

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 2023-2024

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. Yahya Zaheer Bhabay 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 2023 – 2024.

Subject In-Charge

Coordinator In-Charge

External Examiner

College Stamp

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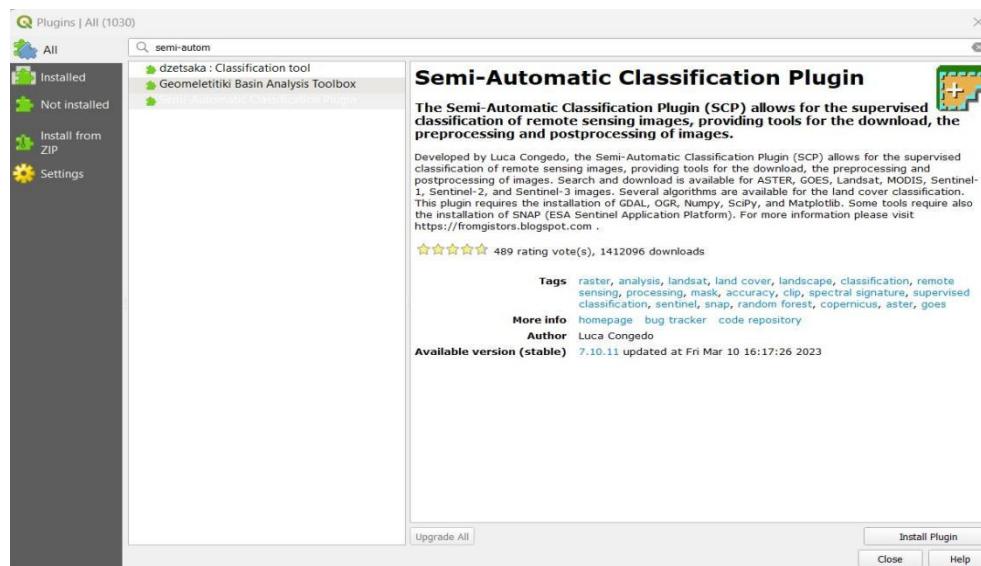
Practical No 1

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

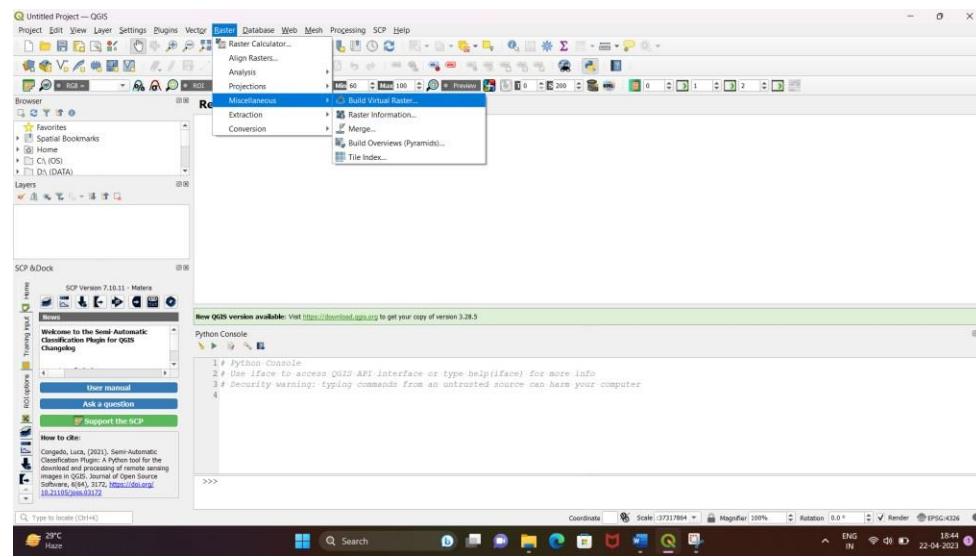
Practical No 1

Step 1:Download & Install QGIS.

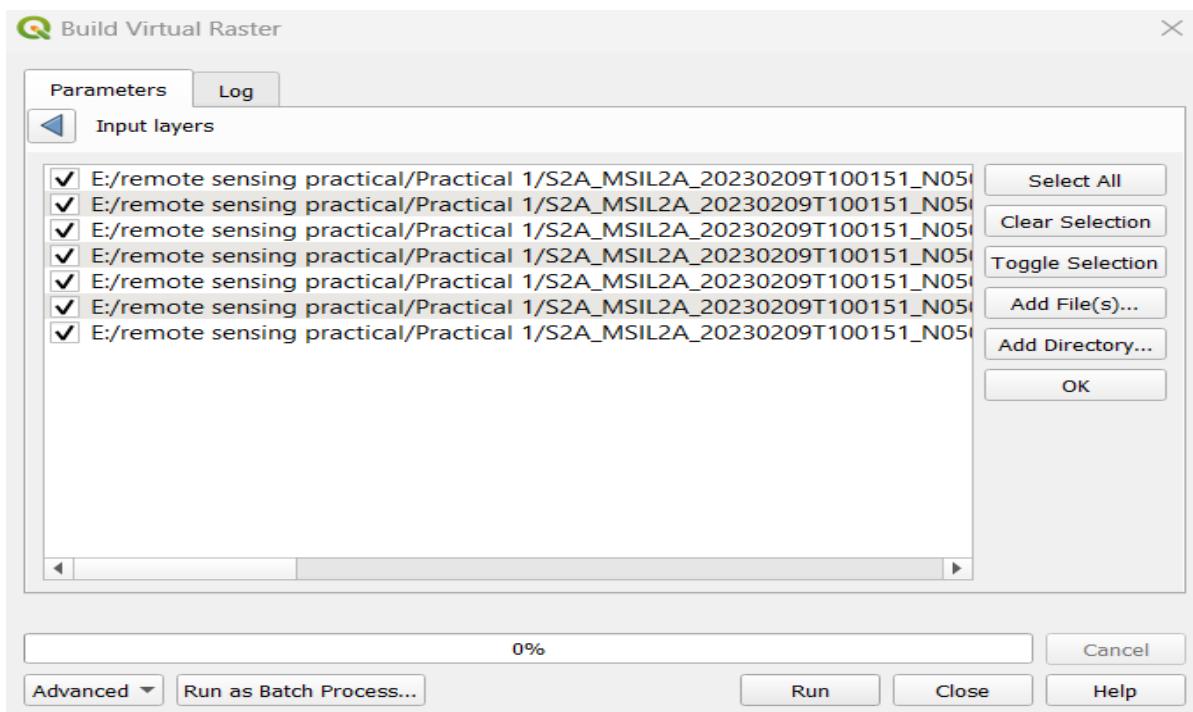
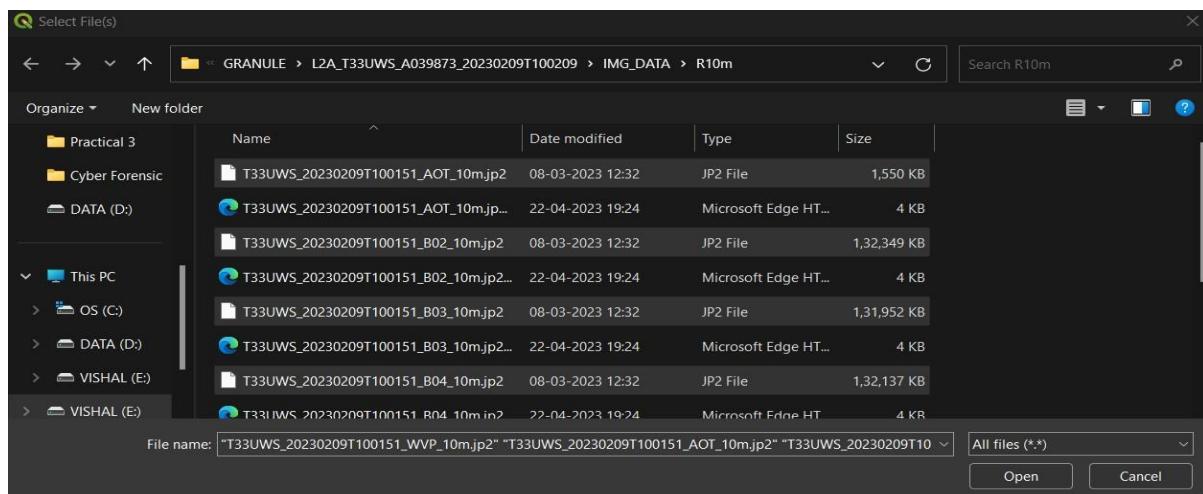
Step 2:Launch QGIS & Go to plugin and install semi automated classification plugin



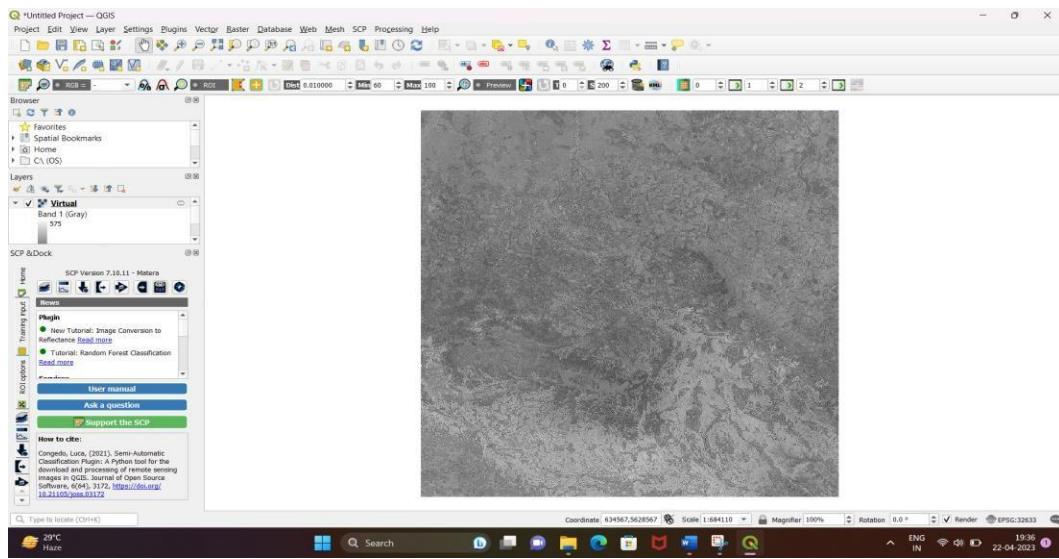
Step 3:Click on Raster > miscellaneous > Build virtual raster



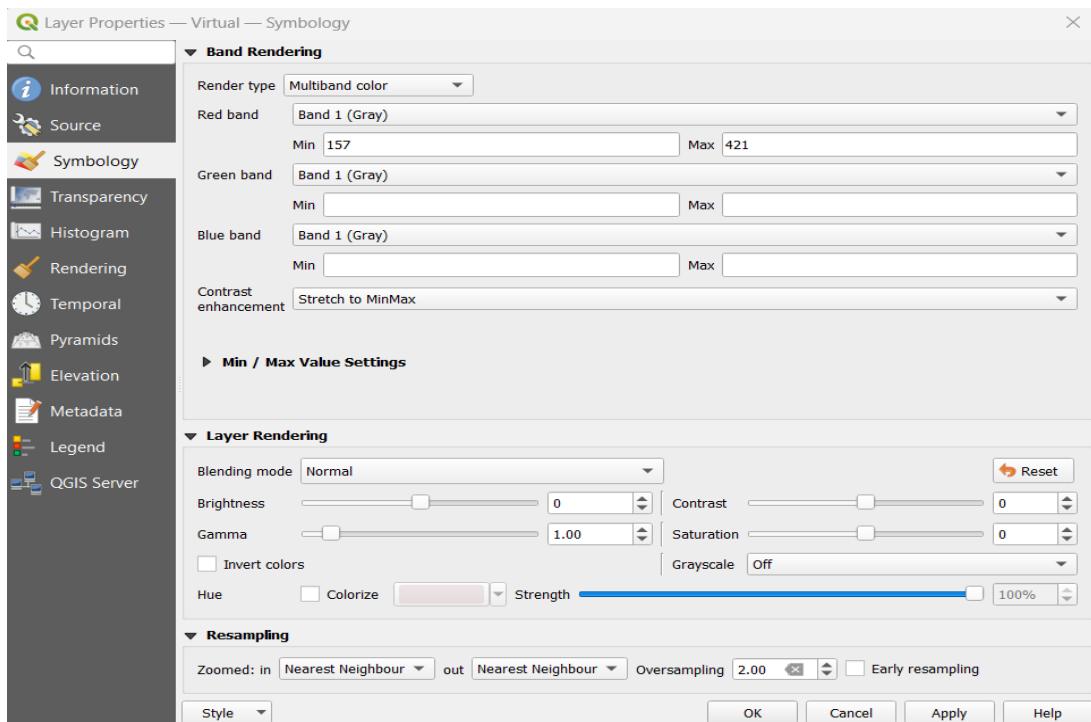
Step 4: In build virtual raster, browse the **input layers** > **Add files** > select your **sentinel 2 map file** > **Granule** > **Img_data** > **R10m** > **Select all JP2 files** > **Run**.



So, Now we have sentinel 2 map.

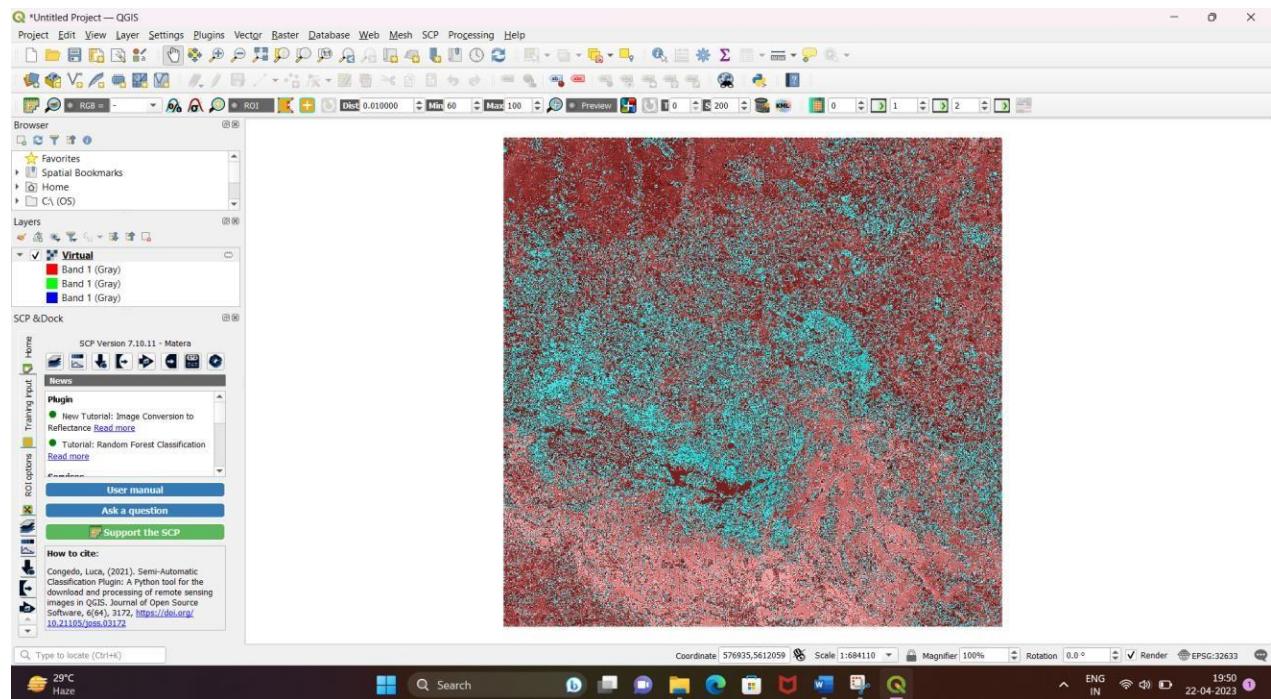


Step 5: Go to Layer & select layer properties, So now we have to change bands and their respective values. Turn the Grayscale option as "OFF"



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

Output:



Practical No 2

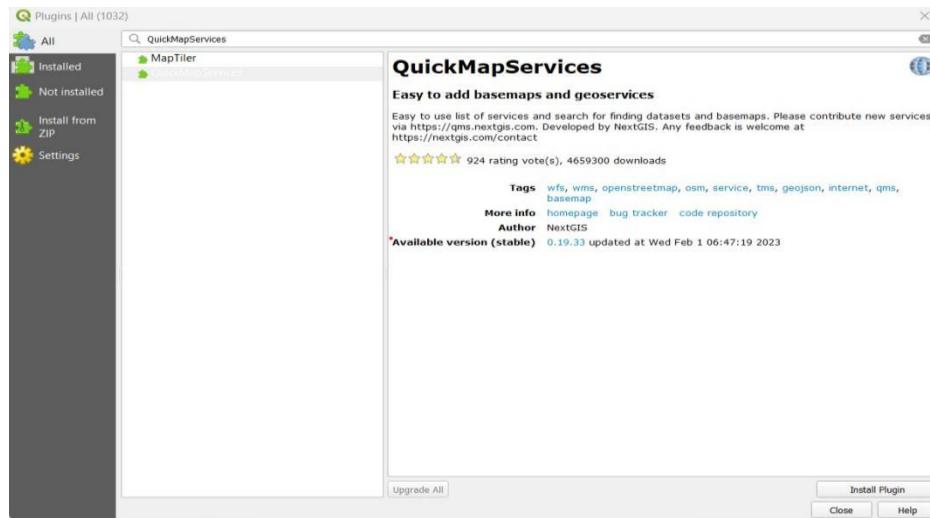
Aim: - Geo referencing Satellite Images with Maps

Practical No 2

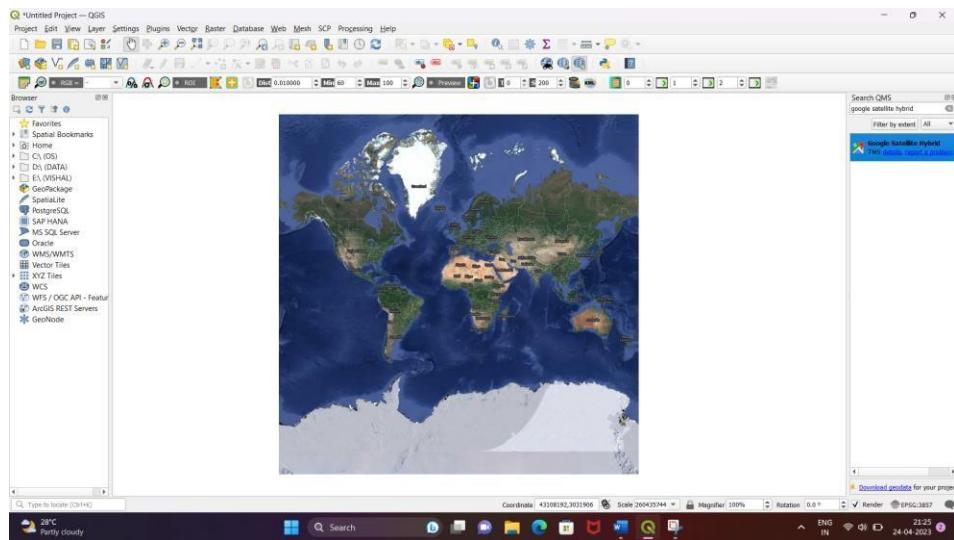
Step 1:Open QGIS.

Step 2:Go to **plugin** and click on **manage & install** and search for “QuickMapServices” click on **install plugin**.

Step 3:After installation restart the QGIS.



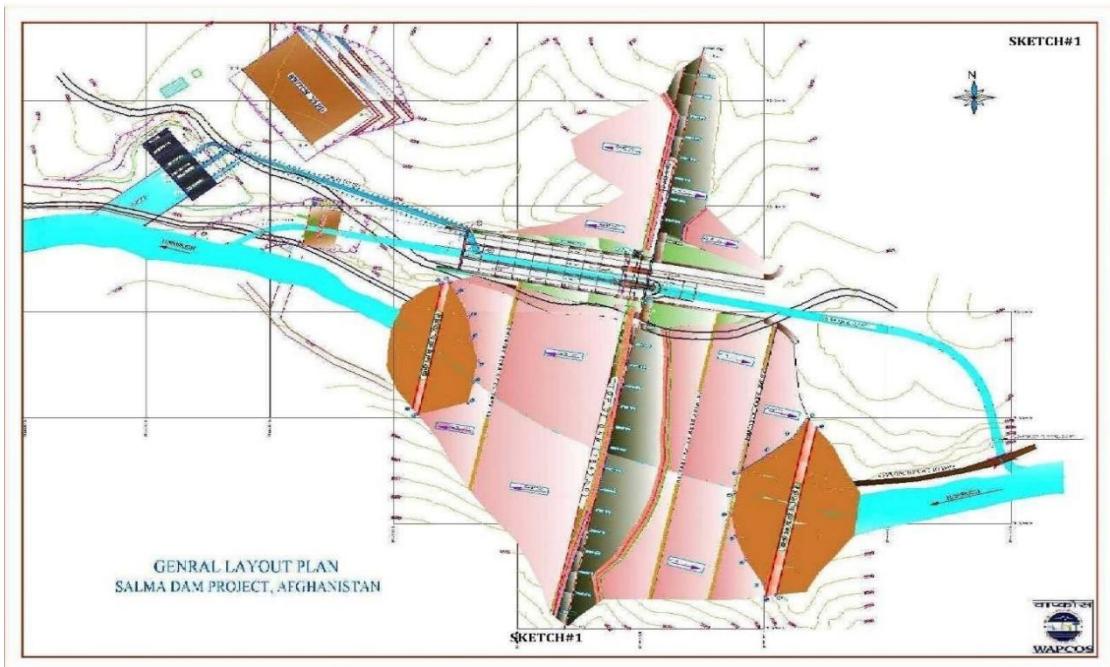
Step 4:Open QGIS and click on **web menu** and select **quick map services** and you can see on your right side **search bar**, just click on search bar and search “**google satellite hybrid**”, double click to open the google satellite image.



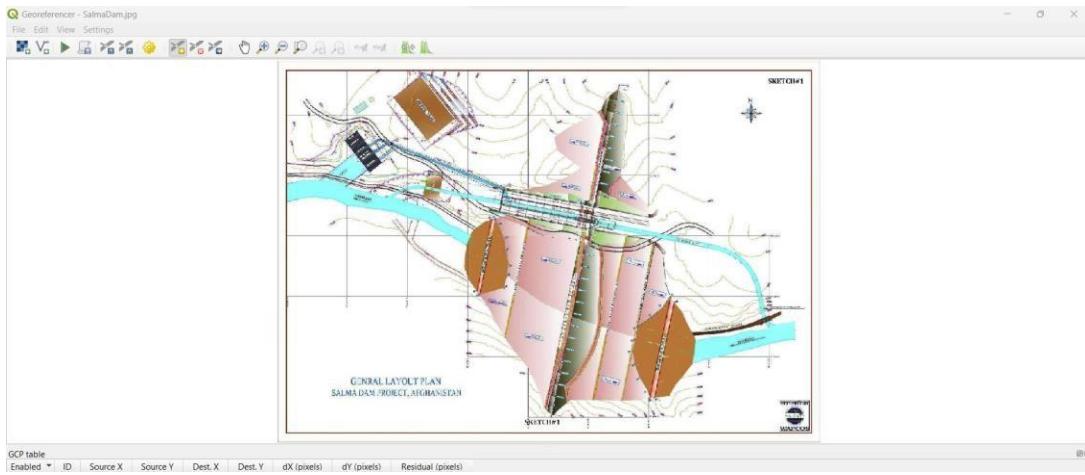
Step 5: Select the specific area or dam, So we picked “Salma dam” from Afghanistan for our geo referencing satellite image.



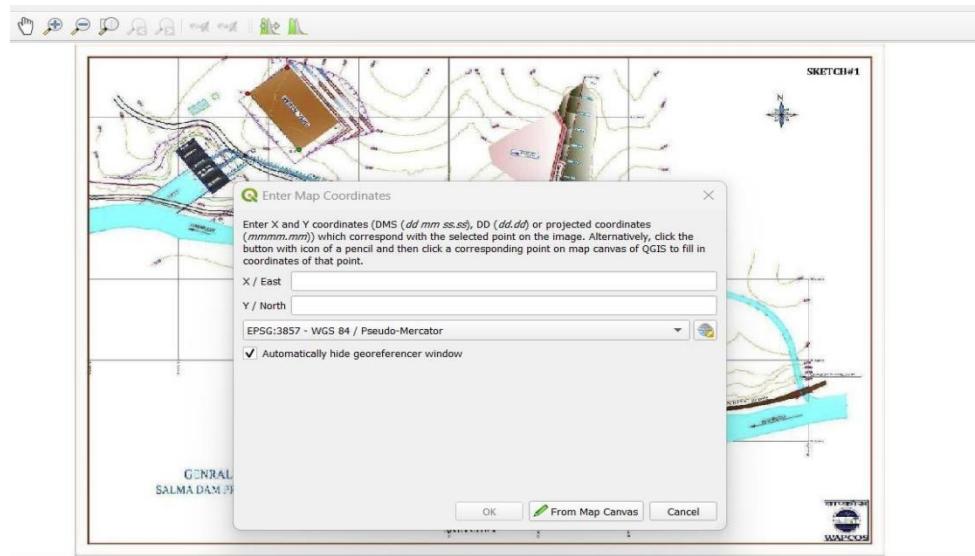
For georeferencing we have to download the scanned image of our “Salma dam” of the specific area we chose.



Step 6: Click on **Raster** and select **georeferencing**, In georeferencing go to **file menu** and select **open raster** and open the scanned image.

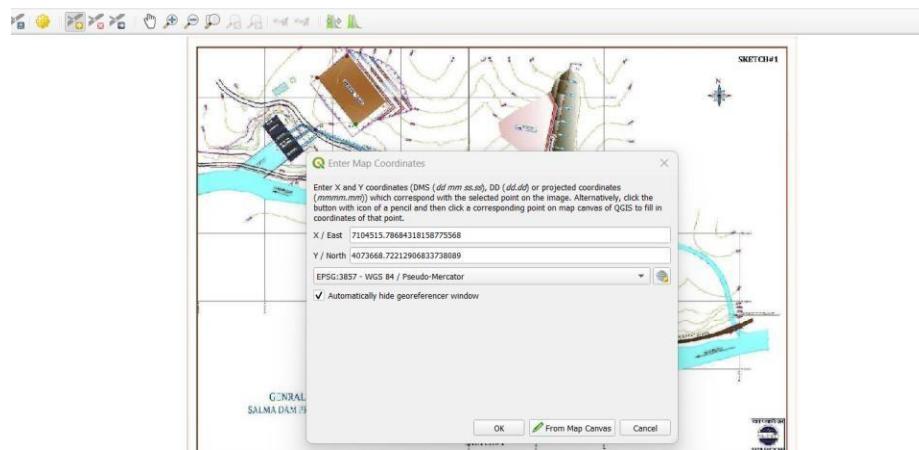


Step 7: Select the coordinates in scanned image and click on **from map canvas** and the coordinate which was taken in the scanned image should be the same in satellite image.

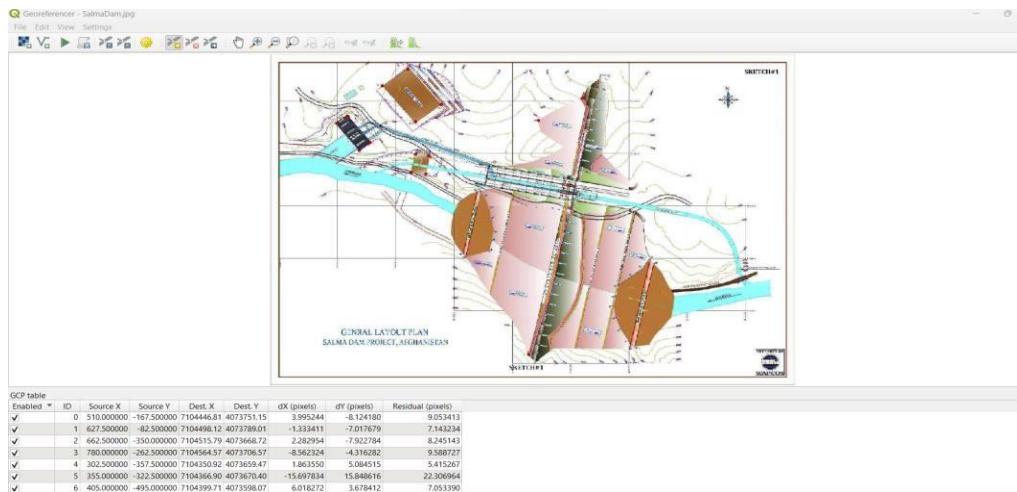




Step 8: After selecting coordinates from satellite image, Click on OK.

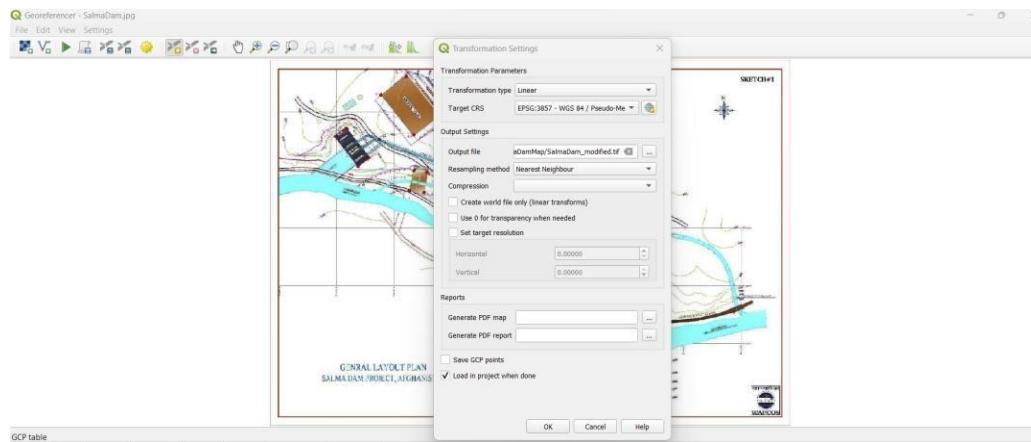


So all the coordinates have been taken from the scanned image as well as from the satellite image.

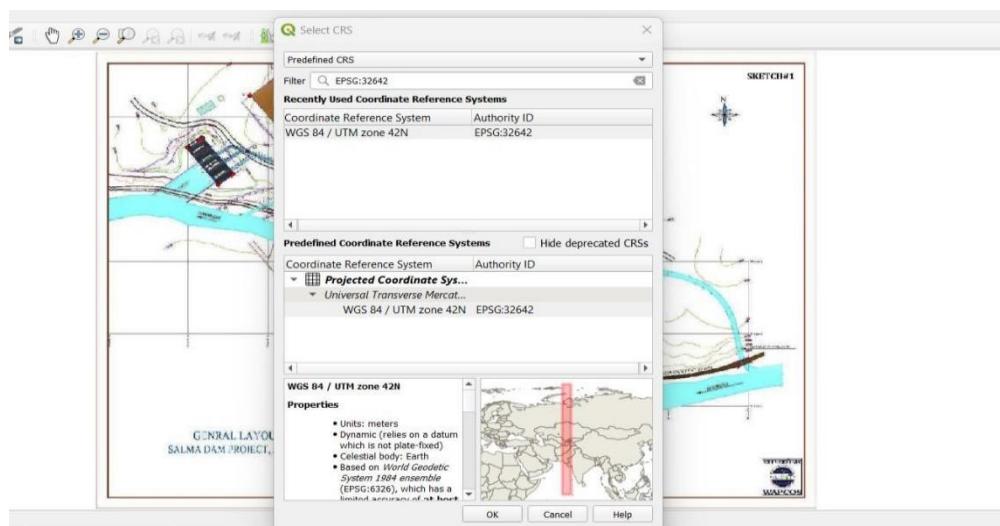




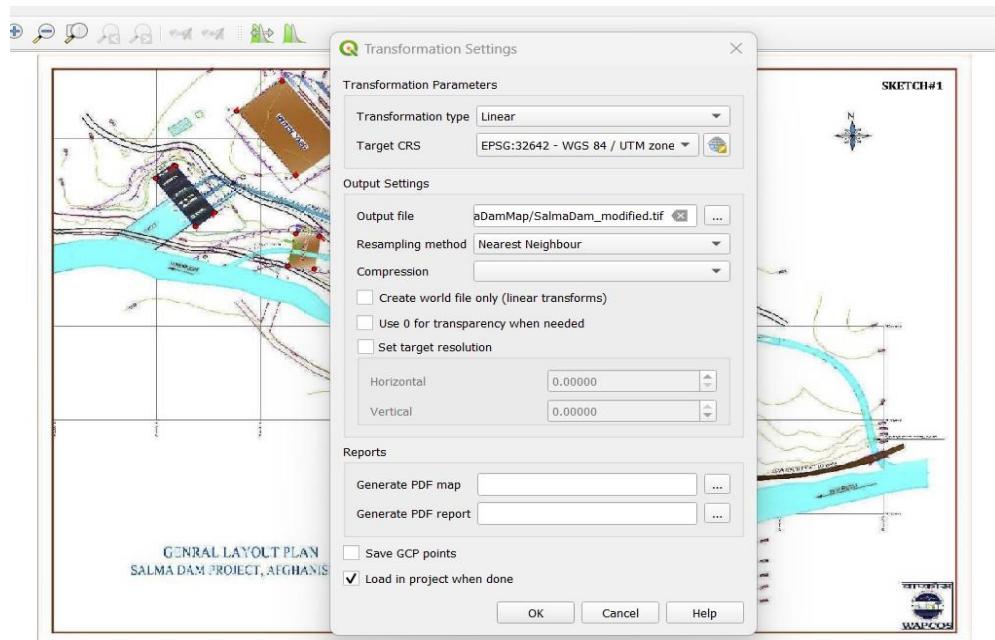
Step 9: Now, go to georeferencer and go to setting and click on transformation setting.



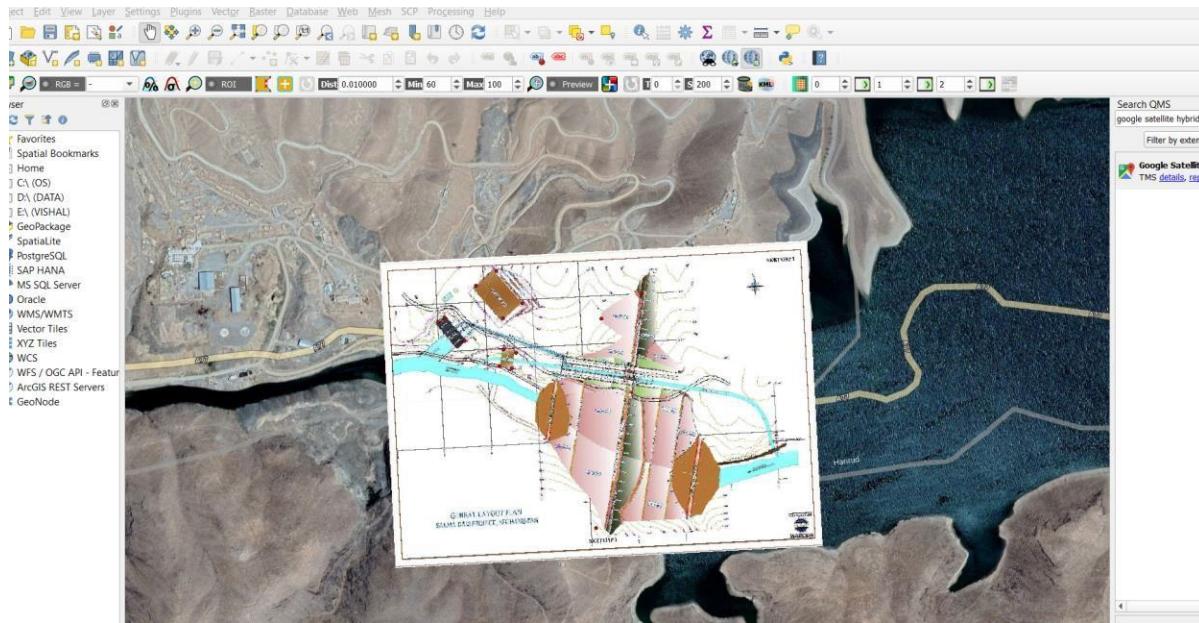
Step 10: In transformation setting, Go to Target CRS and select “EPSG:32642”.



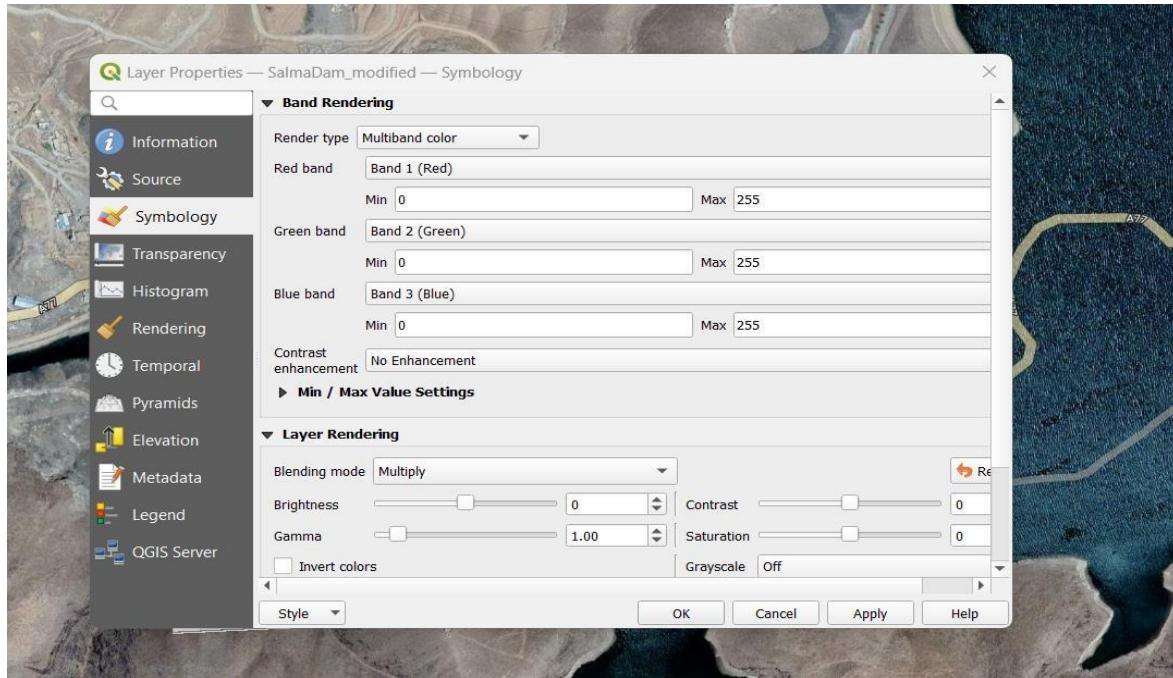
Step 11: Click on **OK**, and go to **file menu** & start the **georeferencing**.



