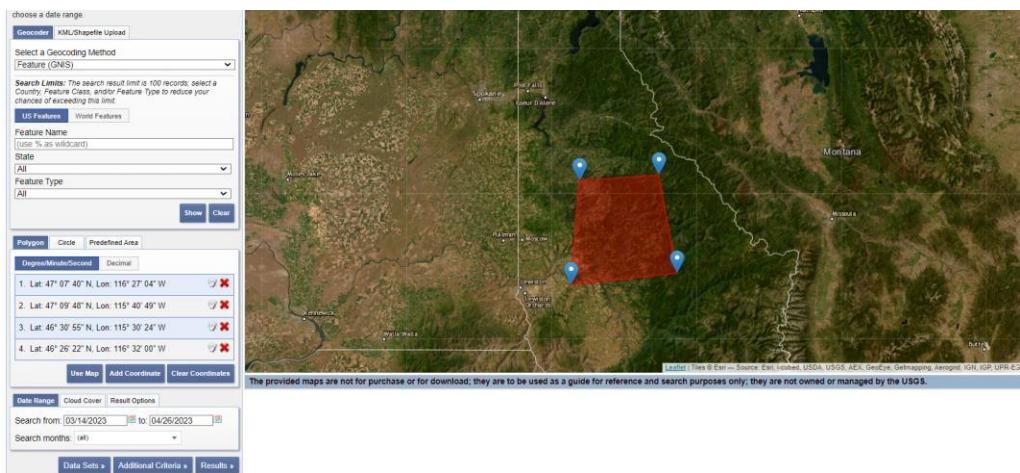
Practical No 4

Aim: - Enhance the satellite image using Pseudocolor image processing

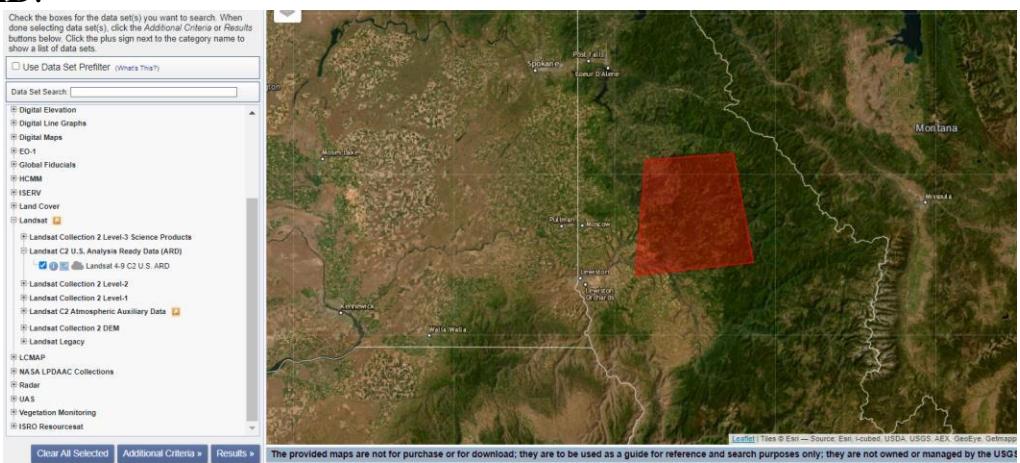
Practical No 4

Aim: - Enhance the satellite image using Pseudocolor image processing

- 1) Open any web browser and go to the site of **earth explorer** and login to the website.
- 2) Download any **landsat 8 satellite image** from earth explorer.
- 3) Before download take **4 coordinates** whatever you want to take and give the **date** you want.



Now, go to **dataset** and in **landsat** open **landsat ARD** and select **landsat 4-9 C2 U.S ARD**.



In additional criteria, **spacecraft identifier** should be **landsat 8** and **sensor identifier** should be **OLI_TIRS**.

3. Additional Criteria (Optional)
If you have more than one data sets selected, use the dropdown to select the additional criteria for each data set.

Data Sets: Landsat 4-9 C2 U.S. ARD

Tile Grid Region: All

Tile Grid Horizontal

Tile Grid Vertical

Tile Identifier

Tile Production Date (Ex. YYYY/MM/DD)

Snow/Ice

Fill (No Data): All

Spacecraft Identifier: Landsat 8

Sensor Identifier: OLI_TIRS

Now , go to **result** and **download** any **landsat 8** satellite image.

EarthExplorer Manage Criteria

Search Criteria Data Sets Additional Criteria Results

4. Search Results

If you selected more than one data set to search, use the dropdown to see the search results for each specific data set.

Show Result Controls

Data Set Click here to export your results

Landsat 4-9 C2 U.S. ARD

First < Previous 1 of 1 Next > Last >

Displaying 1 - 2 of 2

Title ID: LC08_CU_007003_20230322_20230410_02
Acquisition Date: 2023-03-22
Horizontal: 6
Vertical: 3

Thumbnail preview of the satellite image

Tile ID: LC08_CU_007003_20230322_20230410_02
Acquisition Date: 2023-03-22
Horizontal: 7
Vertical: 3

Thumbnail preview of the satellite image

Product Download Options for LC08_CU_007003_20230322_20230410_02

C2 ARD Tile Surface Reflectance Bundle Download

359.73 MB C2 ARD Tile Surface Reflectance Bundle Download

The following items are available for individual download

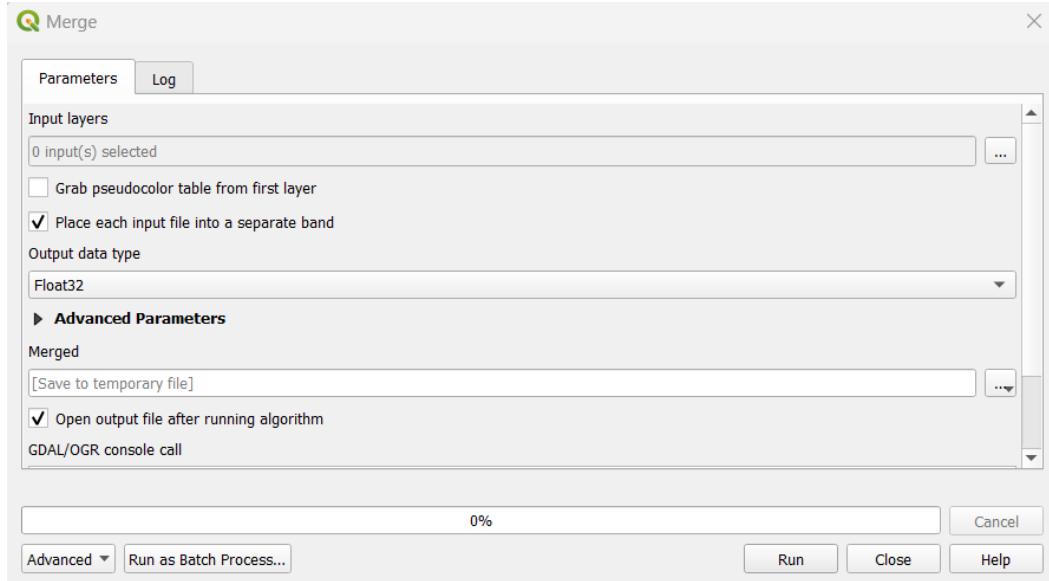
(Item Name Filter)

	File Size	File Name	Description
	51.98 MB	LC08_CU_007003_20230322_20230410_02_SR_B1.TIF	C2 ARD Tile Band Download
	52.09 MB	LC08_CU_007003_20230322_20230410_02_SR_B2.TIF	C2 ARD Tile Band Download
	52.23 MB	LC08_CU_007003_20230322_20230410_02_SR_B3.TIF	C2 ARD Tile Band Download
	52.40 MB	LC08_CU_007003_20230322_20230410_02_SR_B4.TIF	C2 ARD Tile Band Download
	53.04 MB	LC08_CU_007003_20230322_20230410_02_SR_B5.TIF	C2 ARD Tile Band Download
	47.06 MB	LC08_CU_007003_20230322_20230410_02_SR_B6.TIF	C2 ARD Tile Band Download

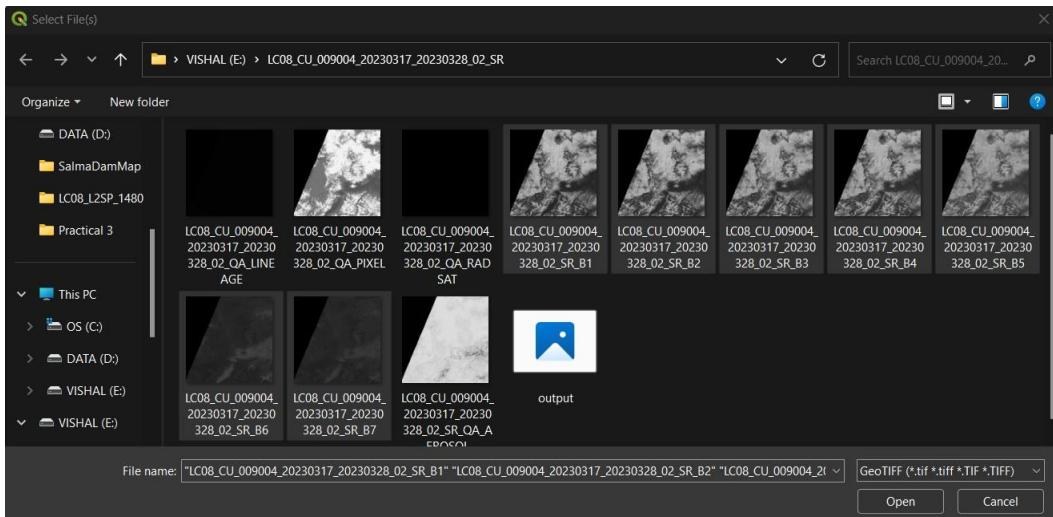
Add All to Bulk Close

1) Steps with Screenshots

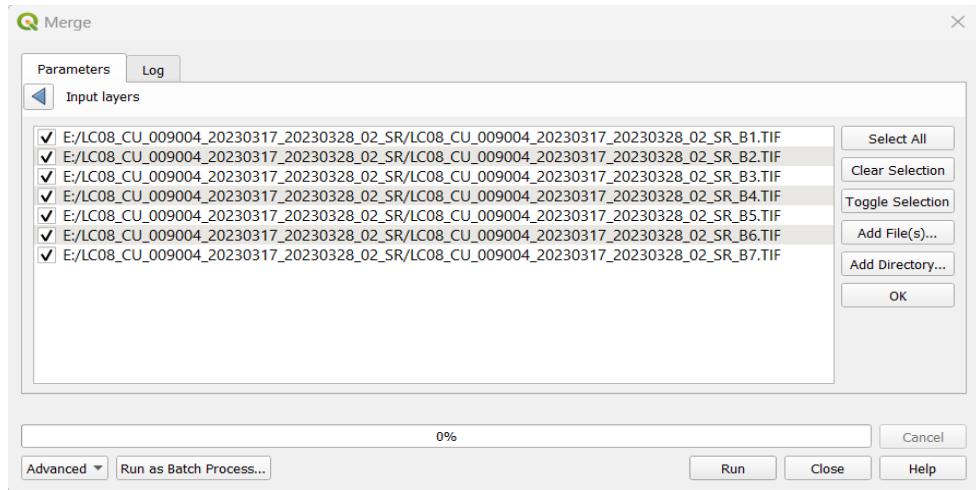
Open your QGIS and go to **raster menu > miscellaneous > Merge**, select the “place each input file into a separate band”.



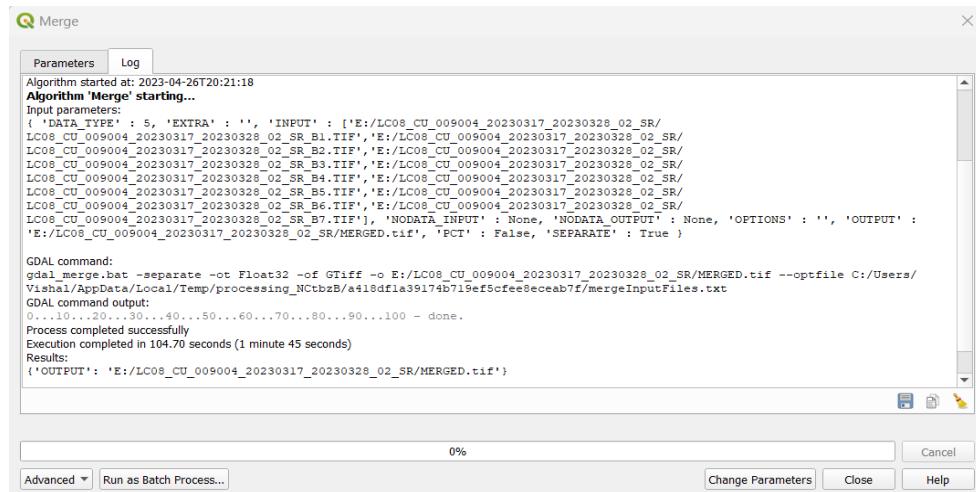
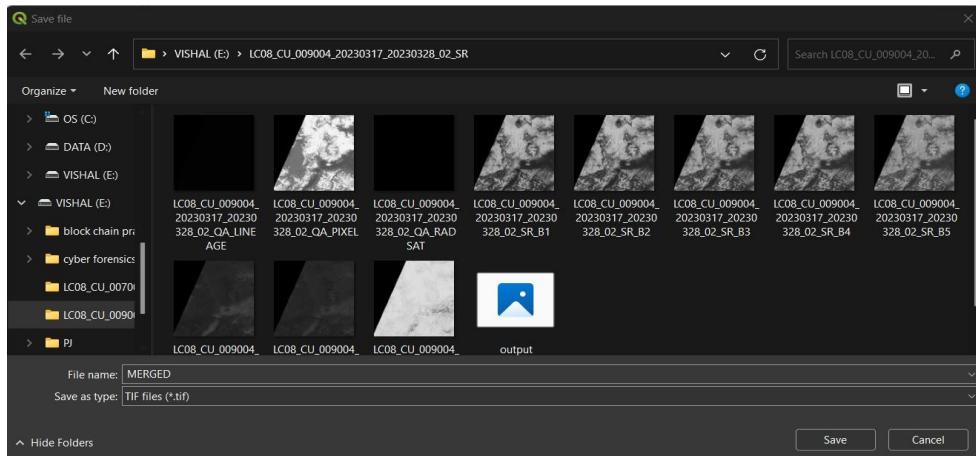
Browse the **input layers**, click on **add files** and select any 7 image from your **landsat 8 satellite image**.



Click on **OK**.

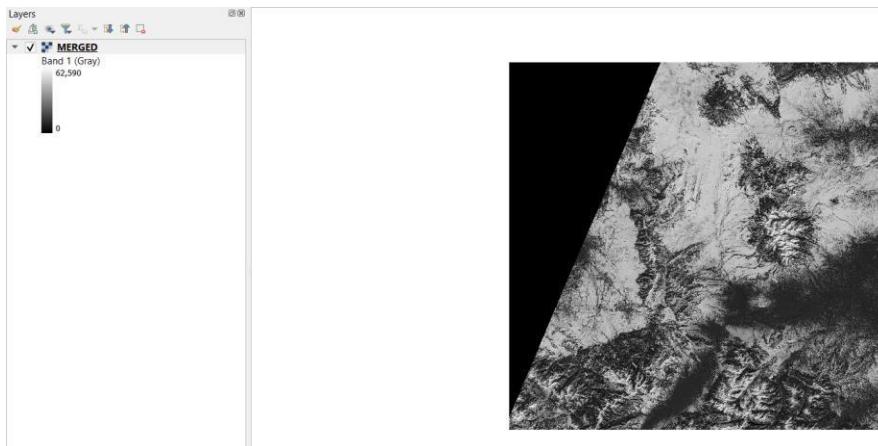


Now browse the **Merged > save to file** and give file name as you want and click on **save**, then click on **run**.

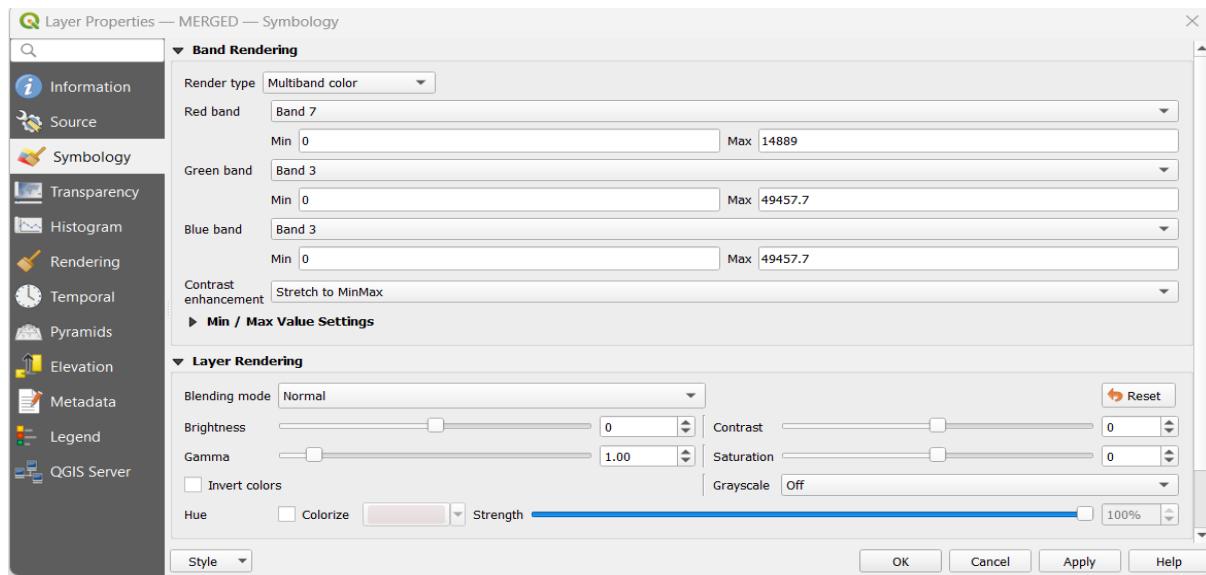


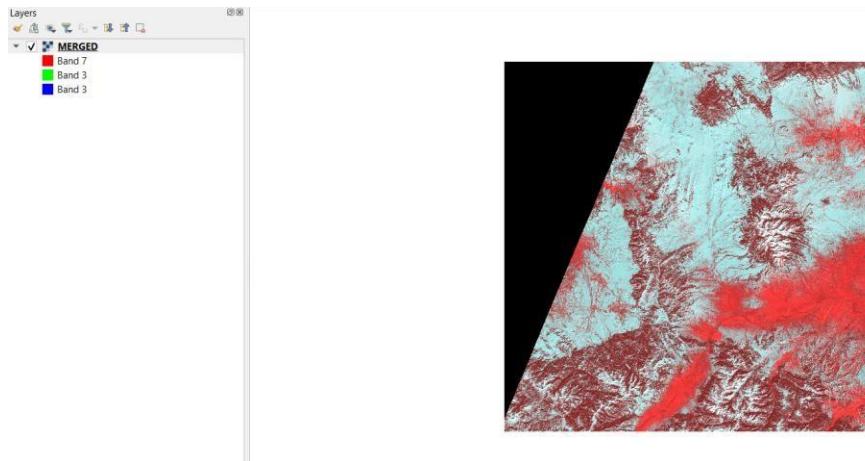
2) Steps with Screenshots

So all the seven image files are successfully merged together.