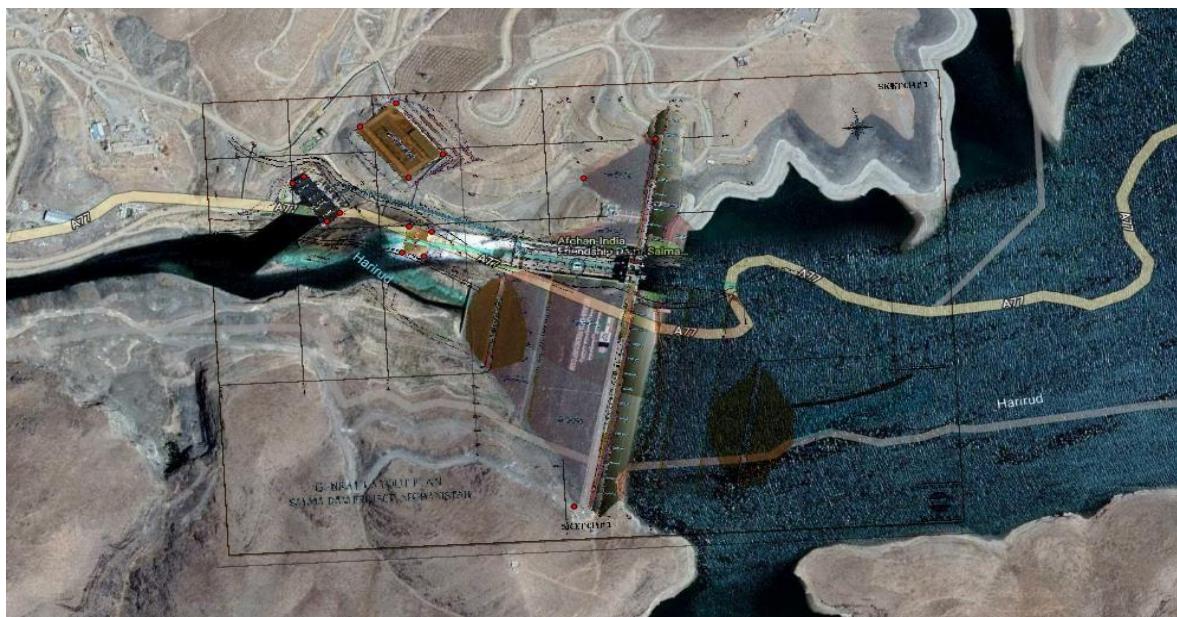
Then after starting georeferencing, our scanned image is overlaid with satellite image.



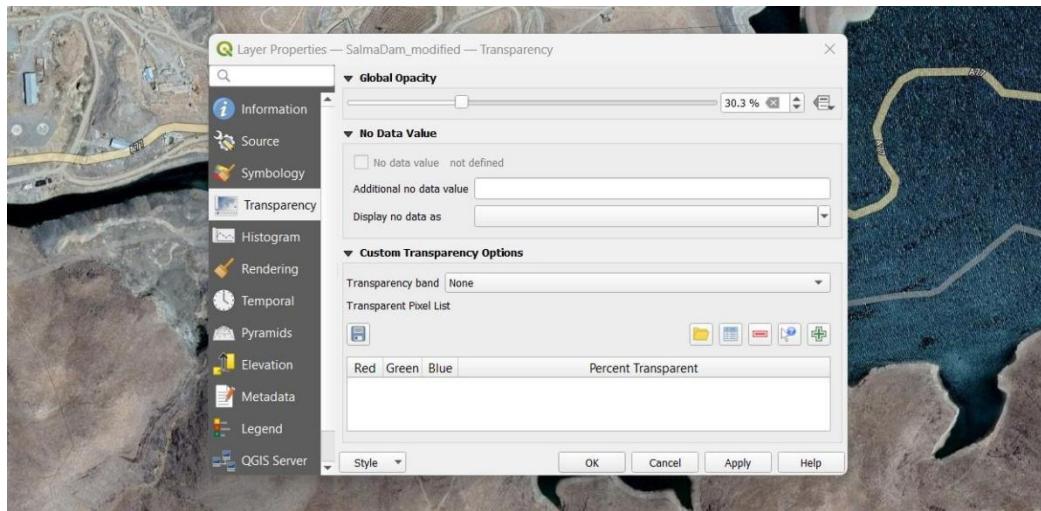
Step 12: Now, go to layer menu and click on layer properties and in symbology set the blending mode to “multiply” and click on apply.



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



Step 13: 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.

Output:



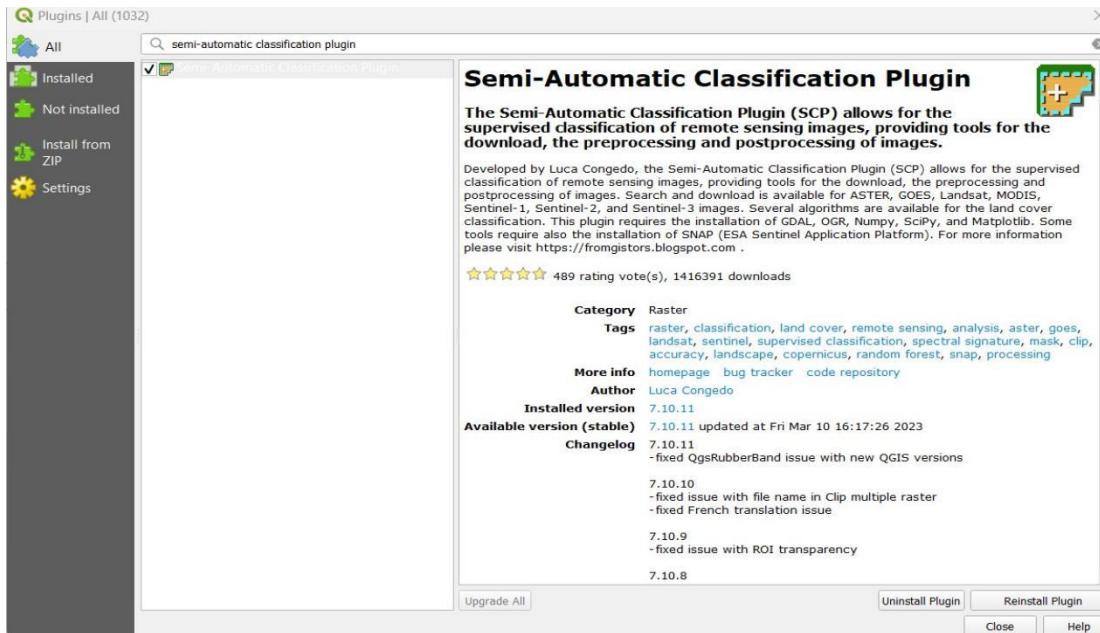
Practical No 3

Aim: - Perform contrast stretching on satellite images

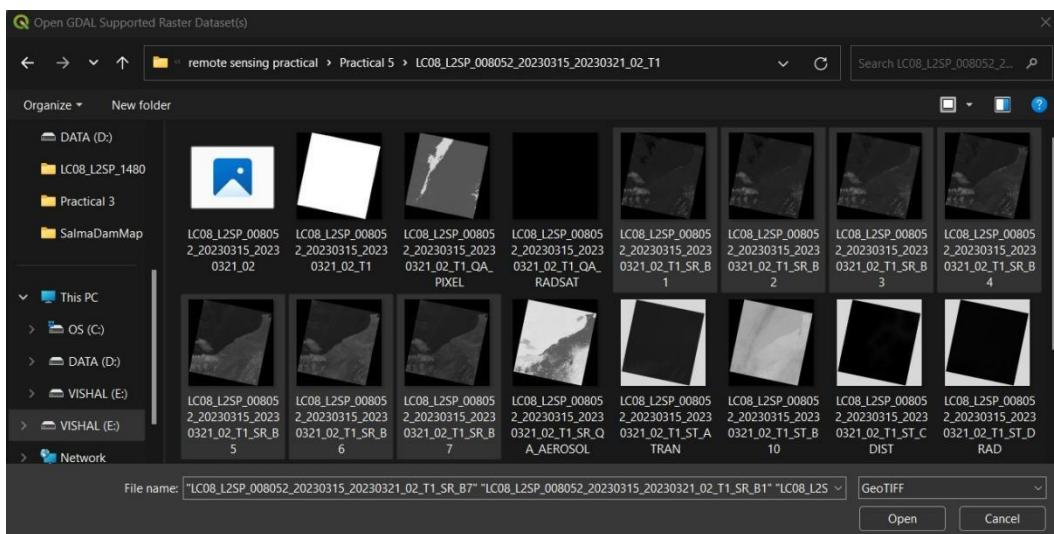
Practical No 3

Step 1: Download any **Landsat 8 satellite image** from **earth explorer**.

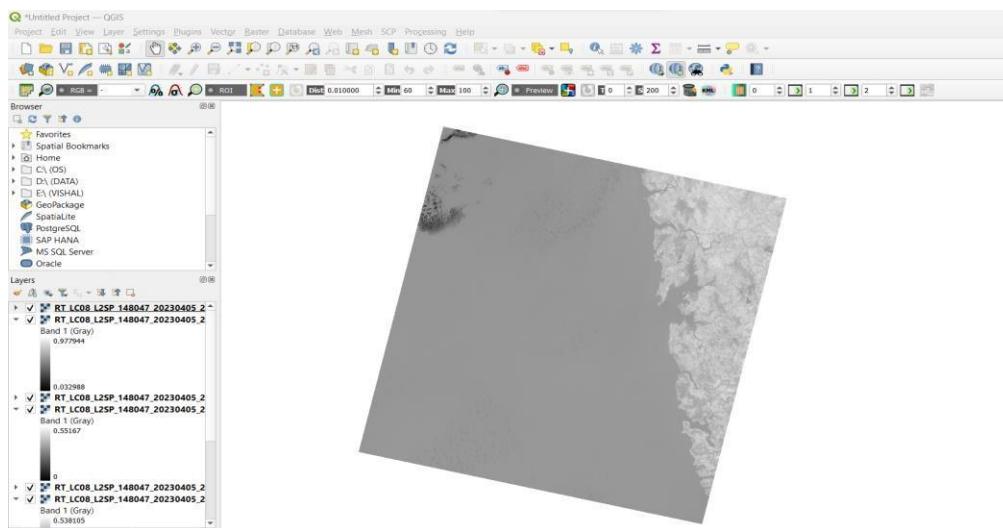
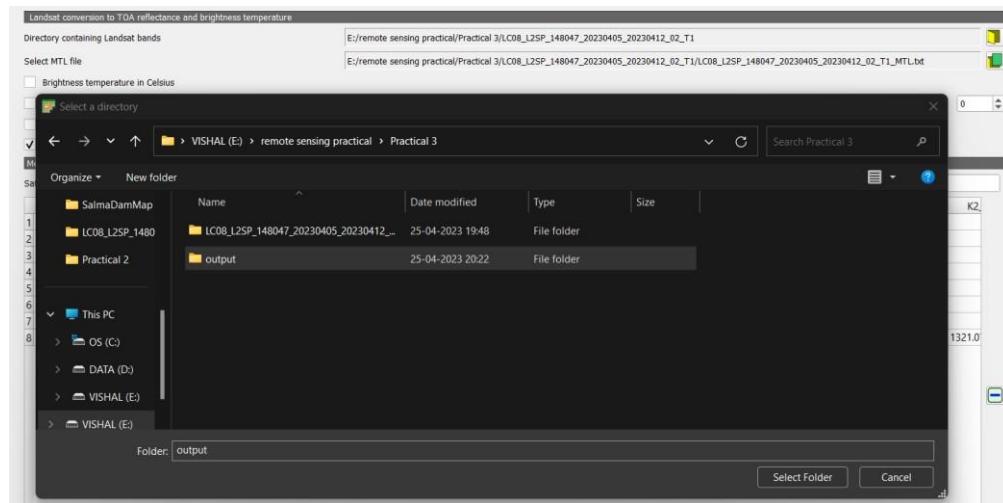
Step 2: Open **QGIS** and go to **plugin > manage and install > search for semi-automatic classification plugin and install.**



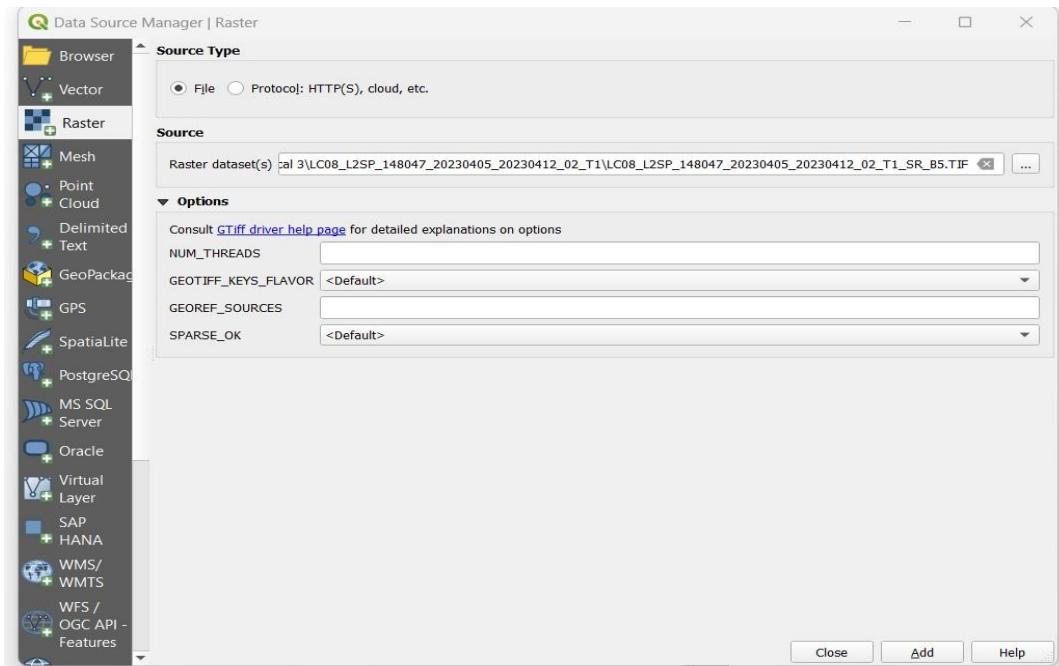
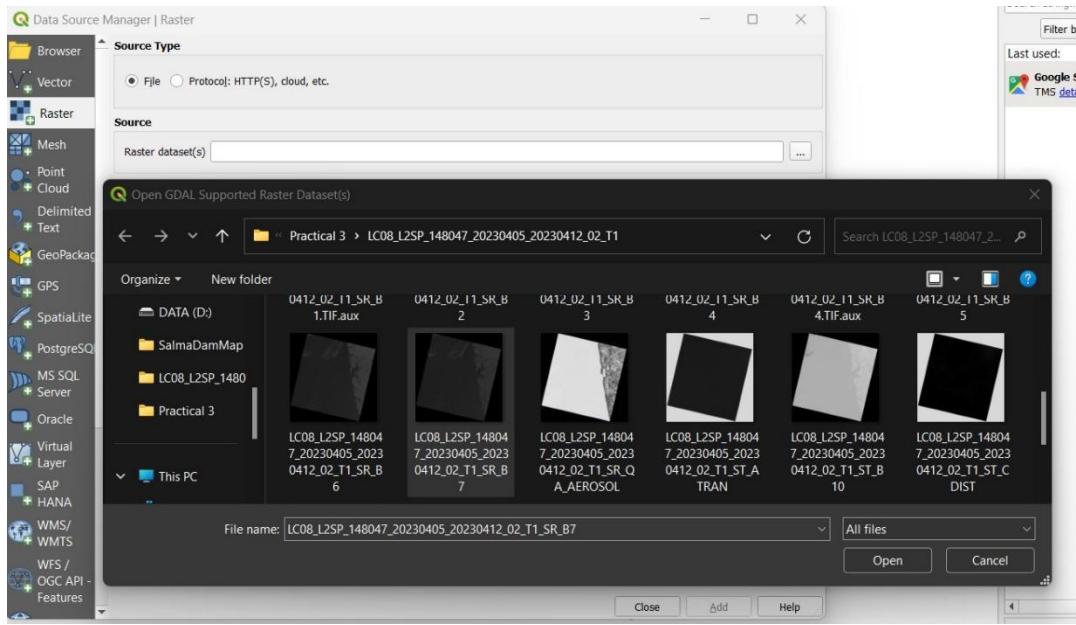
Step 3: Browse the **Raster dataset(s)** and add your downloaded **landsat 8 satellite image**, add at least 7 **Tif files** and click on **Open**.

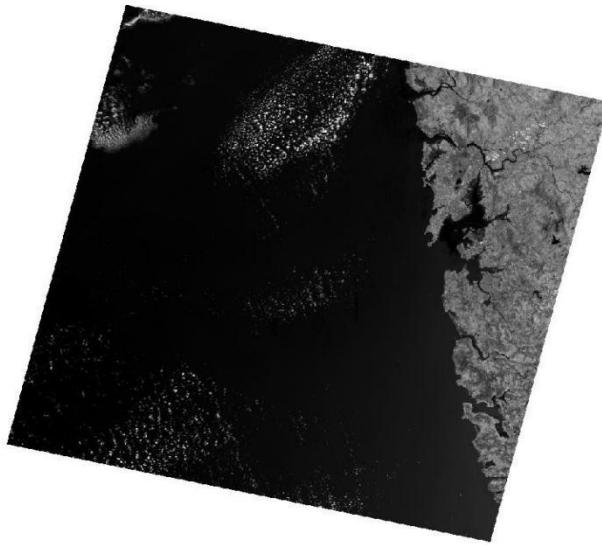


Step 4: Click on **run** and create one folder of name “**output**” and select that folder and let the conversion complete.

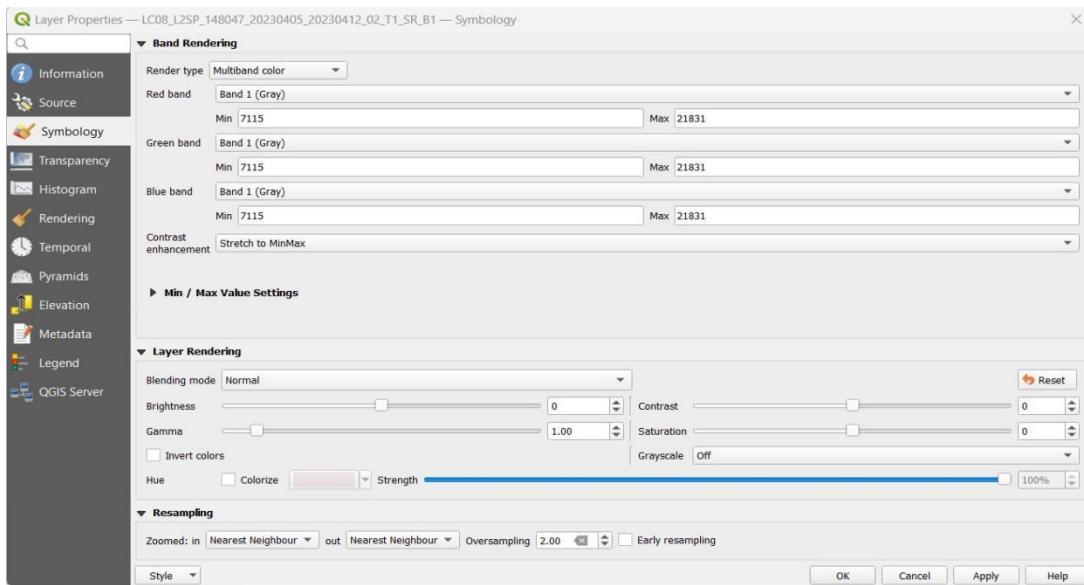


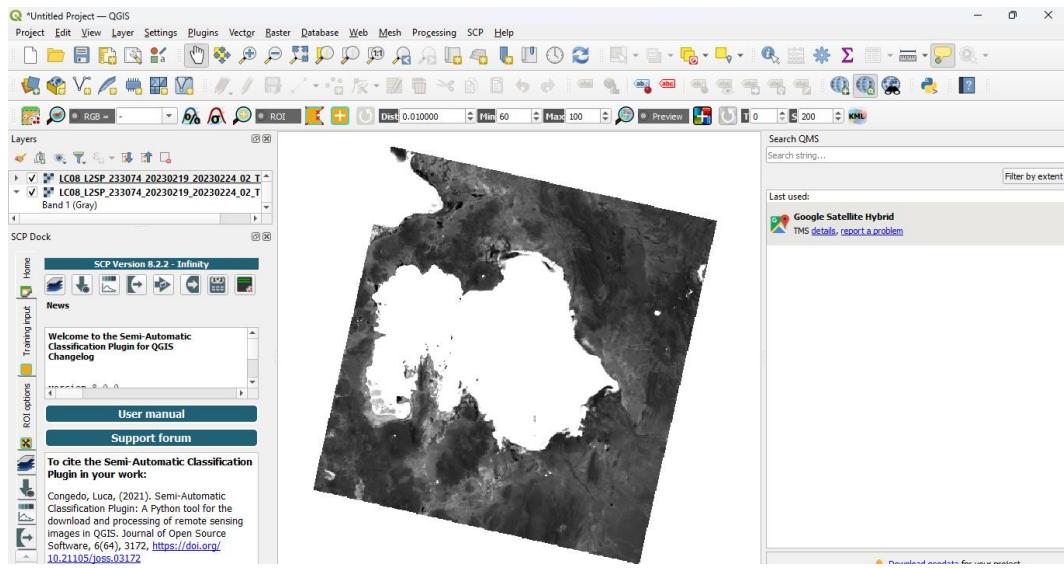
Step 5: Now go to **layer menu > add layer > add raster layer** and browse the **raster dataset(s)**, and select any “Tif file” from your landsat 8 satellite image, click on **add**.





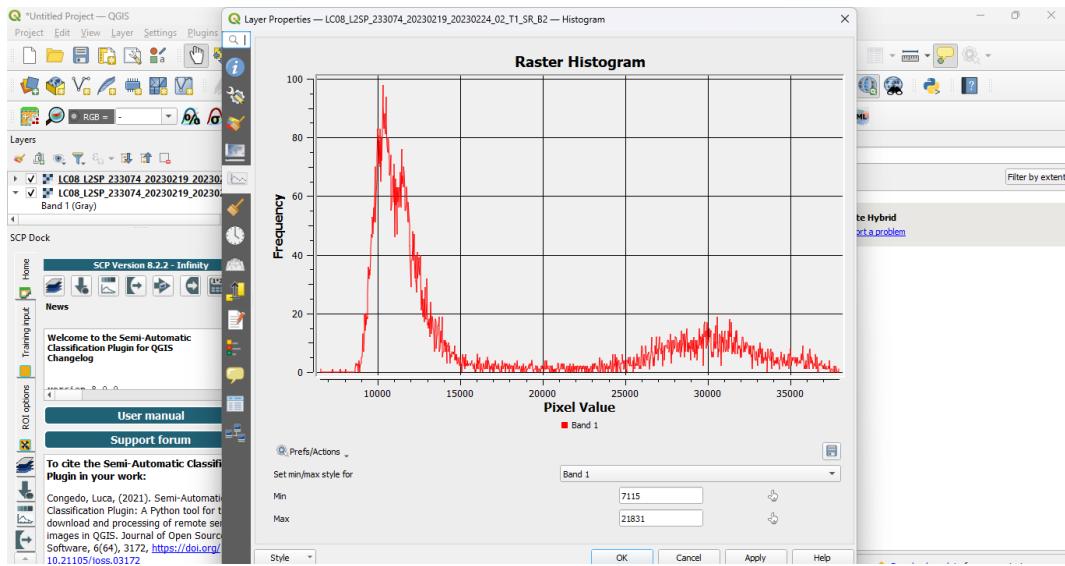
Step 6: Click on **layer menu > layer properties > symbology** and reset the all bands and their respective values and click on **apply**.





Step 7: Again, go to layer menu > layer properties > histogram and click on compute histogram to see the frequency of raster histogram.

Output:



Practical No 4

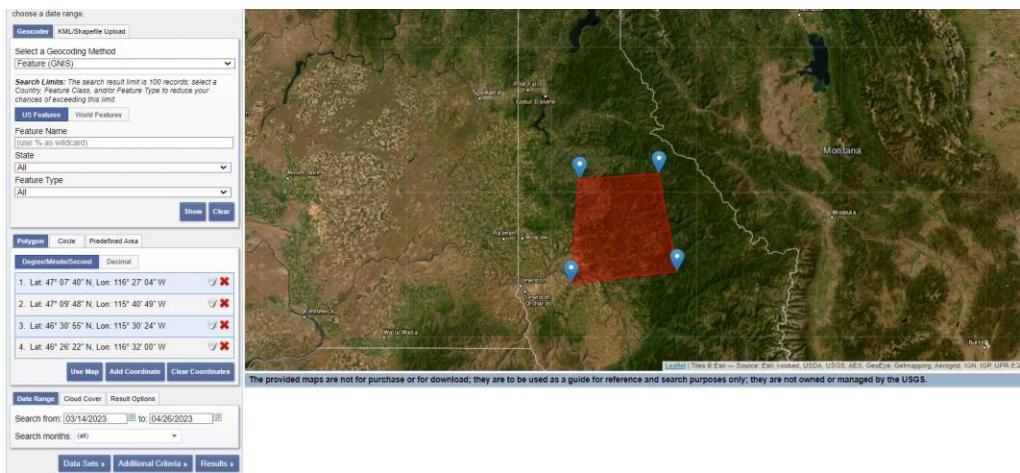
Aim: - Enhance the satellite image using Pseudocolor image processing

Practical No 4

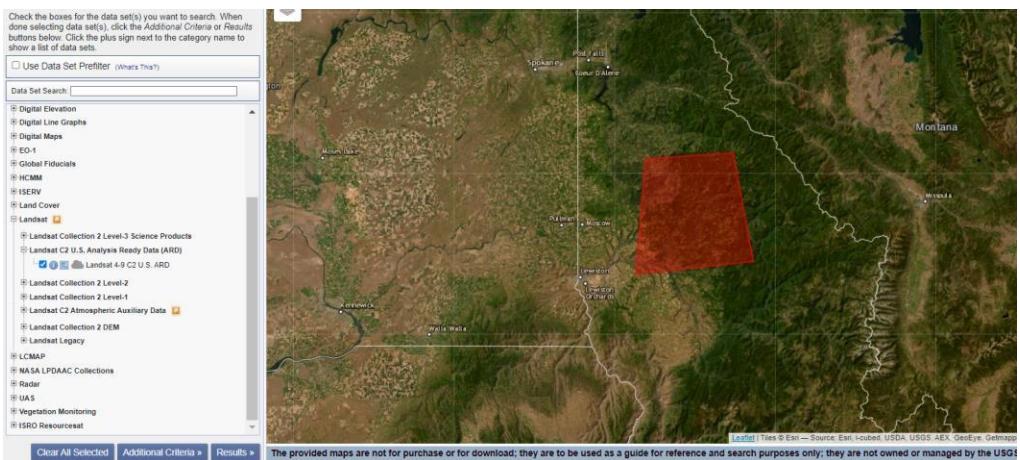
Step 1:Open any web browser and go to the site of **earth explorer** and login to the website.

Step 2:Download any **landsat 8 satellite image** from earth explorer.

Step 3:Before download take **4 coordinates** whatever you want to take and give the **date** you want.



Step 4: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

Step 5: 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

Dataset: Landsat 4-9 C2 U.S. ARD

Displaying 1-2 of 2

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

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

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

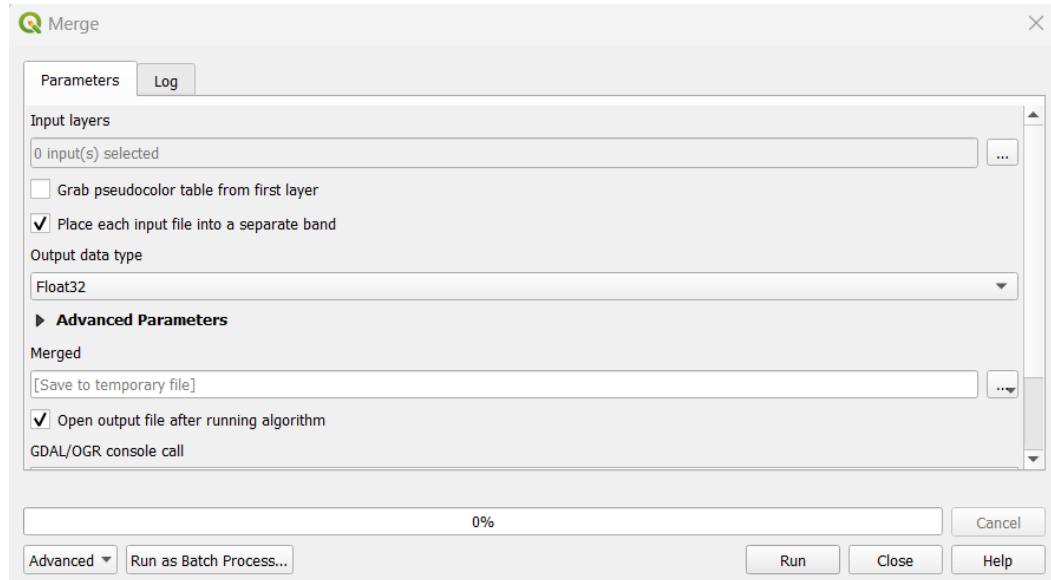
The following items are available for individual download

(Item Name Filter)

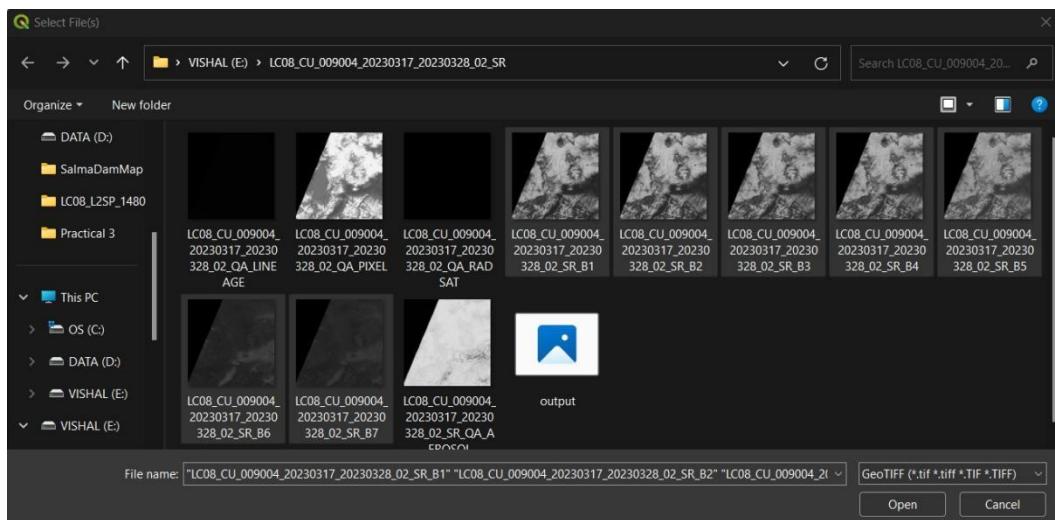
		51.98 MB	LC08_CU_007003_20230322_20230410_02_SR_B1.TIF C2 ARD Tile Band Download
		52.09 MB	LC08_CU_007003_20230322_20230410_02_SR_B2.TIF C2 ARD Tile Band Download
		52.23 MB	LC08_CU_007003_20230322_20230410_02_SR_B3.TIF C2 ARD Tile Band Download
		52.40 MB	LC08_CU_007003_20230322_20230410_02_SR_B4.TIF 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

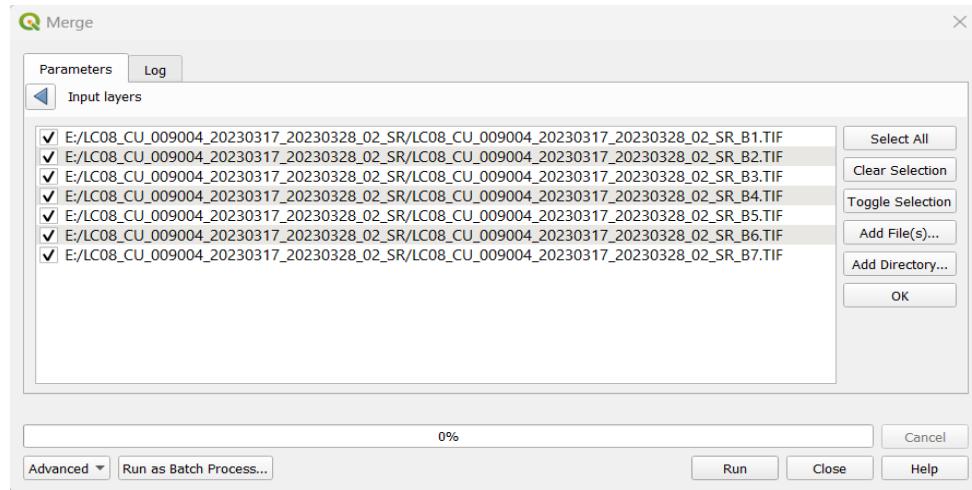
Step 6: Open your QGIS and go to raster menu > miscellaneous > Merge, select the “place each input file into a separate band”.



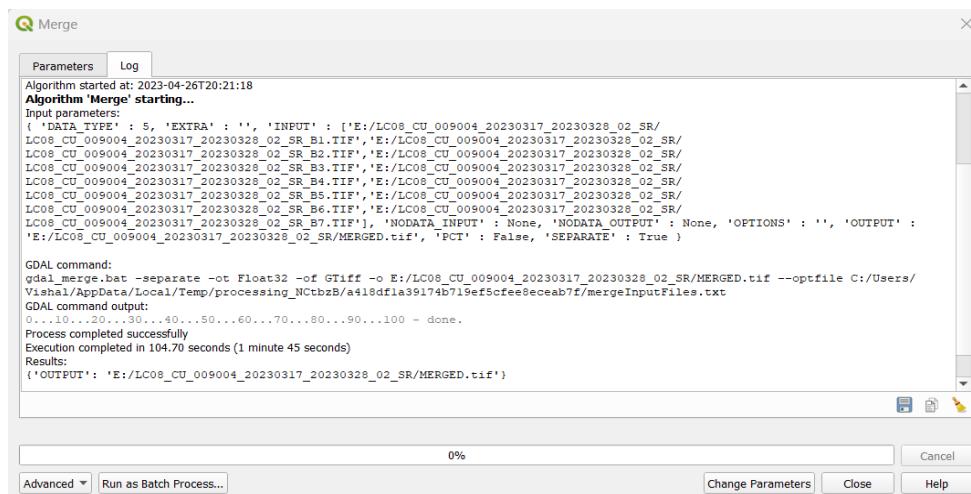
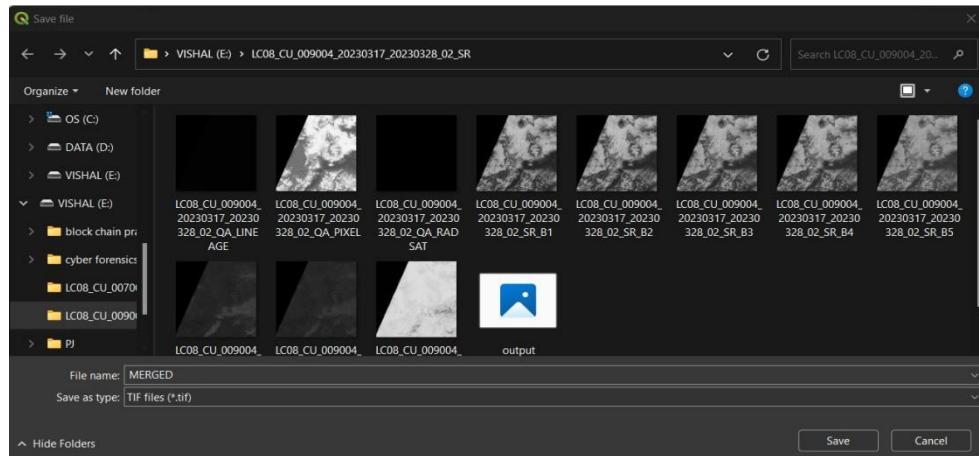
Step 7: Browse the input layers, click on add files and select any 7 image from your landsat 8 satellite image.



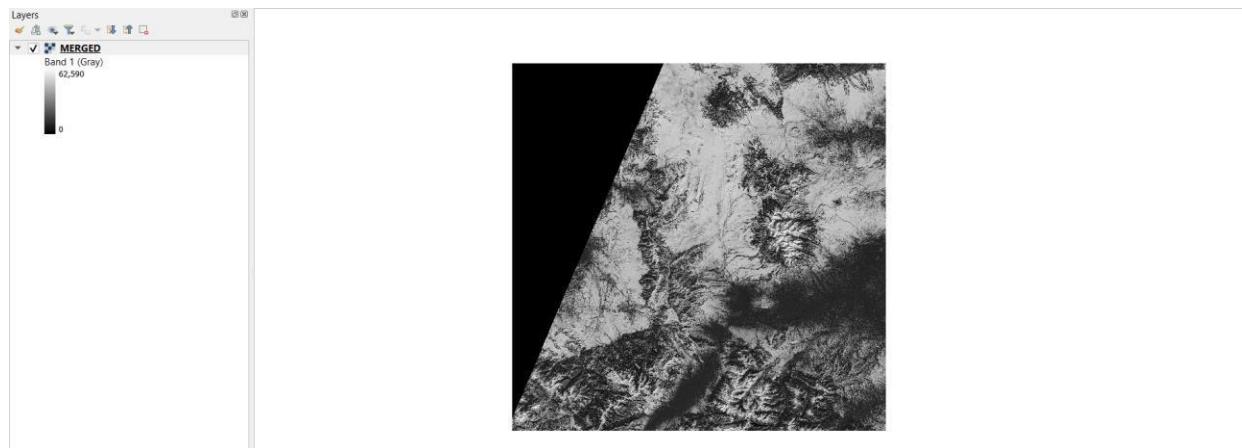
Step 8: Click on OK.



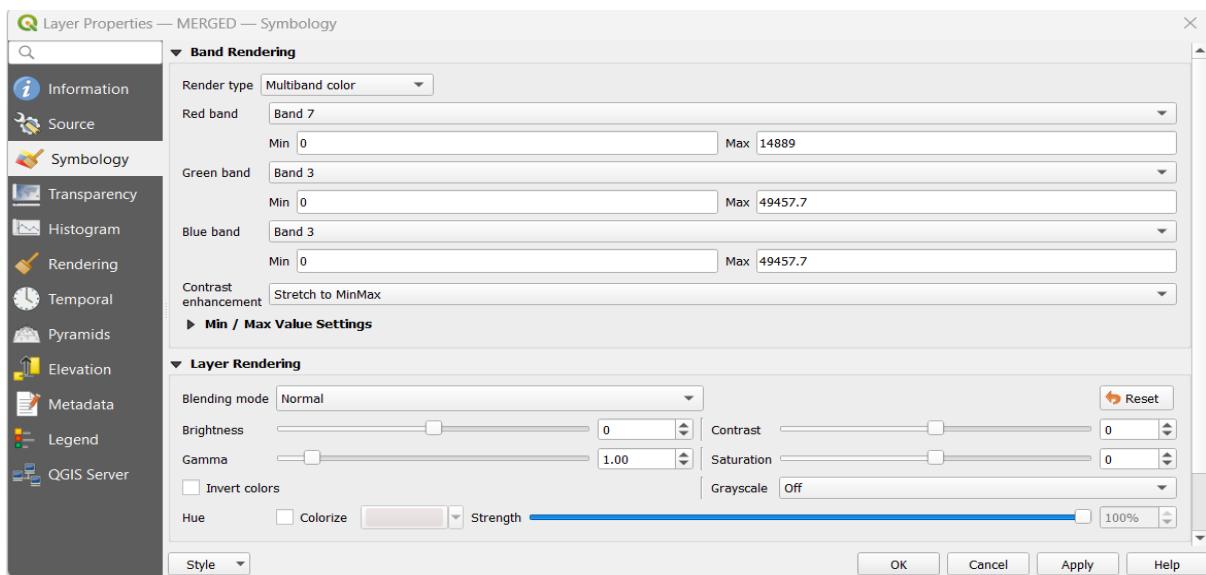
Step 9: Now browse the Merged > save to file and give file name as you want and click on save, then click on run.

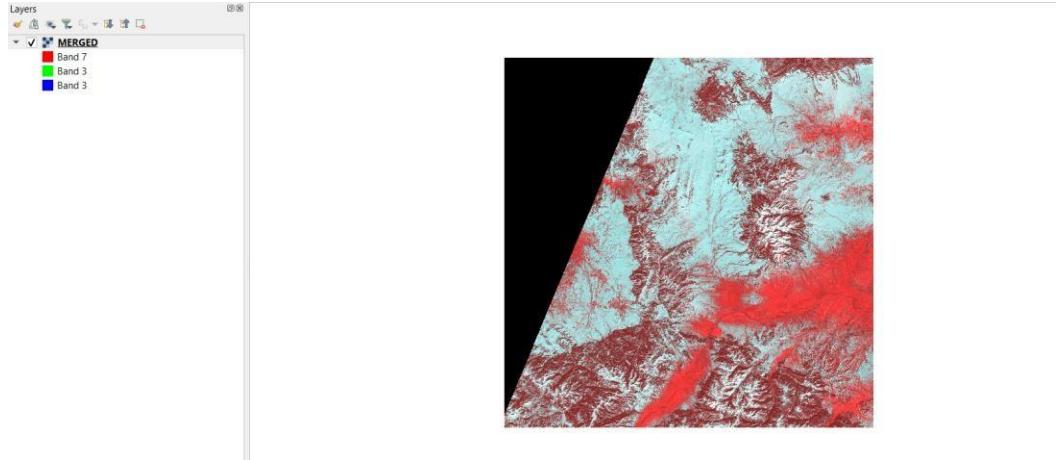


So all the seven image files are successfully merged together.

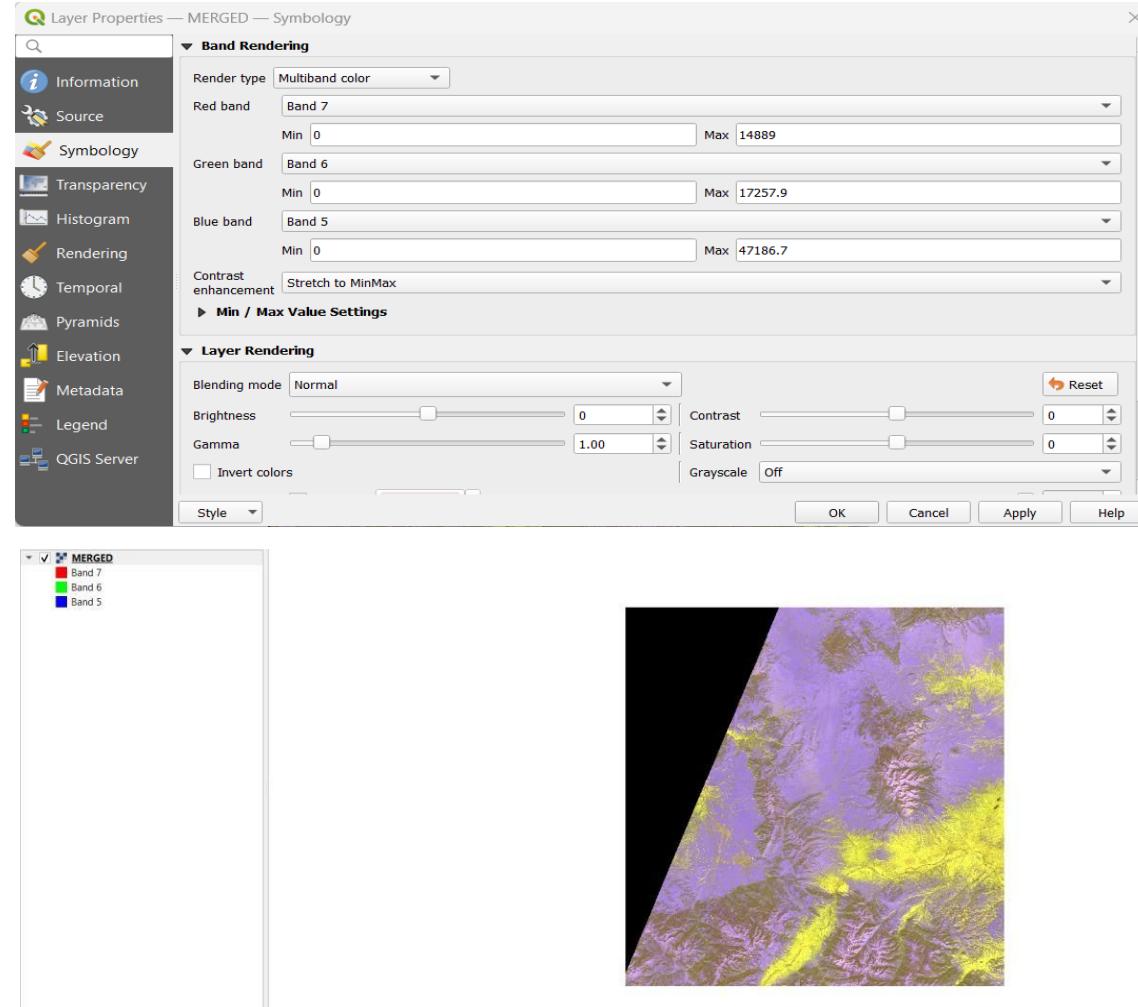


Step 10: Now go to **layer > layer properties > symbology**, change **render type** to “**multiband color**” and keep changing the rest of the **RGB bands** according to your needs for more enhancement using **Pseudocolor** image processing.





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



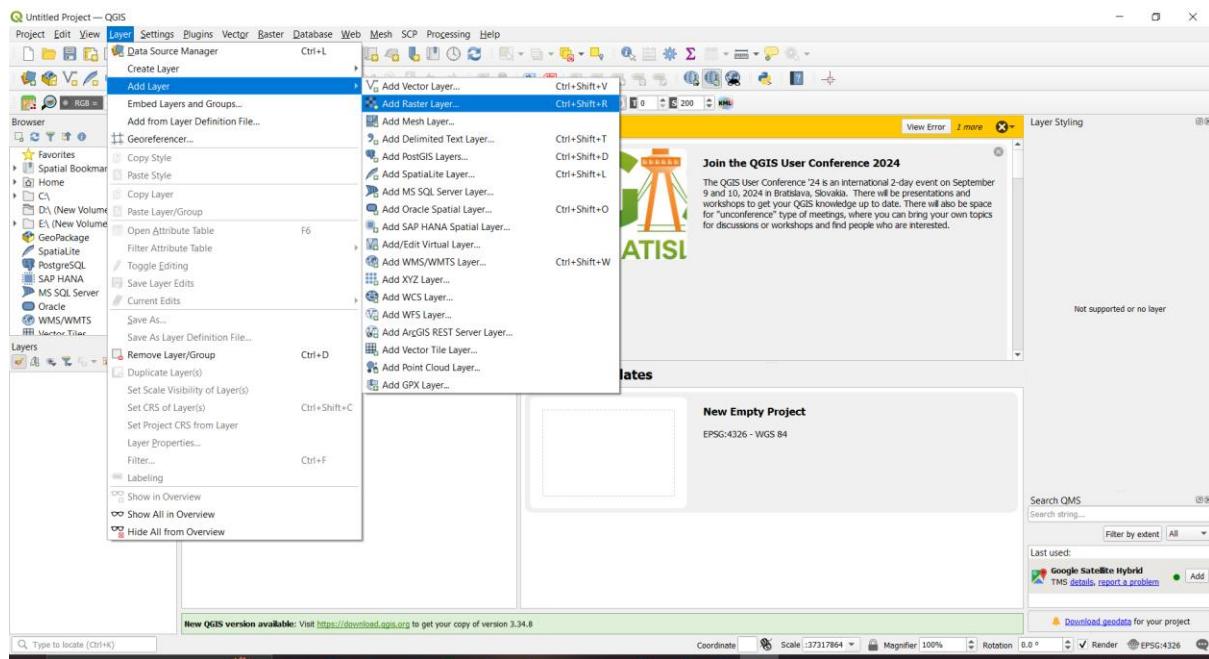
Practical No 5

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

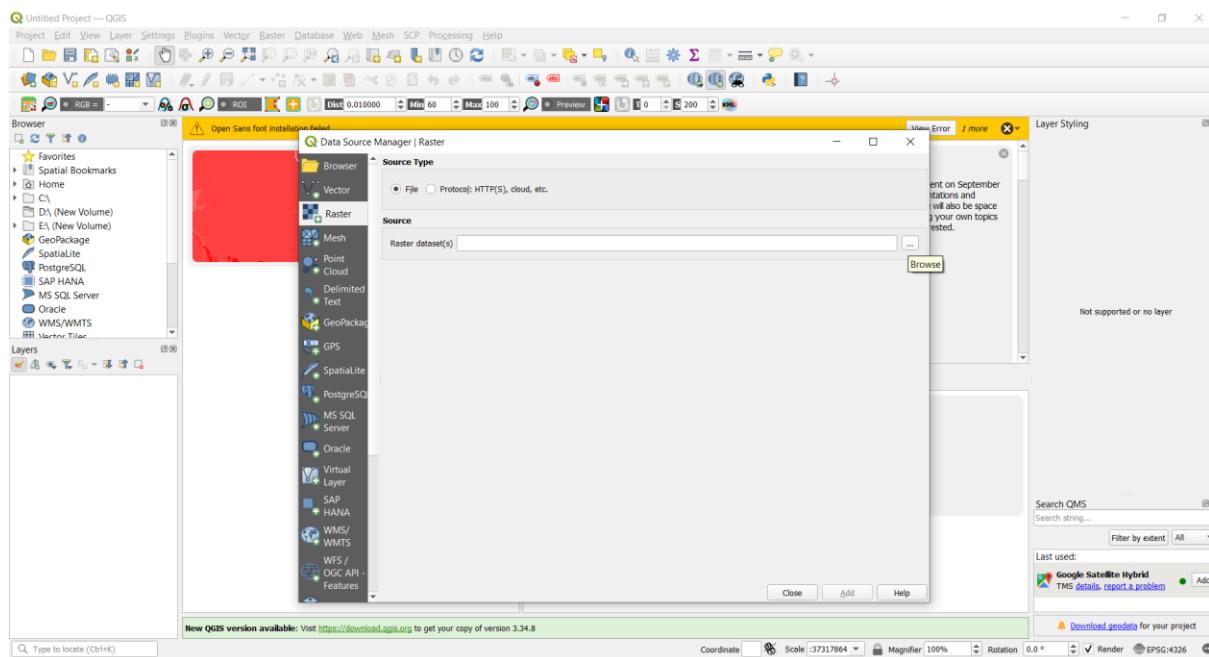
Practical No 5

Step 1: Open QGIS

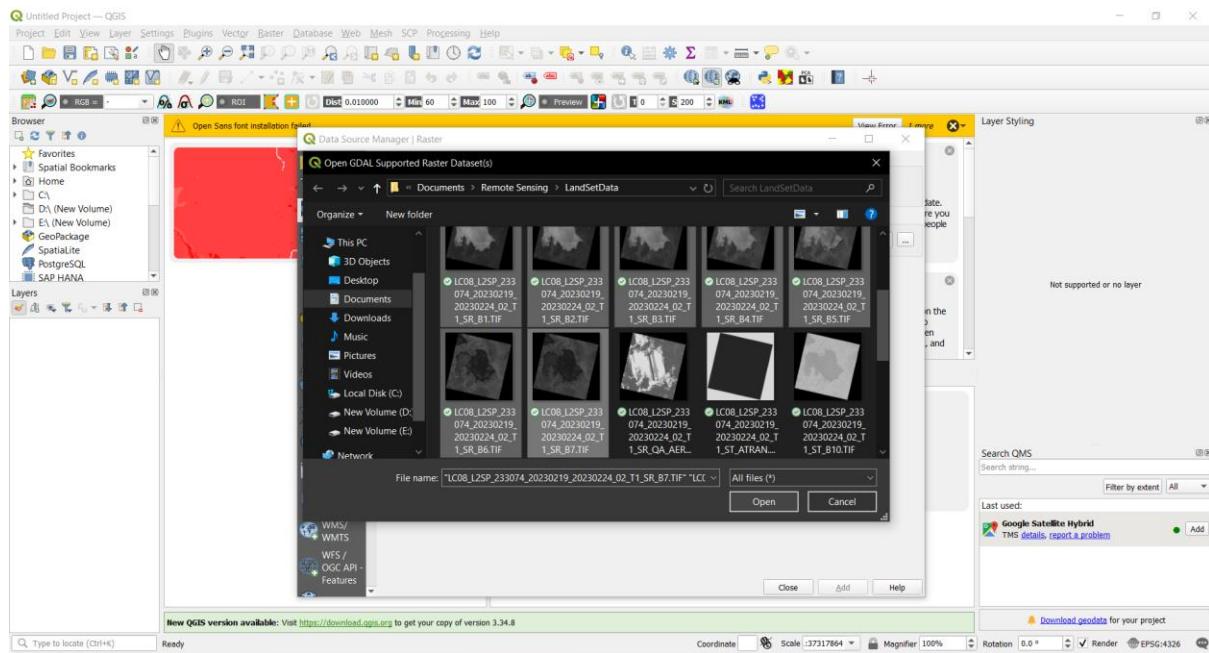
Step 2: Click on Layer and then Select Add Layer and then Select Add Raster Layer



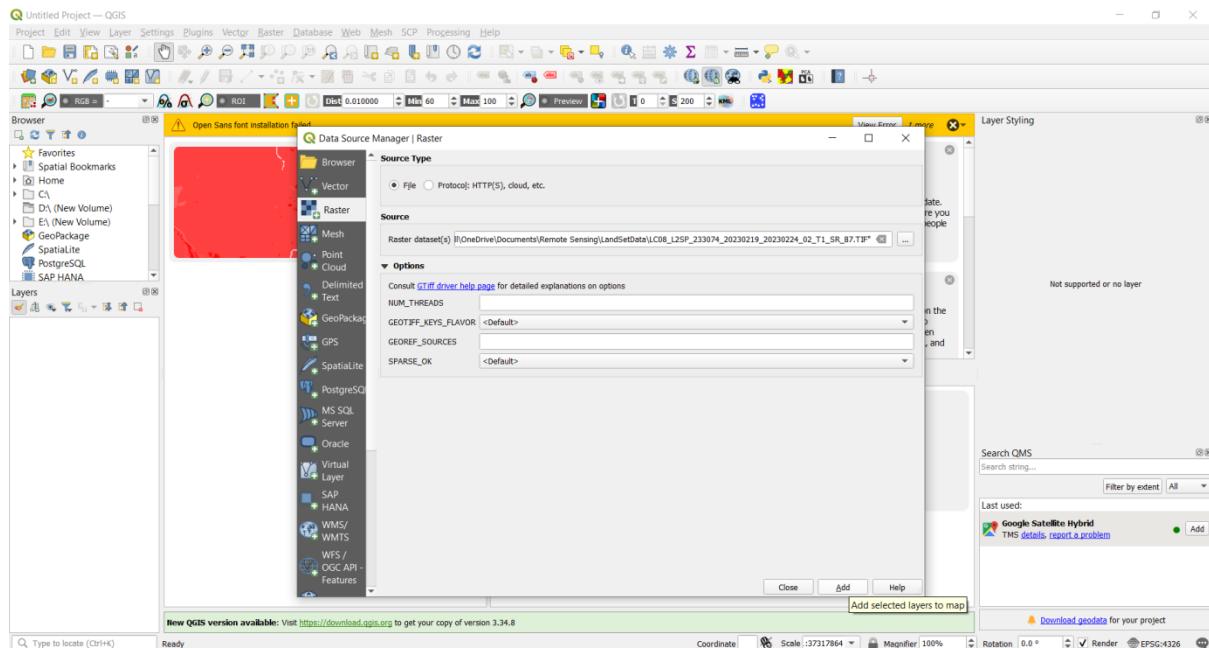
Step 3: Select Source Type File and then Click on Browse



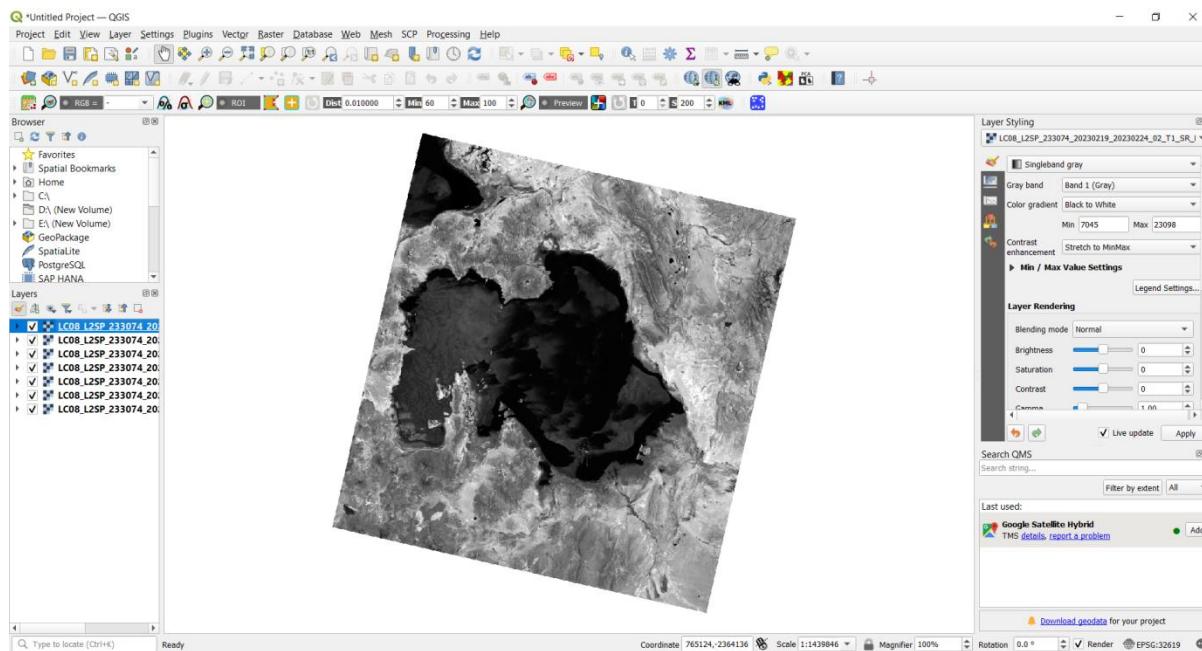
Step 4: Select at least 7 Tif files and then Click on Open



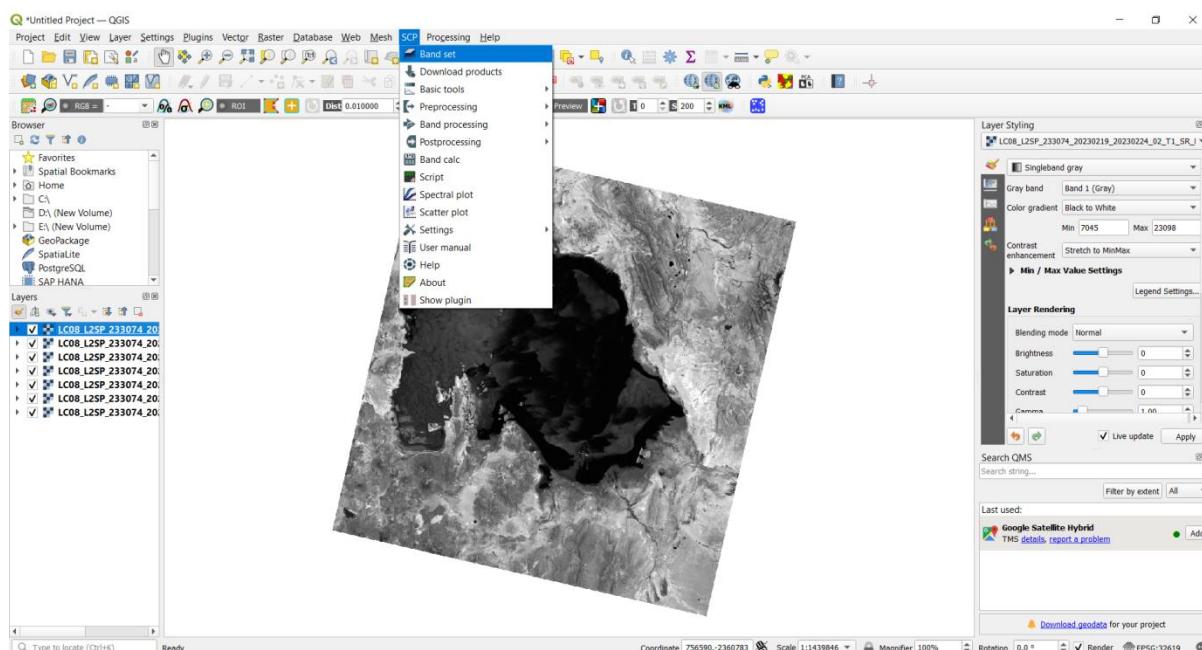
- **Click on Add**



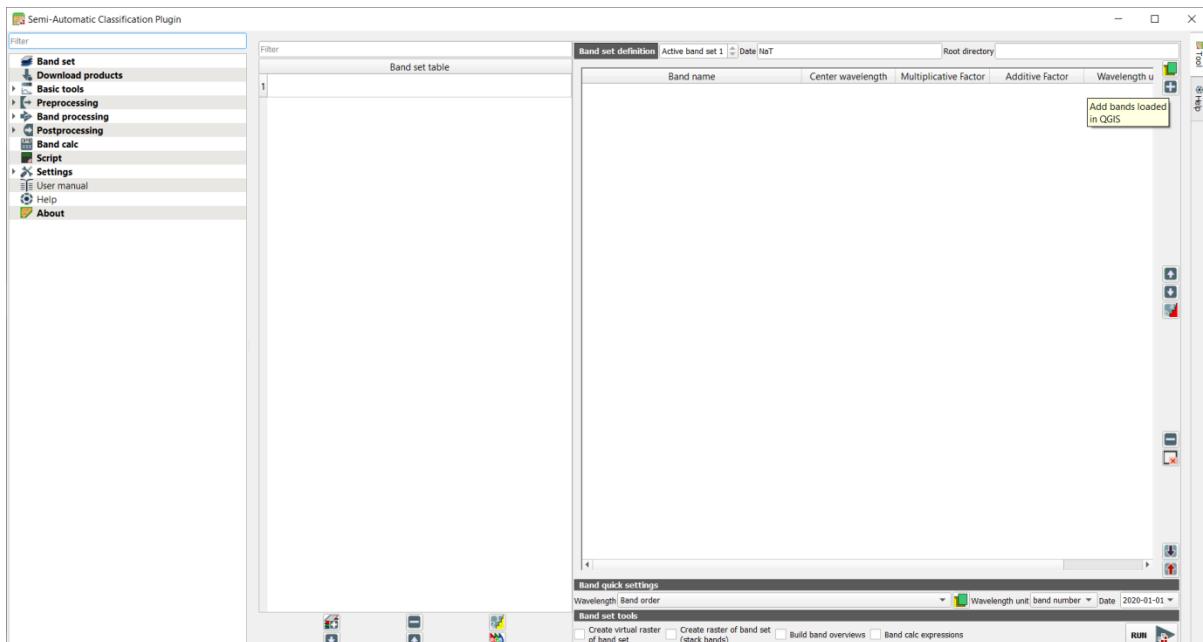
- landsat 8 satellite image



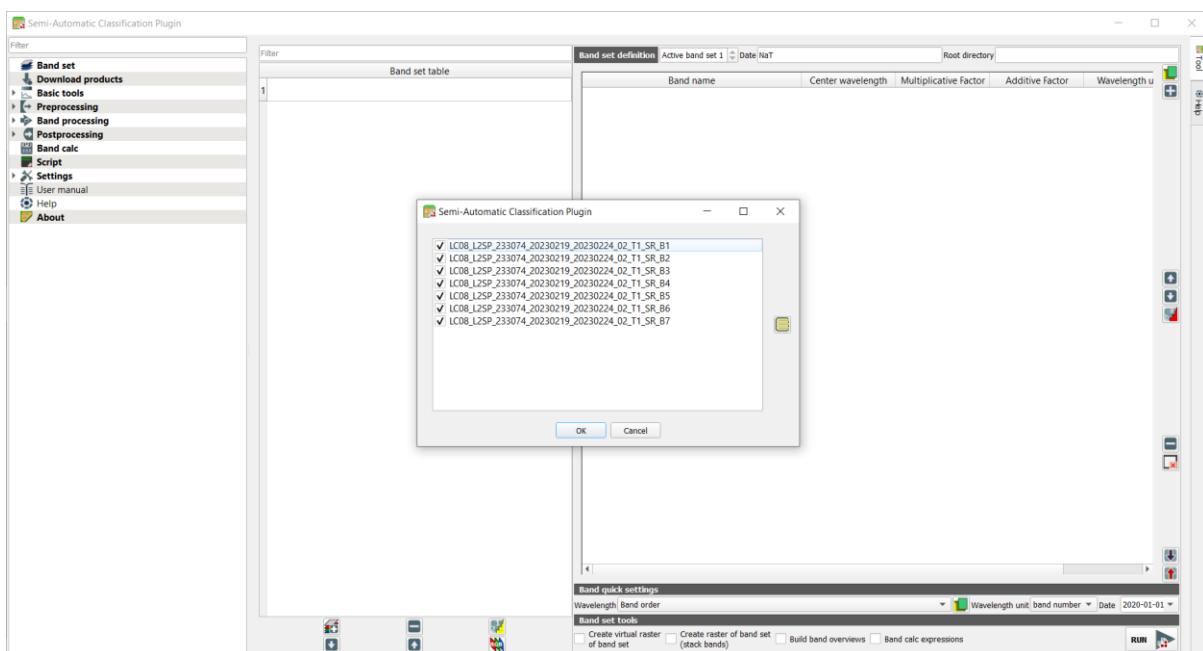
Step 5: Click on SCP and then Select Band set



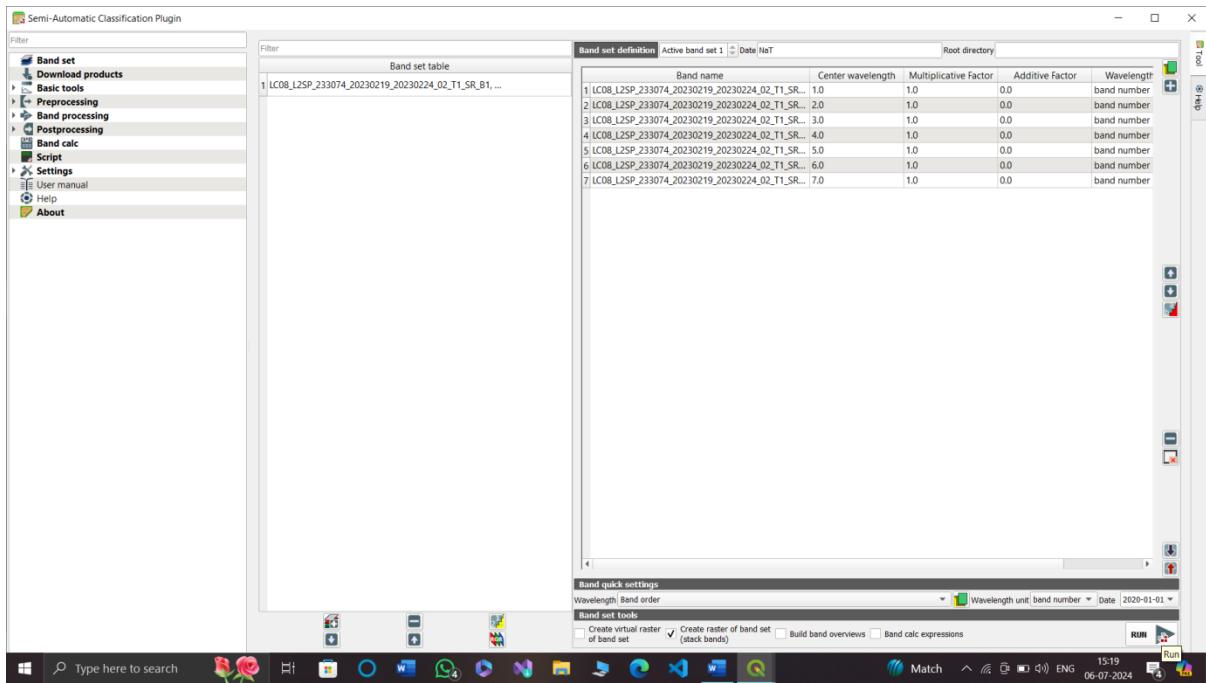
- Click on Add bands loaded in QGIS



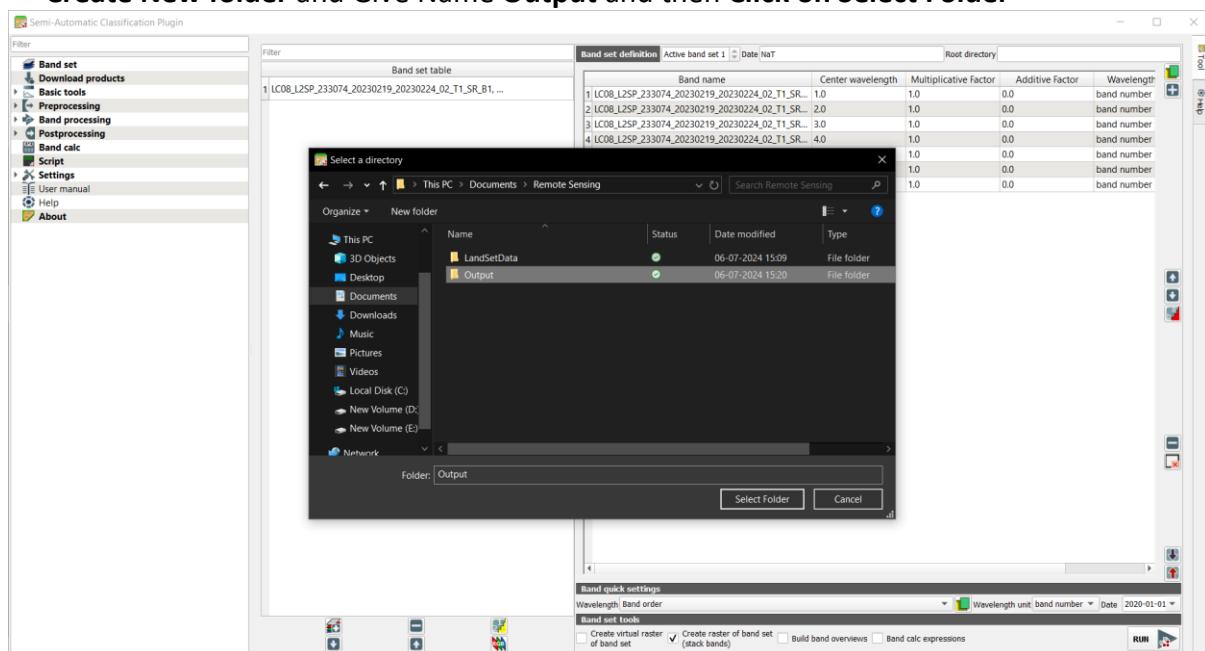
- Select All Files and then Click on OK



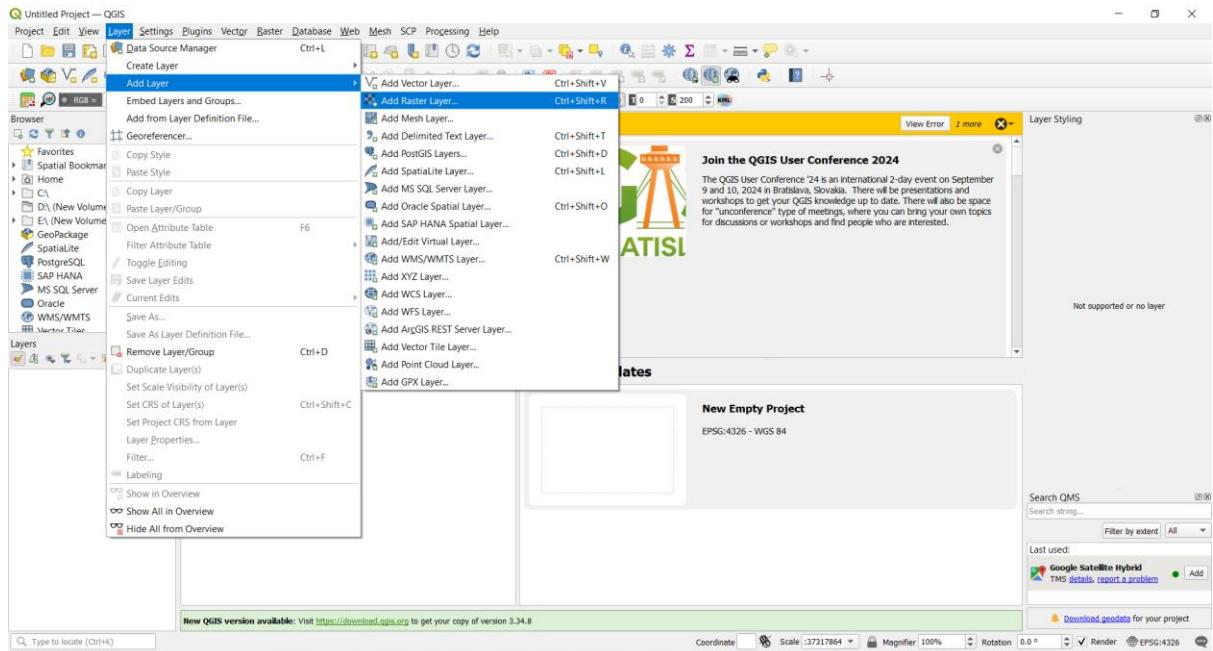
- Check Create raster of band set (stack bands) and then Click on Run