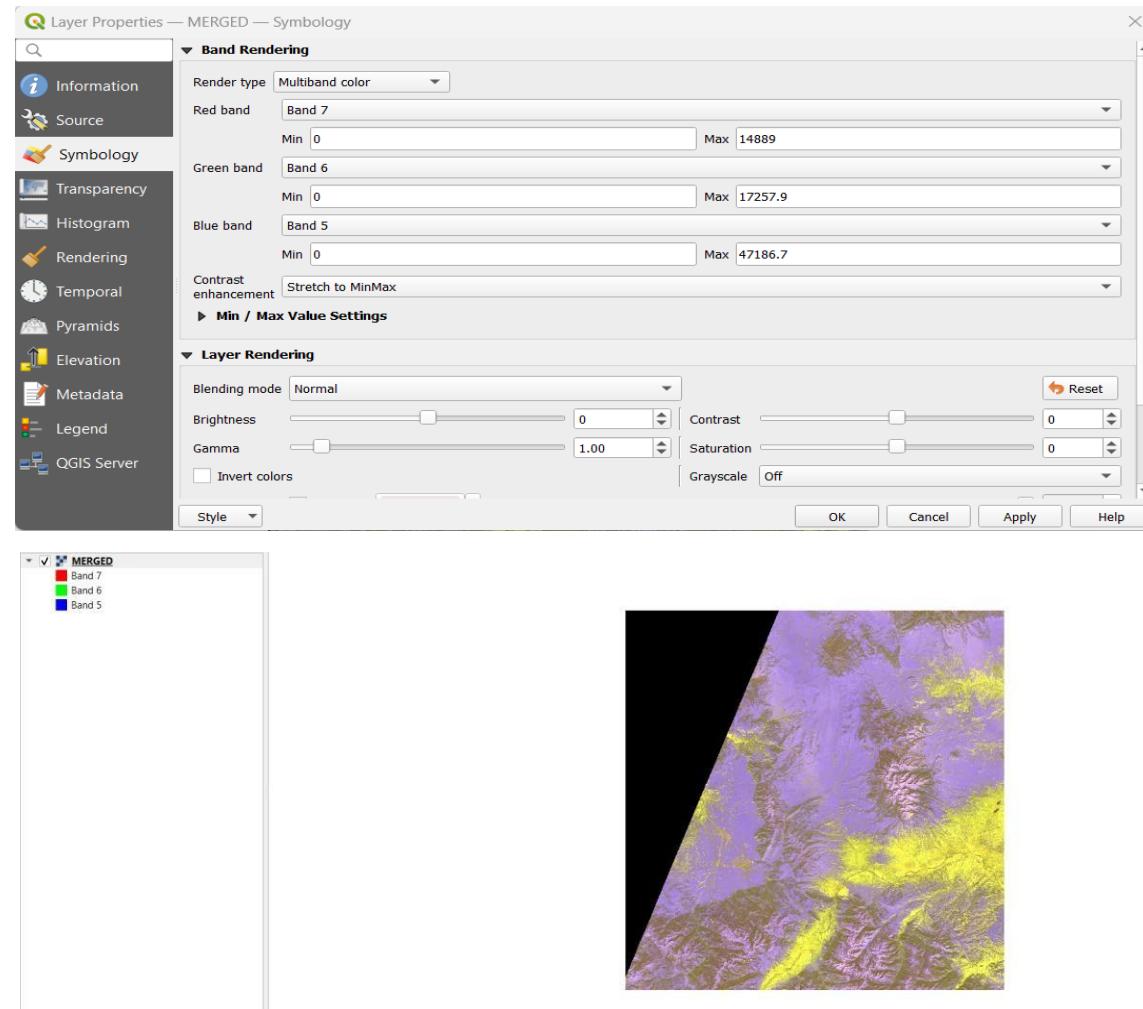


Now go to **layer > layer properties > symbology**, change **render type** to “**multiband color**” and keep changing the rest of the **RGB bands** according to your needs for more enhancement using **Pseudocolor** image processing.





Here is one more example of using **Pseudocolor** image processing with different bands and their respective values.



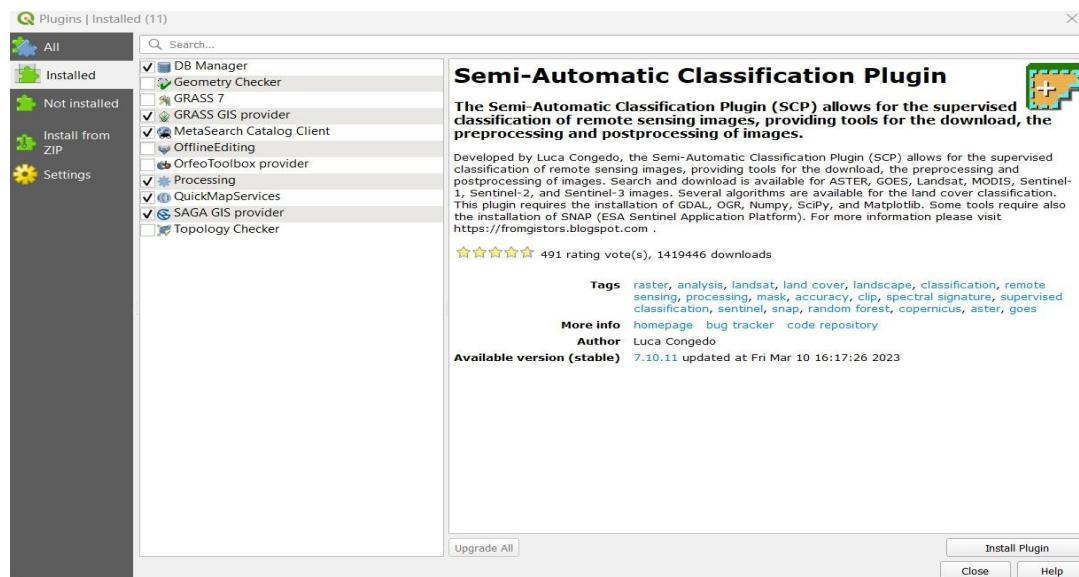
Practical No 5

Aim: - Apply different supervised classification techniques to classify the satellite image

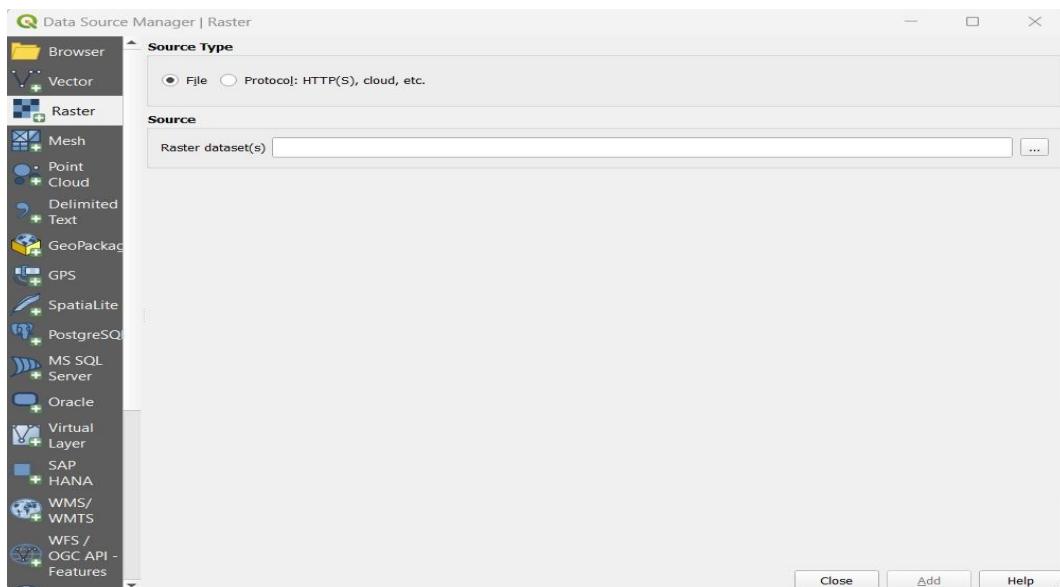
Practical No 5

Aim: - Apply different supervised classification techniques to classify the satellite image

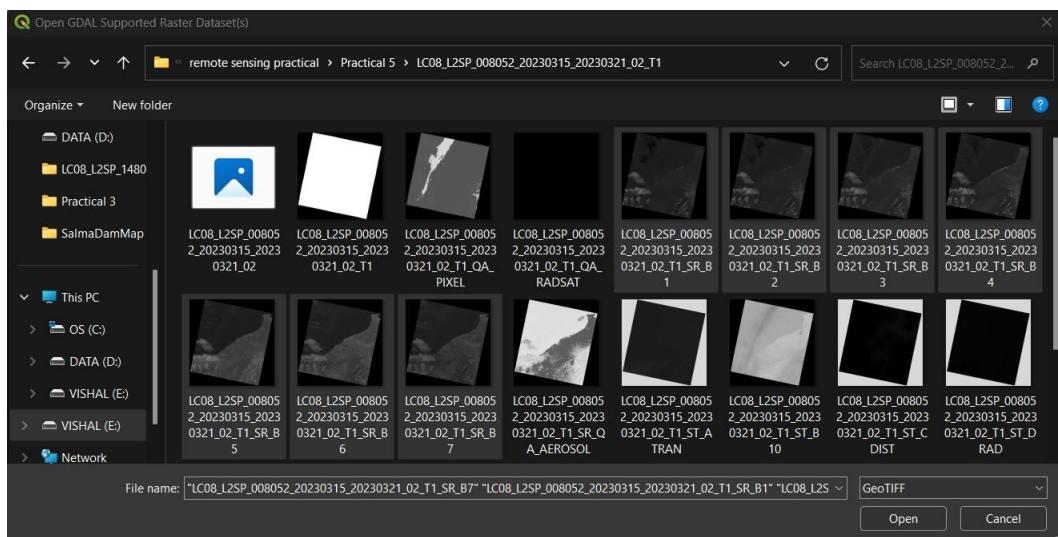
- 1) Download any **landsat 8** satellite image from **earth explorer**.
- 2) Open **QGIS** and go to **plugins > manage & install plugins**, search for “**semi – automatic classification plugin**” and click on **install plugin**.



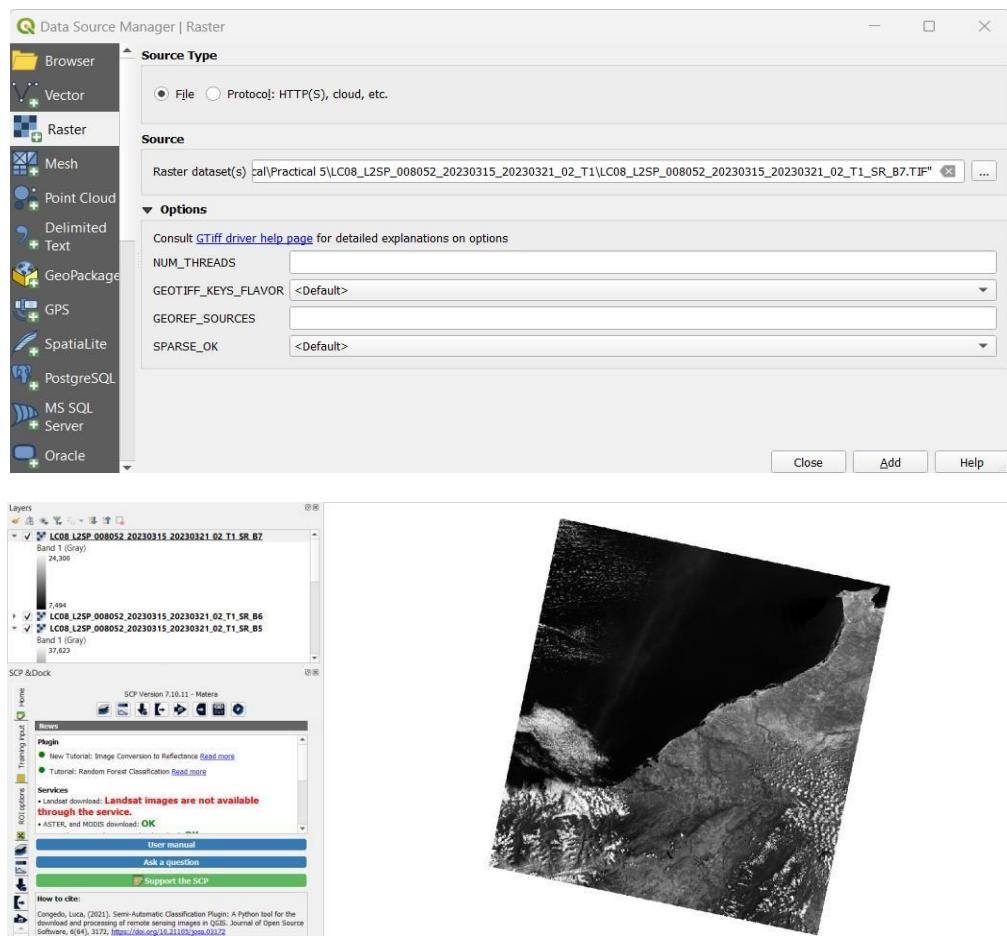
Now, go to **Layer menu > Add layer > Add raster layer**.



Browse the **Raster dataset(s)** and add your downloaded **landsat 8 satellite image**, add at least 7 Tif files and click on **Open**.

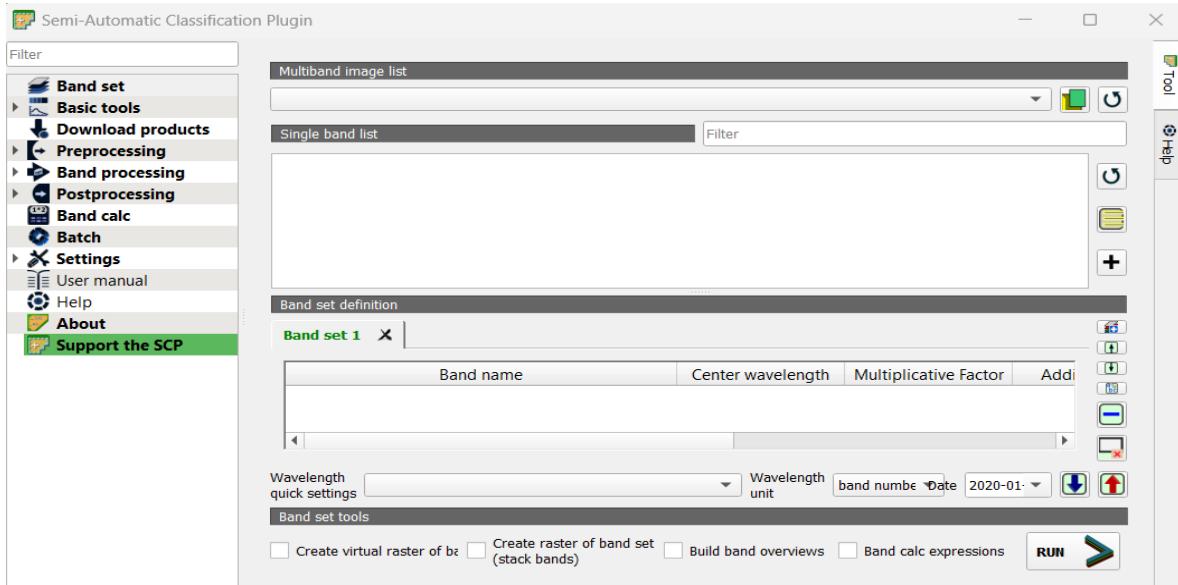


After adding **Tif files of landsat 8 satellite image**, click on **Add**.

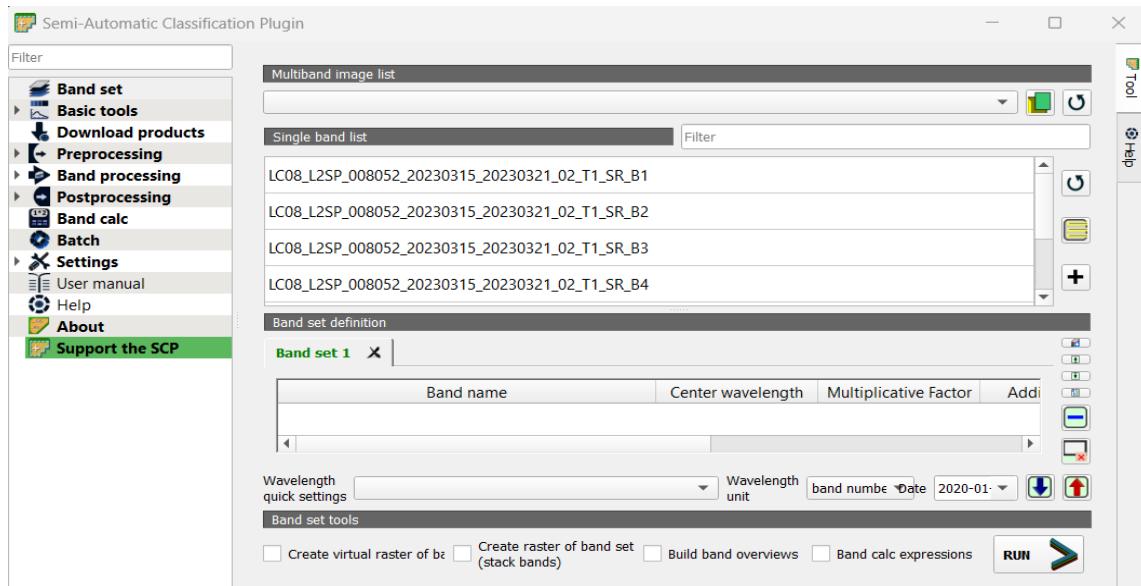


1) Steps with Screenshots

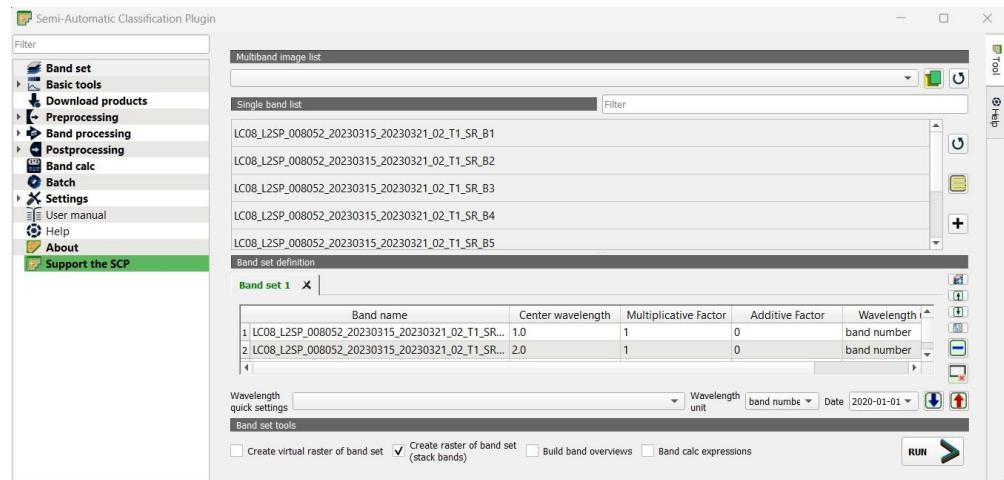
After adding process done, Go to **SCP menu > Show Plugin.**



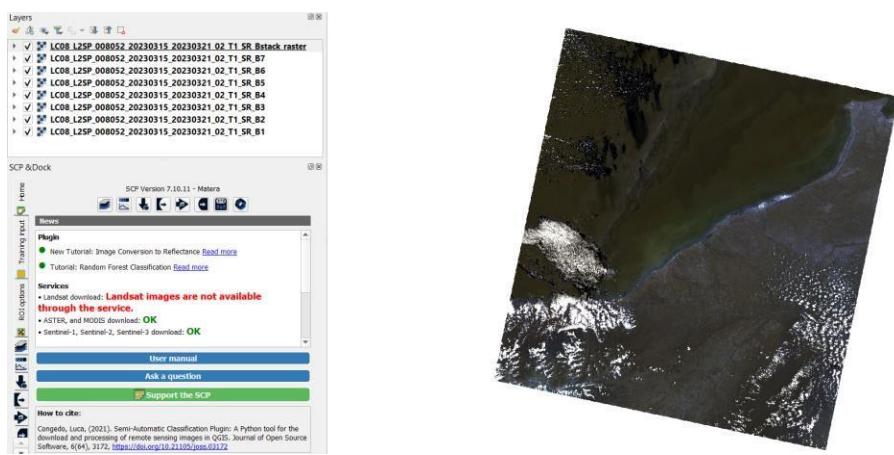
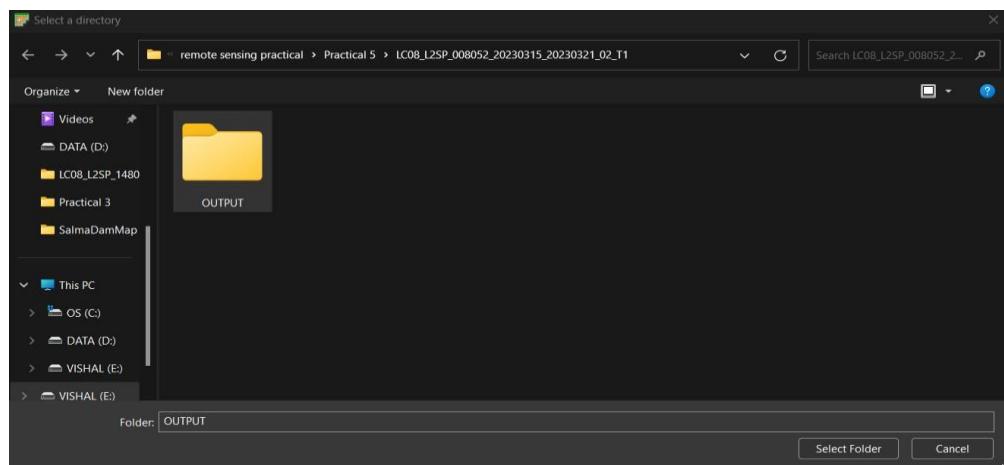
In the **single band list** column, Click on **refresh** to see **single bands**.



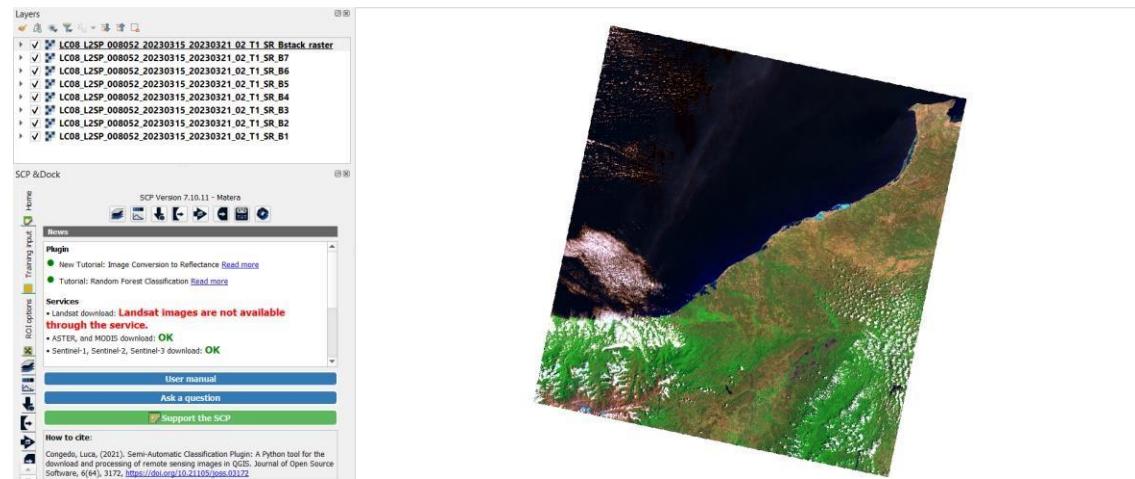
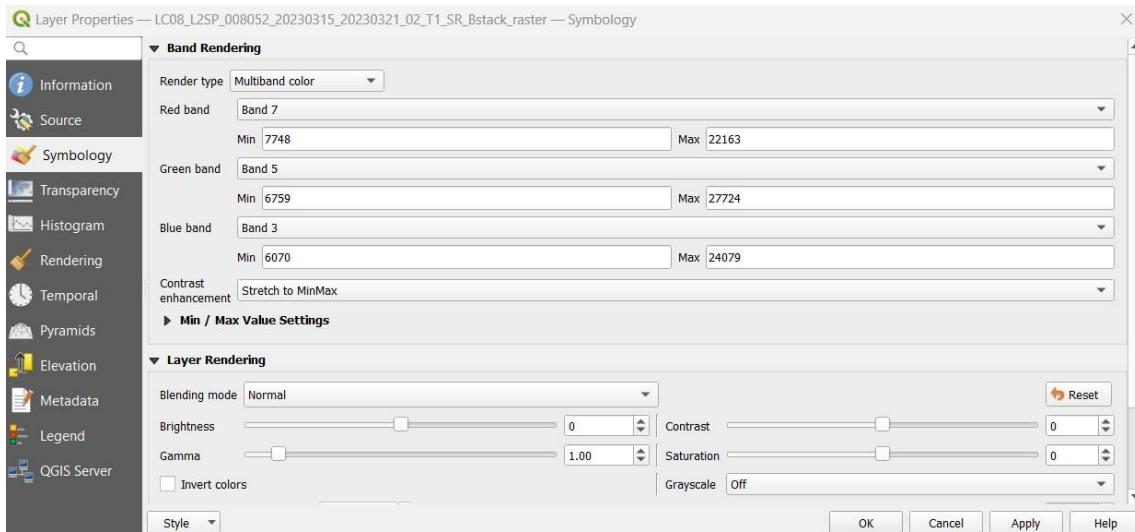
Now select all **bands** and click on **add button**, and check the option “**create raster of band set**”, Click on **RUN**.



After clicking on **RUN**, we have to create a **folder** of name whatever you want to give and select the **folder**.

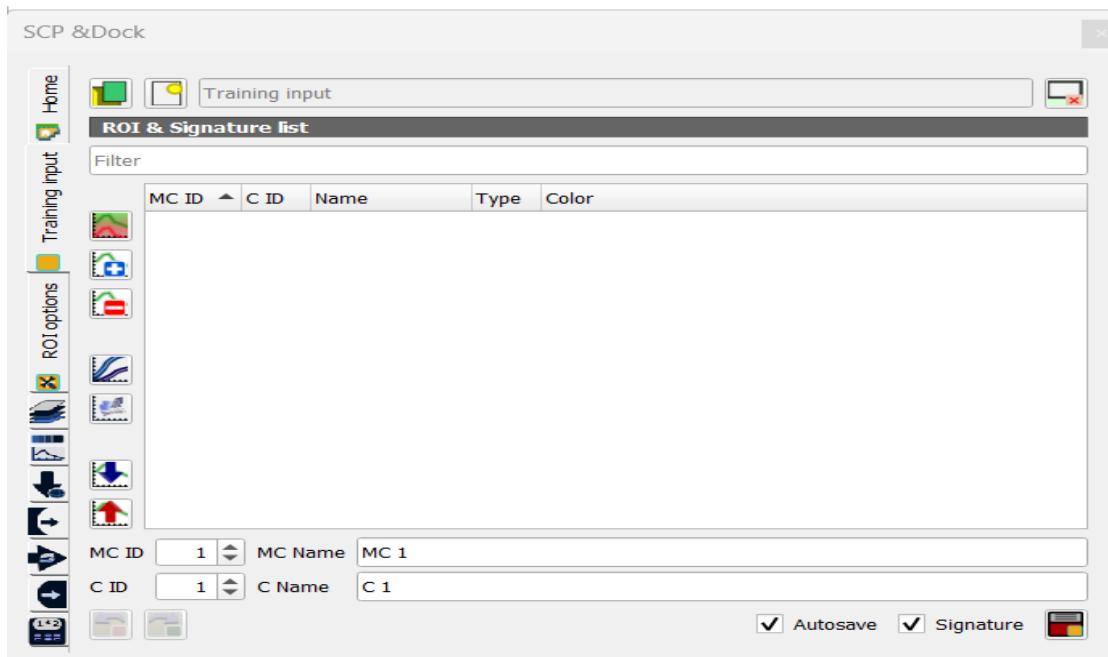


Next step is go to **Layer > Layer properties > symbology**, change **render type** to “**multiband color**” and select **RGB bands** as shown in figure, Click on **Apply**.

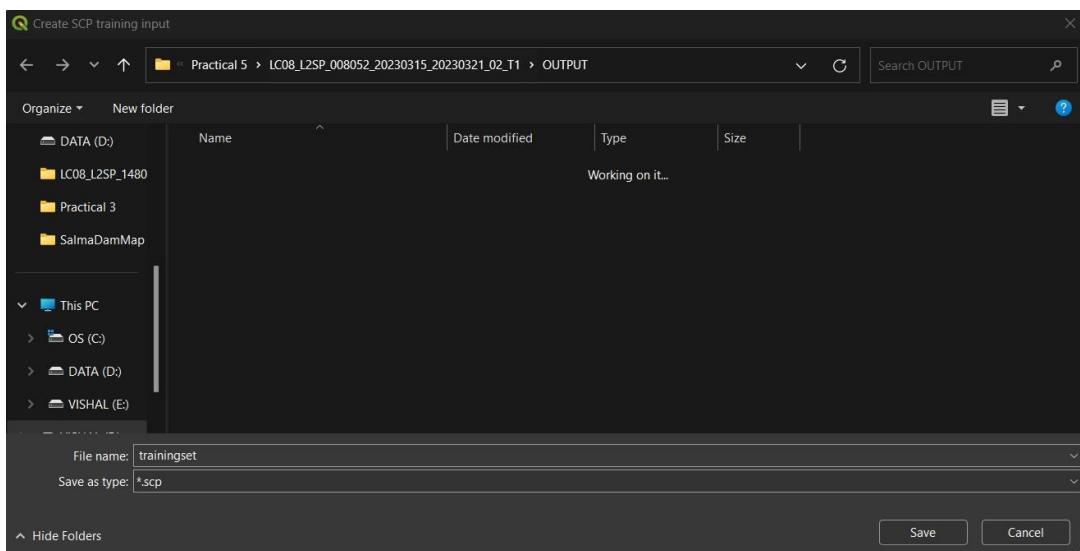


2) Steps with Screenshots

In **SCP & Dock** section you can see you will have **training input** in left click in it.



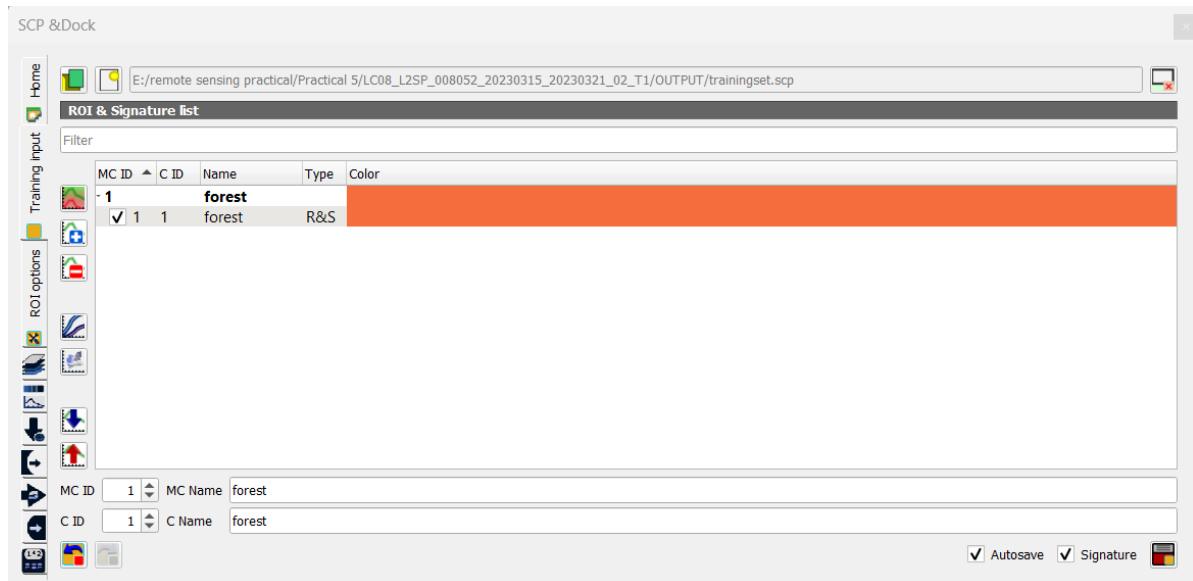
In **SCP & Dock** section, click on “**create a new training input**” and give name of file “**trainingset**”, click on **Save**.



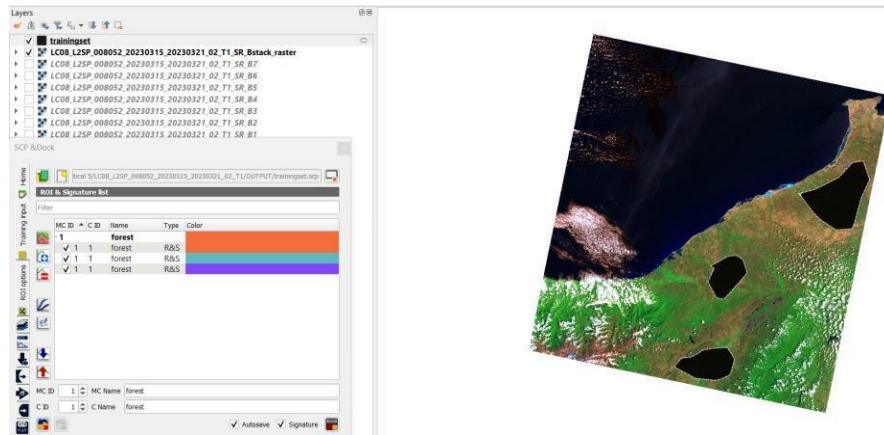
So now we will start training the input so for that we have to click on “**create a ROI polygon**”, so that we can draw the input on the **map**.