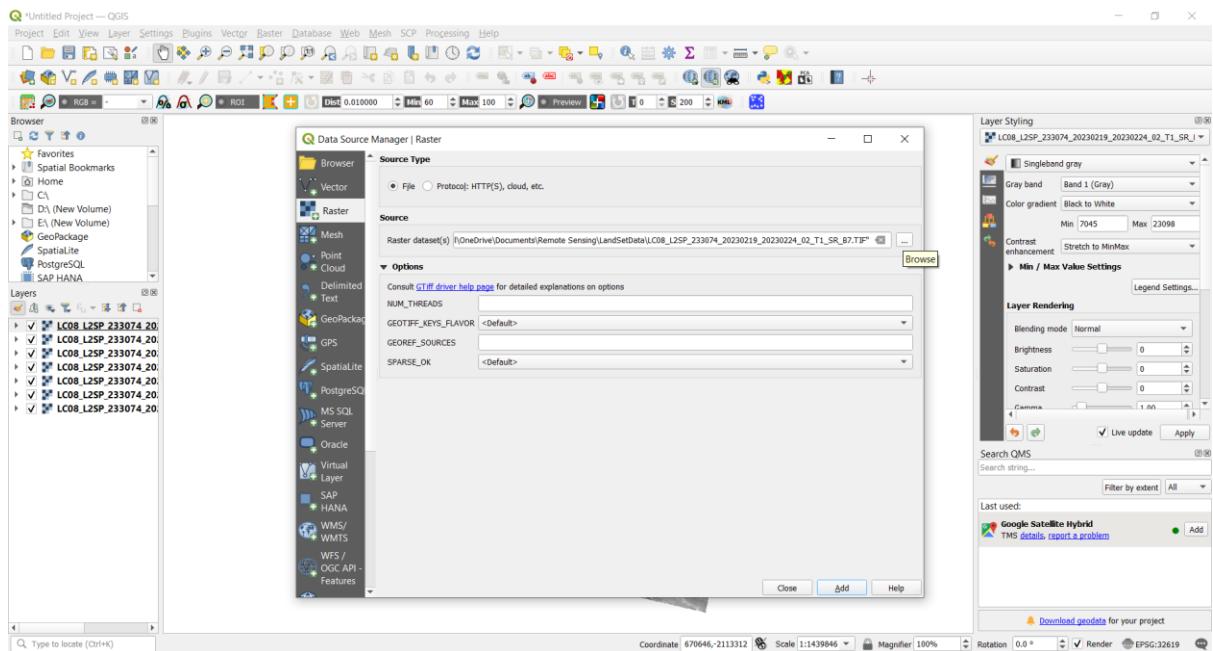
- Create New folder and Give Name Output and then Click on Select Folder



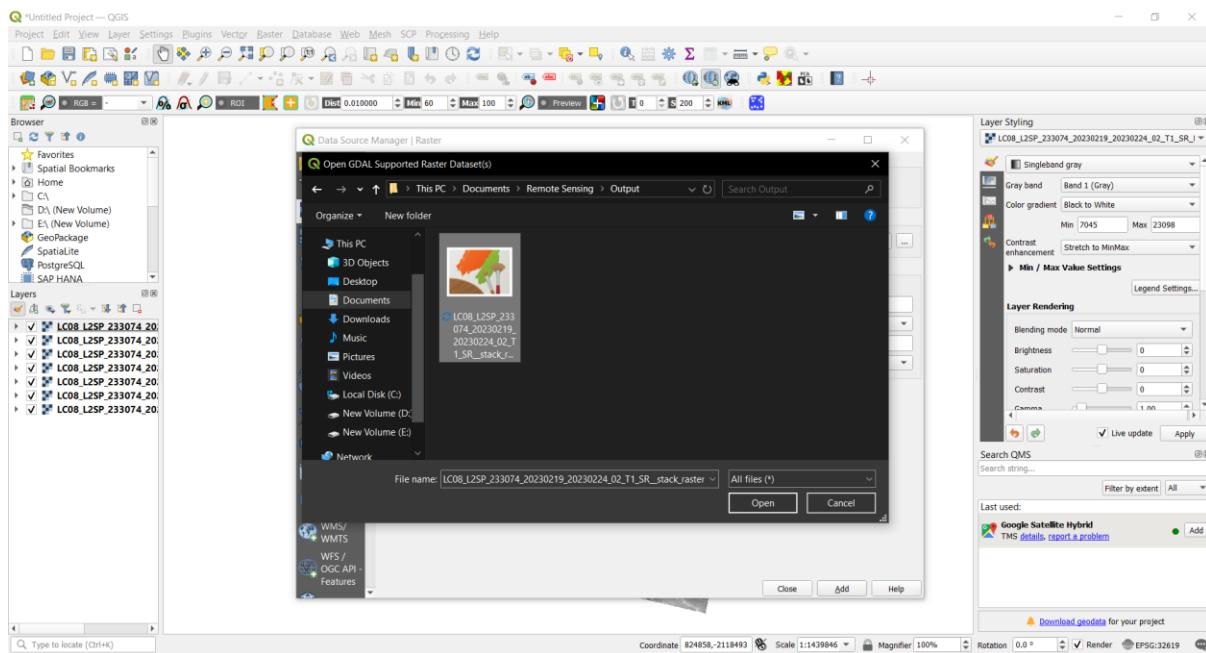
Step 6: Again, Click on Layer and Select Add Layer and then Select Add Raster Layer



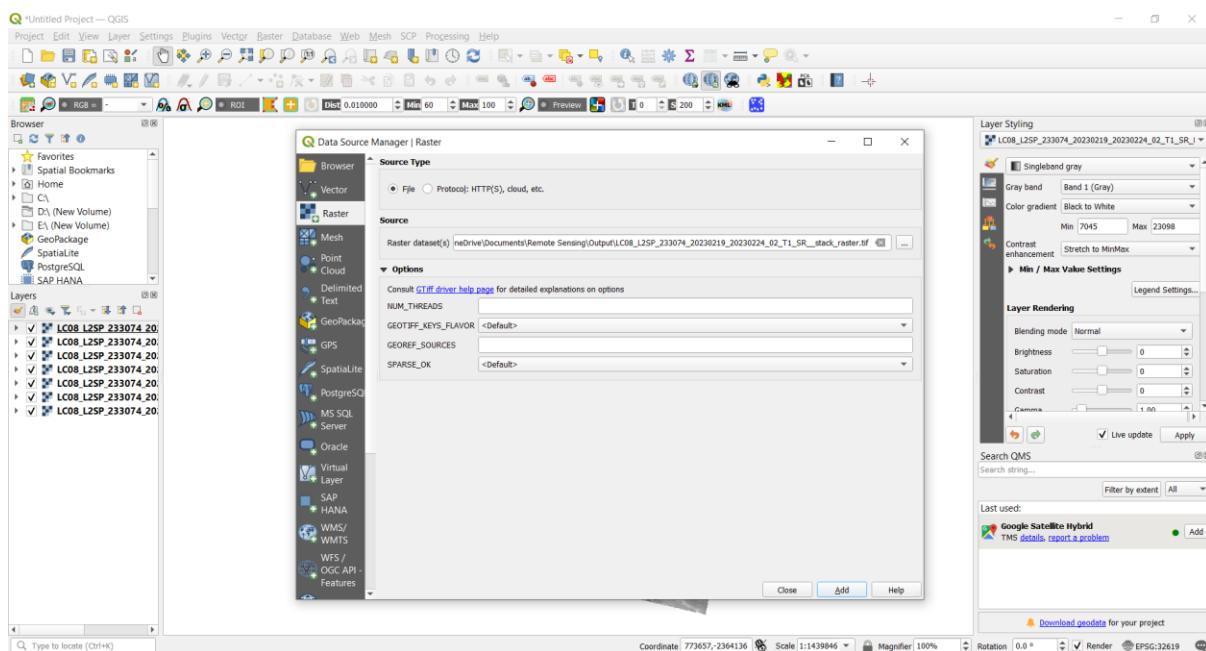
- Select Source Type File and then Click on Browse



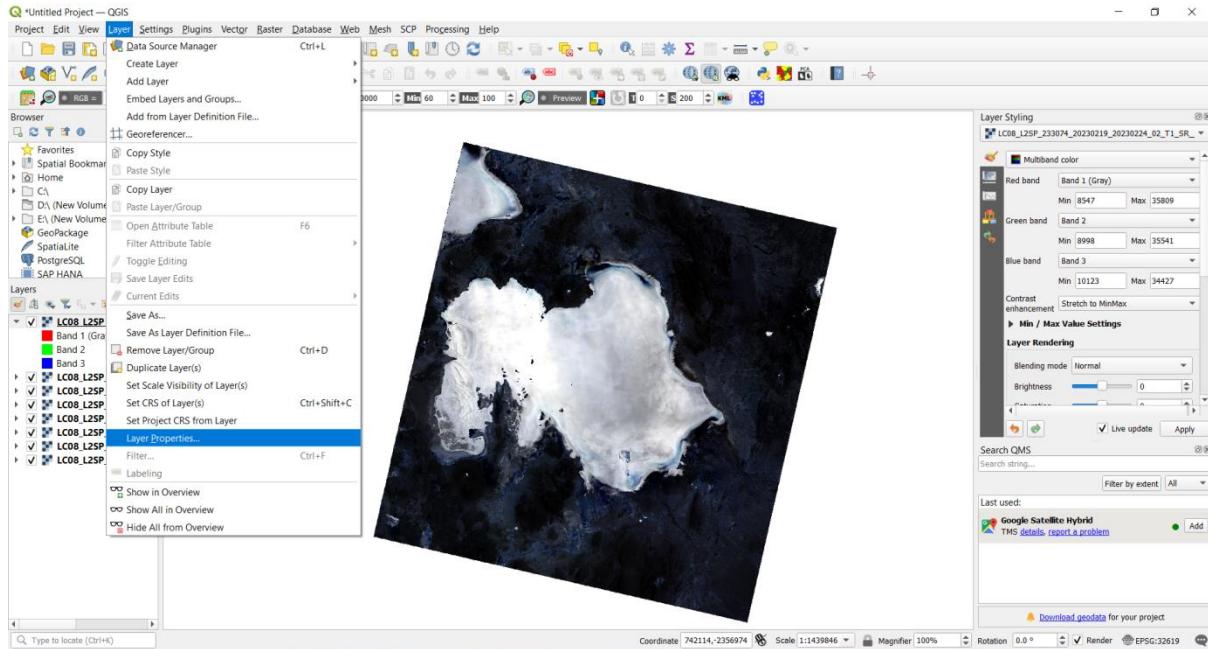
- Select stack raster files and then Click on Open



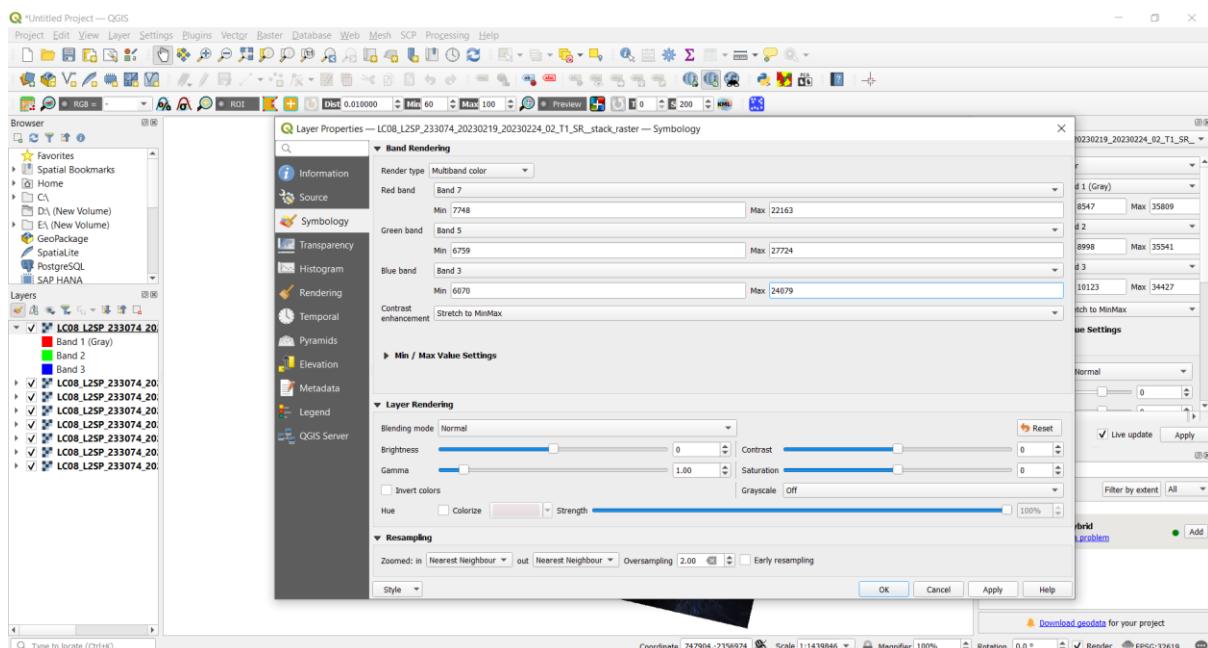
- Click on Add

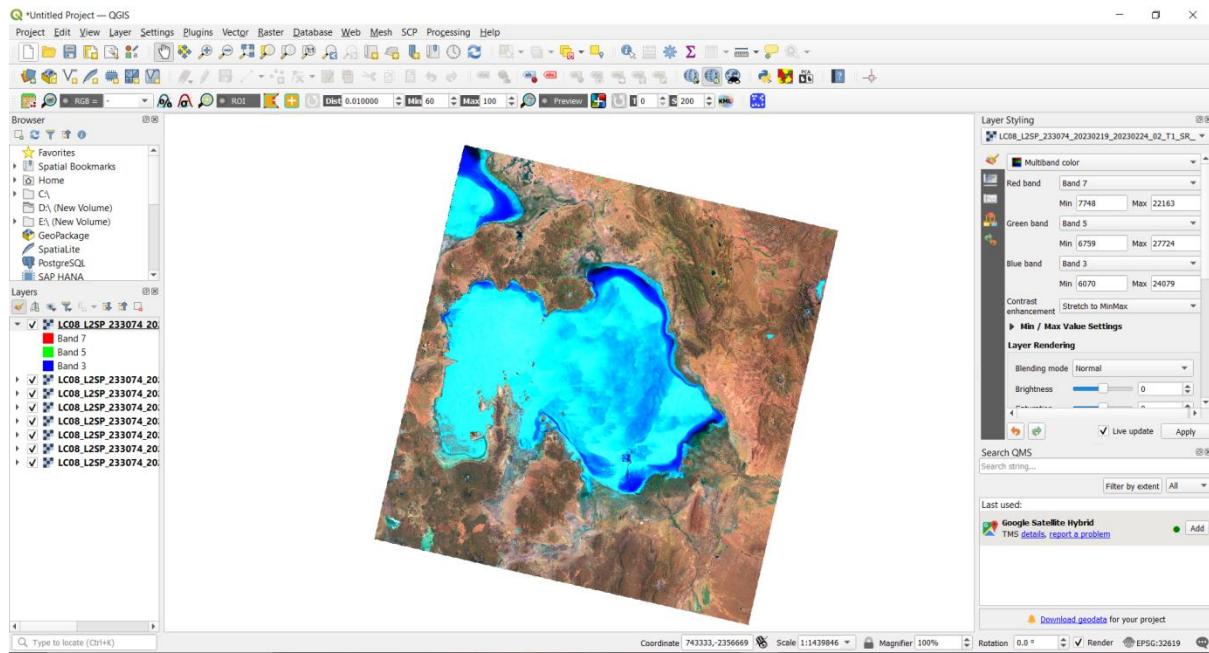


Step 7: Click on Layer and then Select Layer Properties

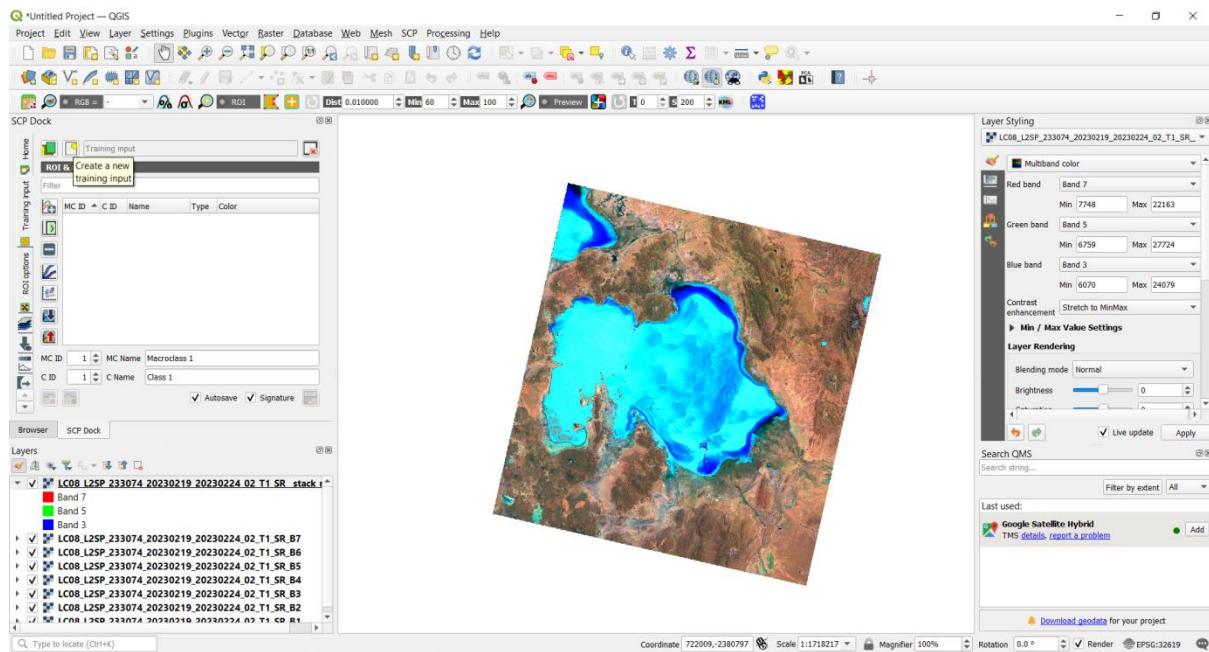


- Under Layer Properties Click on symbology, change render type to “multiband color” and select RGB bands as shown in figure, Click on Apply.

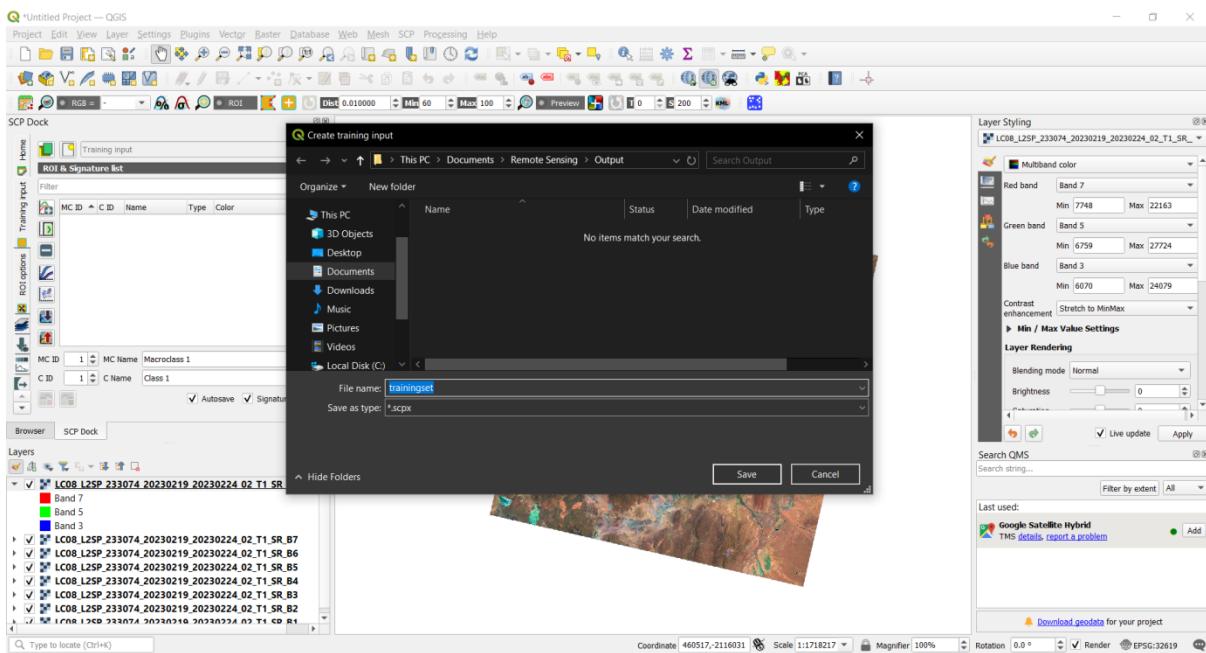




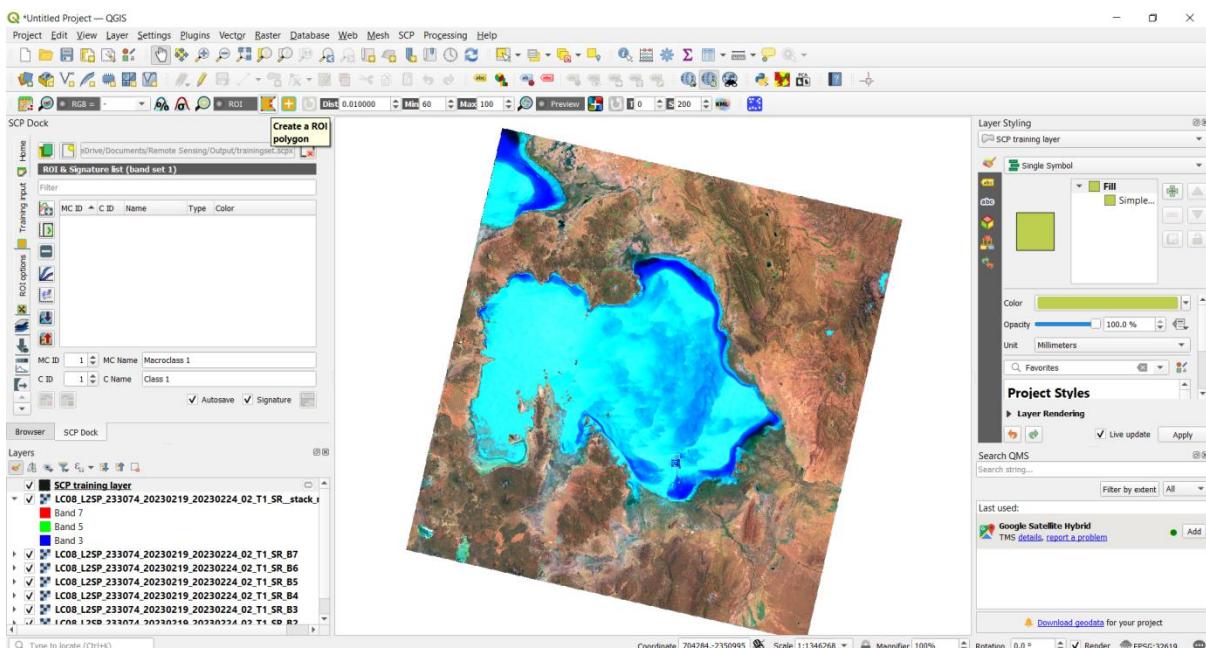
Step 8: Click on SCP Dock and Click on Training input and then Click on Create a new training input



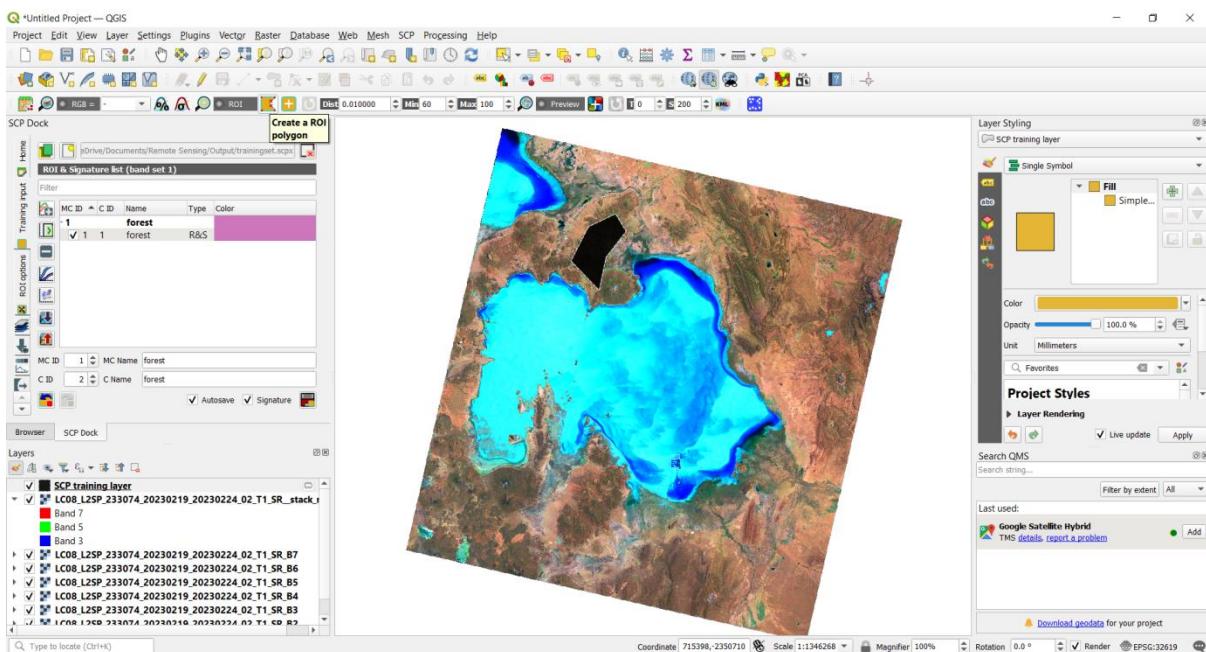
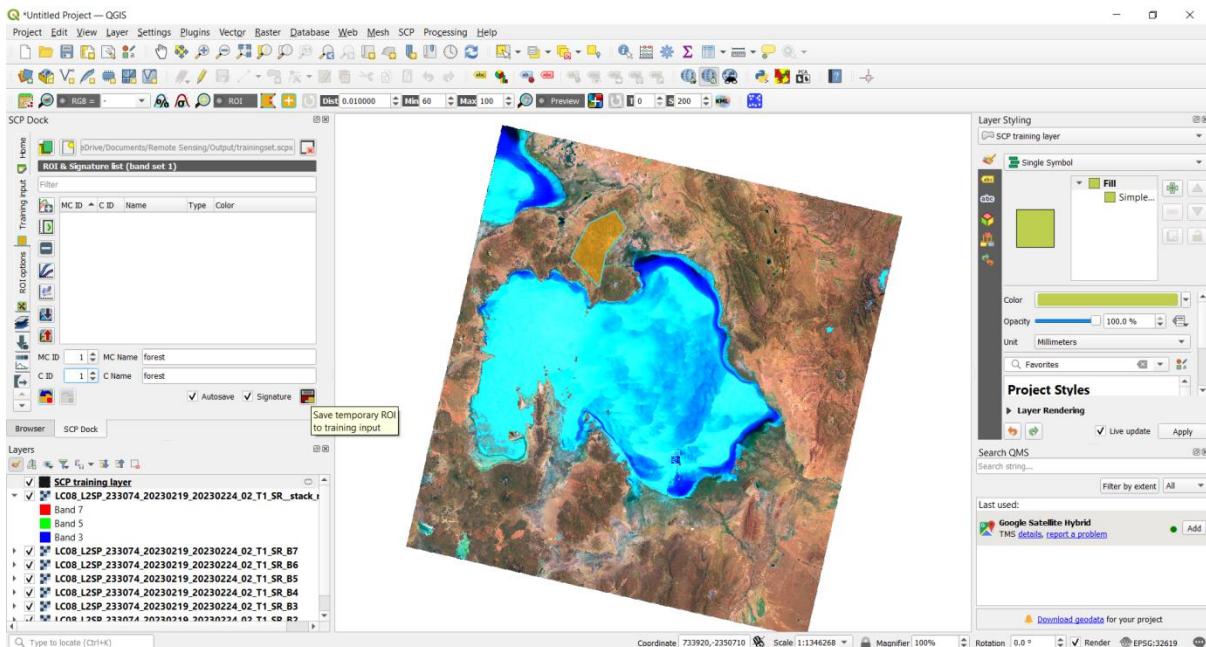
- Give File name (Here it is: **trainingset**) and then Click on Save



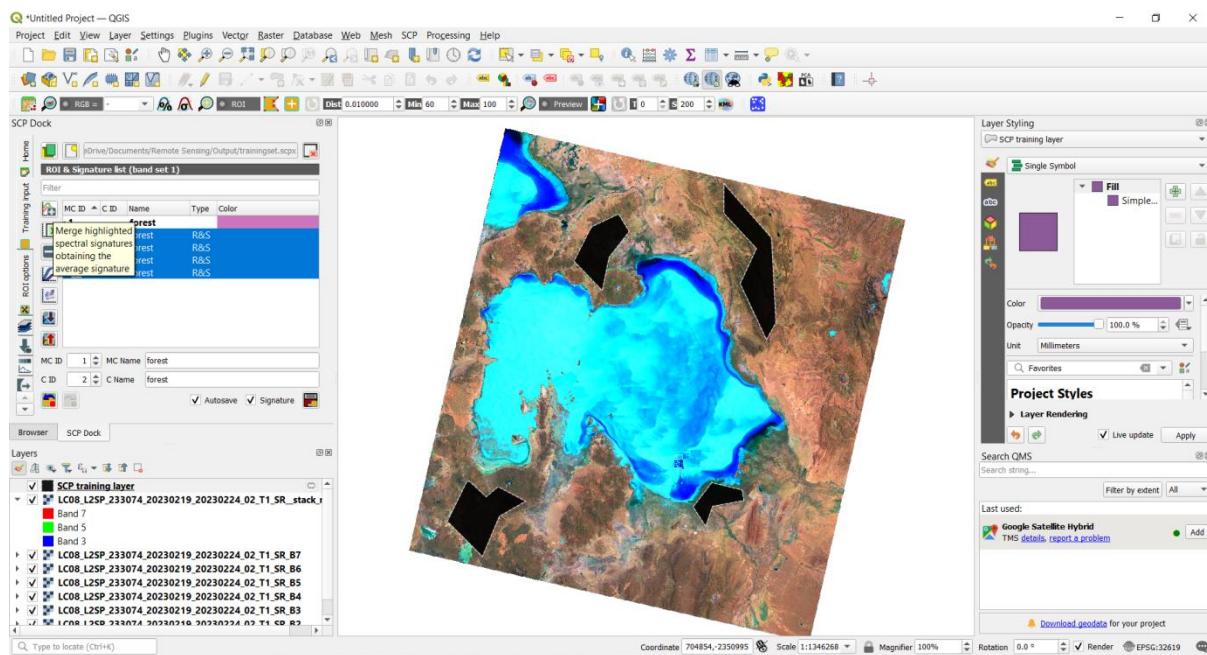
Step 9: Click on Create a ROI polygon



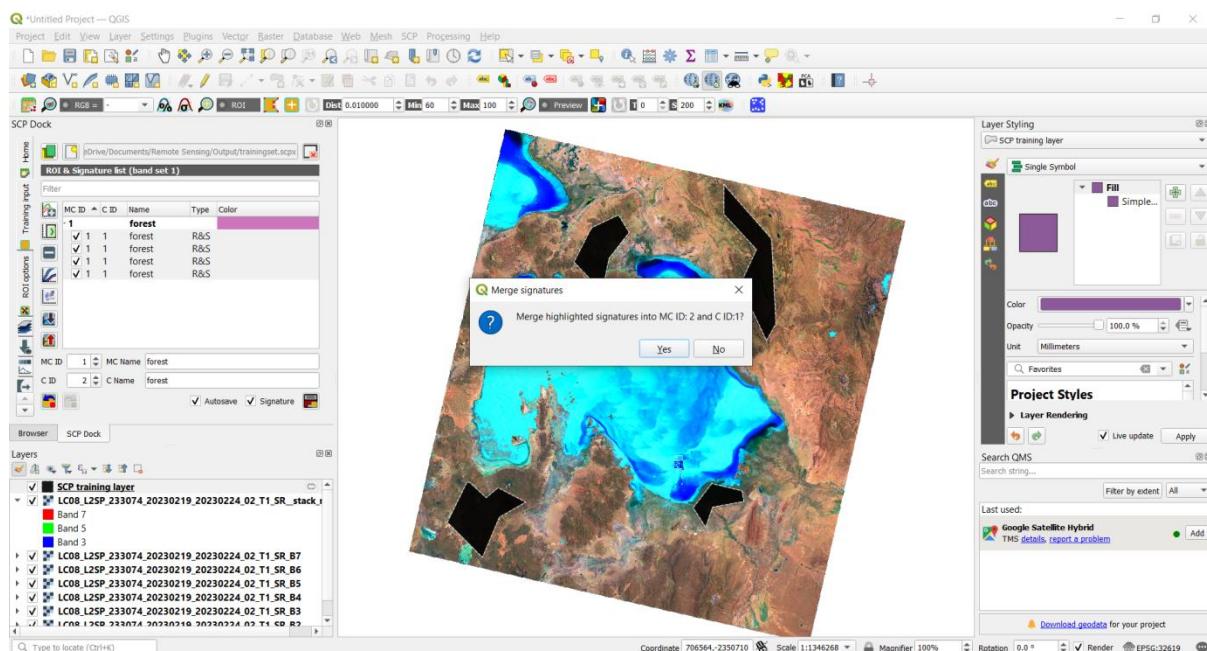
- Draw the input on the map. After drawing the input, next step is to save that input and for that we have to give MC ID = 1, MC Name = Forest and C ID & C Name will be same as MC ID & MC Name and then Click on “save temporary ROI to training input”, we named MC Name forest because we have taken the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



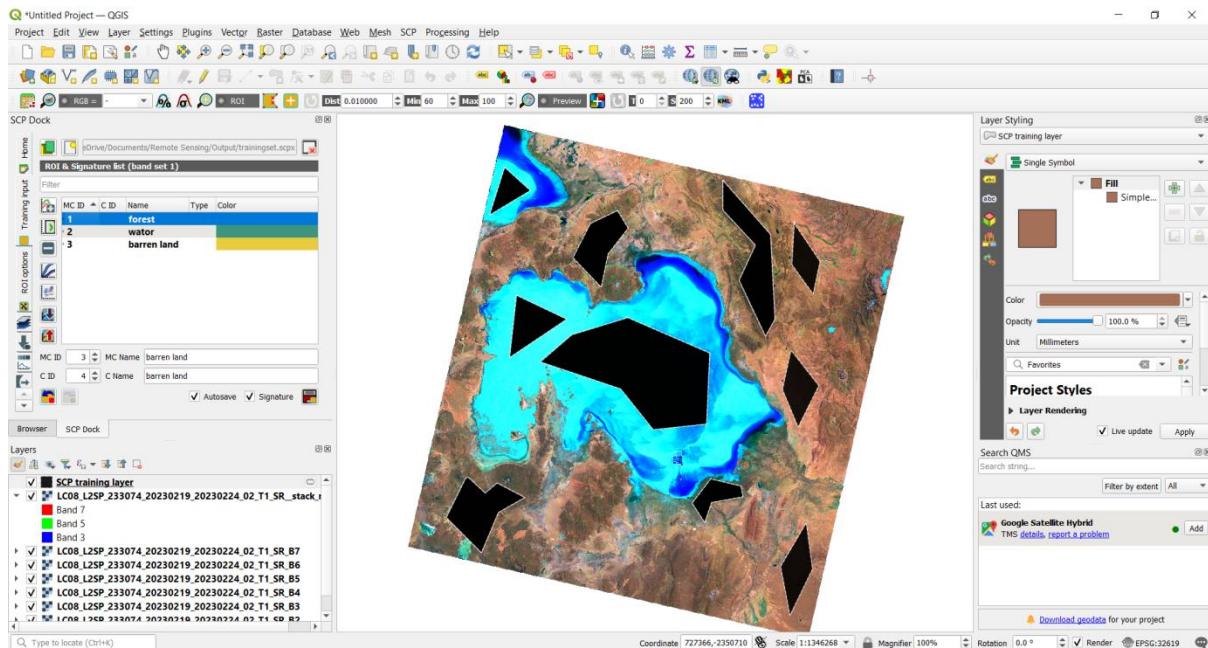
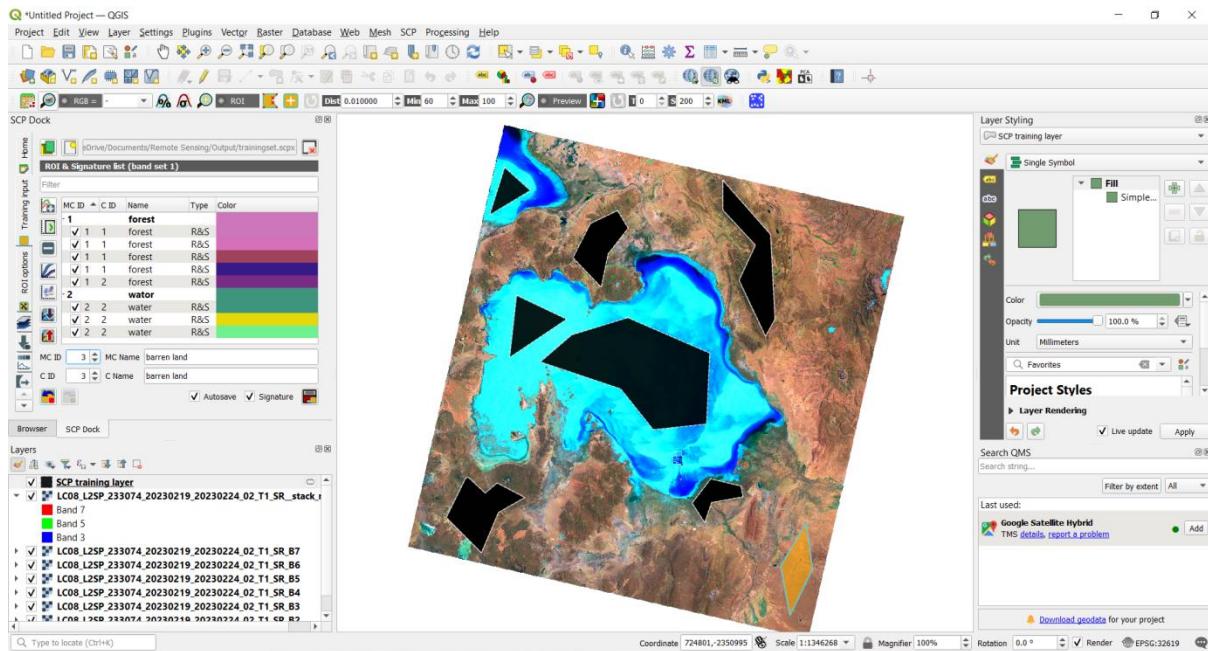
- We can take multiple inputs for single class, we took 4 inputs for forest area.
- Next step is to merge all the inputs for single class, so for that we'll select all the inputs and click on “merge highlighted spectral”.