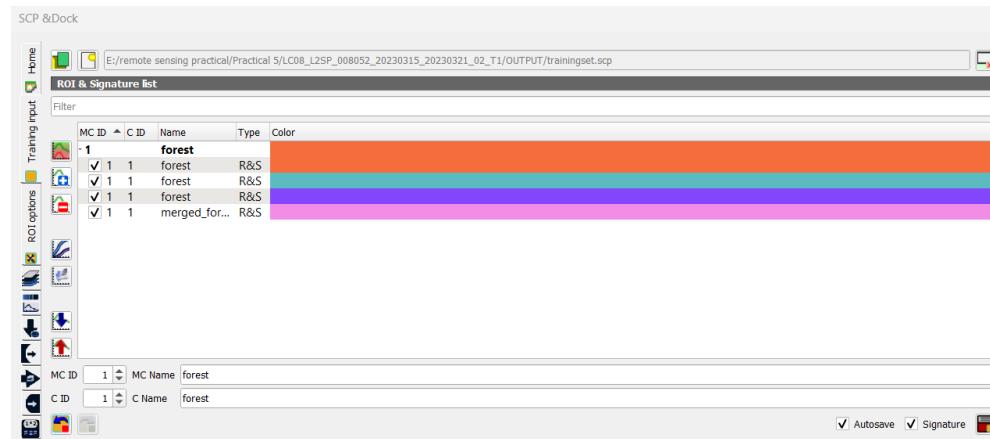
After drawing the input, next step is to save that input and for that we have to give **MC ID = 1, MC Name = Forest** and **C ID & C Name** will be same as **MC ID & MC Name** then click on “**save temporary ROI to training input**”, we named **MC Name forest** because we have taken the first input for forest.



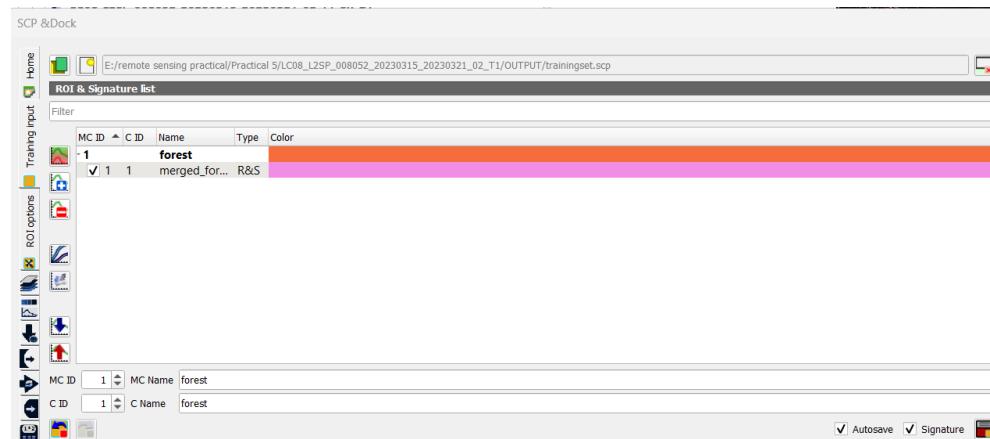
We can take multiple inputs for **single class**, we took 3 inputs for **forest area**.



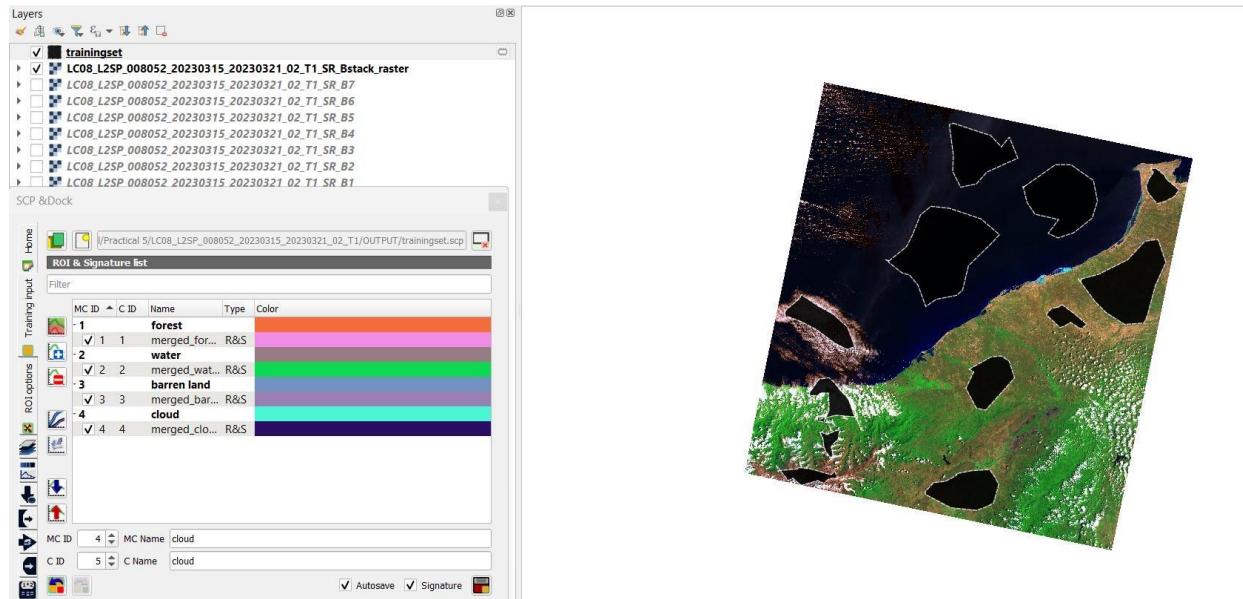
Next step is to merge all the inputs for **single class**, so for that we'll select all the inputs and click on “**merge highlighted spectral**”.



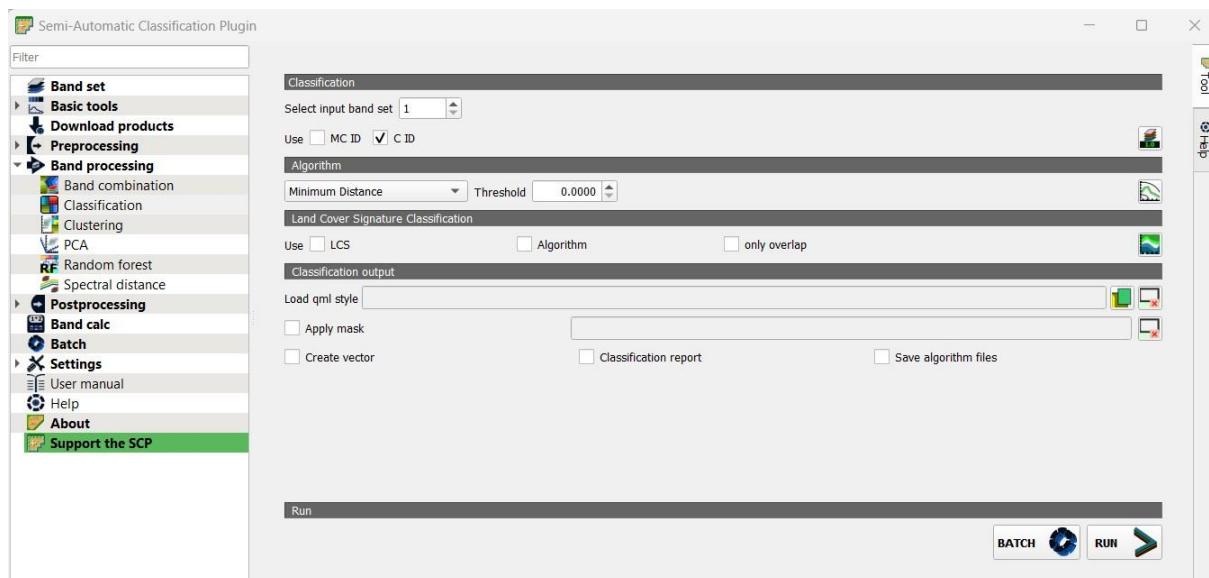
After merging we can delete the previous inputs.



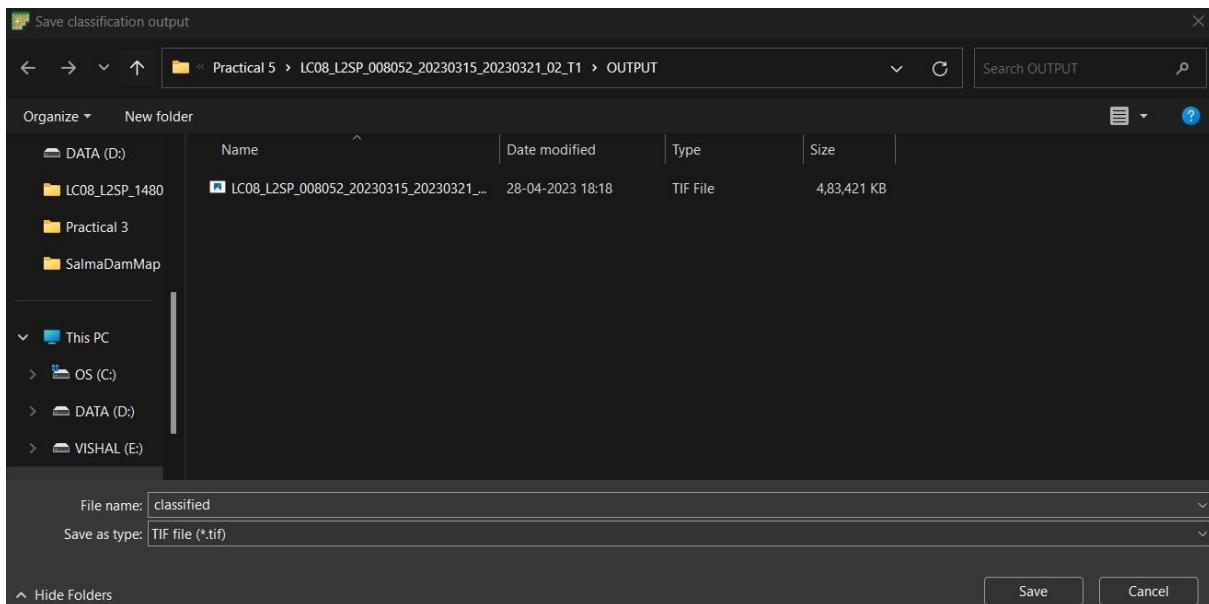
So we took many types of inputs for training such as **forest**, **water**, **barren land**, and **cloud**.



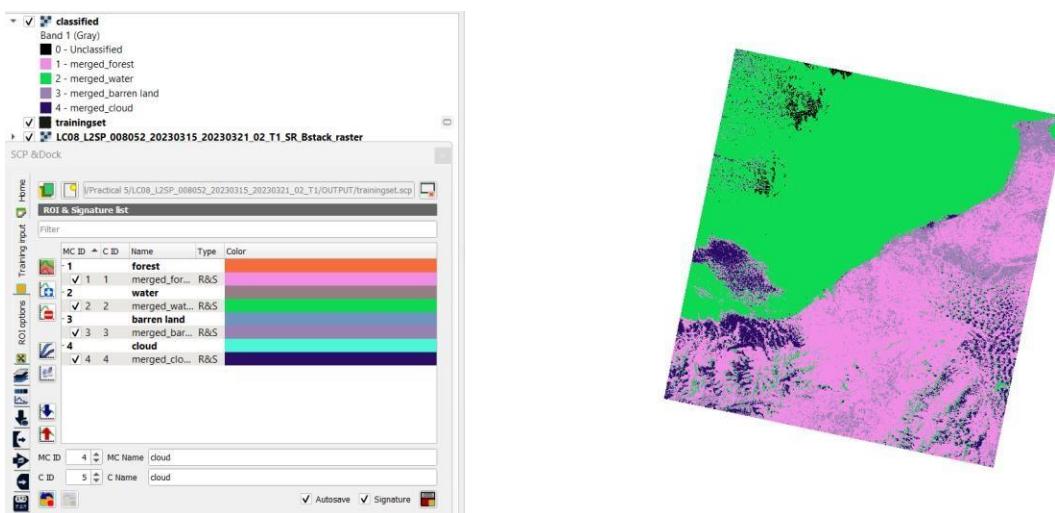
So the next is to go **SCP menu > Band processing > classification**, click on **RUN**.



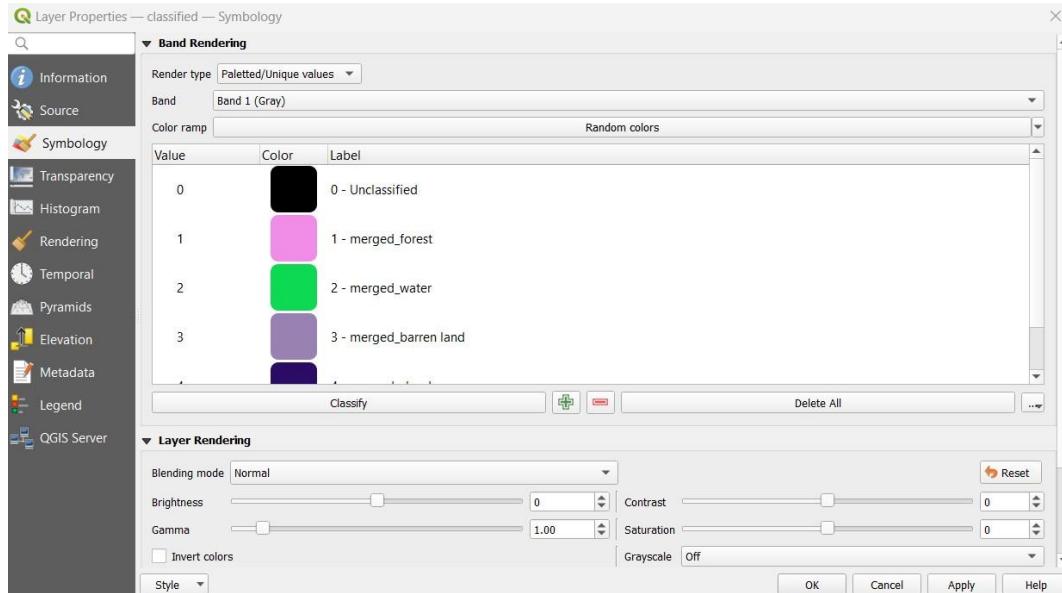
After clicking on **RUN**, you have to give a file name of “**classified**” then click on **SAVE**.



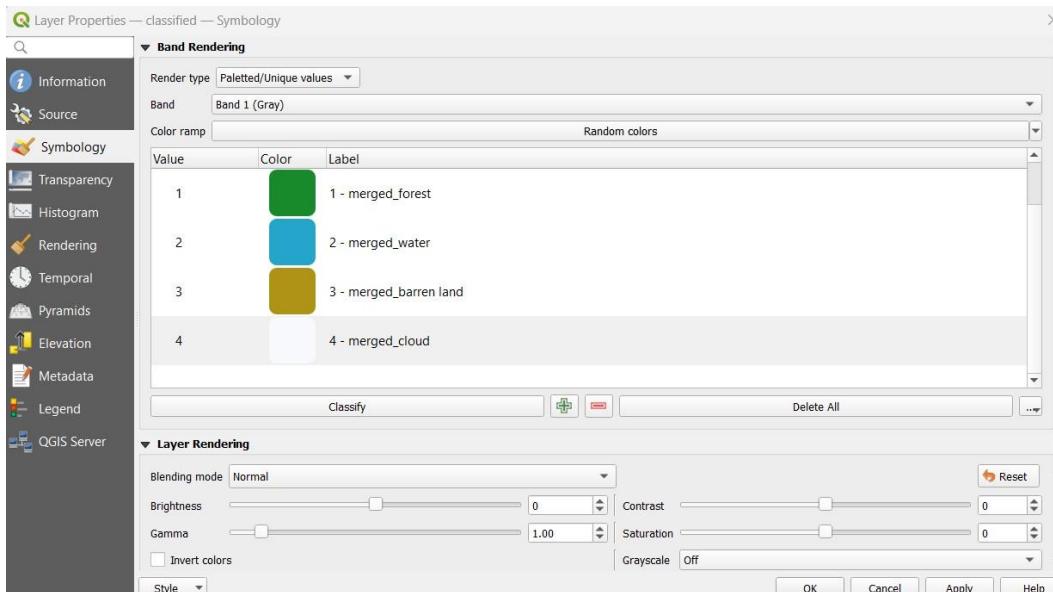
The classification process of our training input is complete, this is our classified product.



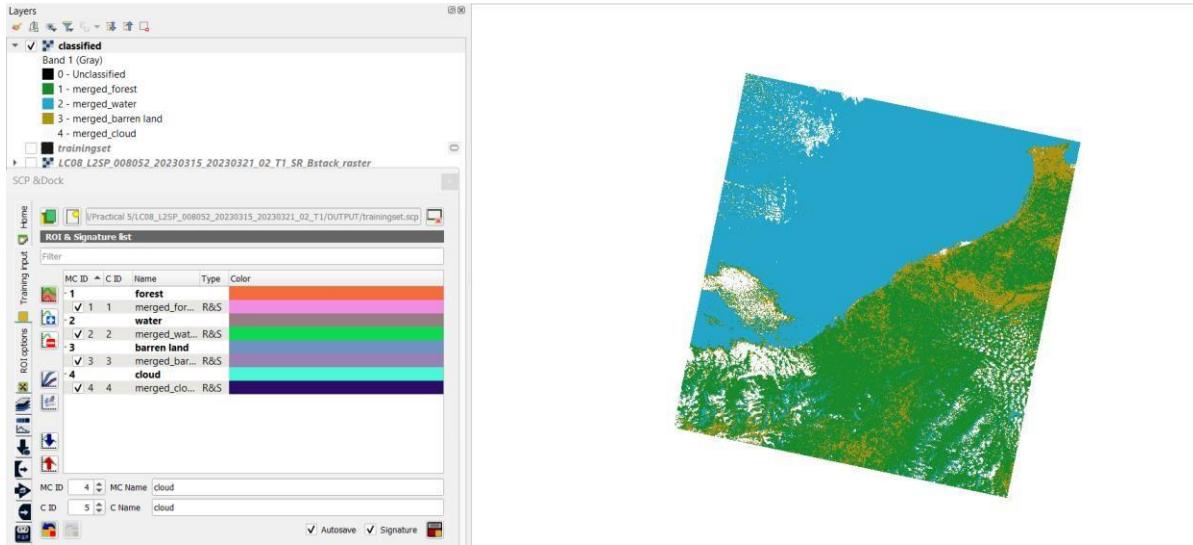
Now we have to give our **merged inputs** their natural colors for which we have to go to **Layer menu > Layer properties > symbology**.



In **symbology**, by clicking **right** on each **merged input**, we get the option of “**change color**” by which we can give our inputs their natural color.



After giving each **merged inputs** to their natural colors, click on **Apply** to see real or natural colors of our **landsat 8 satellite image**.



Practical No 6

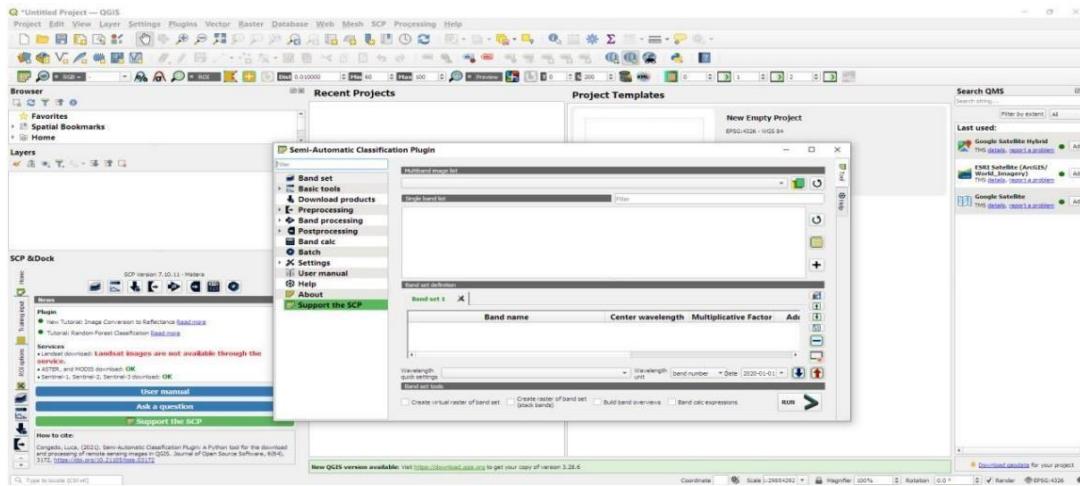
Aim: - Apply Different Unsupervised Classification Techniques to Classify the Satellite Image

Practical No 6

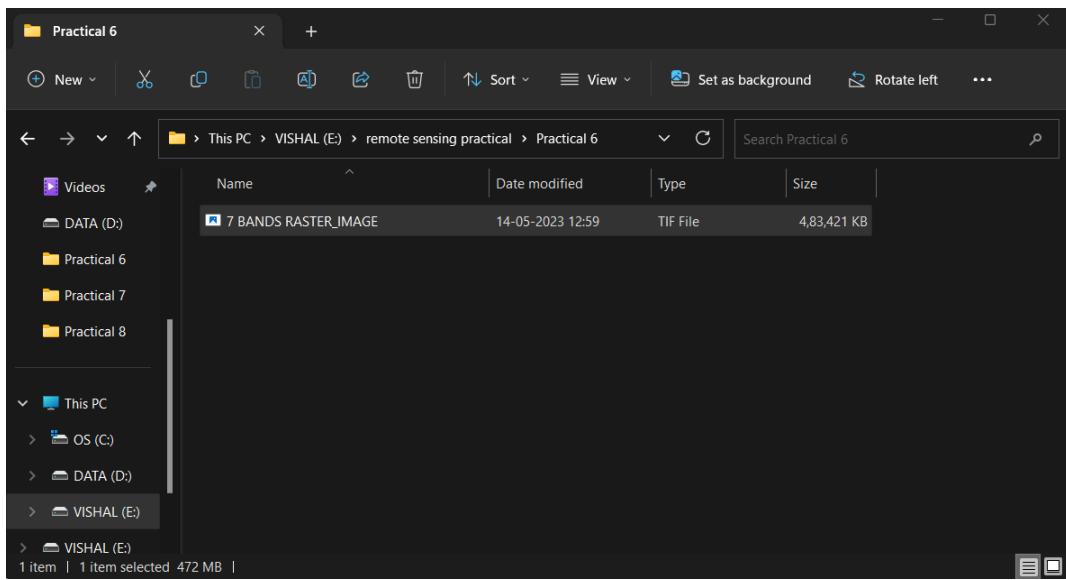
Aim: - Apply Different Unsupervised Classification Techniques to Classify the Satellite Image

1) Steps with Screenshots

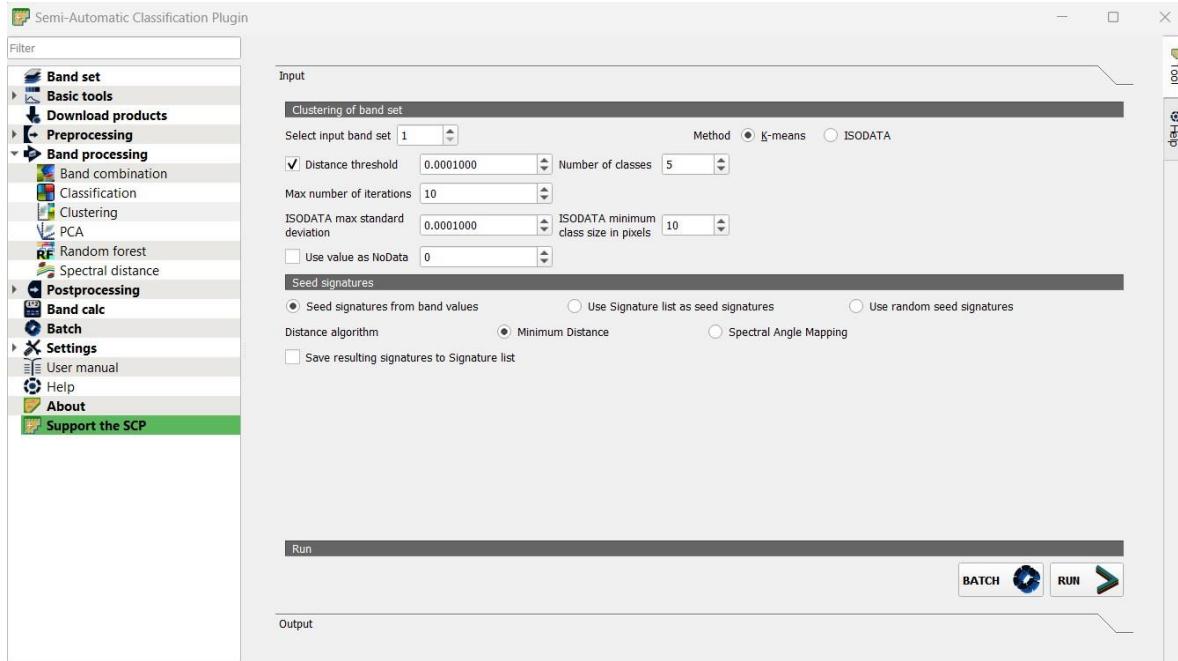
Open QGIS and select band set from SCP & DOCK and Open a file from Multiband image list.



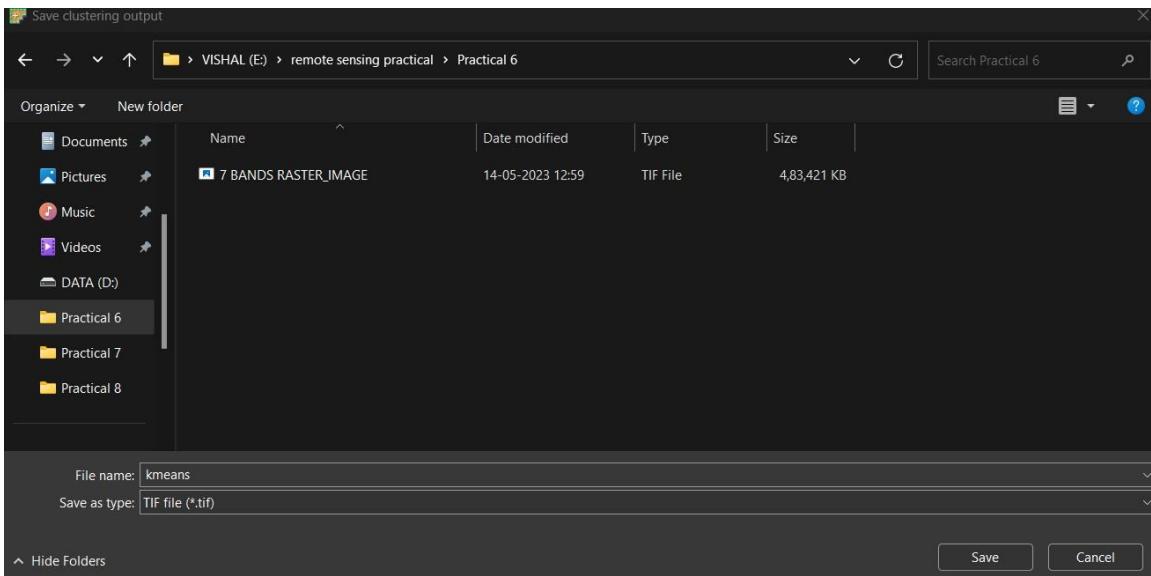
We will select already created all 7 band color raster image.



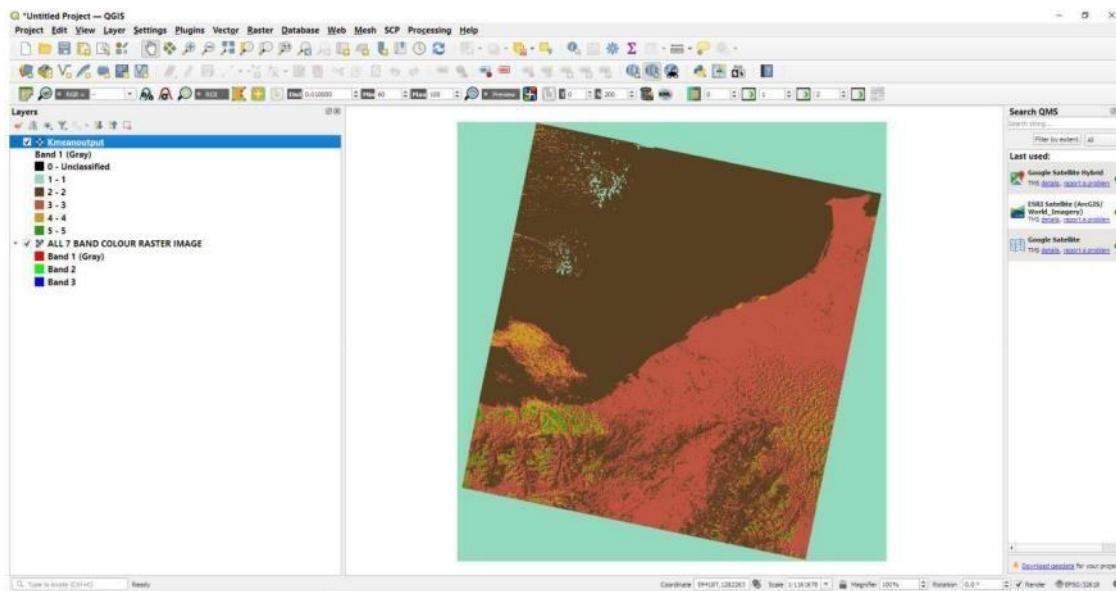
After opening the image, we will go to **Band Processing > Clustering** and change Number of Classes to **5**.



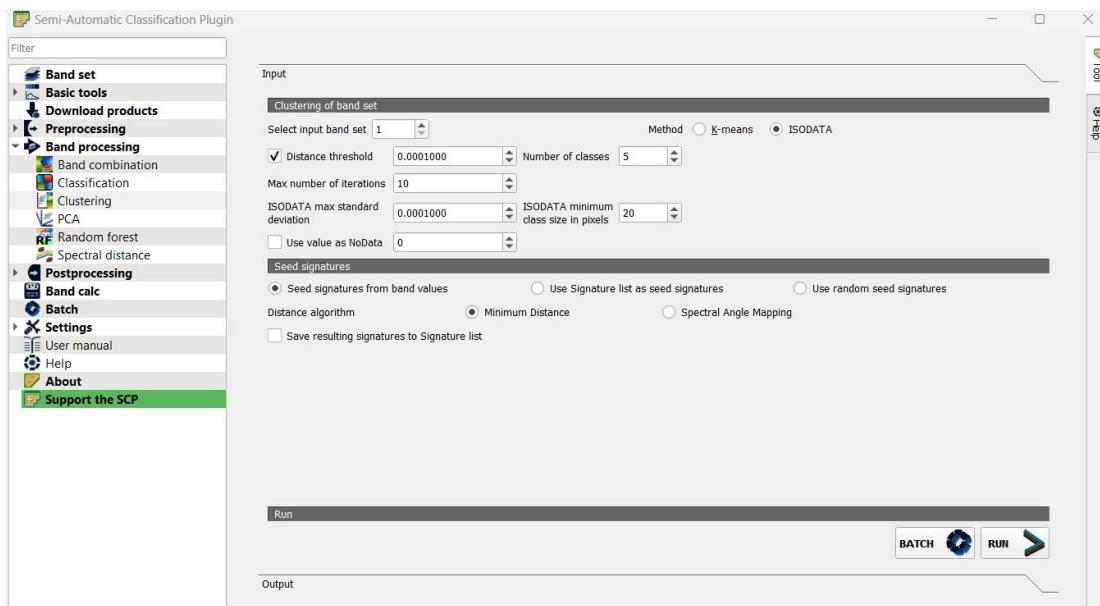
After Click on Run you have to give the name of your output and save the file.



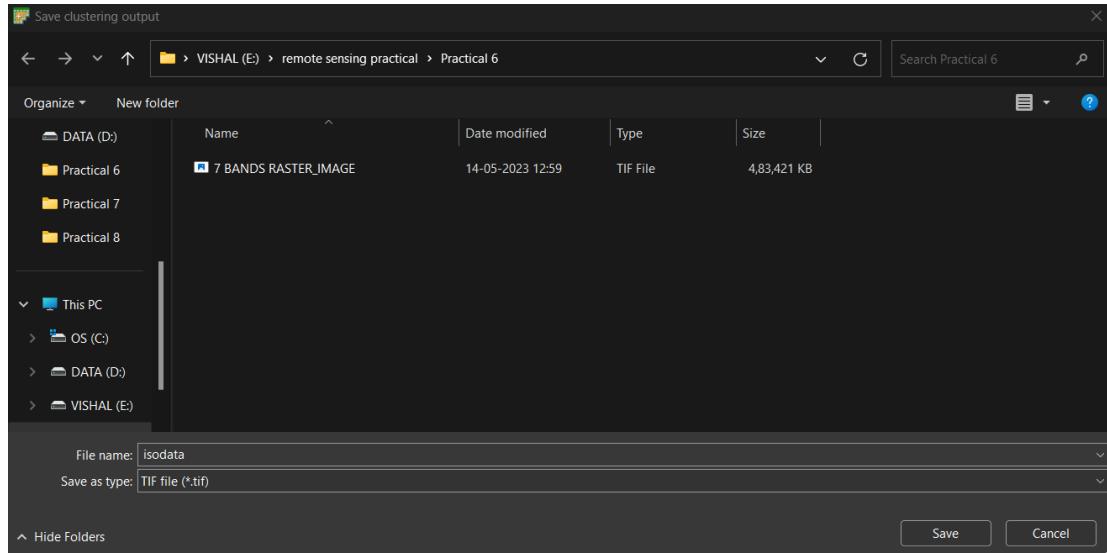
After Running K-mean you will get the output



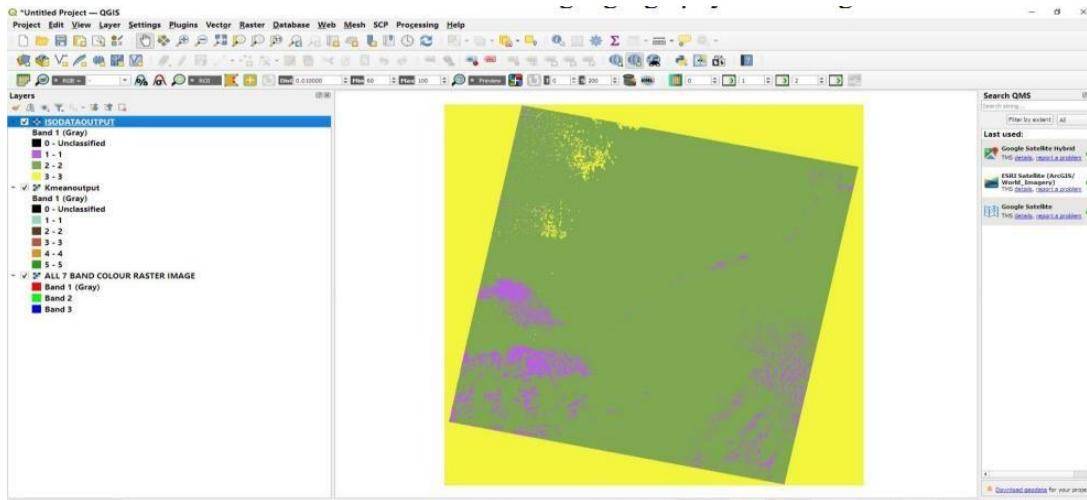
Now again go to **clustering** and select **ISODATA** and Change **ISODATA minimum class size in pixel to 20**



Then Run and give output file name and save and wait for the classification iteration.

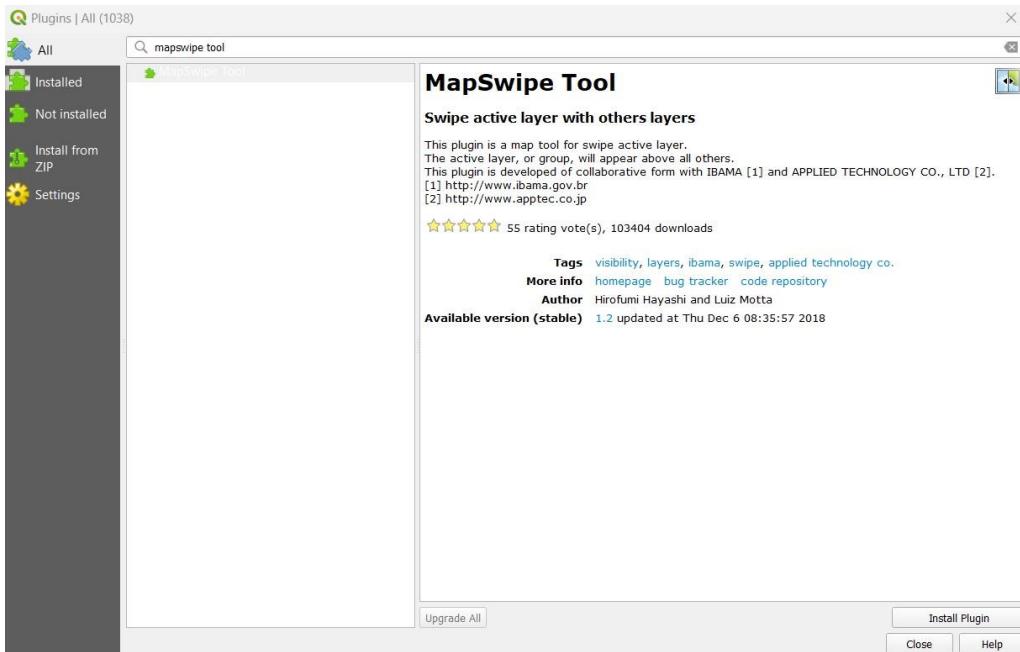


Now both **k-mean** and **ISODATA** has done, here you can see all the bands from **ISODATA** and **k-mean** which are unlabeled not classified color according to geography of the image.