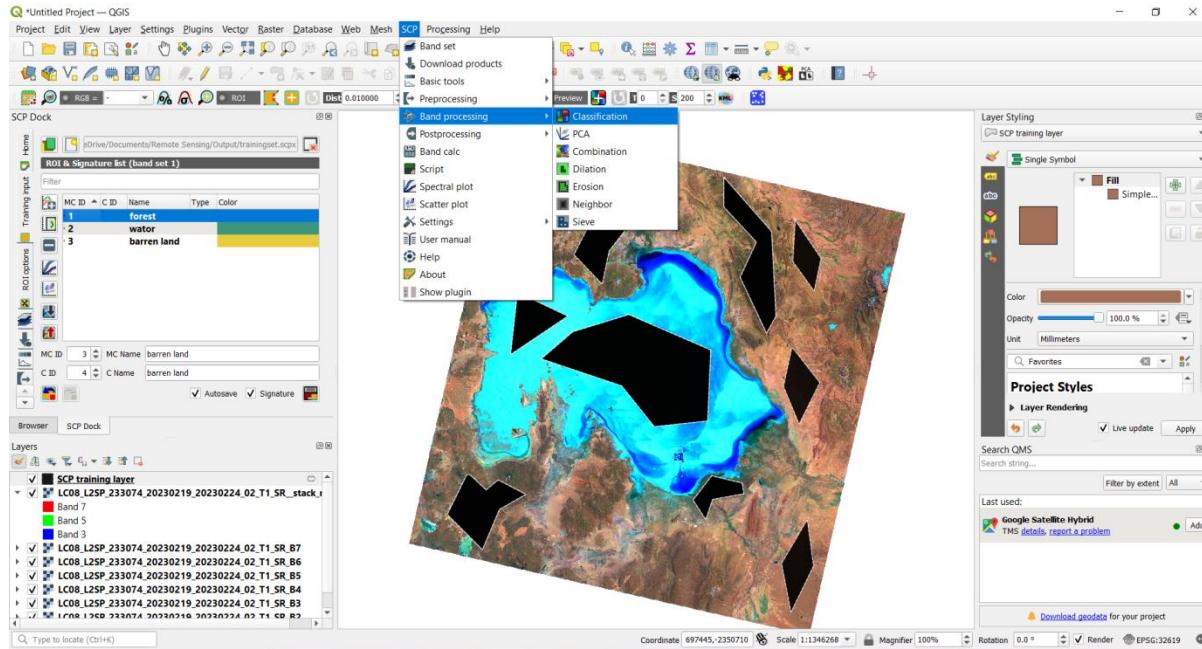
- Click on Yes



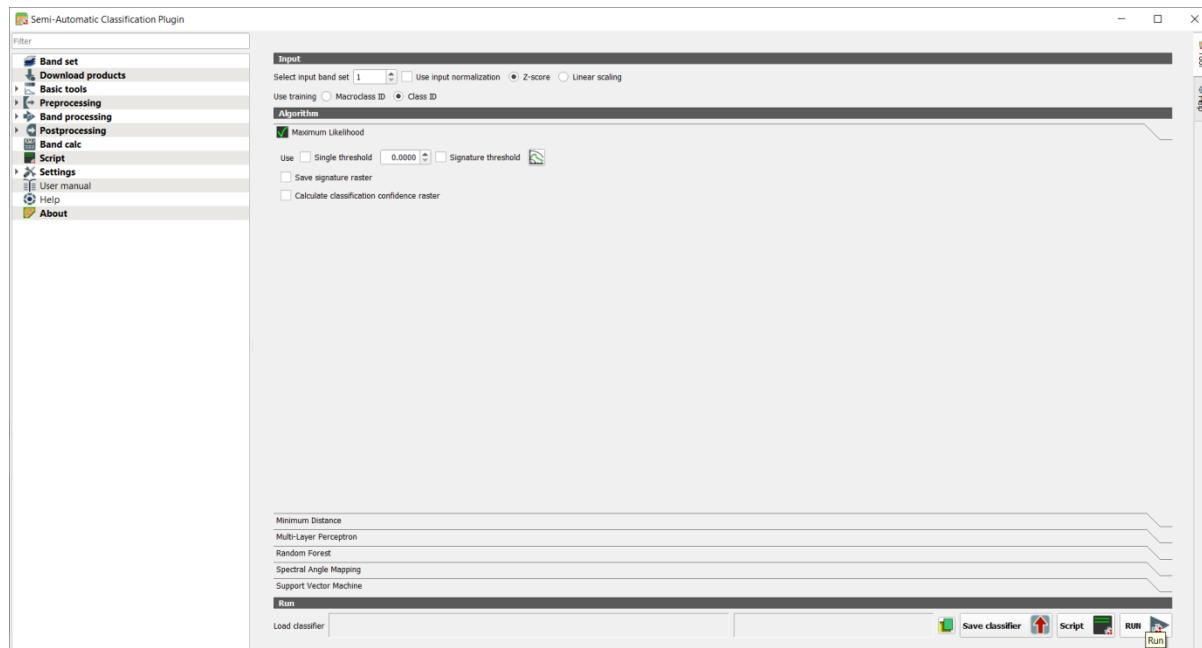
- So we took many types of inputs for training such as forest, water, barren land.



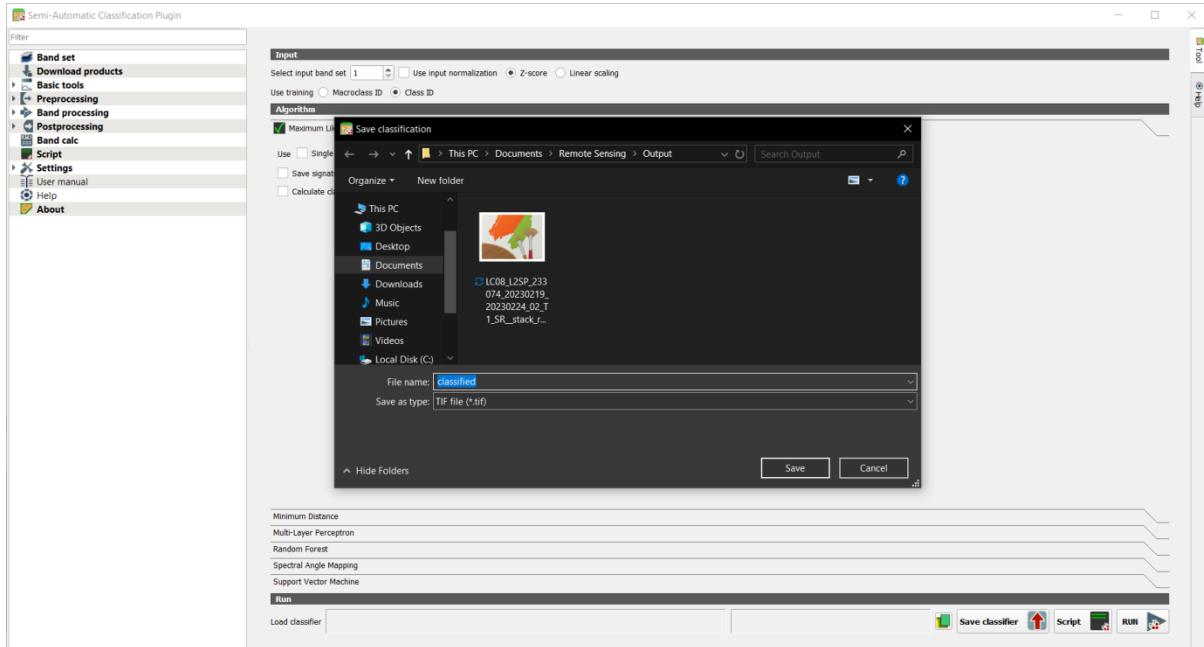
Step 10: Click on SCP Within SCP Select Band processing and then Select Classification



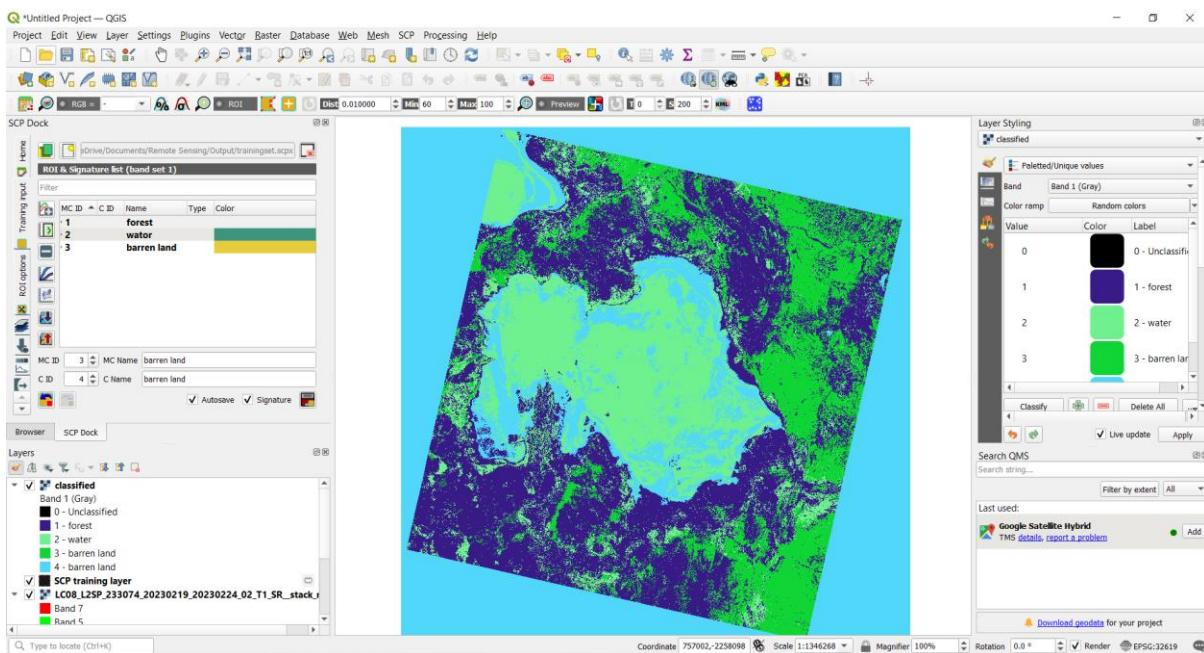
- Select Class ID and then Click on Run



- After Clicking on RUN, you have to give a file name of “classified” then Click on Save.

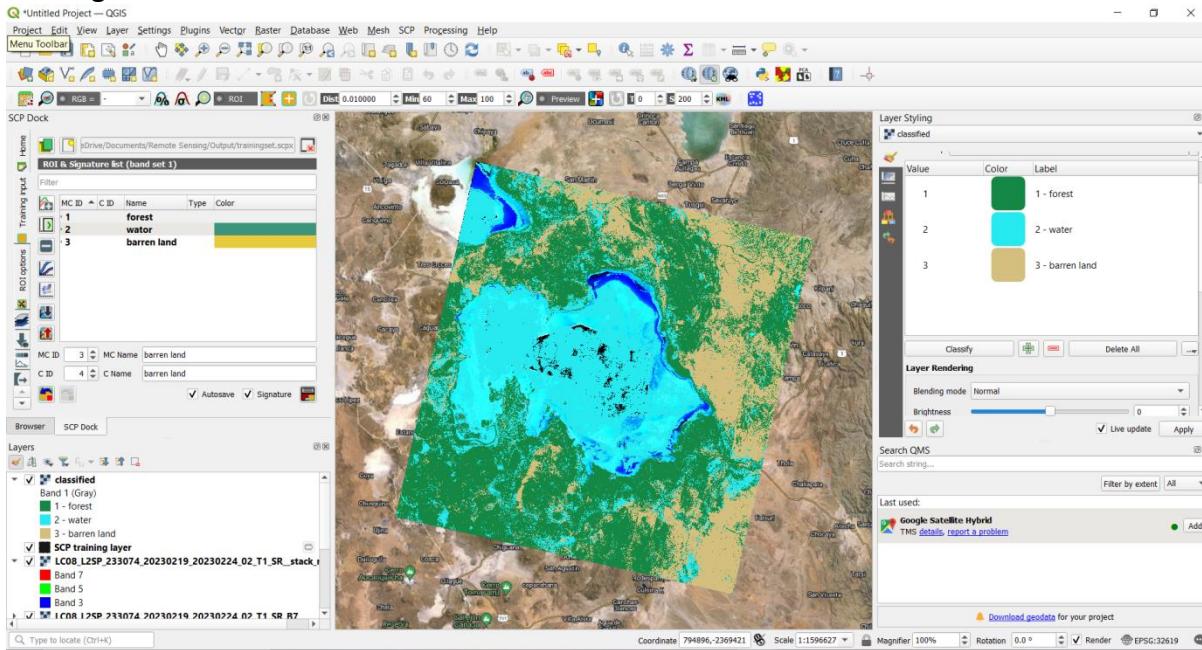


- The classification process of our training input is complete, this is our classified product.



Now we have to give our merged inputs their natural colors. Go to the **Layer Styling Double Click on forest** and then we get the option of “**change color**” by which we can give our inputs their natural color and then Click on Apply.

- Same for Water and barren land.
- After giving each inputs to their natural colors see real or natural colors of our landsat 8 satellite image.

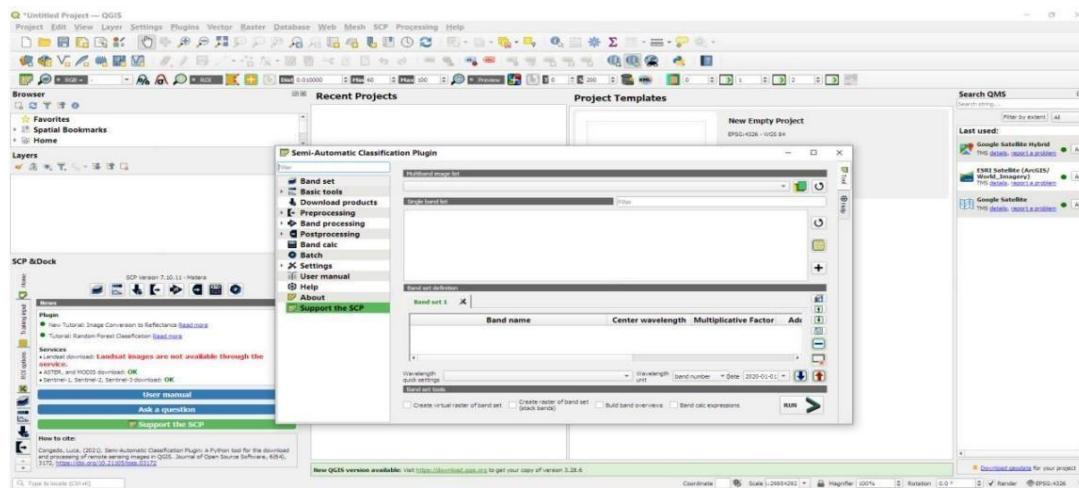


Practical No 6

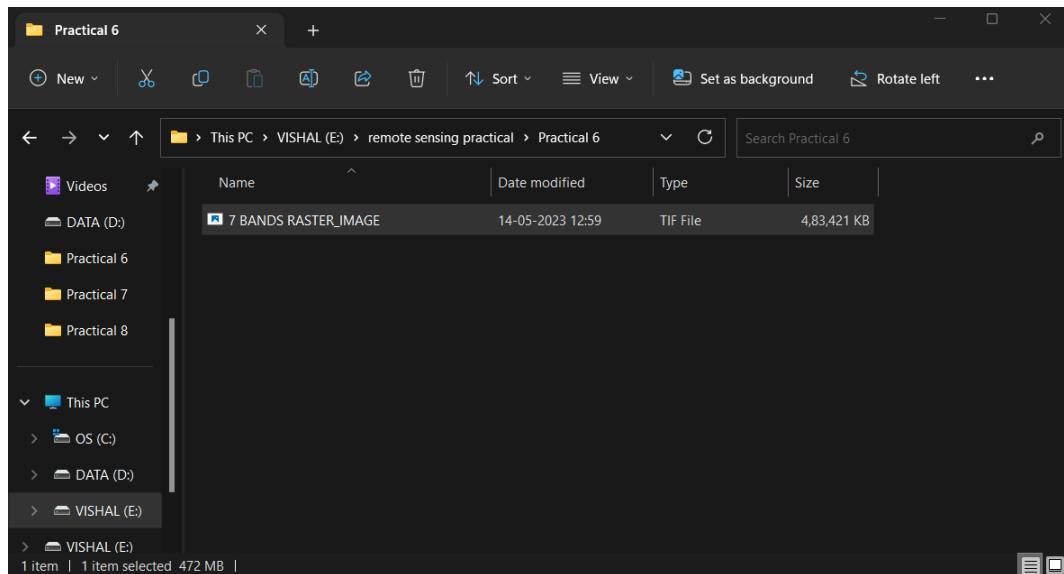
Aim: - Apply Different Unsupervised Classification Techniques to Classify the Satellite Image

Practical No 6

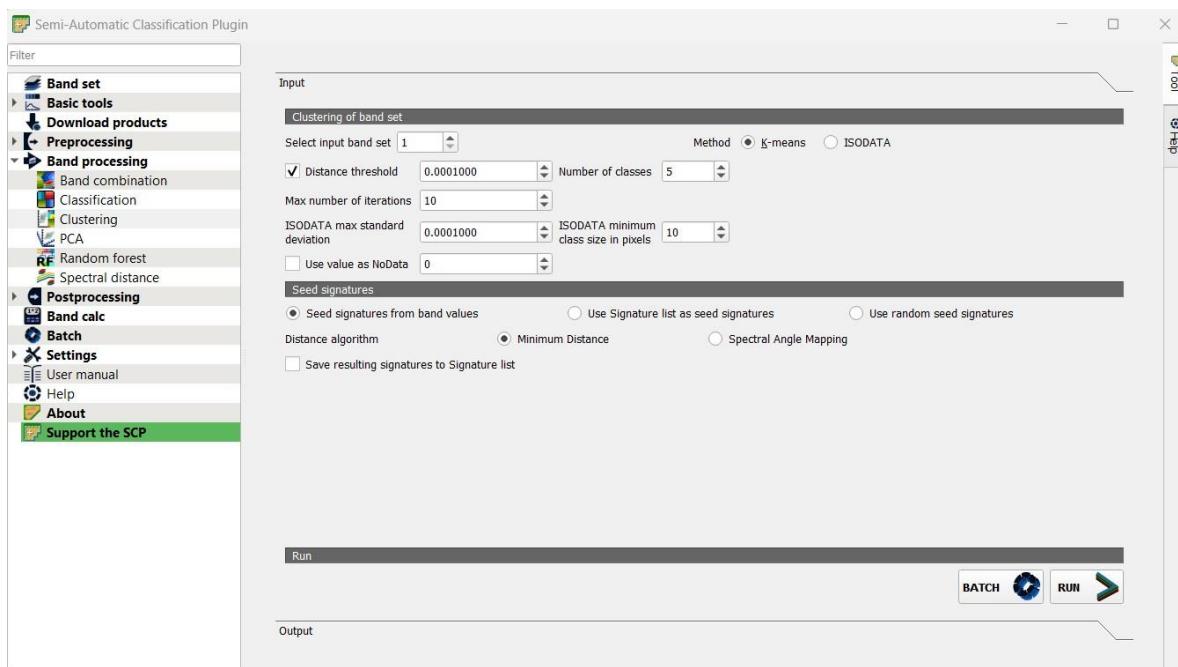
Step 1: Open QGIS and select band set from SCP & DOCK and Open a file from Multiband image list.



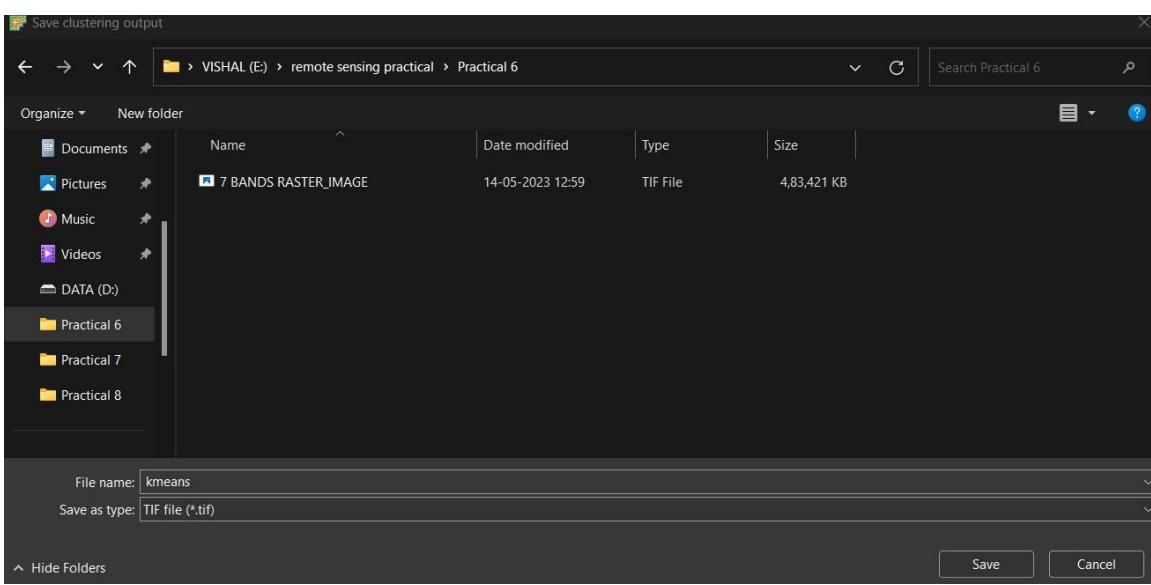
We will select already created all 7 band color raster image.



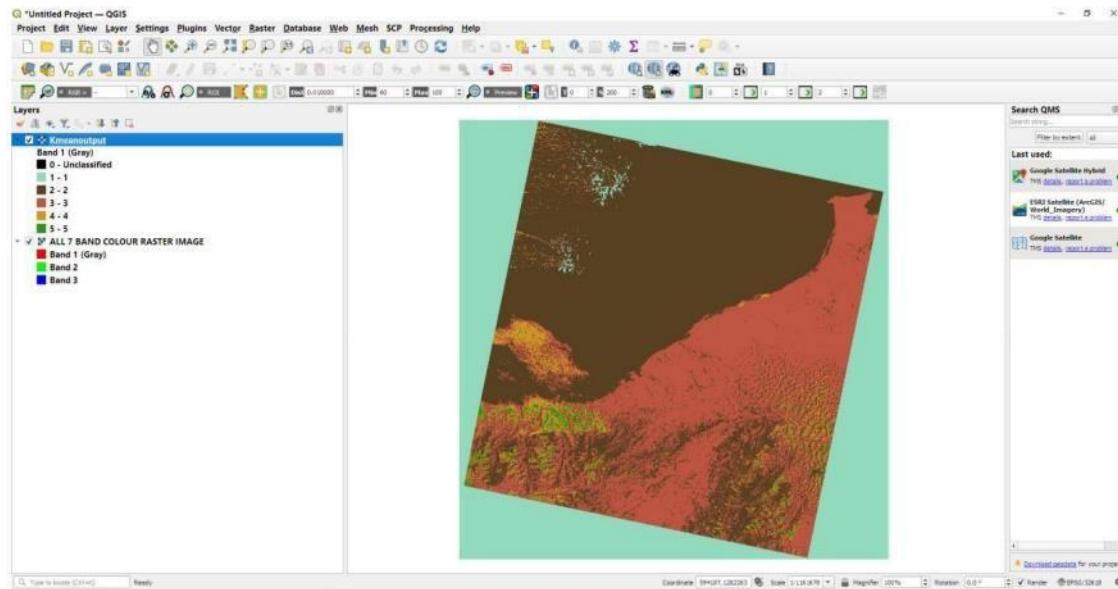
Step 2: After opening the image, we will go to **Band Processing > Clustering** and change Number of Classes to 5.



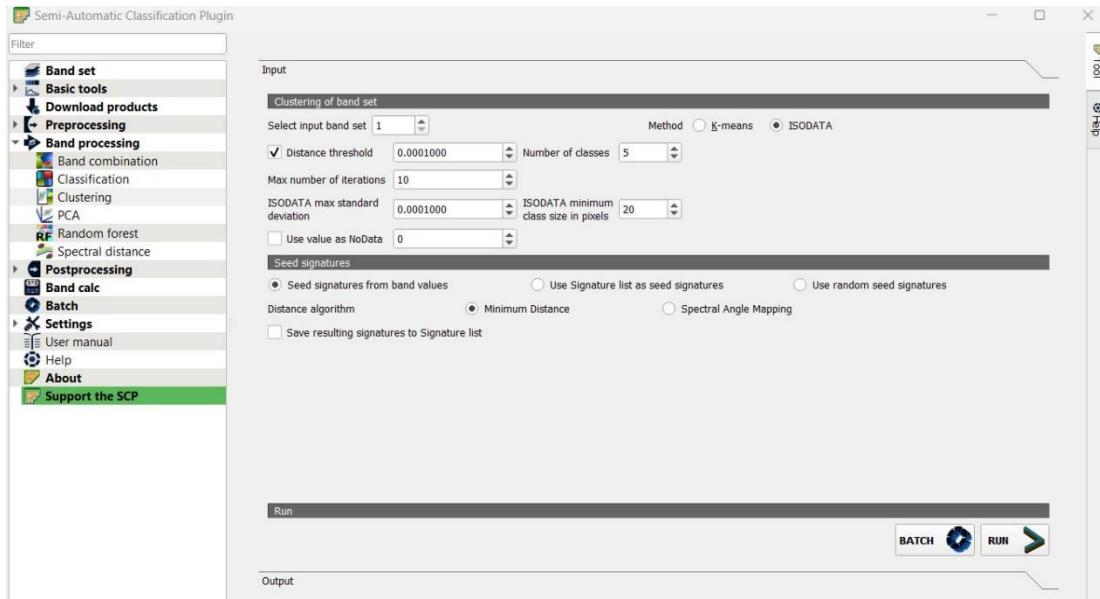
Step 3: After Click on Run you have to give the name of your output and save the file.



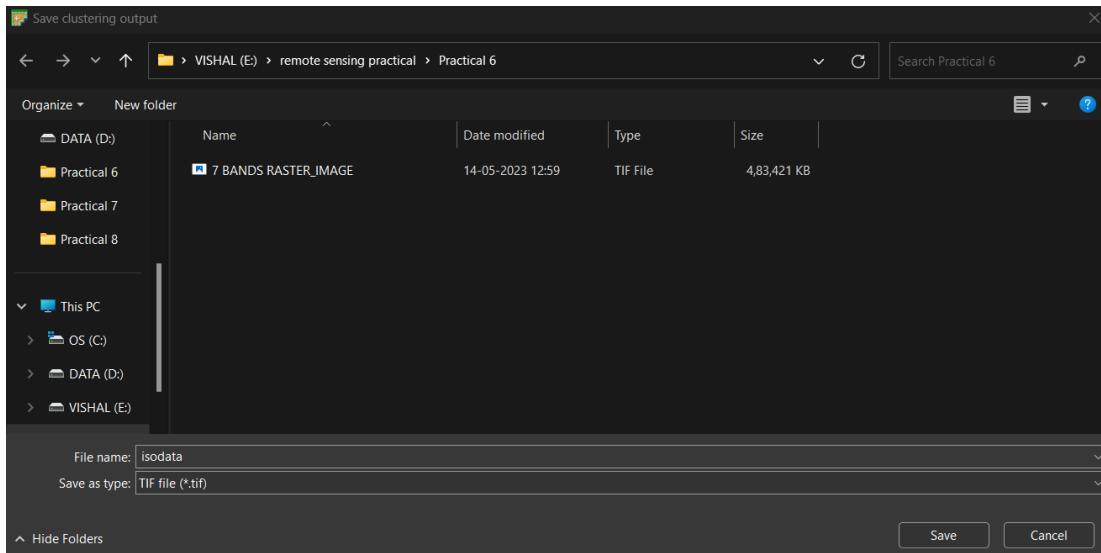
After Running K-mean you will get the output



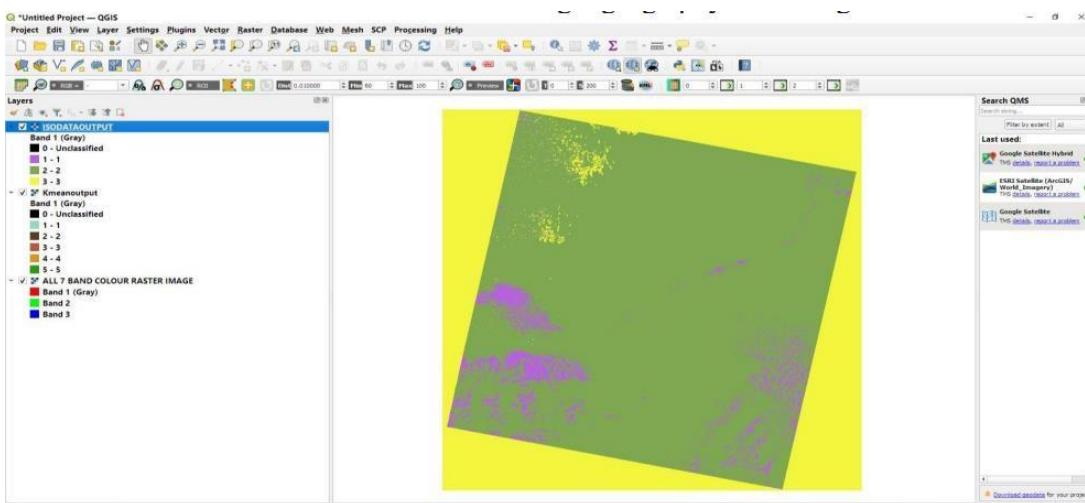
Step 4: Now again go to clustering and select ISODATA and Change ISODATA minimum class size in pixel to 20



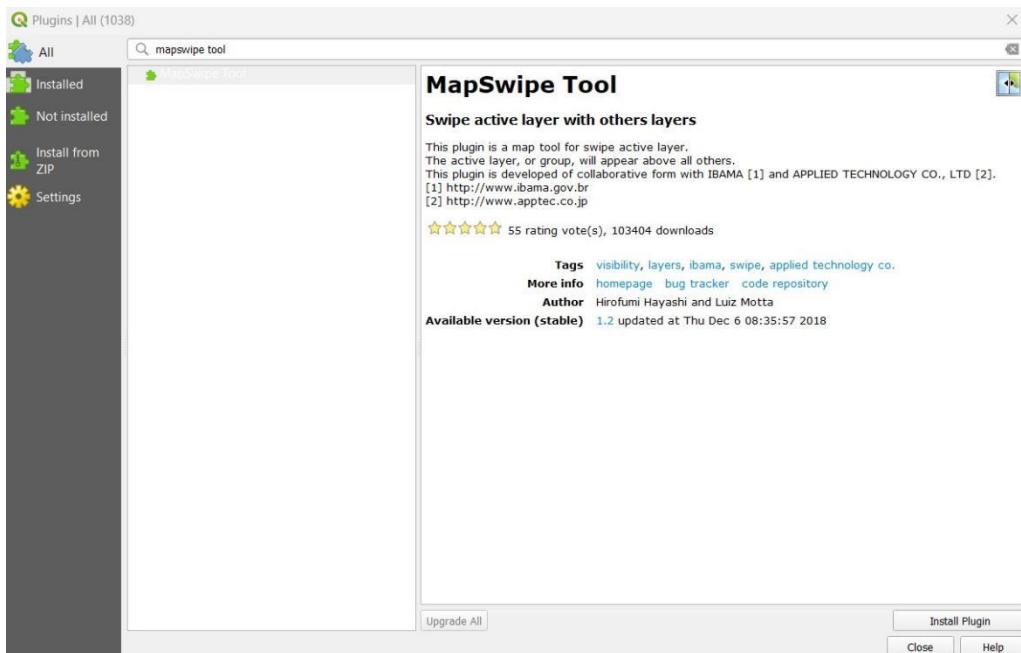
Step 5: Then Run and give output file name and save and wait for the classification iteration.



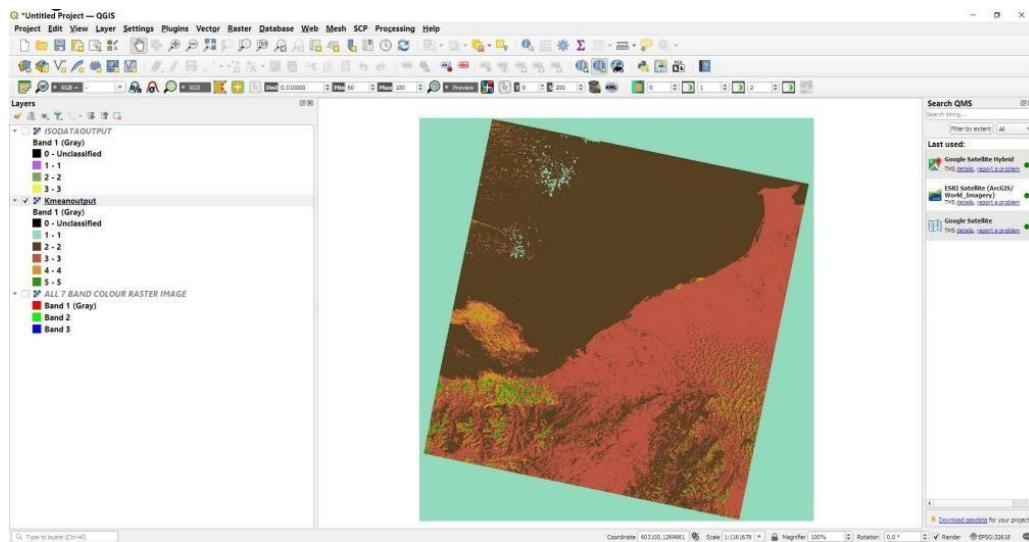
Now both **k-mean** and **ISODATA** has done, here you can see all the bands from **ISODATA** and **k-mean** which are unlabeled not classified color according to geography of the image.



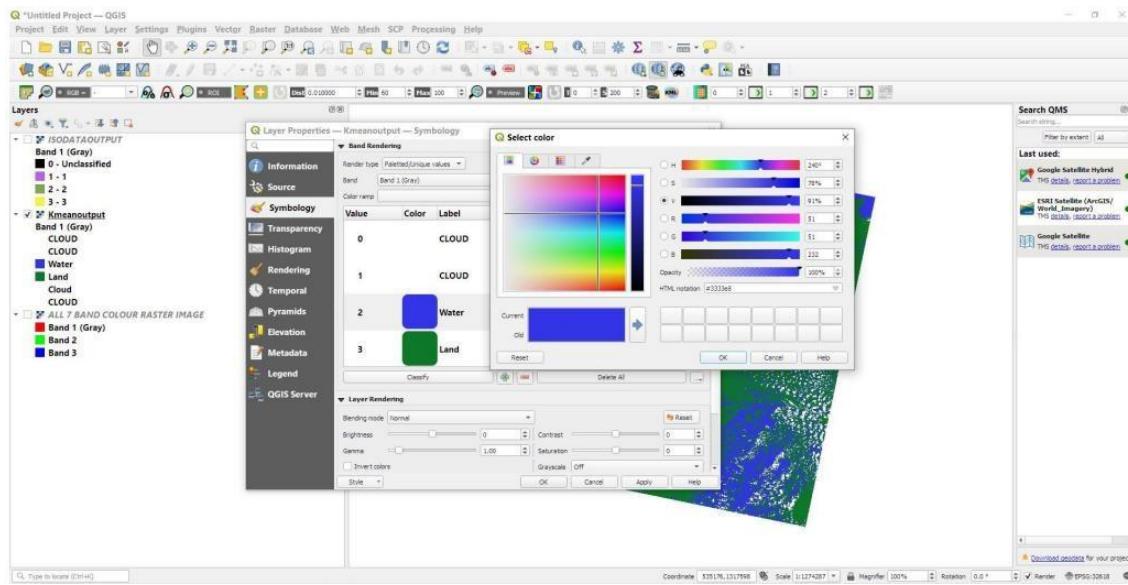
Step 6: Now go to plugin and install **MapSwipe Tool**.