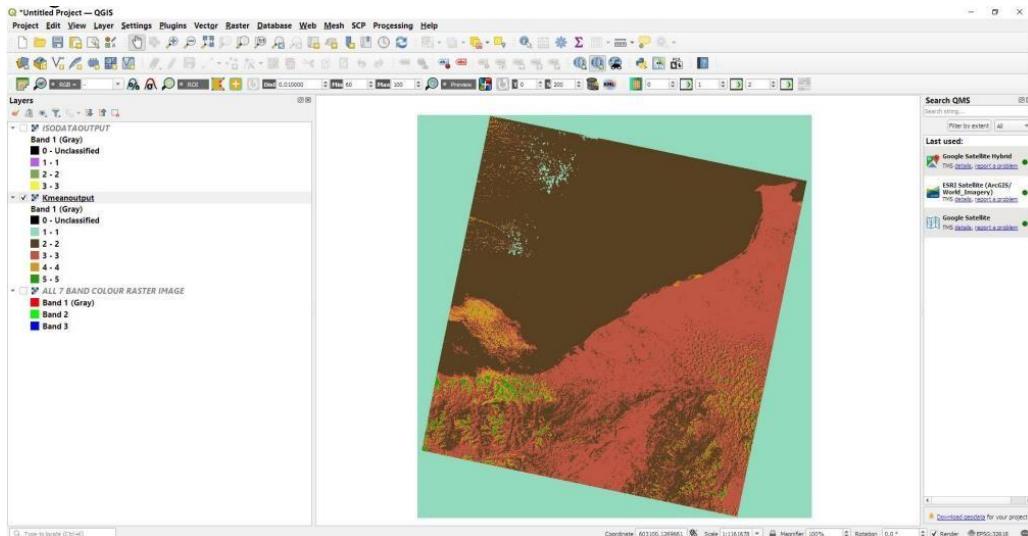


2) Steps with Screenshots

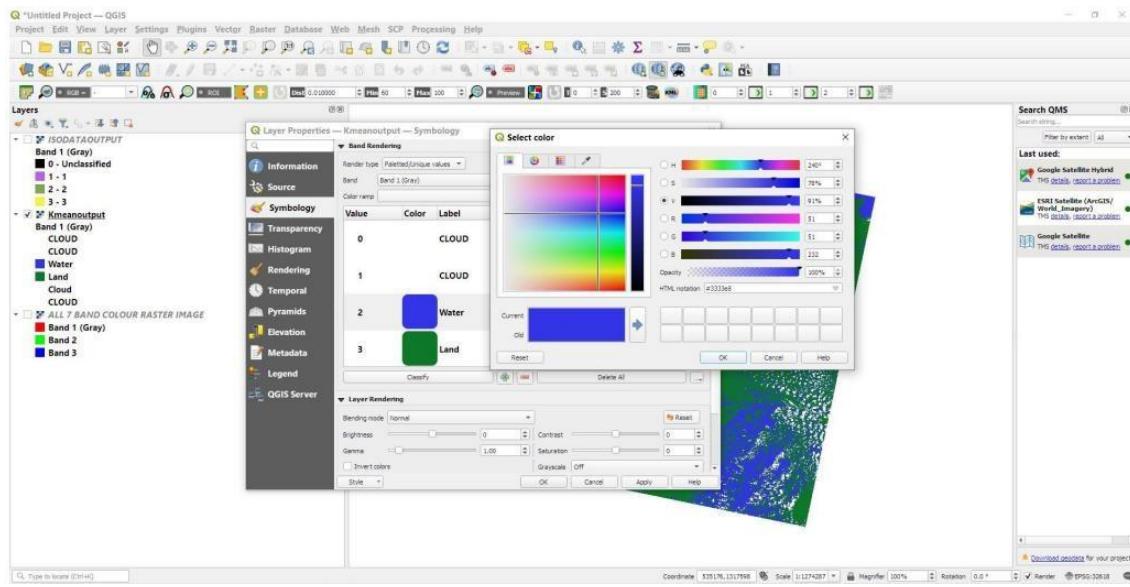
Now go to **plugin** and install **MapSwipe Tool**.



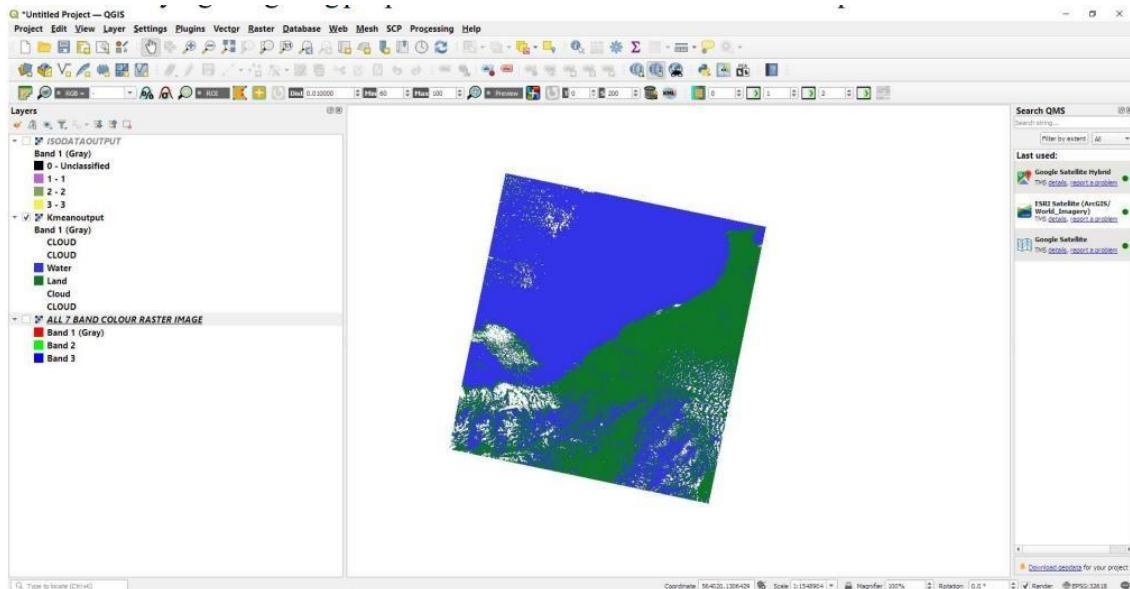
Now we have to change labels and give proper color and names according to image geography. Here, we will select **k-mean** output because it has more band and color to distinguish detail in image.



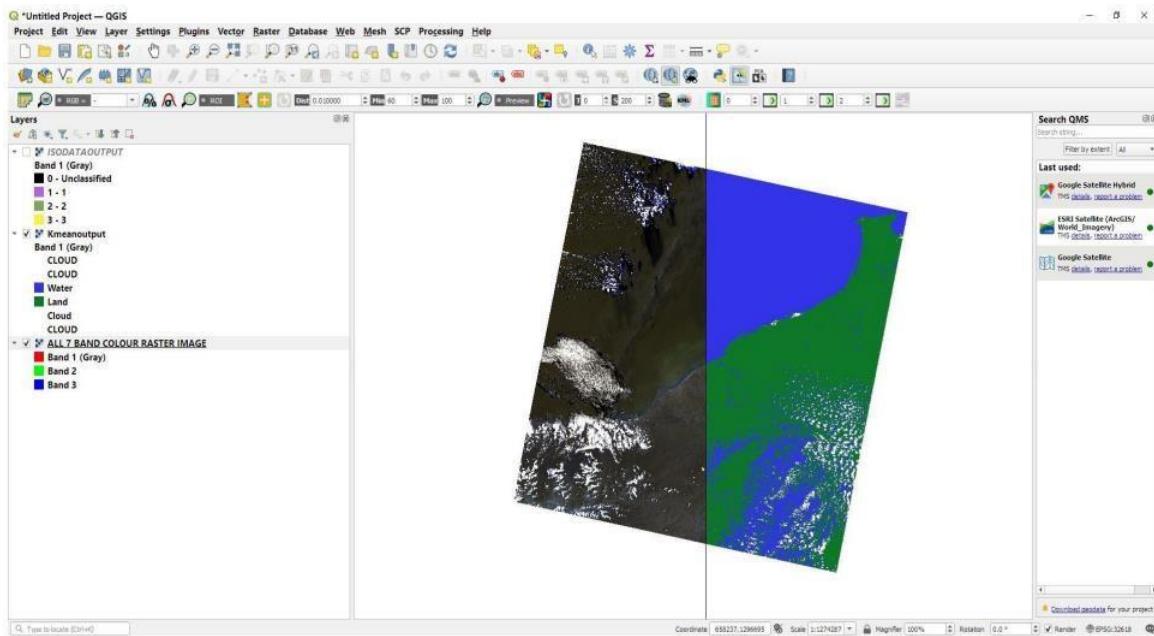
To Change color and label just double click the **band color** and also **change labels**



After Classifying and giving proper labels and color on **k-mean** band output.



Using **MapSwipe Tool** We can see the difference between two images side by side



Practical No 7

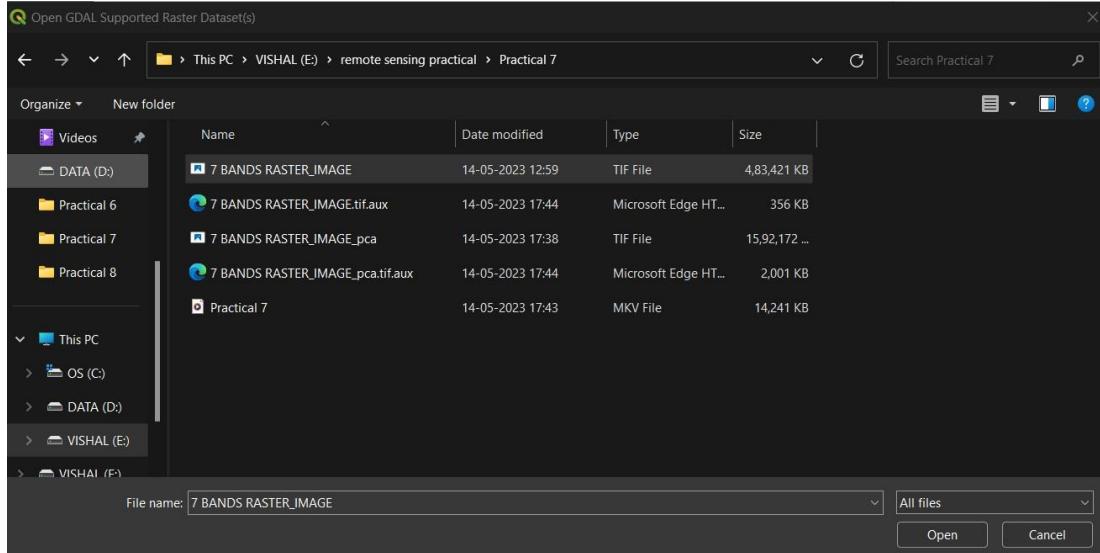
Aim: - Apply principal component analysis on satellite images

Practical No 7

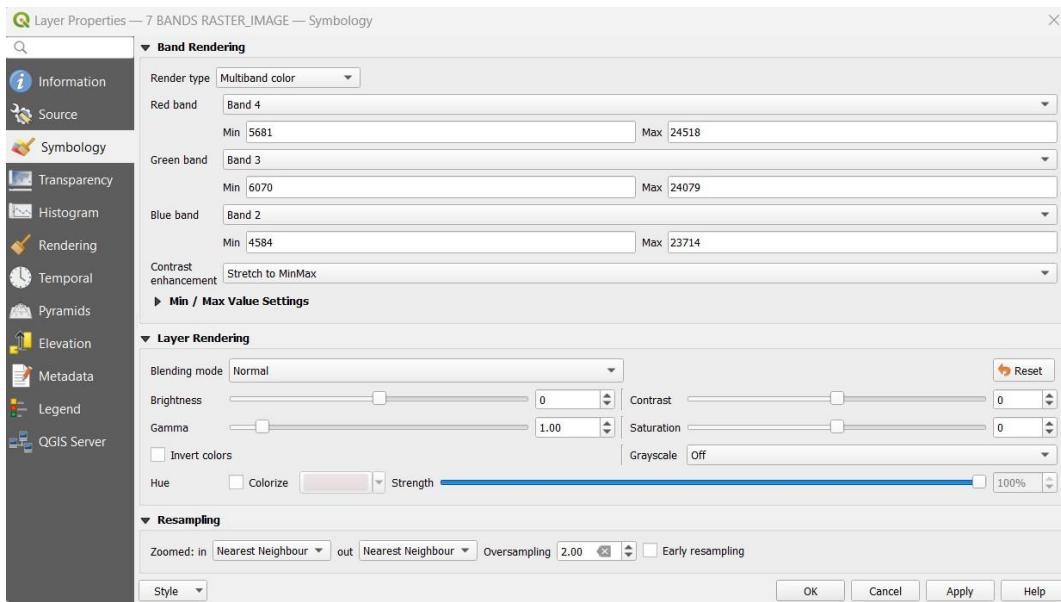
Aim: - Apply principal component analysis on satellite images

1) Steps with Screenshots

Open QGIS and go to Layer > Add layer > Add raster layer, then in raster dataset(s) section select 7 band color raster image and click on add.

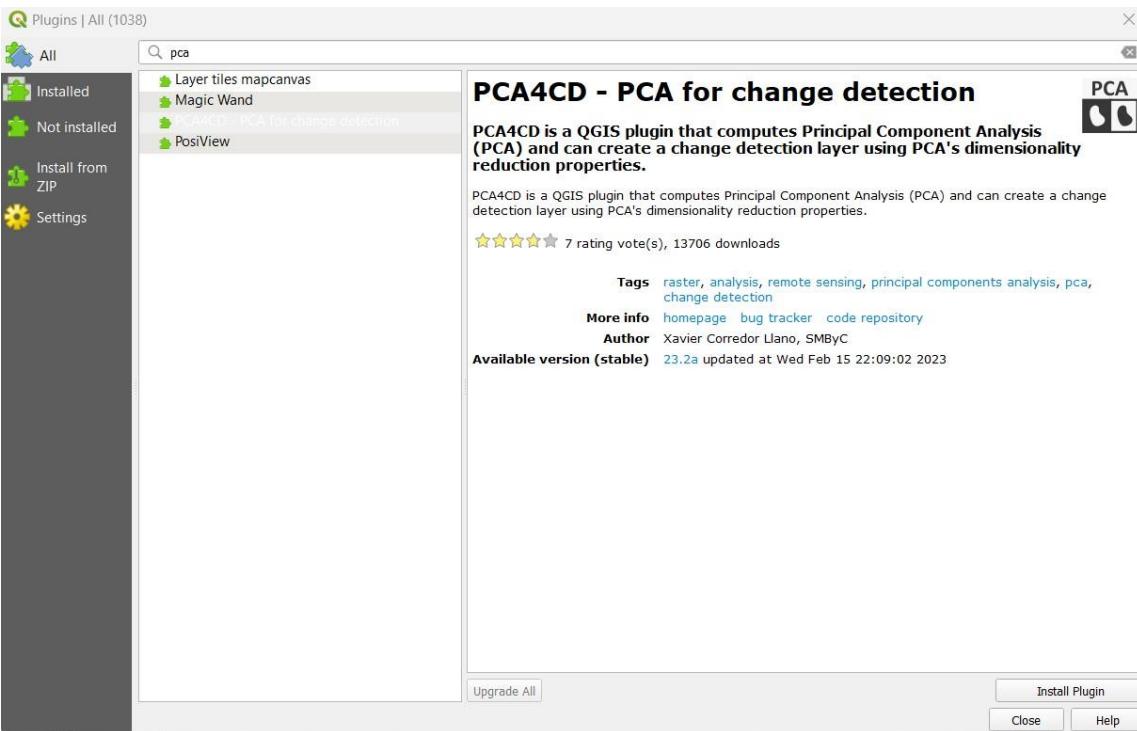


After adding the raster image go to **layer properties > Symbology** and change **render type** to **Multiband color** and Select **RED BAND to Band 4, GREEN BAND to Band 3, BLUE BAND to Band 2**.



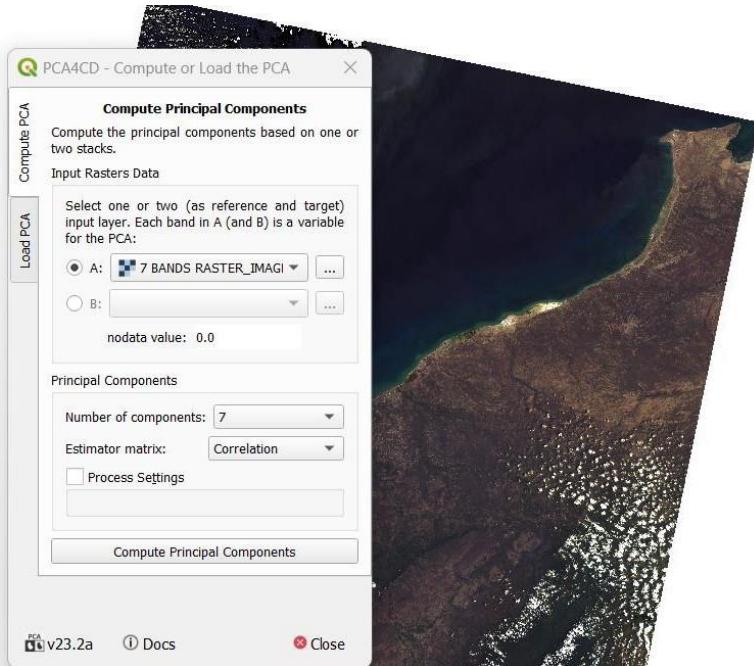


After Applying, Now install plugin **PCA4CD -PCA** for change detection.

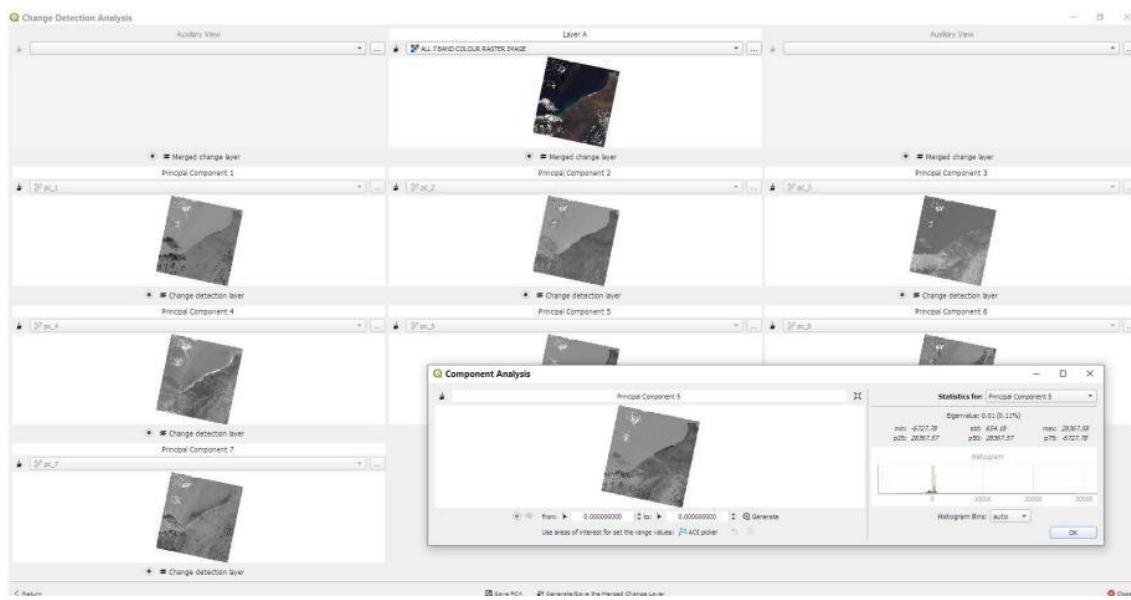


2) Steps with Screenshots

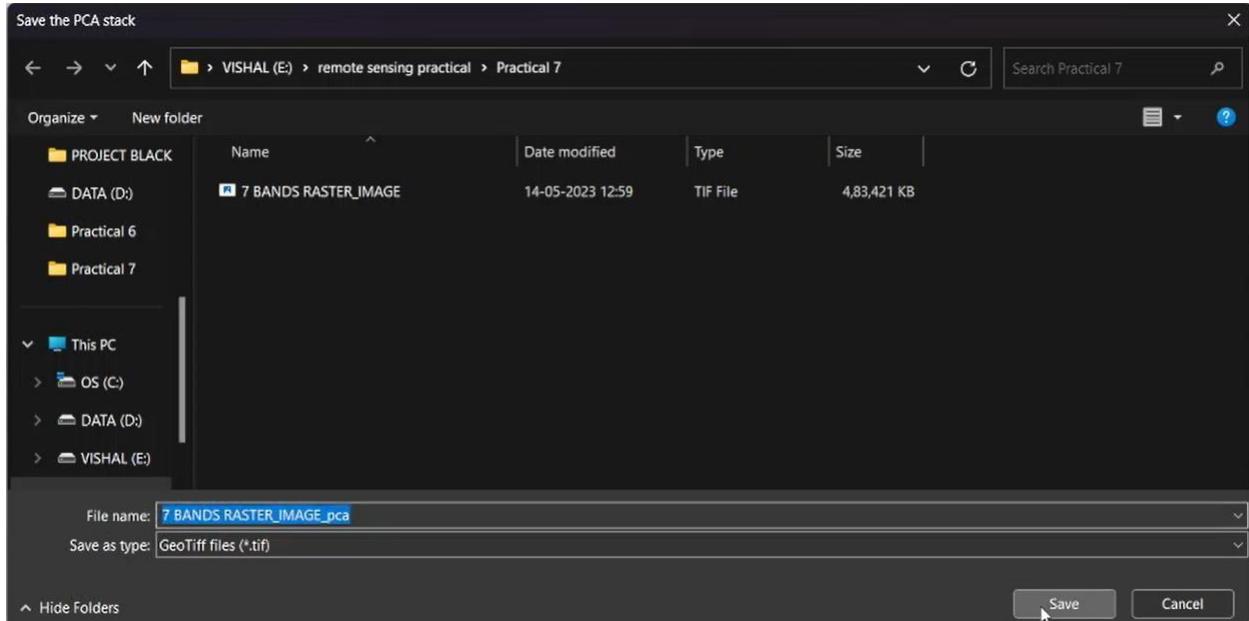
Now go to **plugins** and open **PCA4CD** plugin and select your **raster image** on option **A** and click on **compute principal component** and wait for some time to compute it.



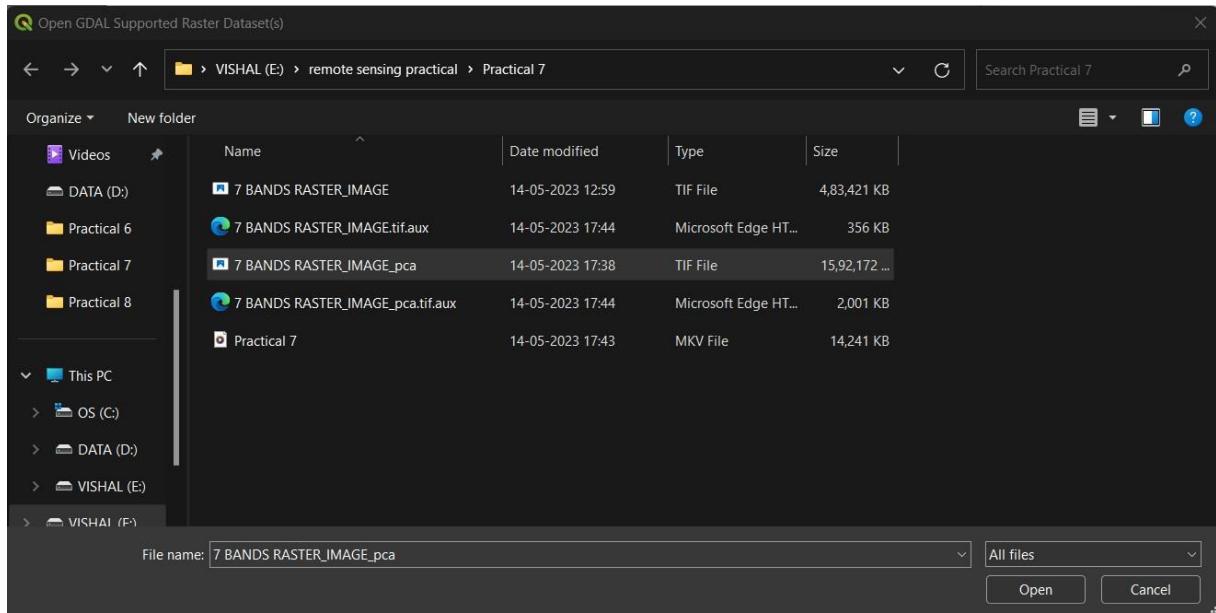
After Computing we will get 7 separate images , here you can click on **change detection layer** and view the component analysis along with histogram details of particular image.



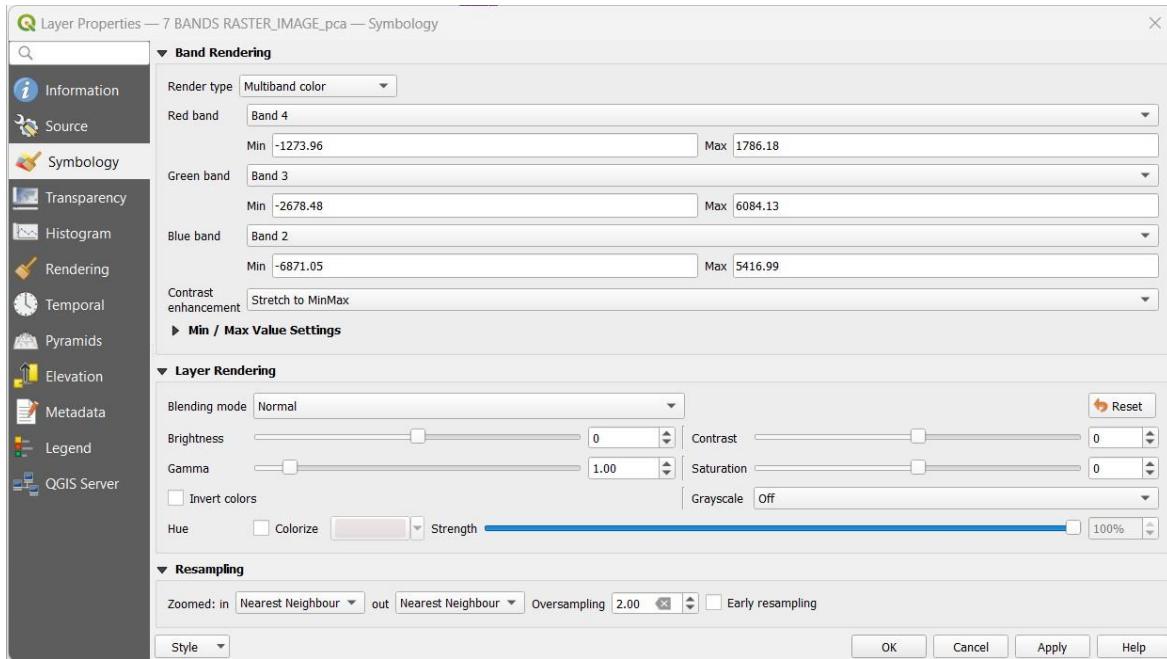
Now we have to save the **pca** file and close the **PCA4CD** plugin.



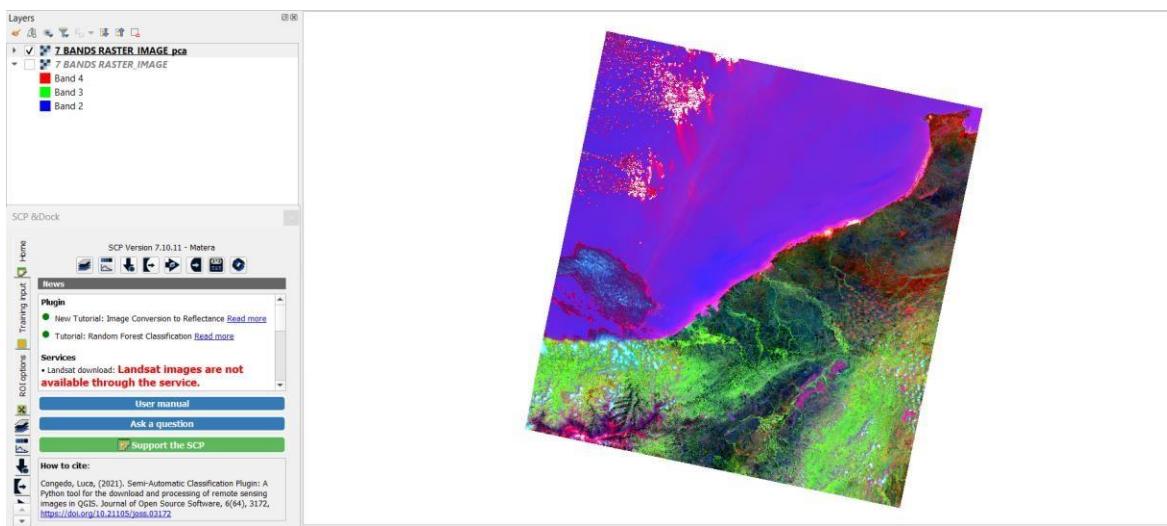
Now again add the raster layer and this time select your **pca saved file**.



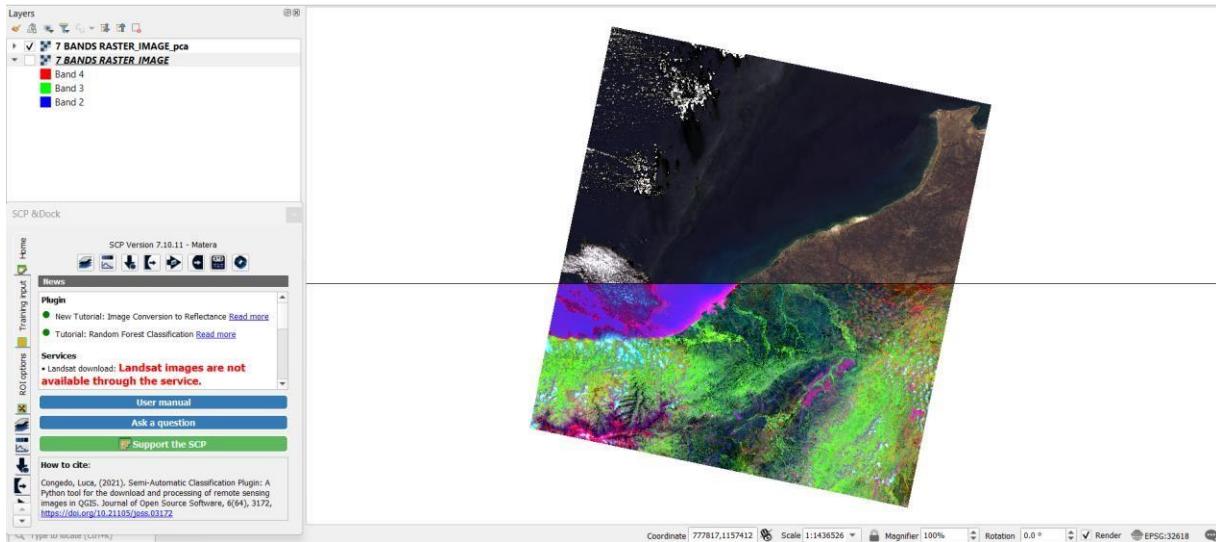
After opening the pca image, now you can change the band from **layer properties** > **Symbology** > **Render Type** > **Multiband Color** here you can set the **RGB TO B1,B2,B3 OR RGB TO B5,B6,B7** and Click on **Apply**.



Final Output of Principal Component Analysis on Satellite Images.



Lastly you can use **Map swipe** Plugin to see the difference between both images.



Practical No 8

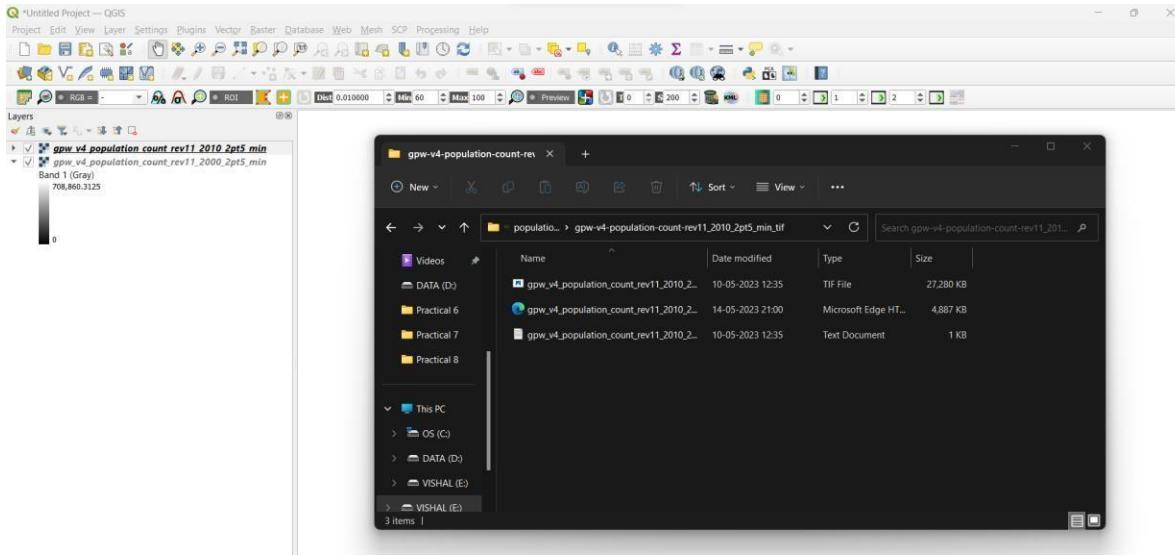
Aim: - Apply Raster analysis on satellite images