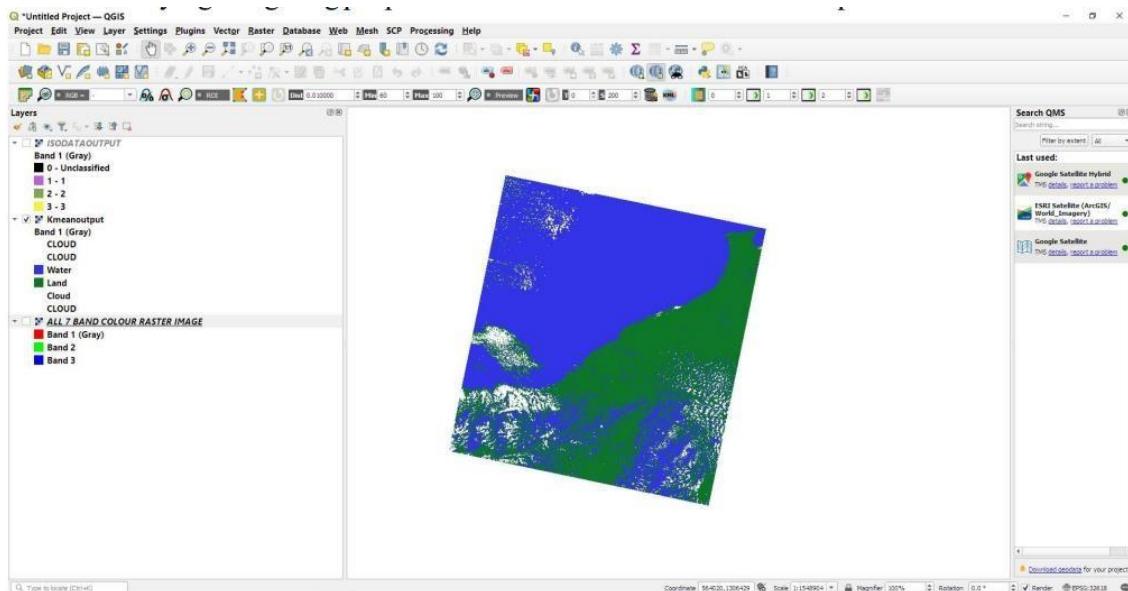
Now we have to change labels and give proper color and names according to image geography. Here, we will select **k-mean** output because it has more band and color to distinguish detail in image.



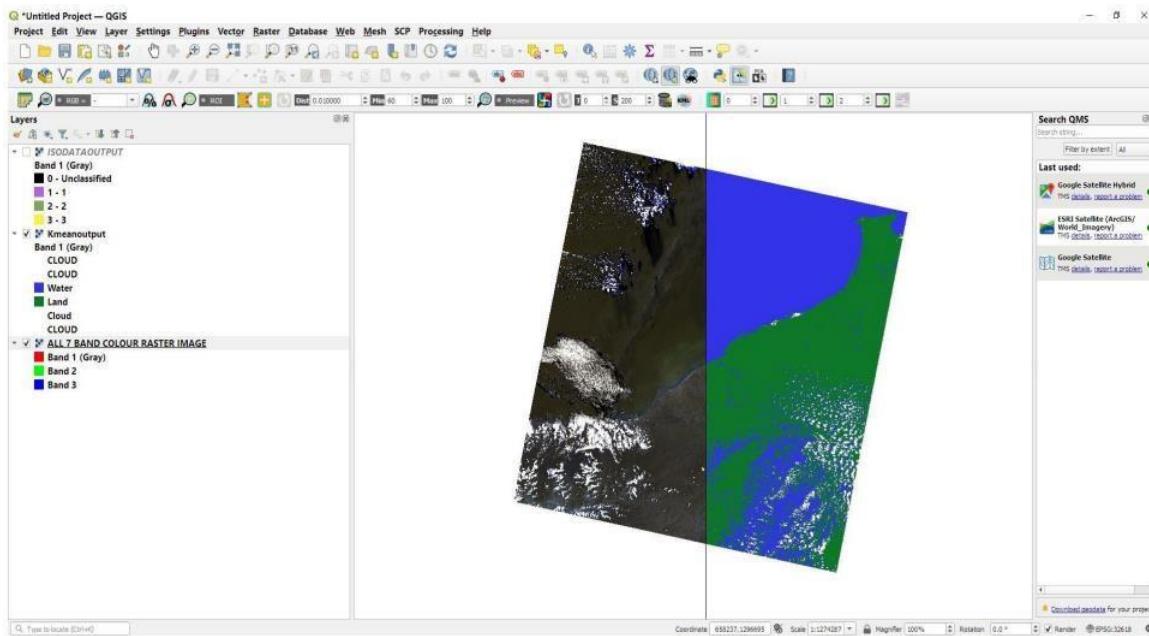
Step 7: To Change color and label just double click the **band color** and also **change labels**



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



Step 8: Using MapSwipe Tool We can see the difference between two images side by side

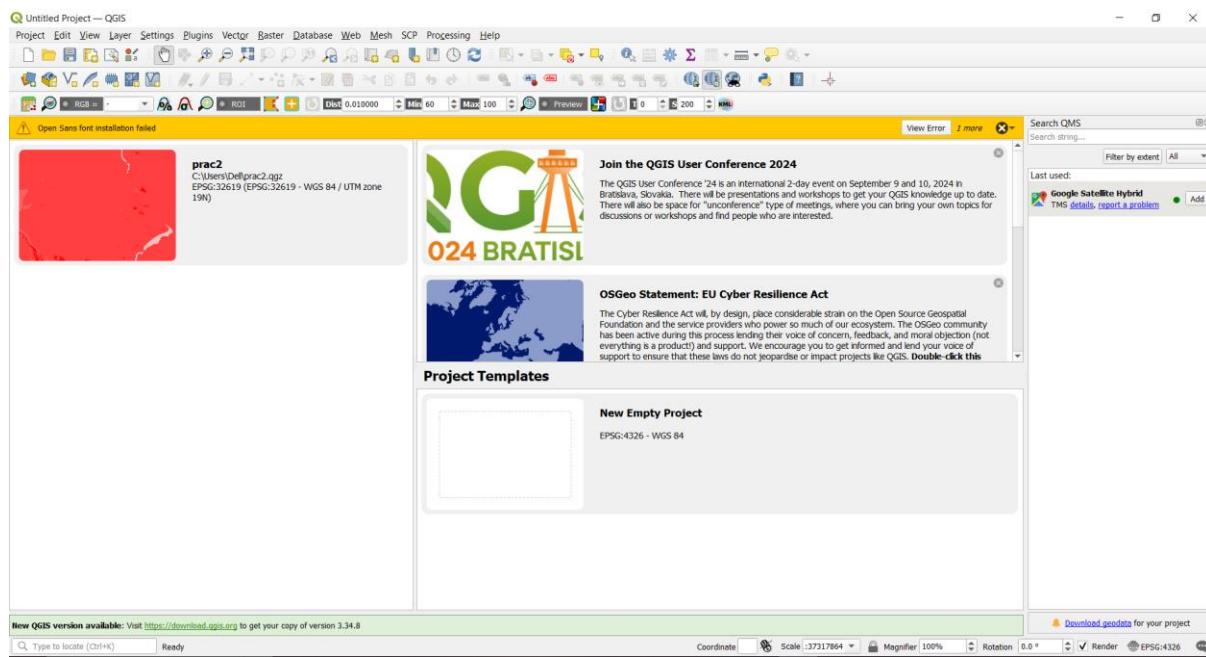


Practical No 7

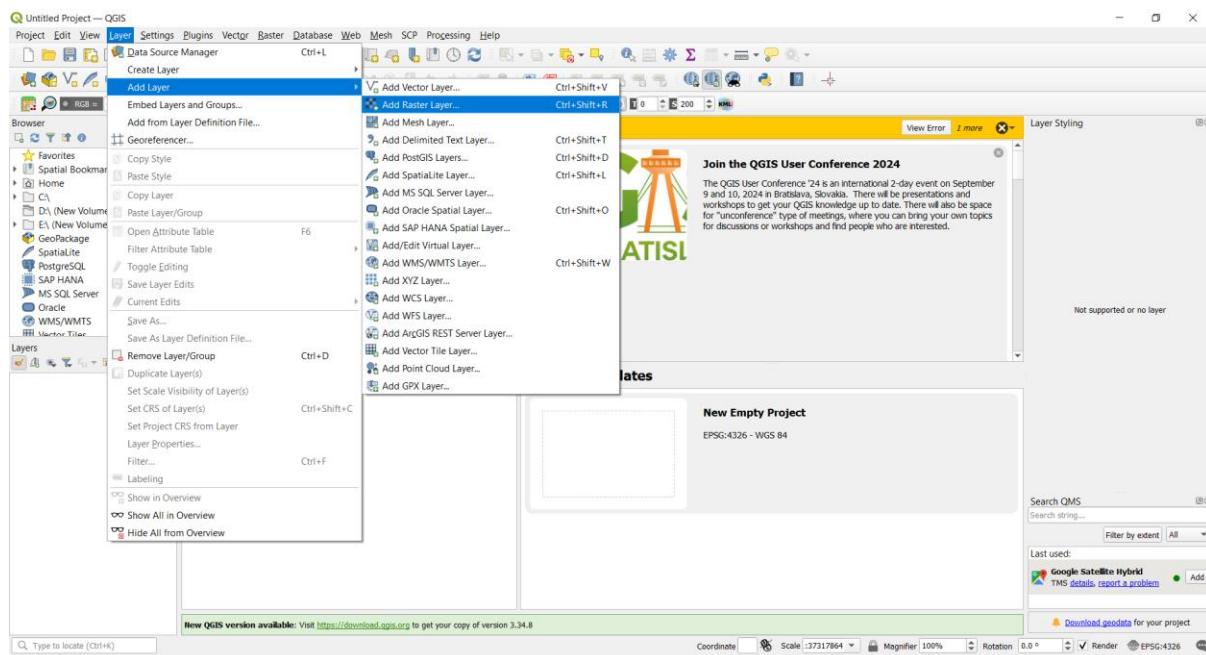
Aim: - Apply principal component analysis on satellite image

Practical No 7

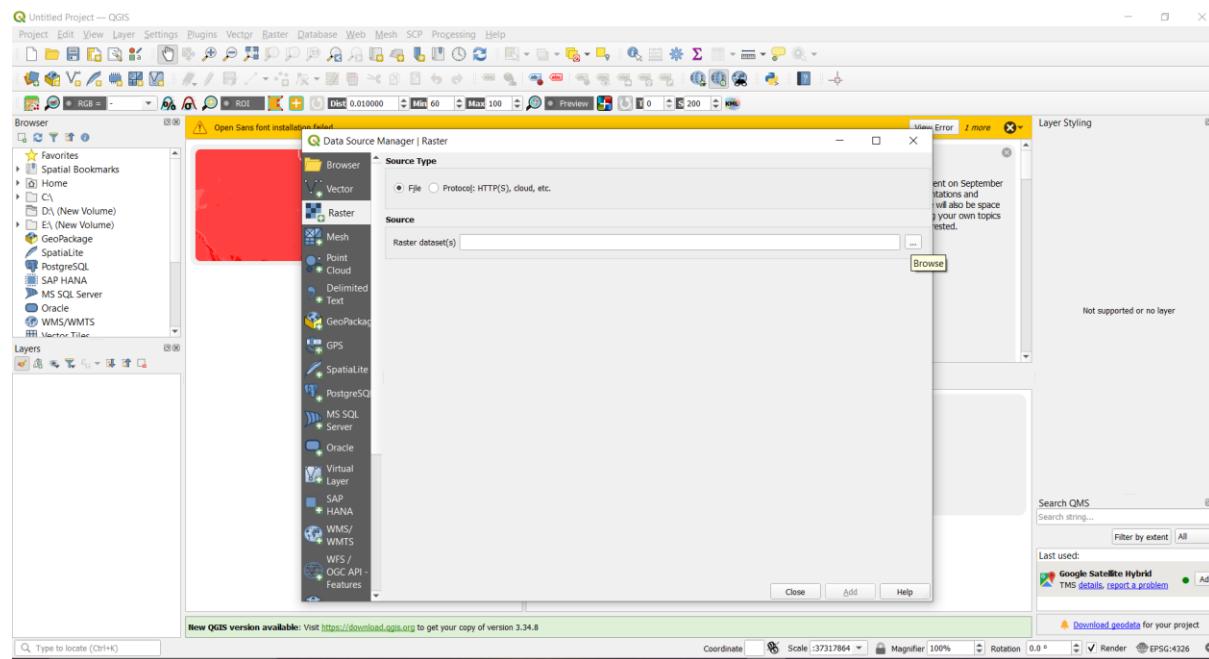
Step 1: Open QGIS



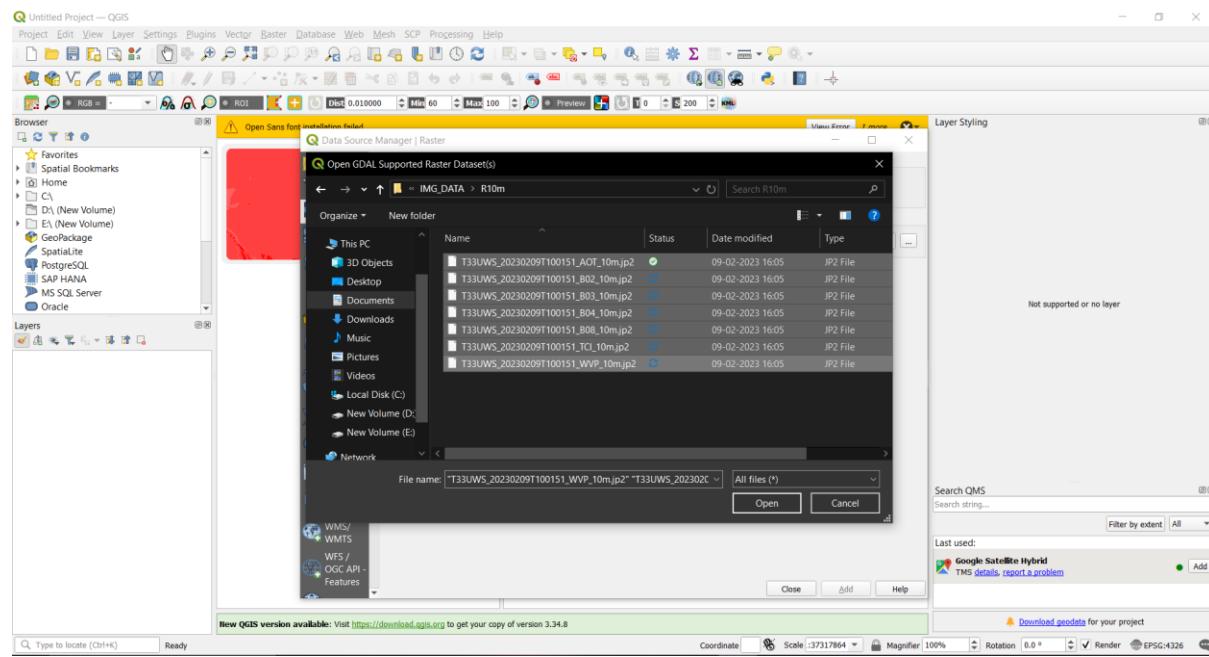
Step 2: Click on and Select Add Layer and then Select Add Raster Layer



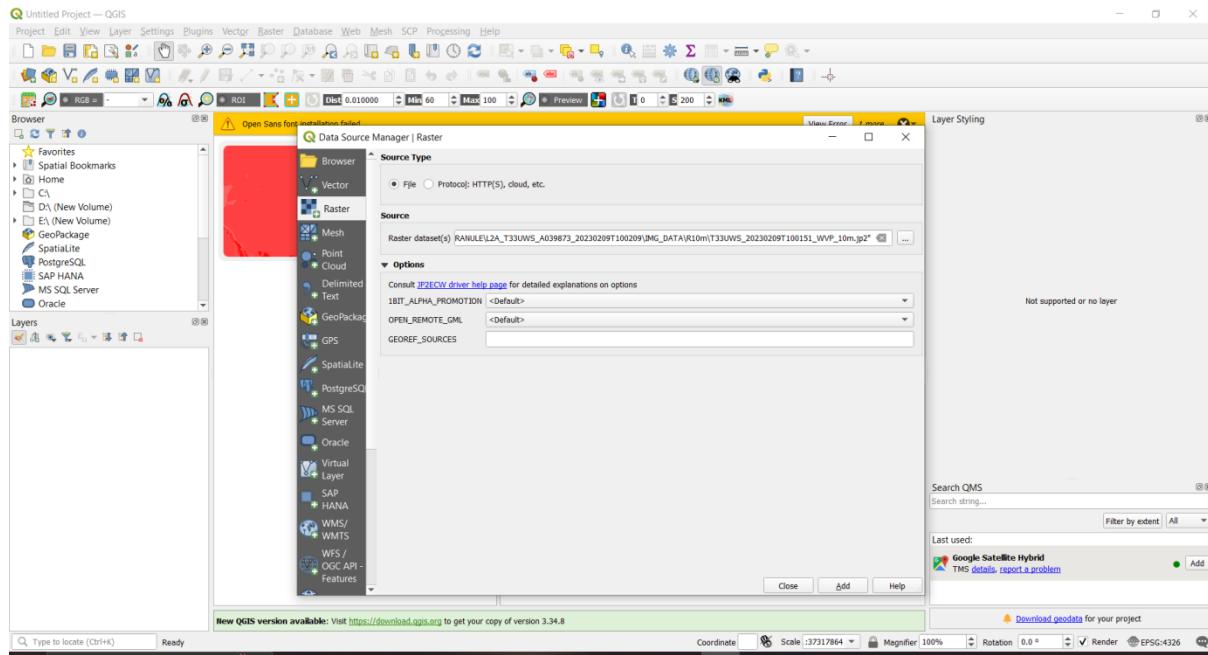
Step 3: Select Source Type File and then Click on Browse



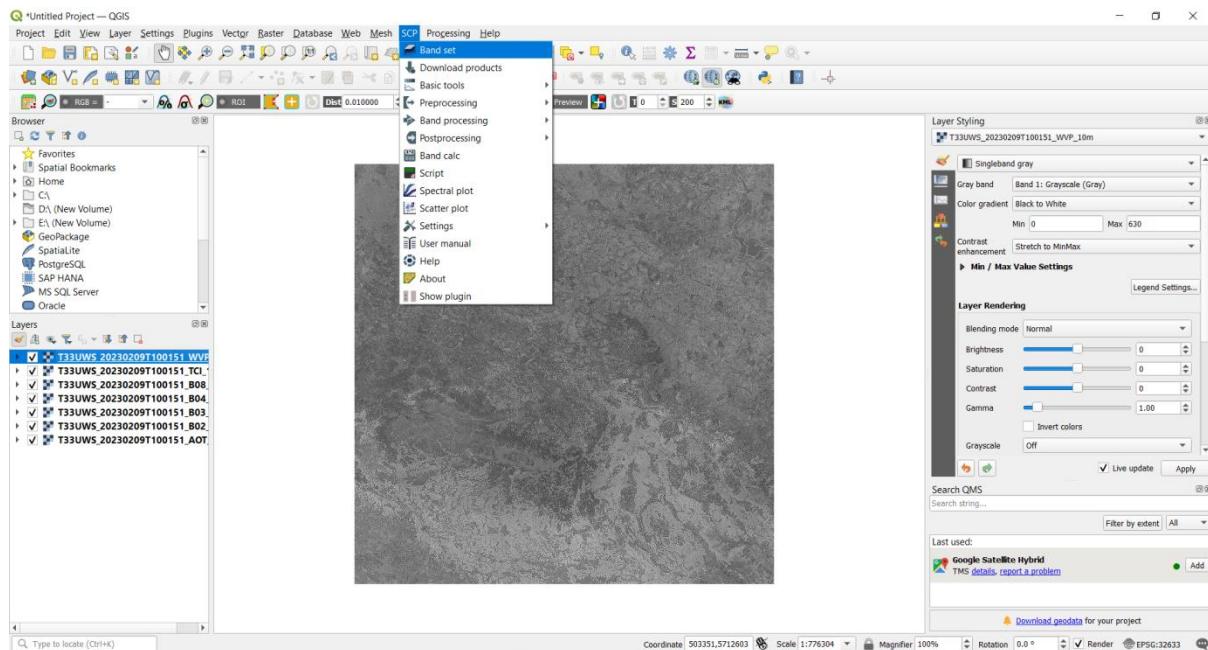
Step 4: Select jp2 images and then Click on Open



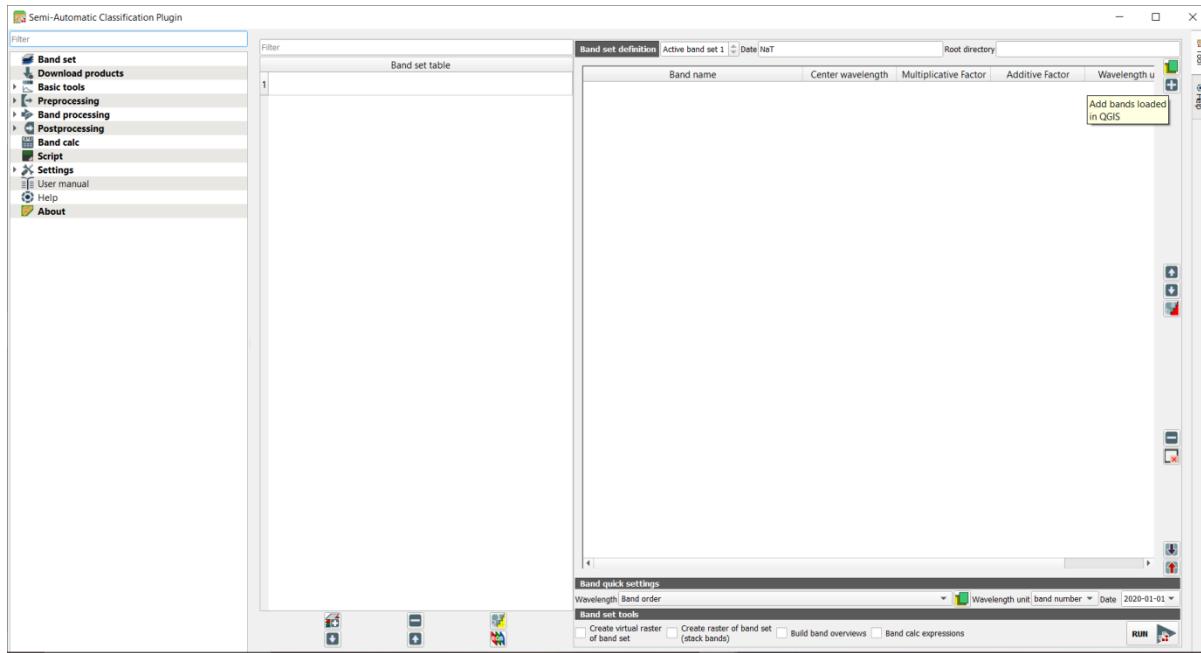
- Click on Add



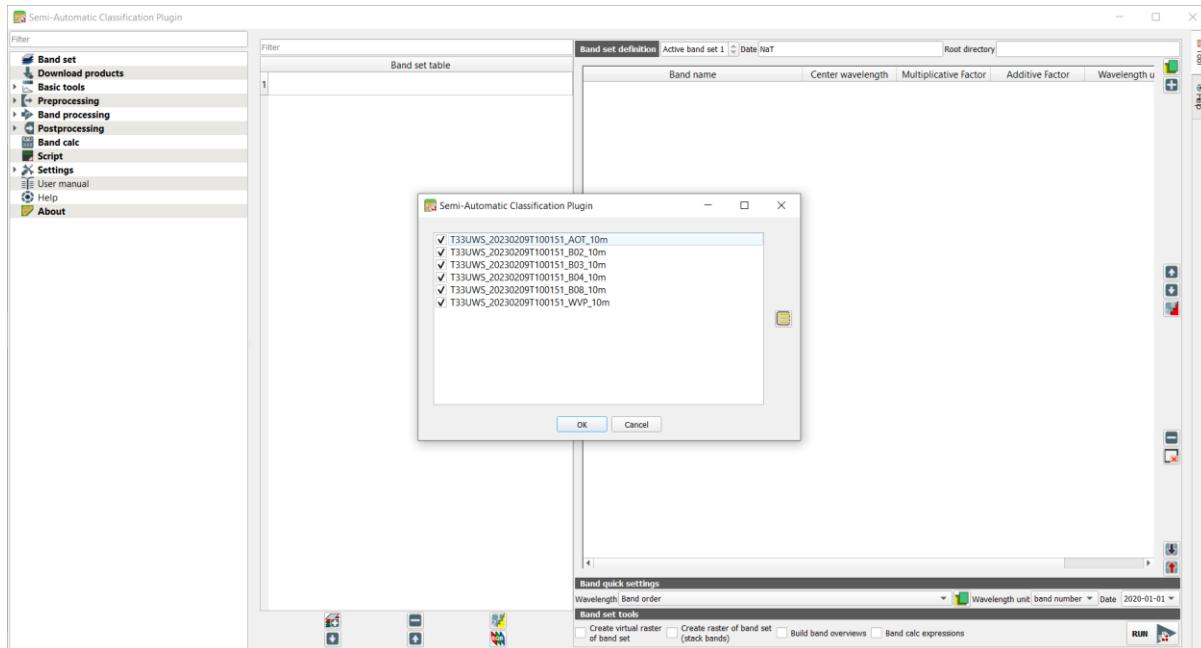
Step 5: Click on SCP and Select Band set



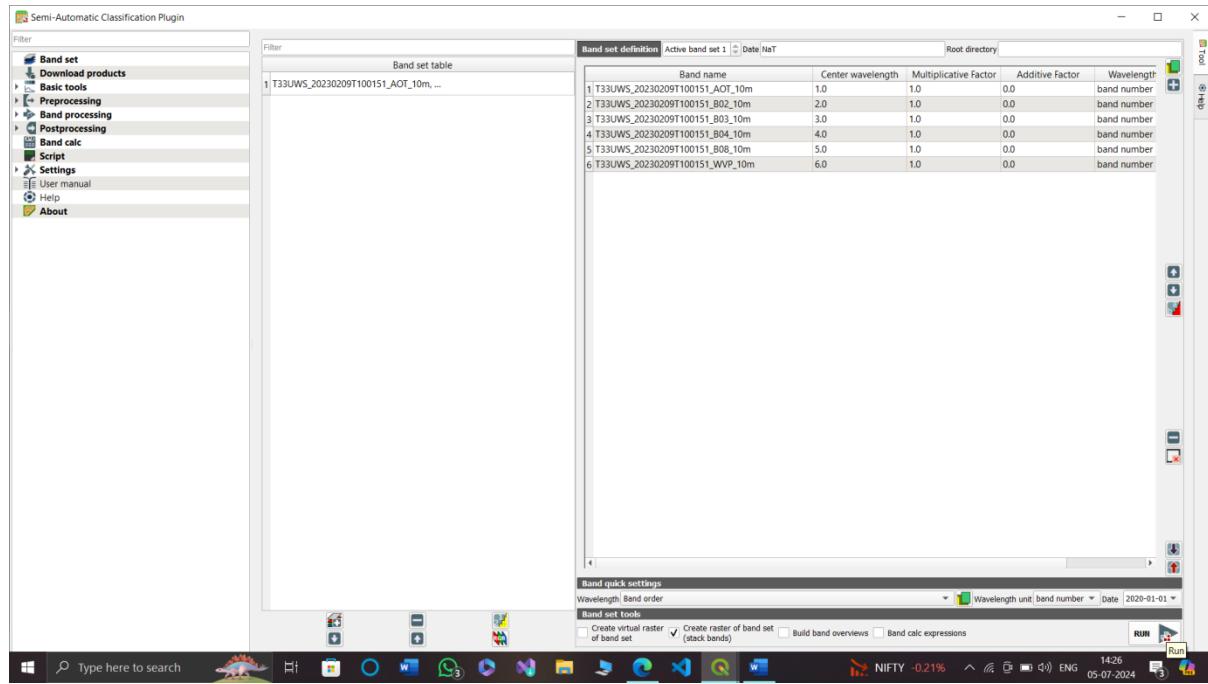
- Click on Add bands loaded in QGIS



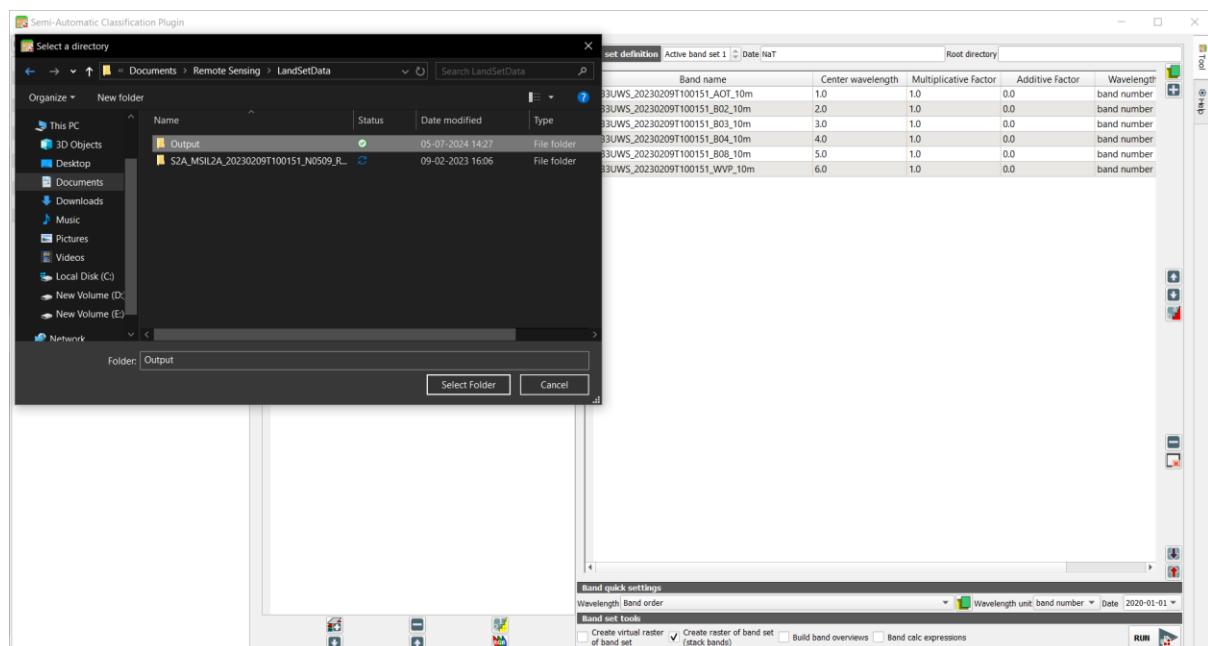
- Select all images and then Click on OK

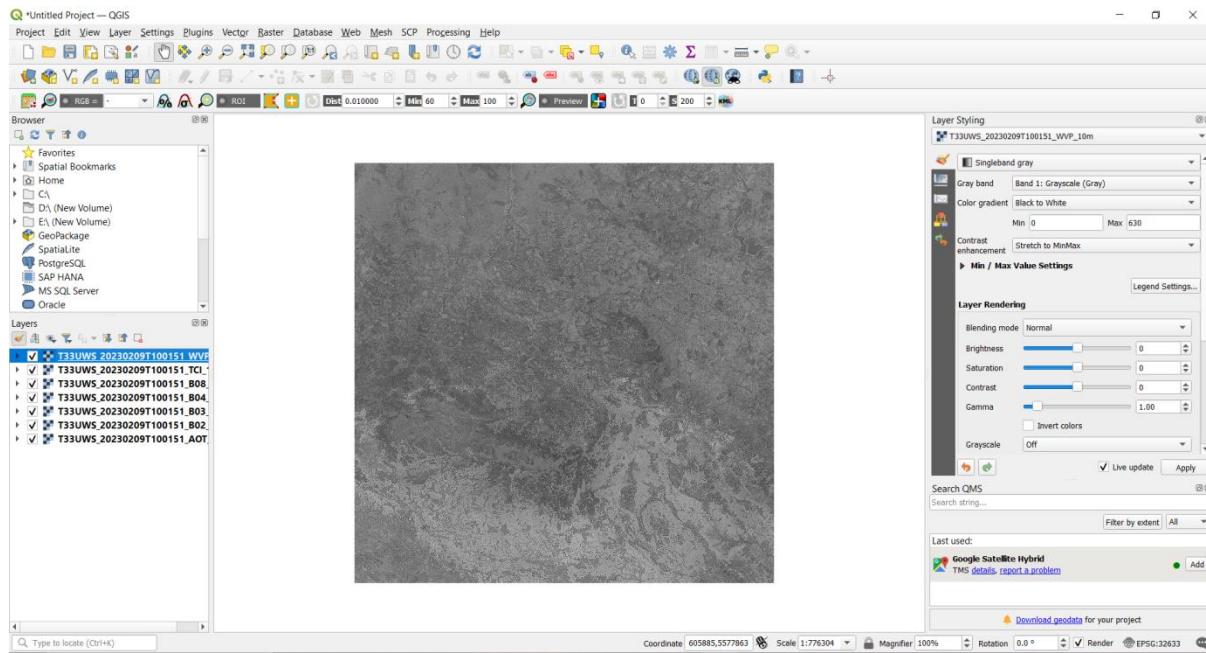


- Check Create raster of band set (stack bands) and Click on Run

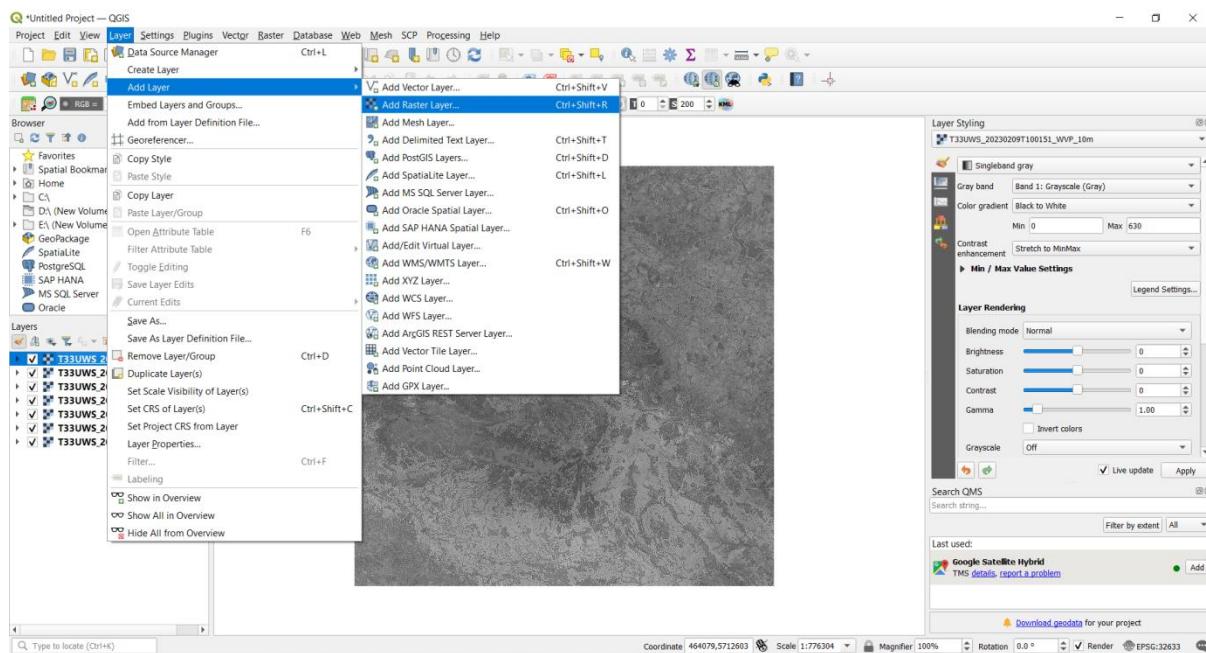


- After Click on Run Pop-up Open and Select a directory Under Select a directory Create New Folder and Give Name Output and then Click on Select Folder

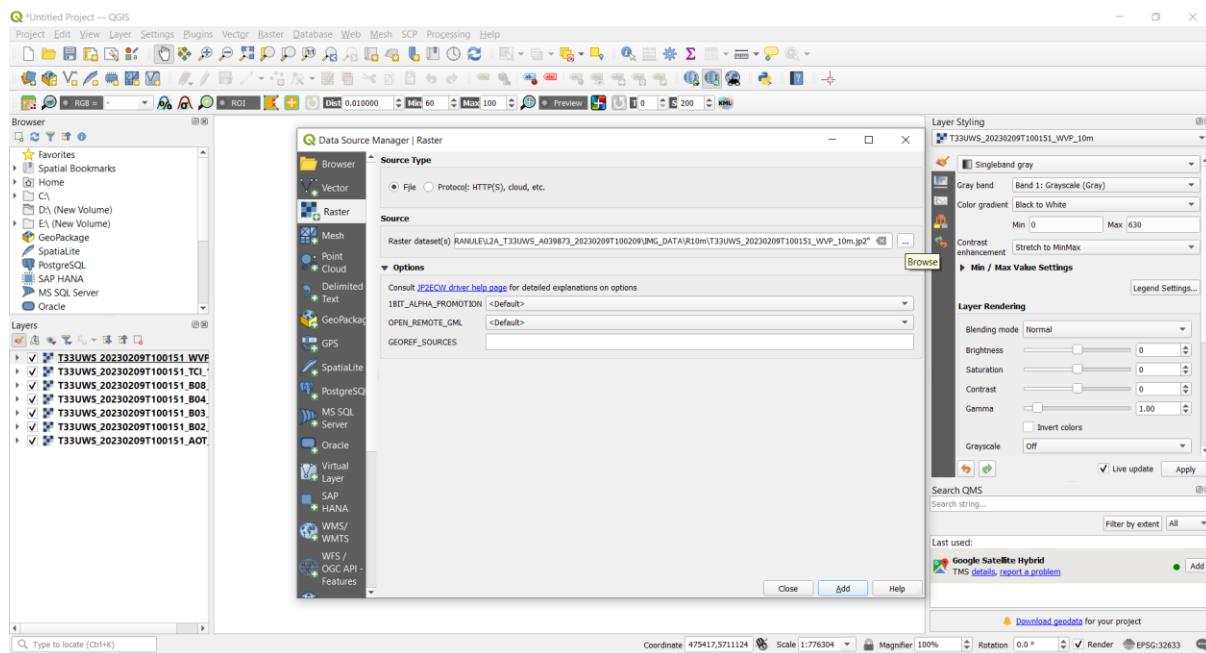




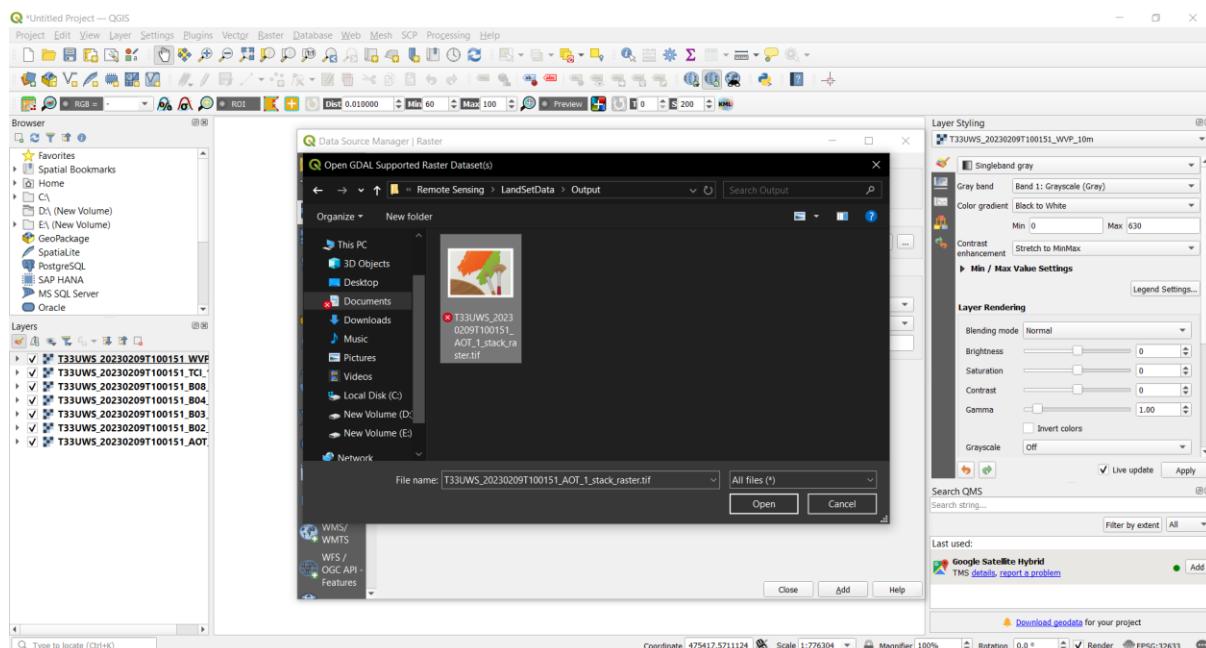
Step 6: Go to the Add Layer and then Select Raster Layer