Practical No 8

Aim: - Apply Raster analysis on satellite images

1) Steps with Screenshots

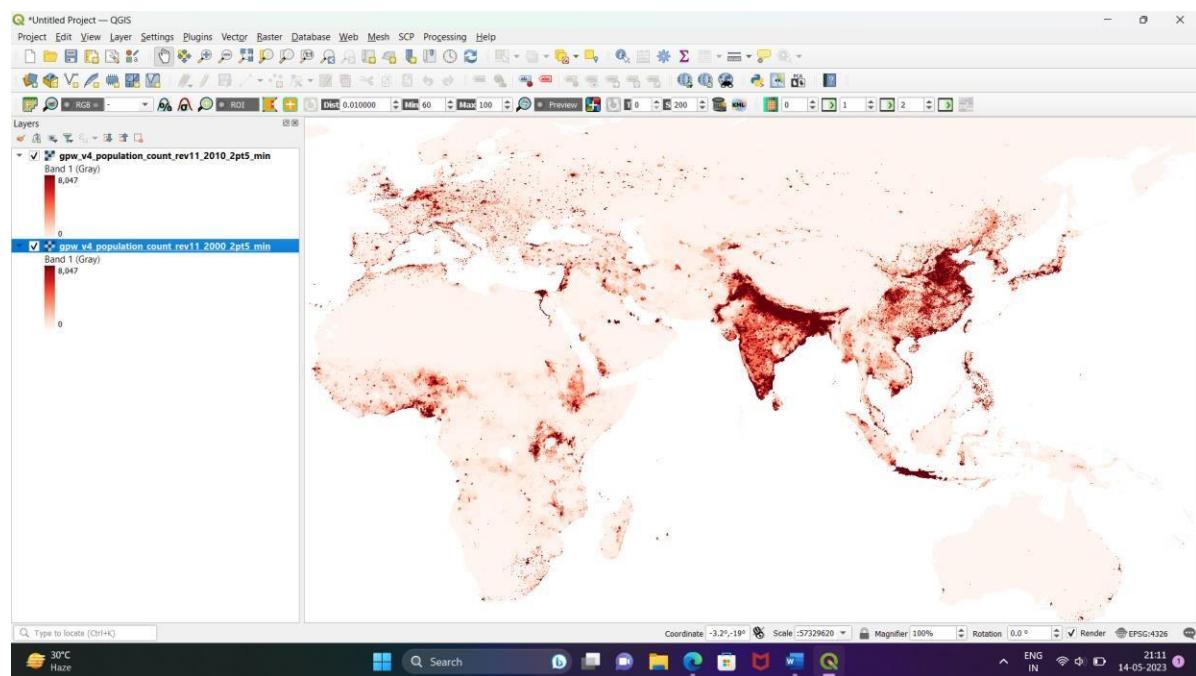
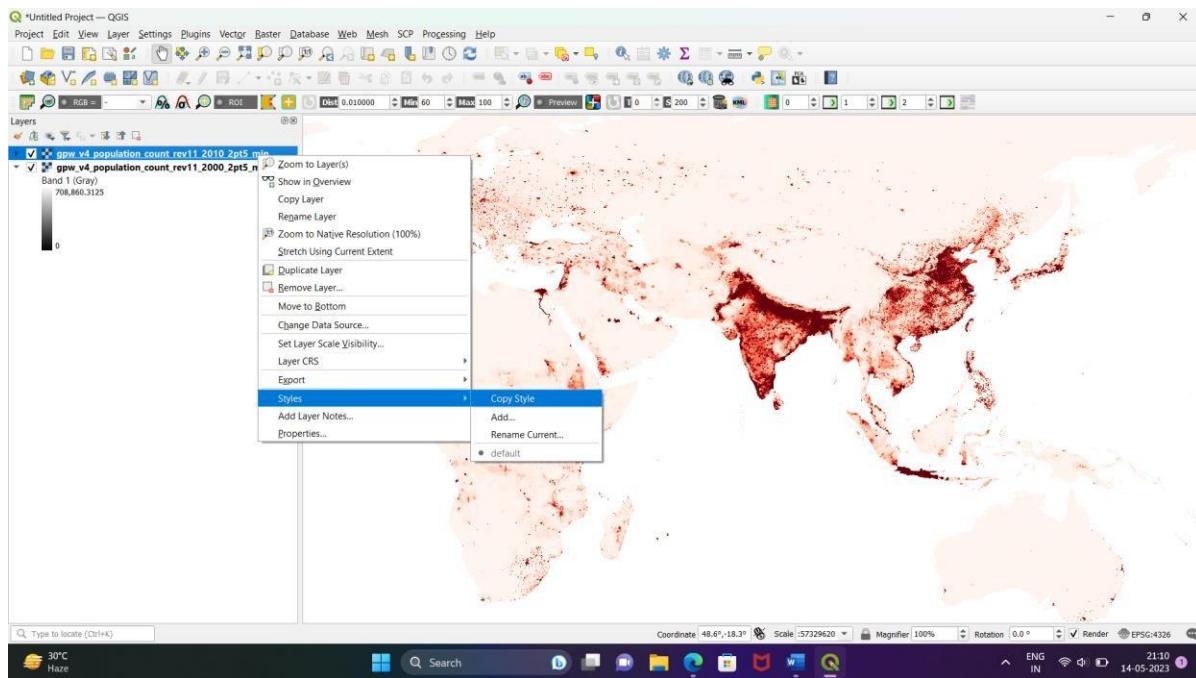
Drag and Drop 2000 MIN TIFF File and 2010 MIN TIFF File to Layer Section.



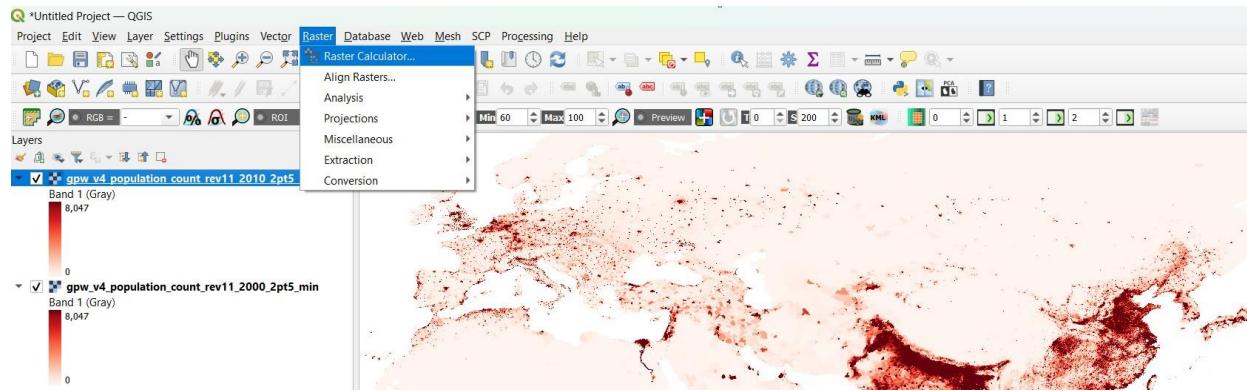
Go To Layer Styling and Select Singleband Pseudocolor and Set Color Ramp to Reds and Set Max to 8047.



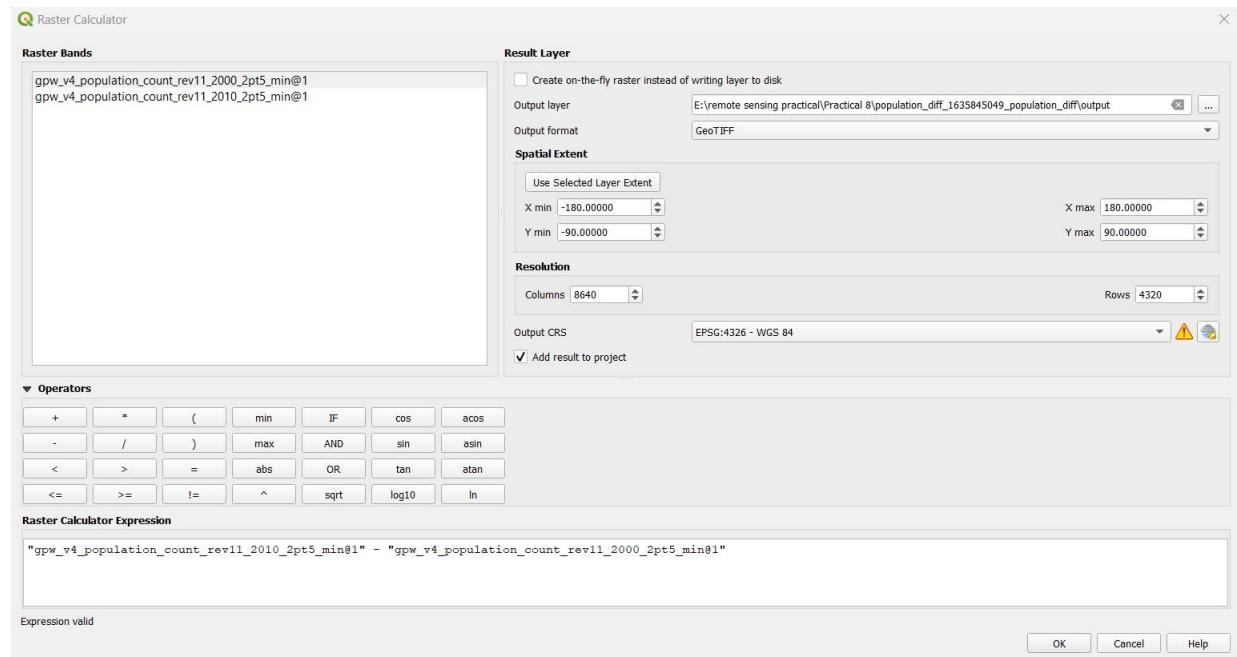
Here you can copy and paste the style of **one layer** to another layer.



Now go to Raster and Select Raster Calculator.

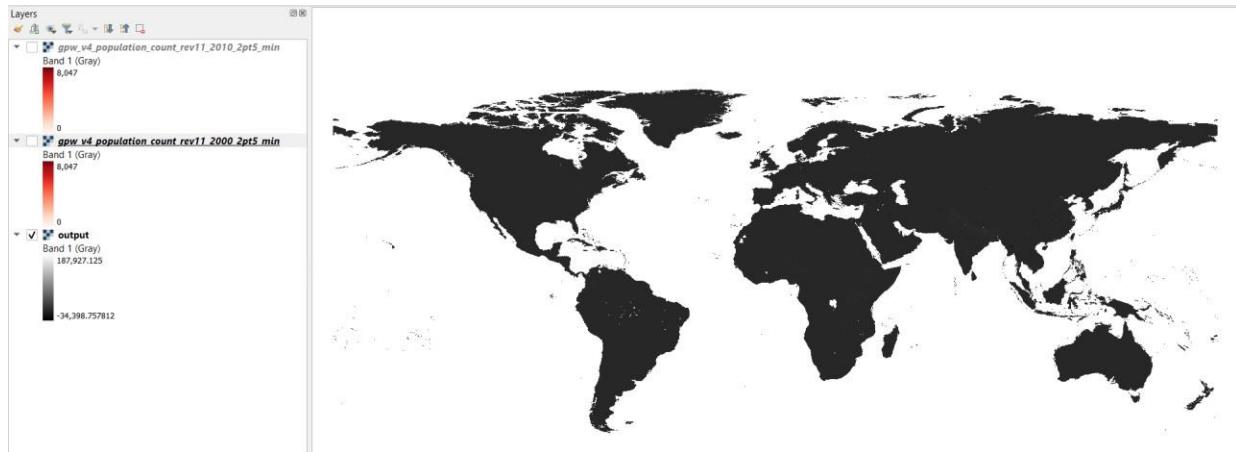


In Raster Calculator Double Click First **2010 Population** then select **minus** from the operators and then Double Click **2000 Population** and give the **Output Layer Name** and set the path and press **Ok**.

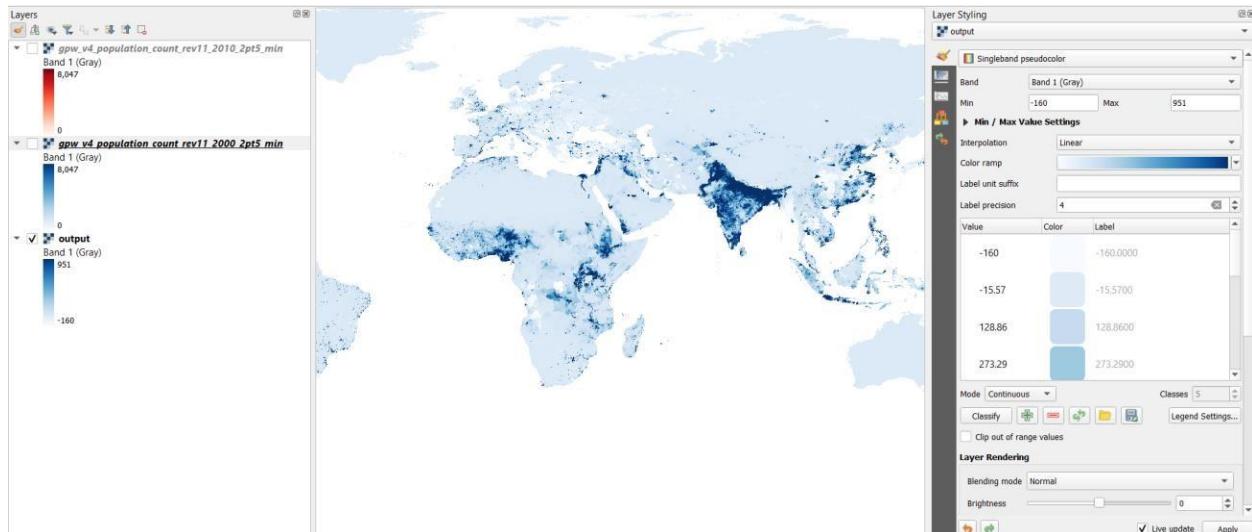


2) Steps with Screenshots

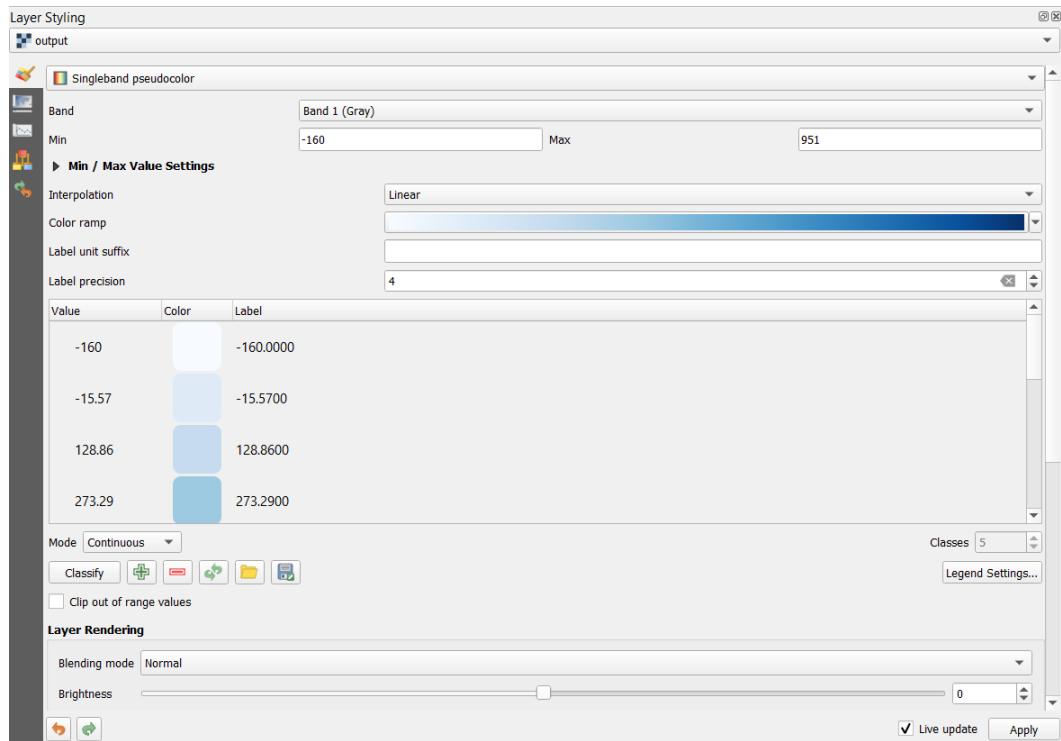
Now Uncheck both the **population layer** and select your new **output layer**.



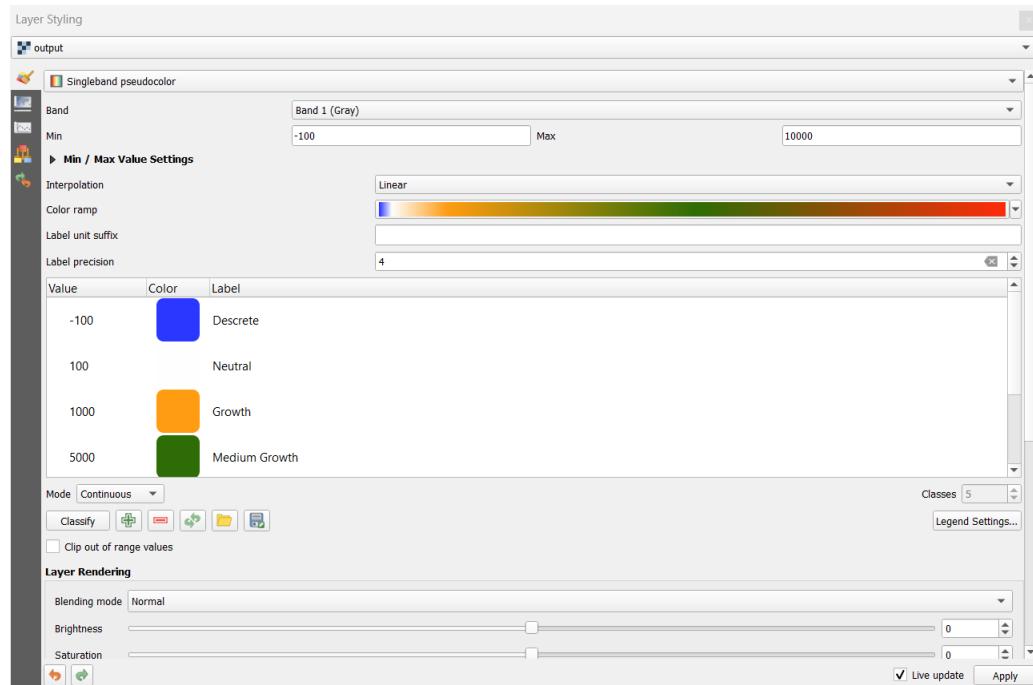
Now go to **layer styling** and set **Symbology** to **Singleband Pseudocolor** and **Color Ramp** to **Blues** and Set **Min** and **Max** to **-160** to **951**.



Now Remove All the values.



Now Add 5 Values Naming Label and Values, **Discrete = -100**, **Neutral = 100**, **Growth = 1000**, **Medium Growth = 5000**, **High Growth =10000** and give each value different color.



Here is the Final Output.