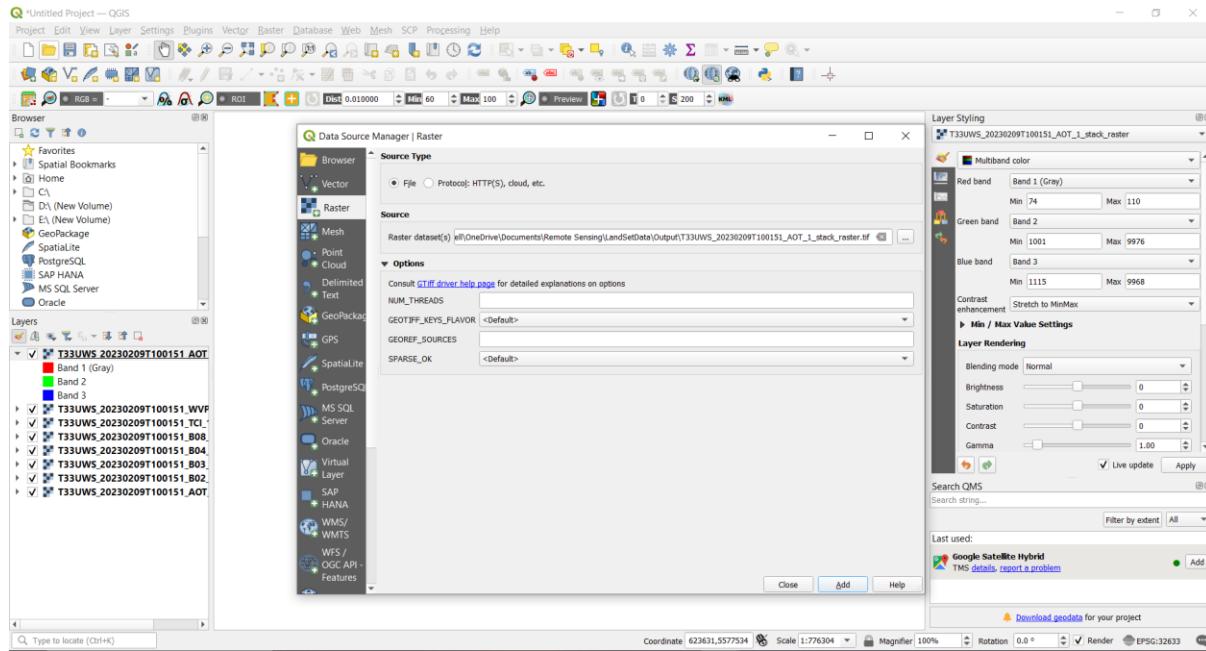
- Click on Browse



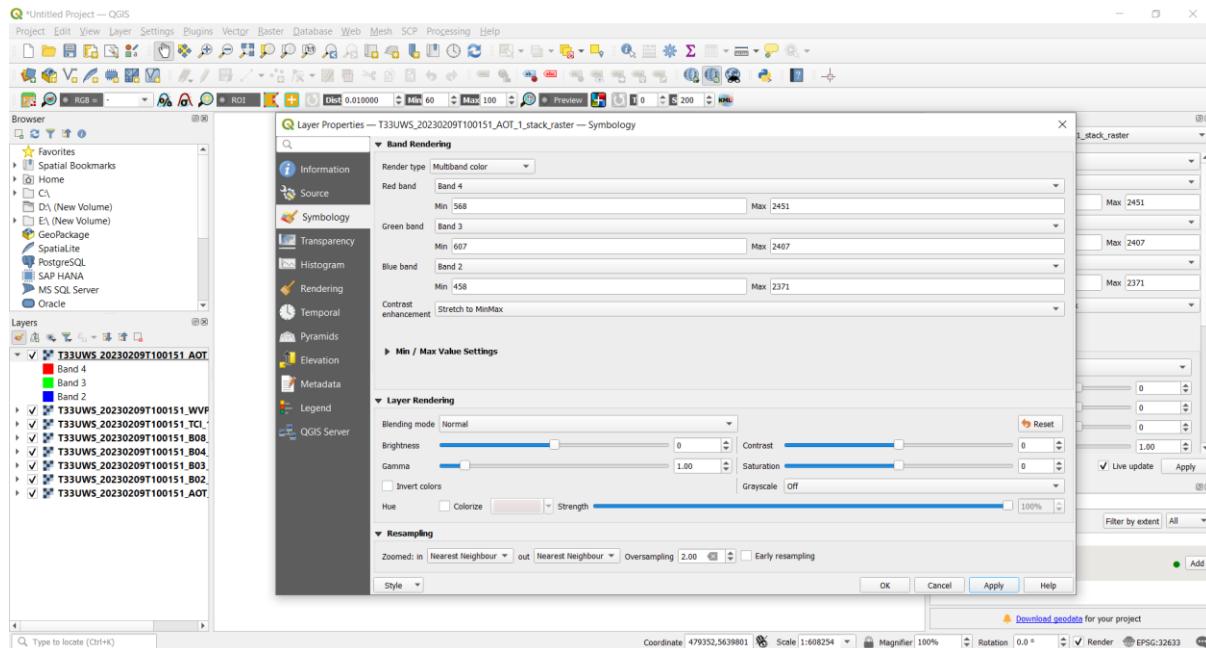
- Select **T33UWS_20230209T100151_AOT_1_stack_raster.tif** and then Click on Open

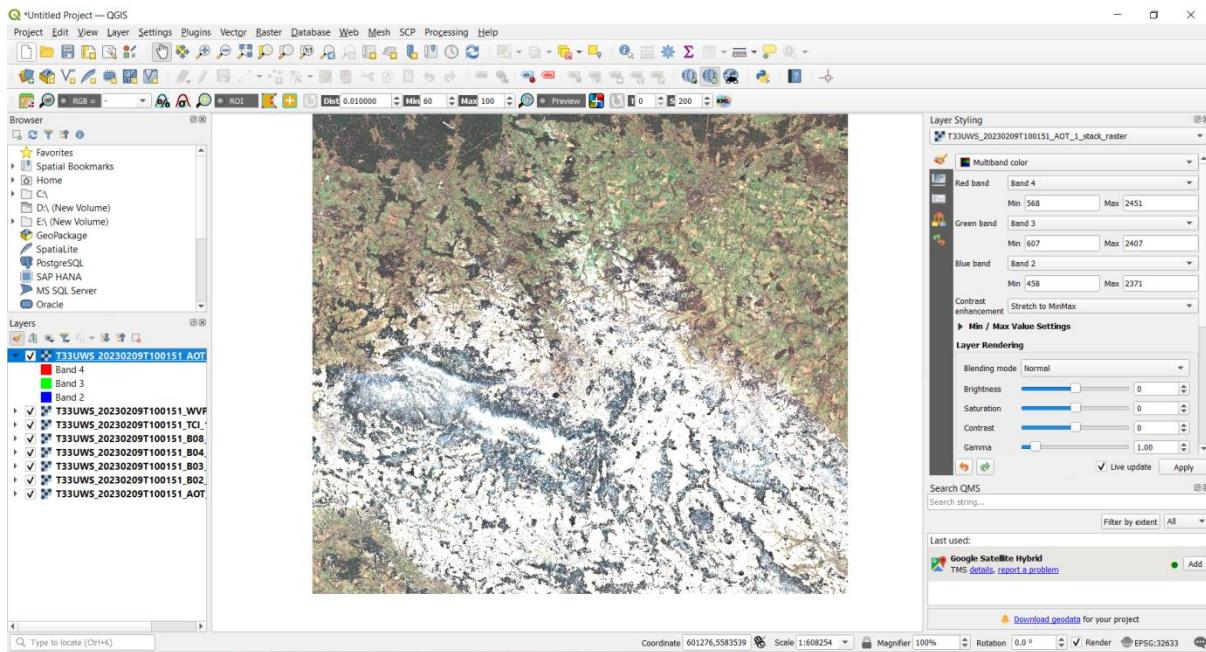


- Click on Add

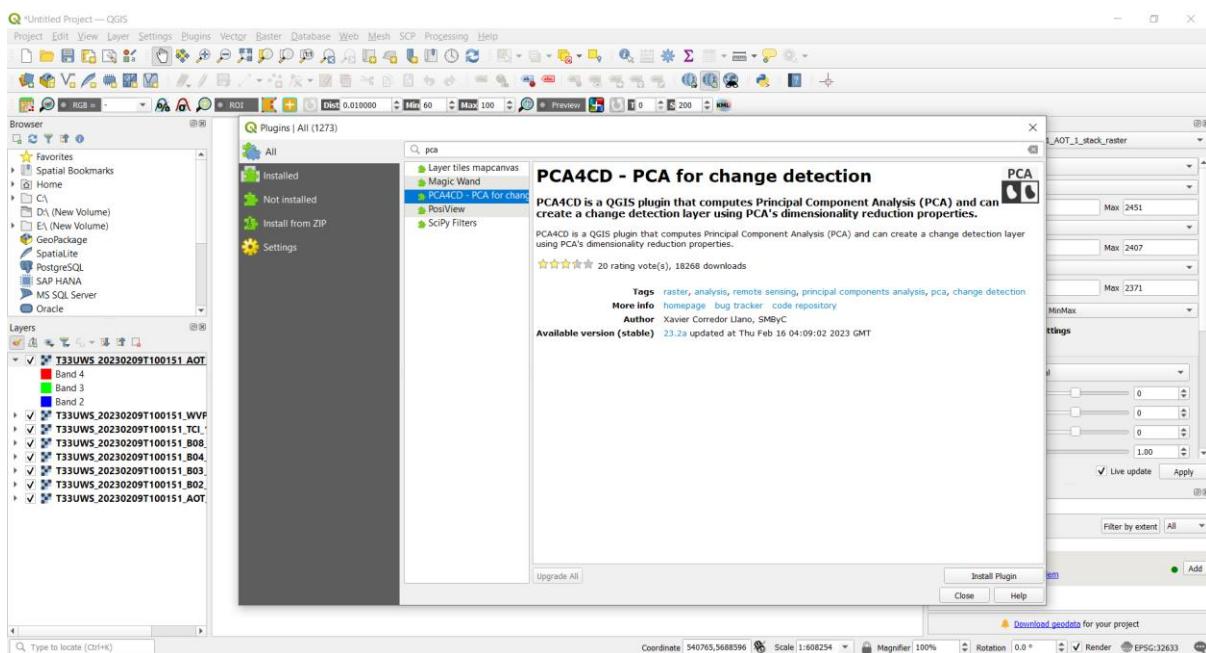


- After adding the raster image go to **layer properties > Symbology** and change render type to **Multiband color** and Select **RED BAND** to Band 4, **GREEN BAND** to Band 3, **BLUE BAND** to Band 2.

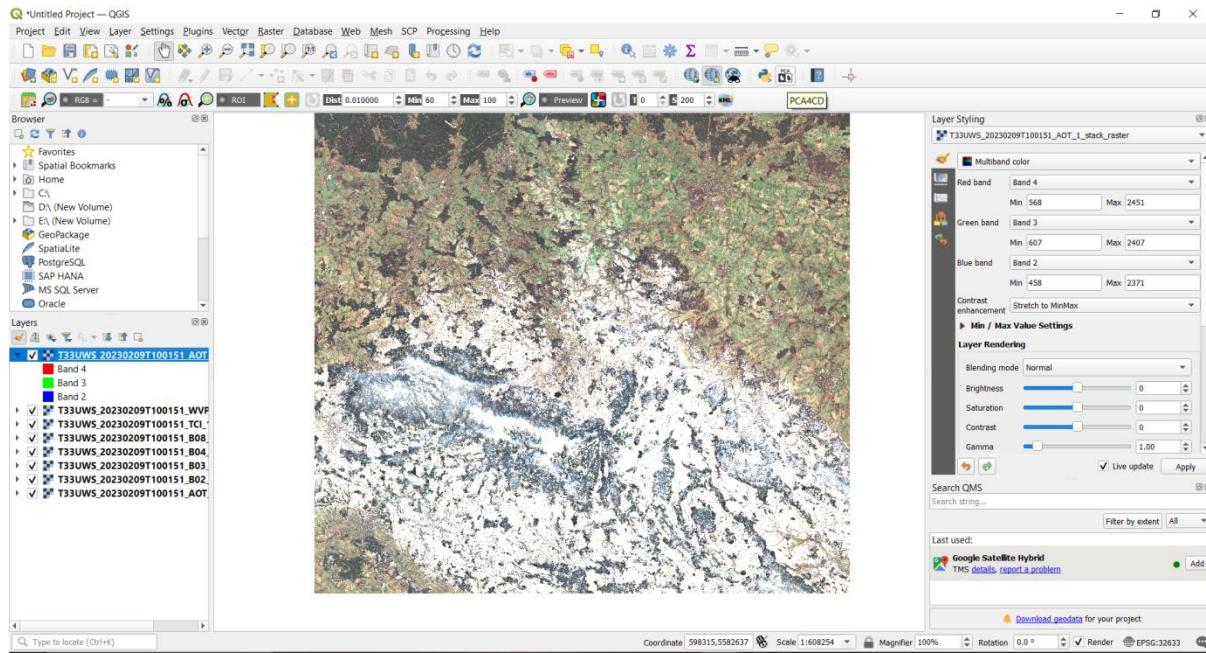




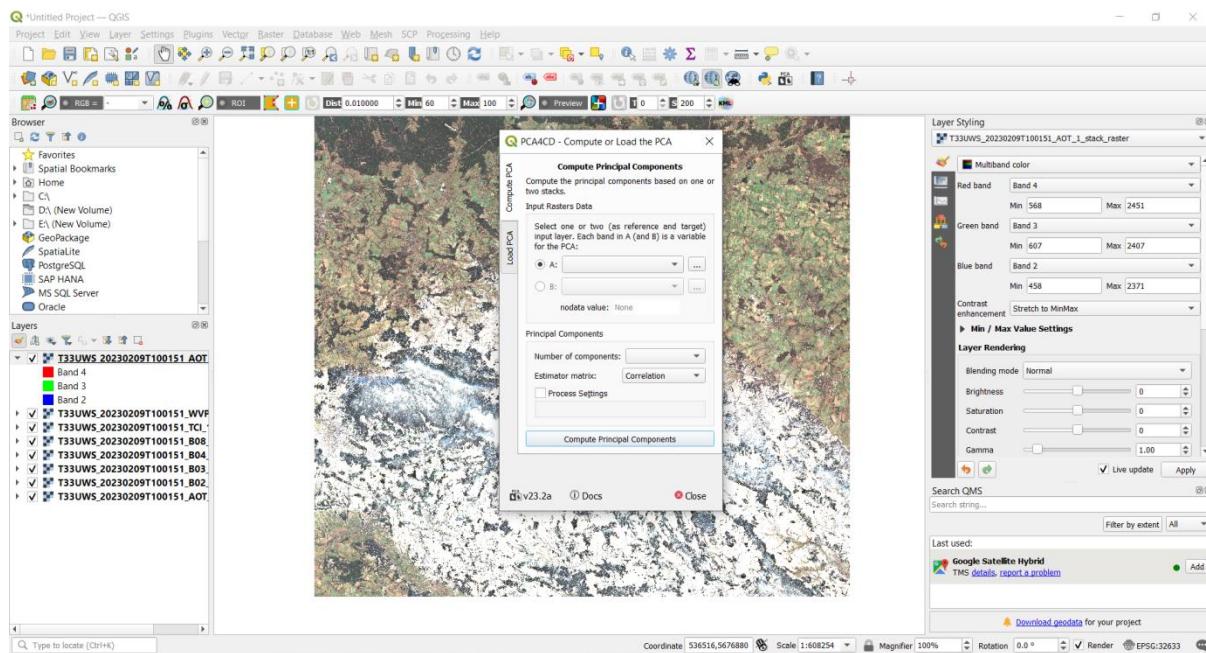
Step 7: Now install plugin PCA4CD -PCA for change detection.



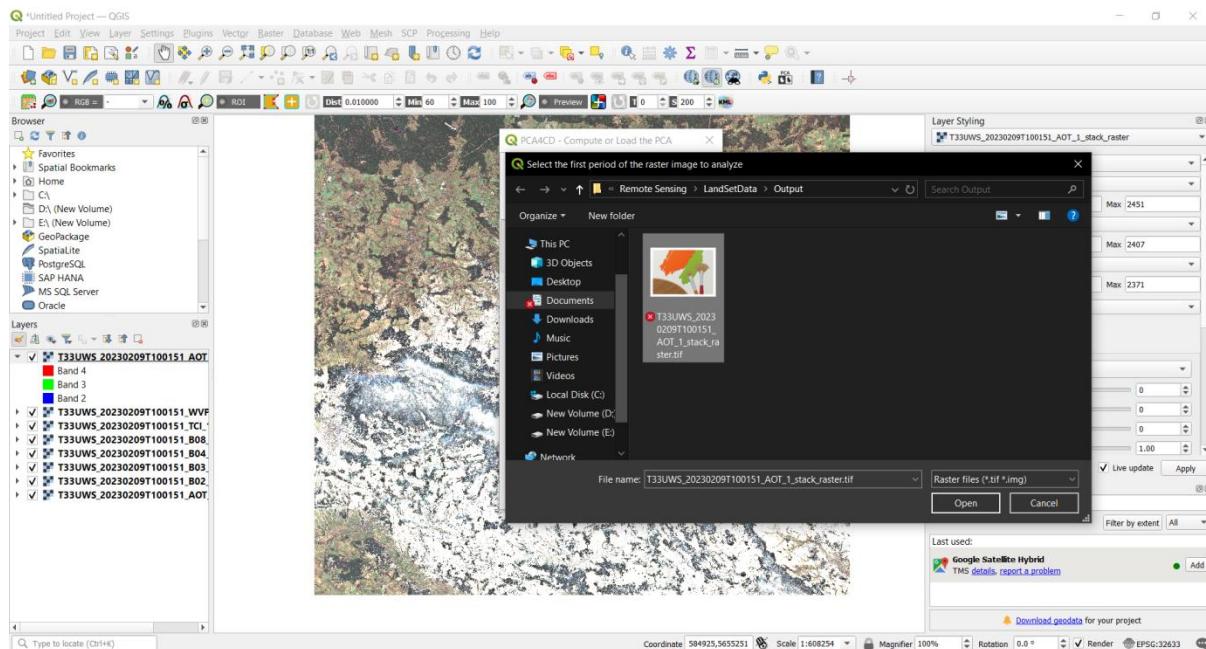
- Click on PCA4CD



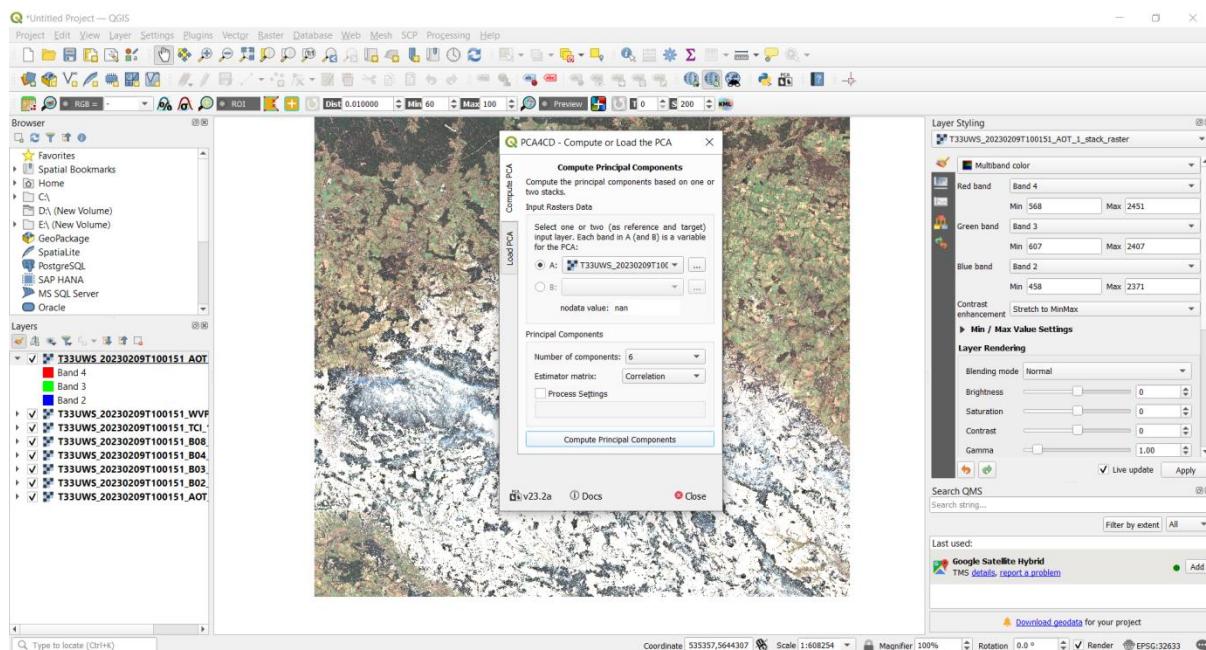
- Under PCA4CD-Compute or Load the PCA Select Variable A and Click on Browse



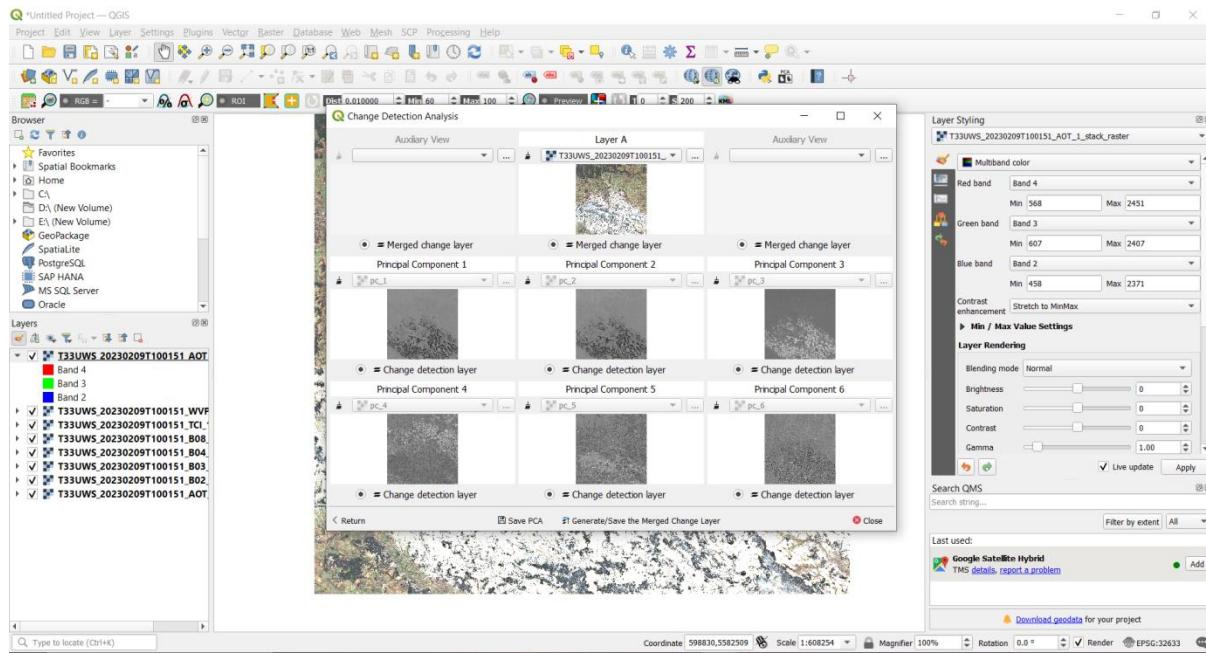
- Select T33UWS_20230209T100151_AOT_1_stack_raster.tif and then Click on Open



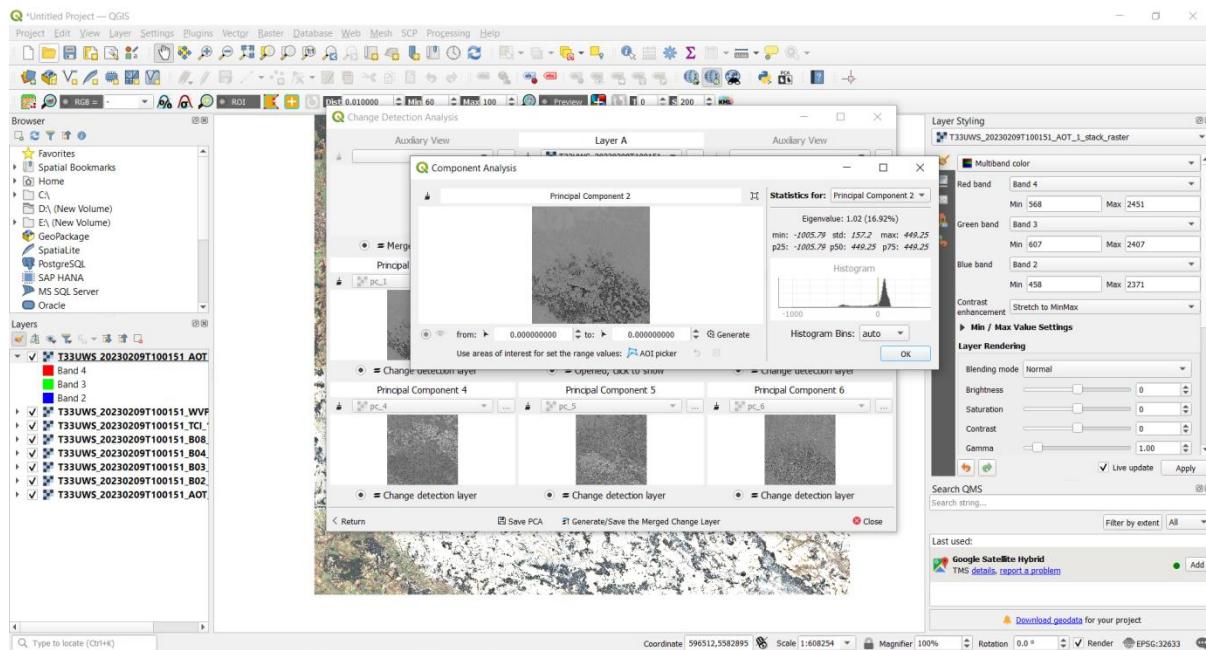
- Click on Compute Principal Components



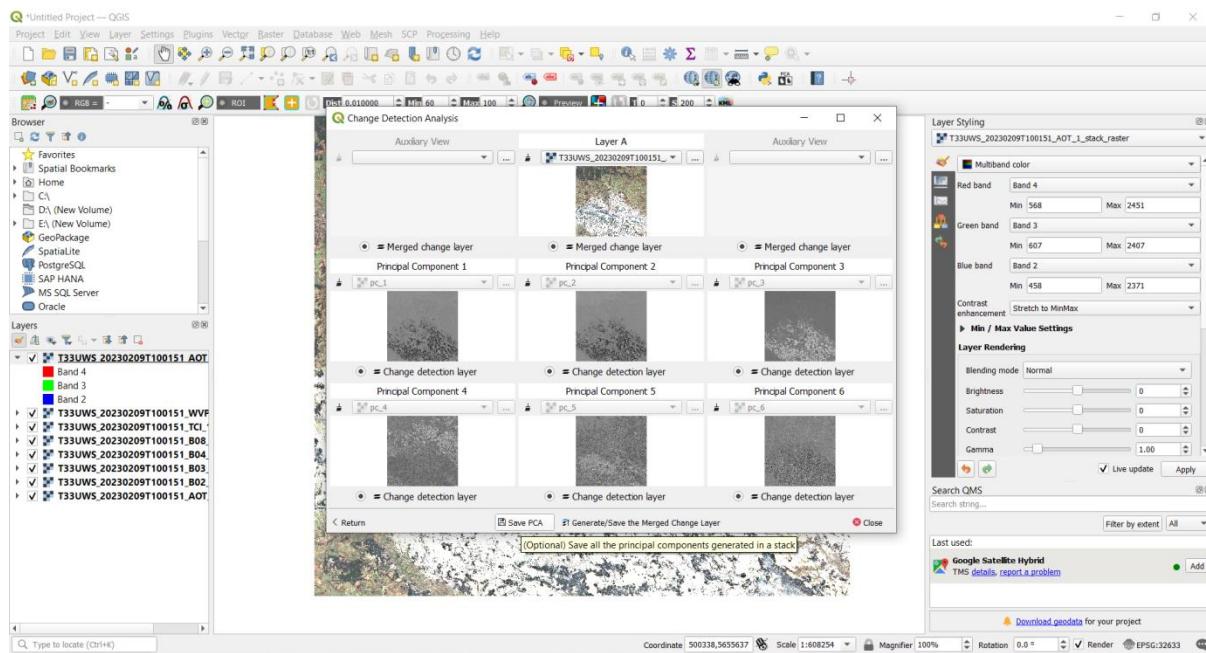
- After Computing we will get 7 separate images



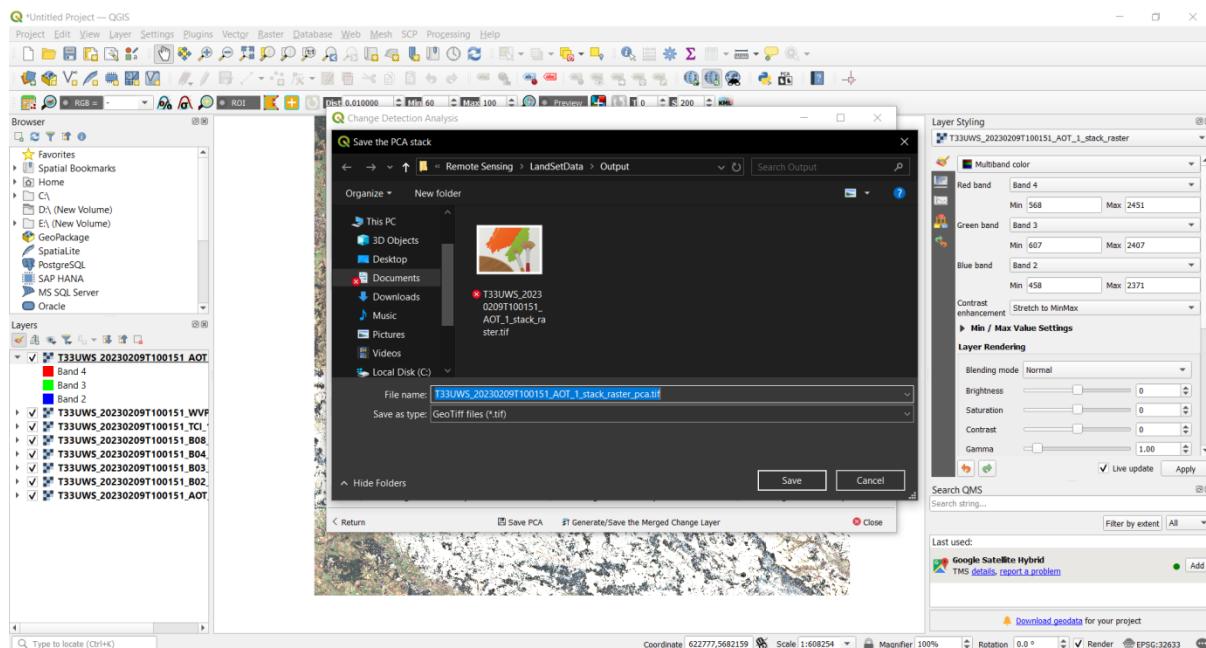
- here you can Click on Change detection layer and view the component analysis along with histogram details of particular image



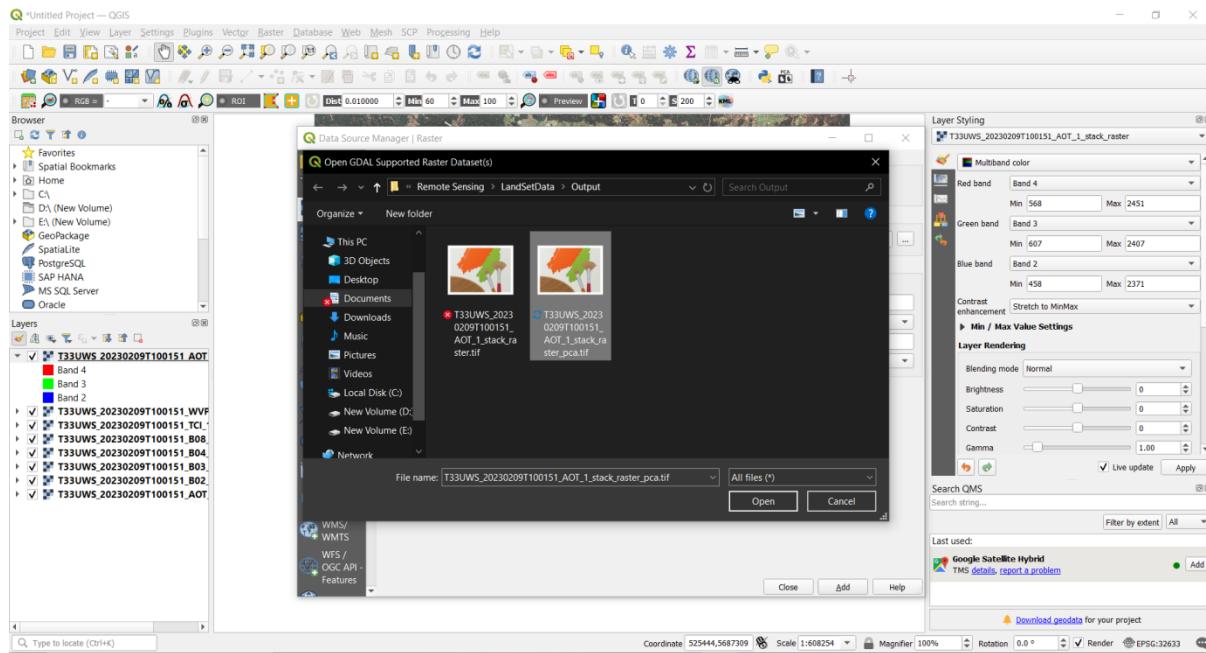
- Click on Save PCA File



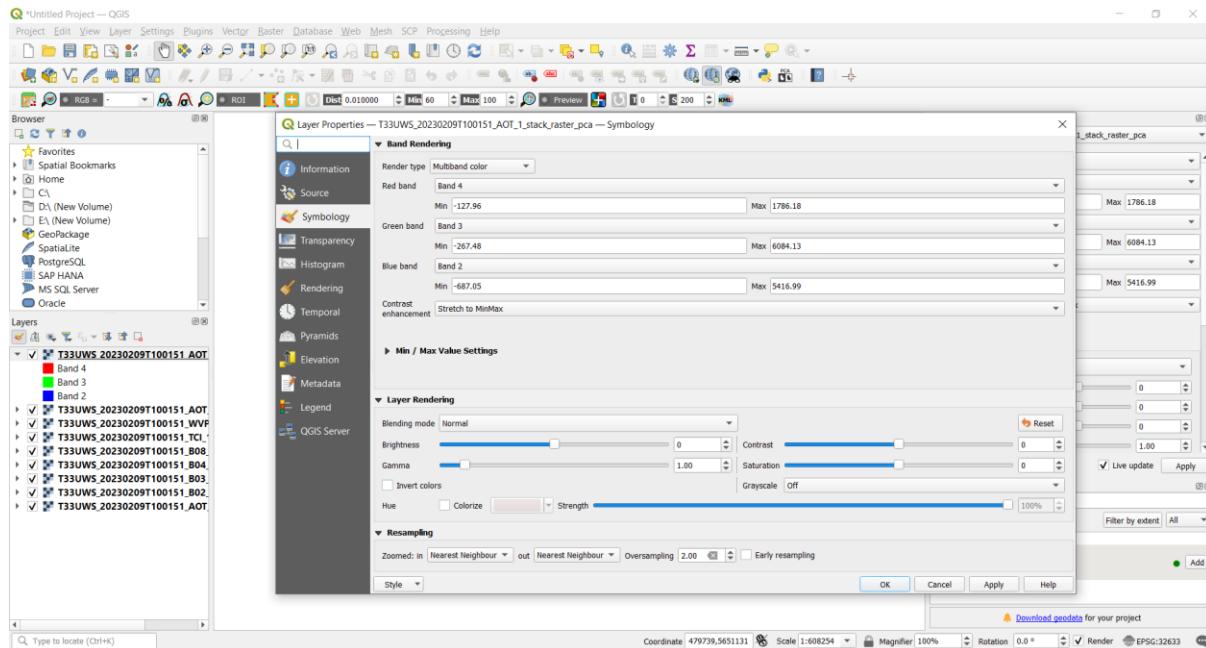
- Click on Save



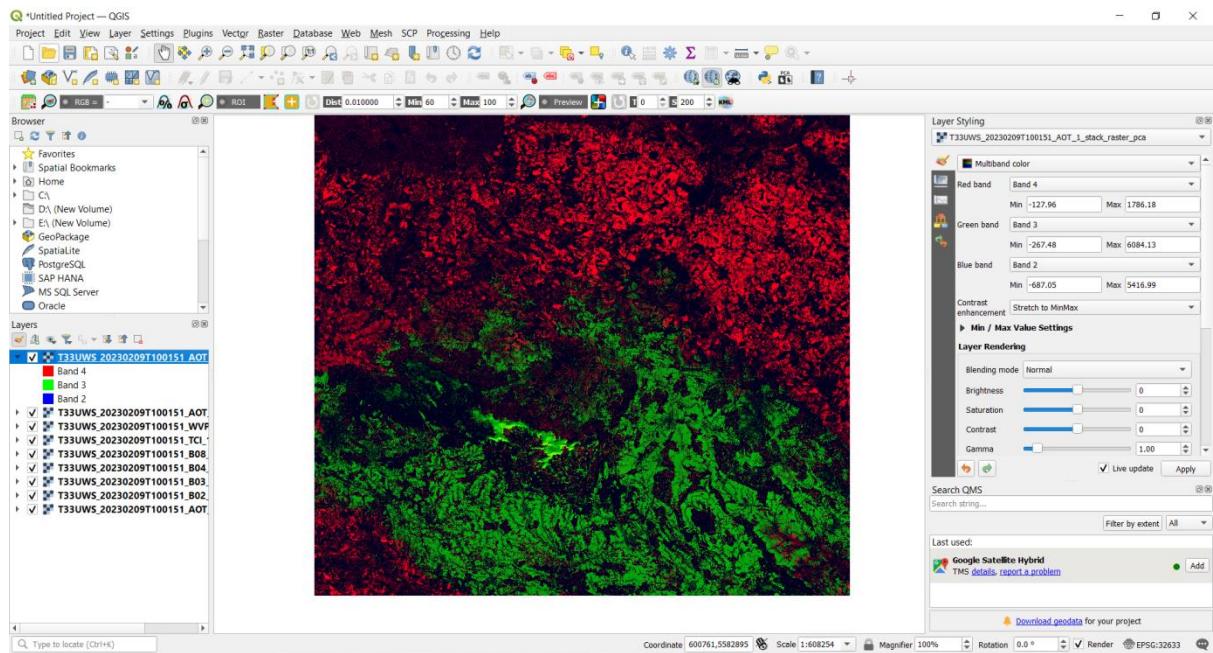
- Again go to Layer > Add layer > Add raster layer, then in raster dataset(s) and this select saved pca file and click on add.



- 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.

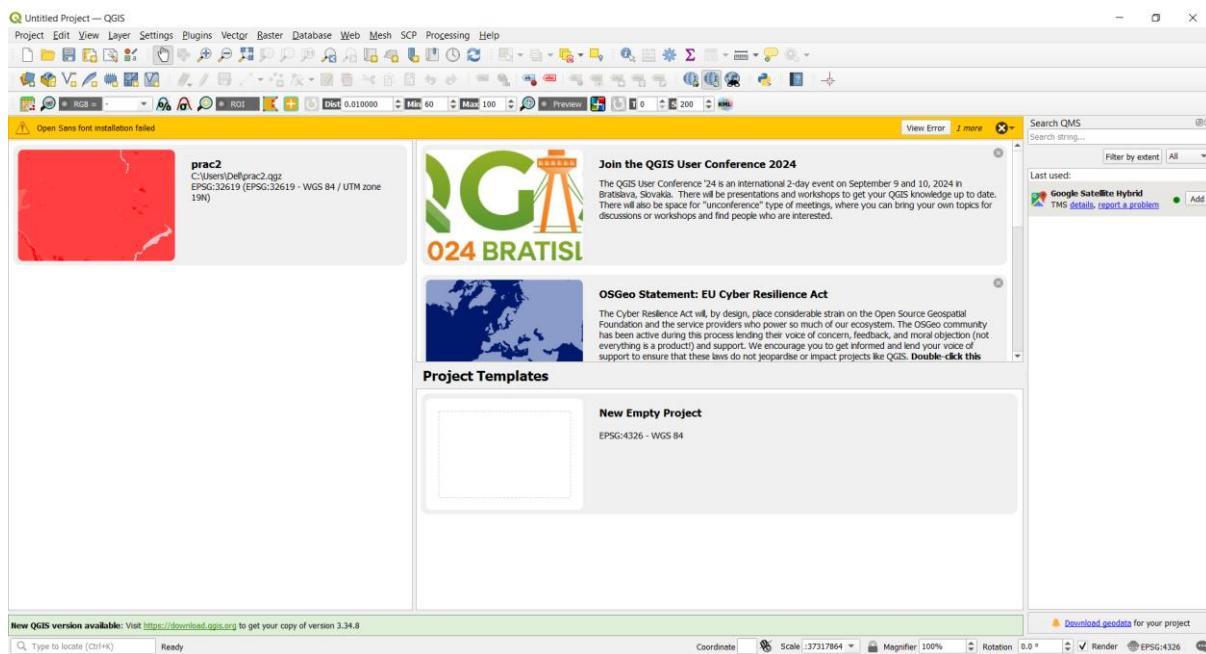


Practical No 8

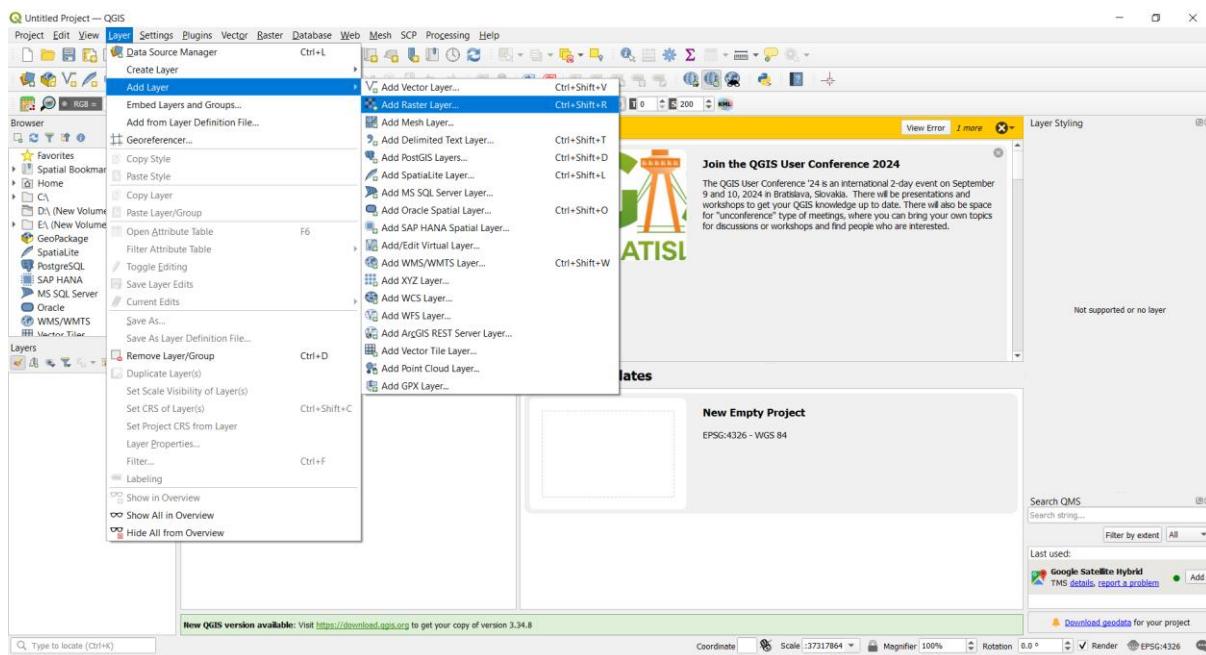
Aim: - Apply Raster analysis on satellite images

Practical No 8

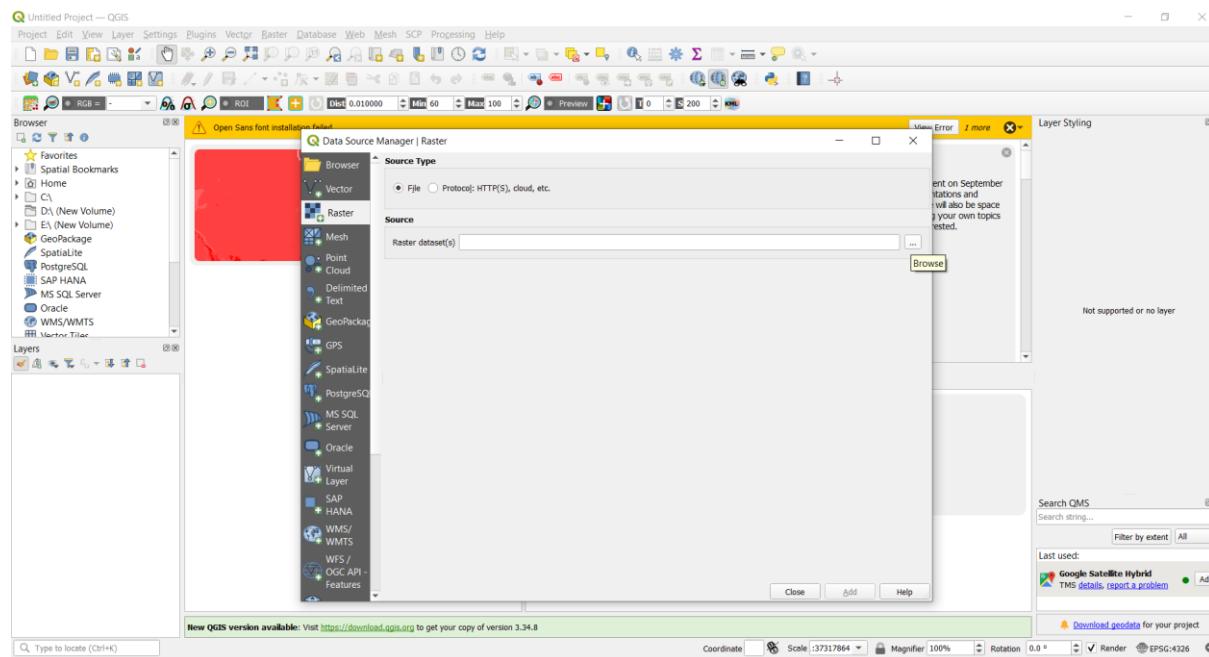
Step 1: Open QGIS



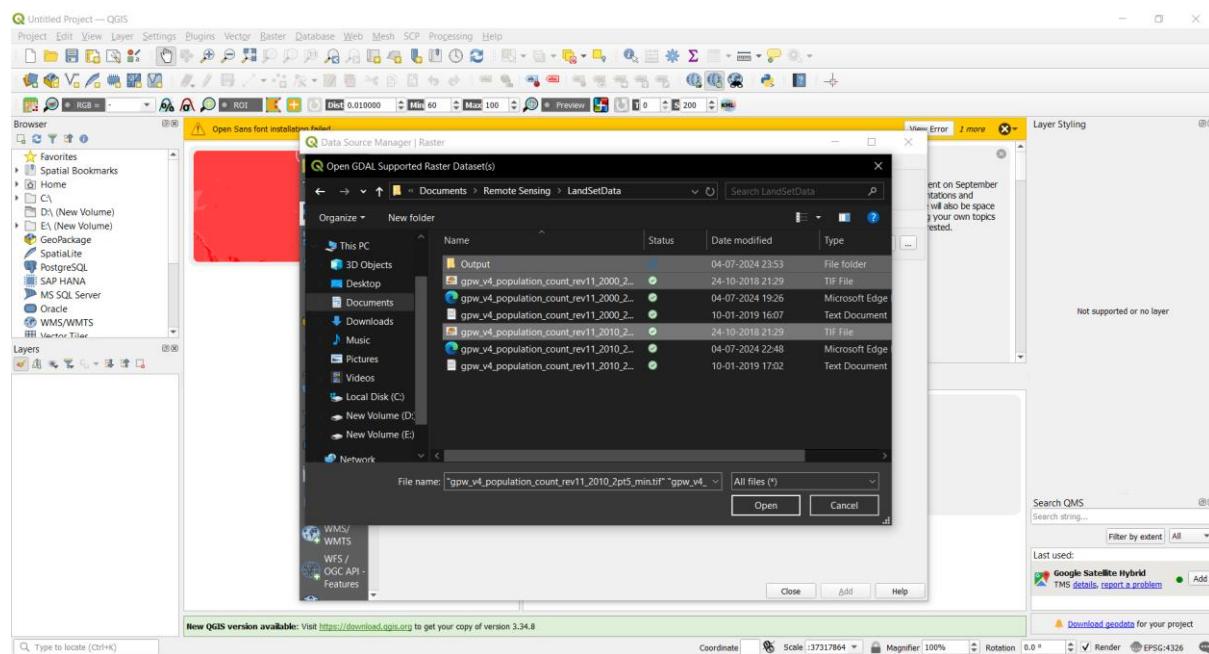
Step 2: Click on and Select Add Layer and then Select Add Raster Layer



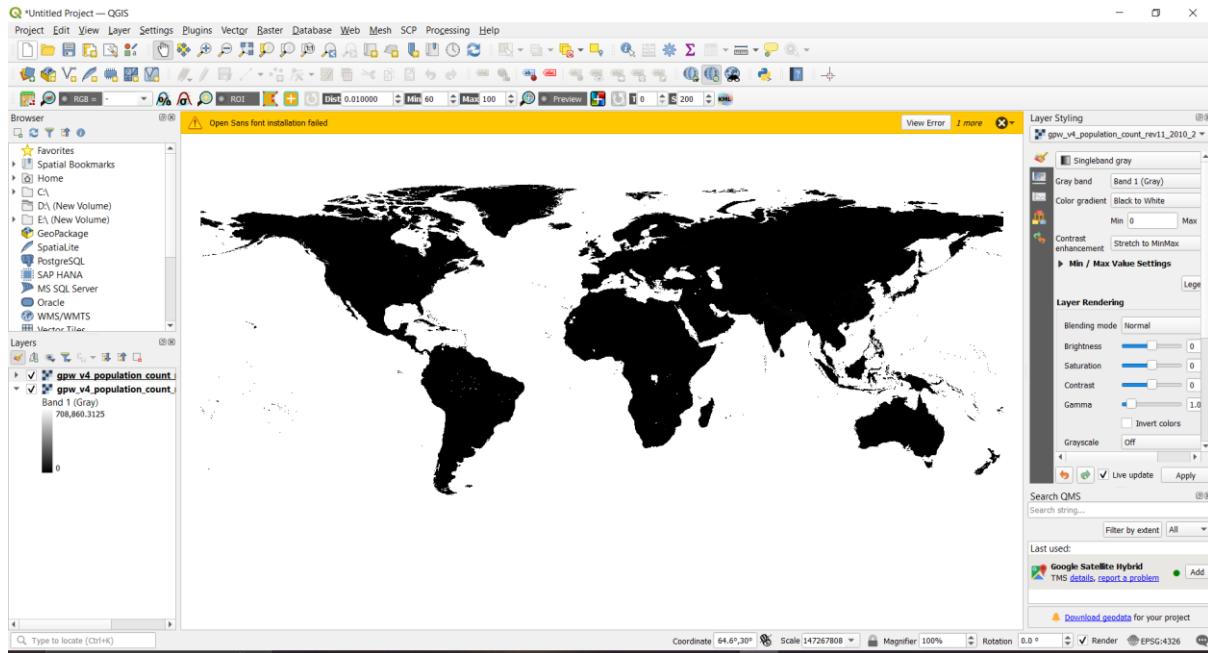
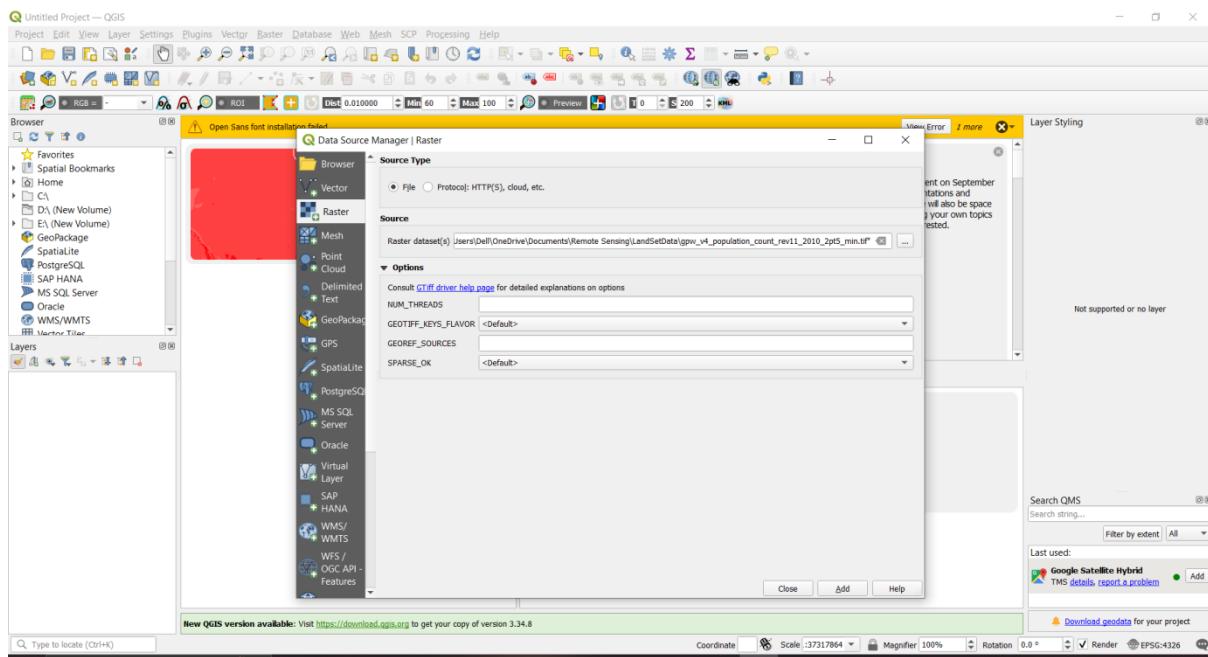
Step 3: Select Source Type File and then Click on Browse



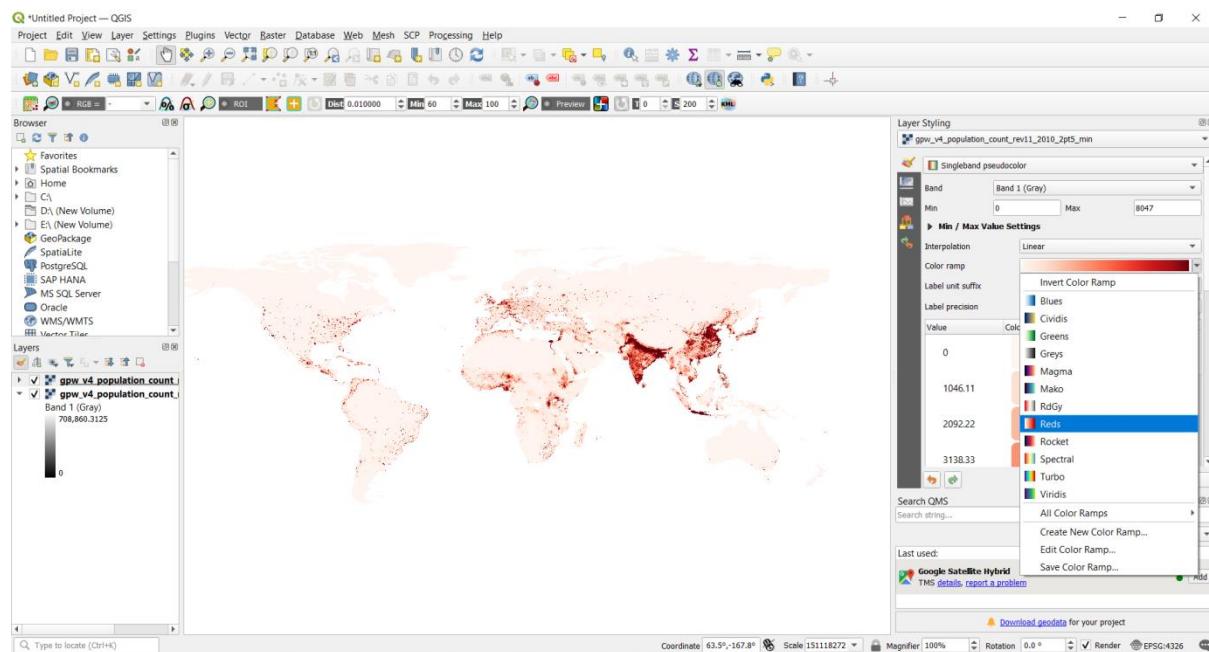
Step 4: Select 2000 MIN TIFF File and Select 2010 MIN TIFF File and then Click on OK



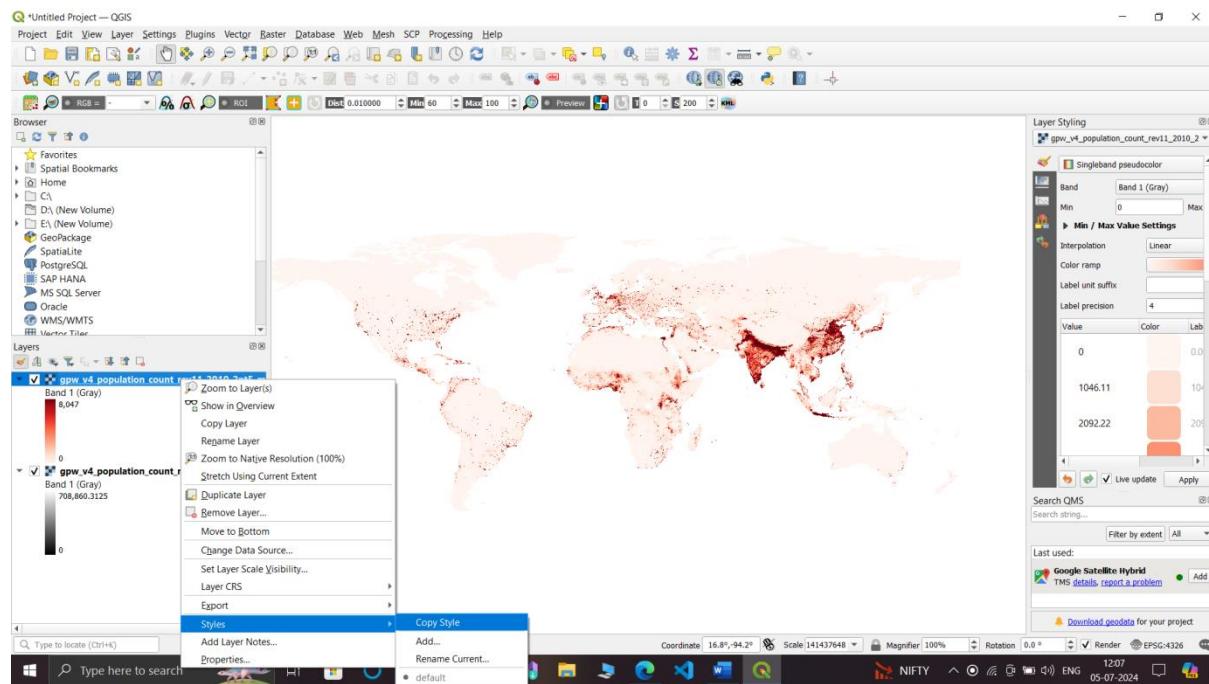
- Click on Add



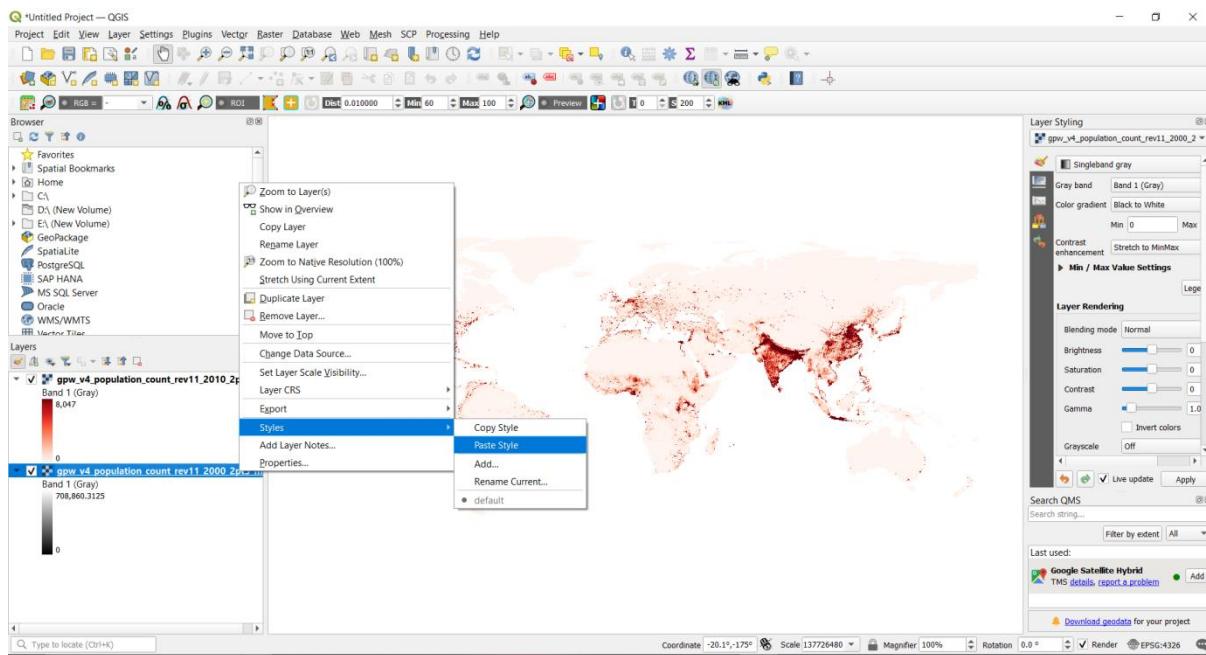
Step 5: Go To Layer Styling and Select Singleband Pseudocolor and Set Color Ramp to Reds and Set Max to 8047.



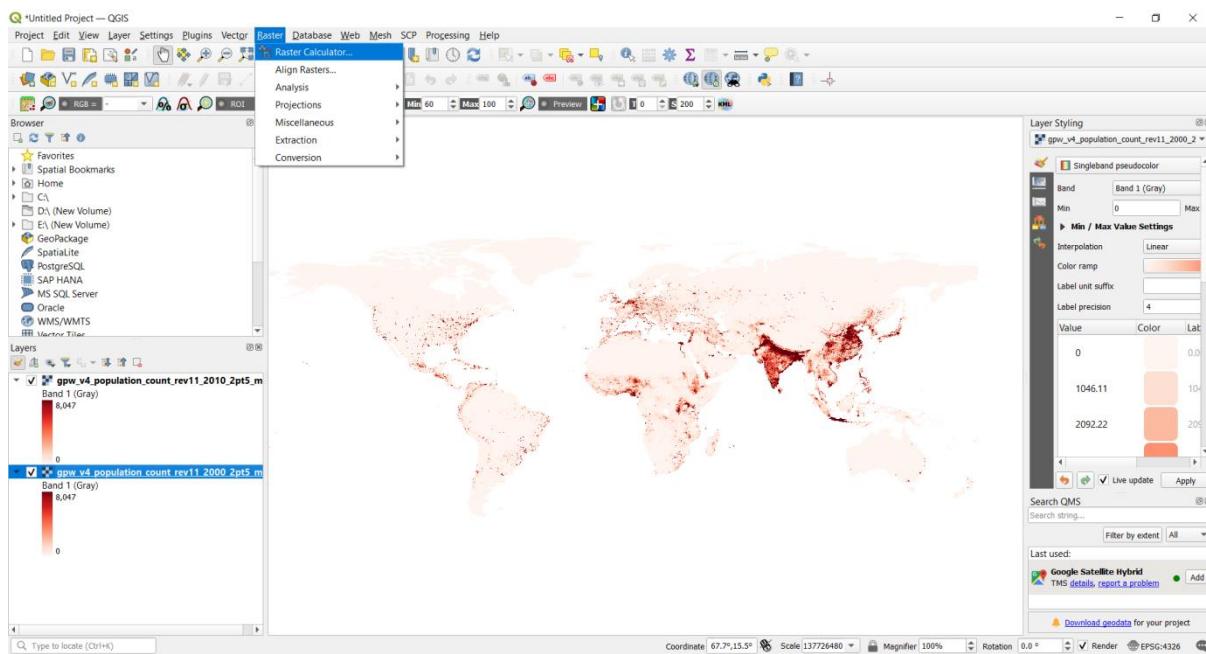
- Here you can copy and paste the style of one layer to another layer. Right Click on **gpw_v4_population_count_rev11_2010_2pt5_min** and Select Style and then Select Copy Style



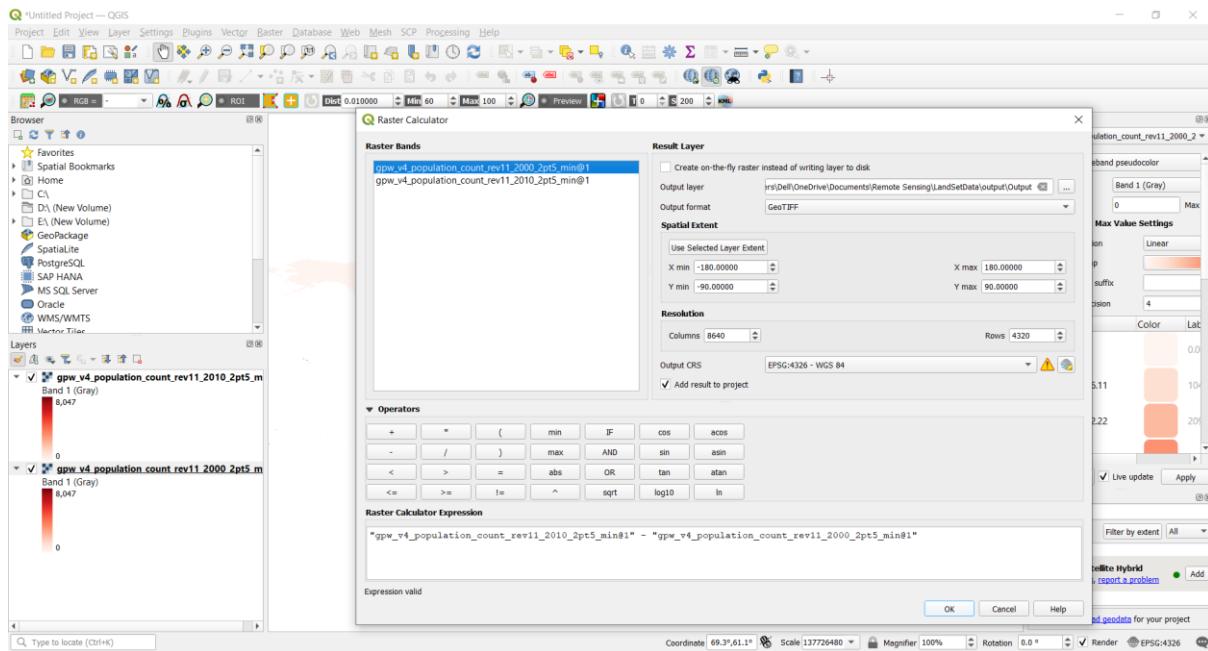
- **gpw_v4_population_count_rev11_2000_2pt5_min** and Select Style and then Select Paste Style



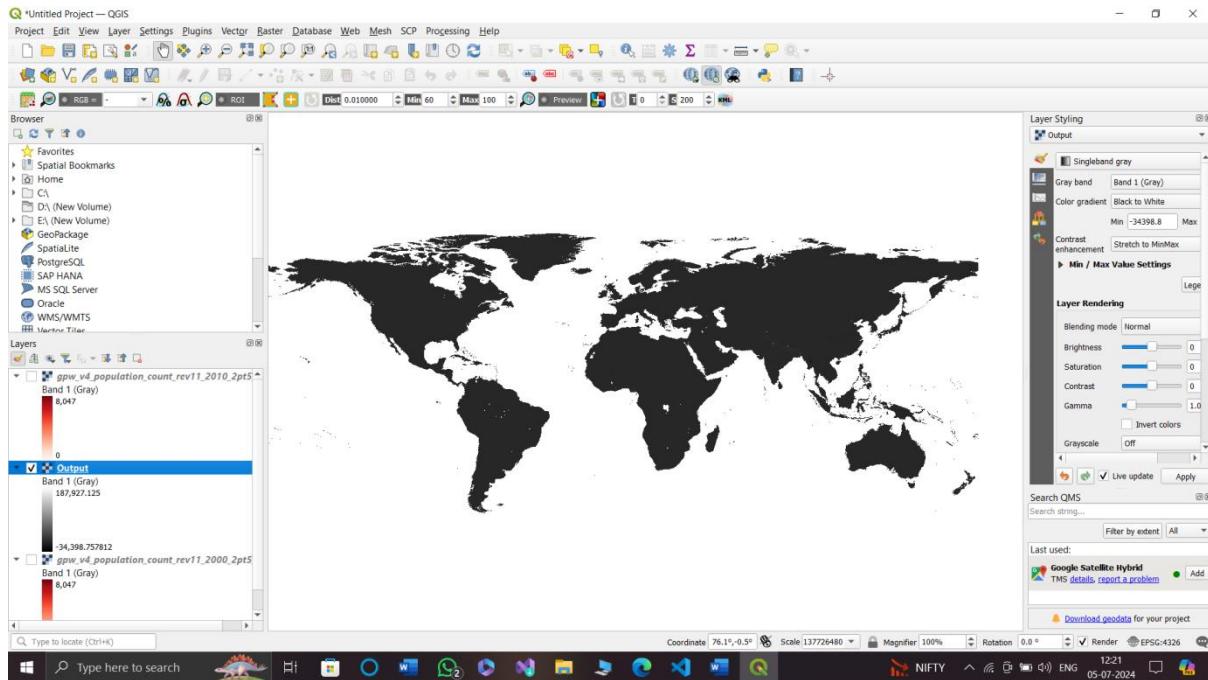
Step 6: Now go to Raster and Select Raster Calculator.



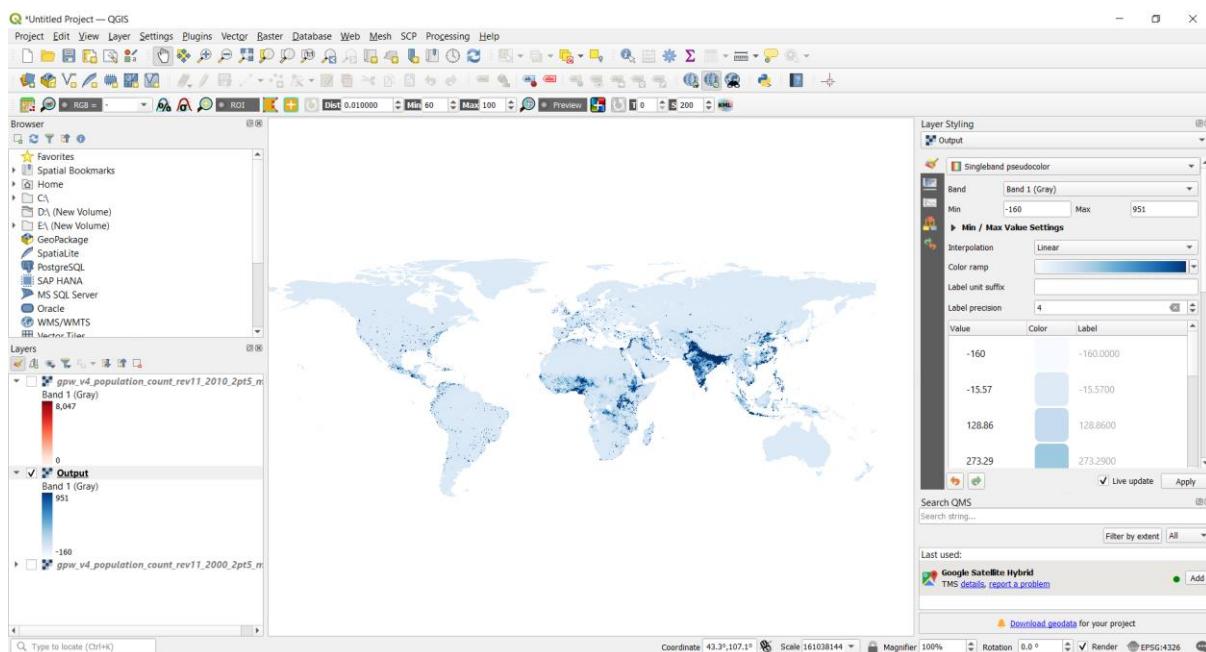
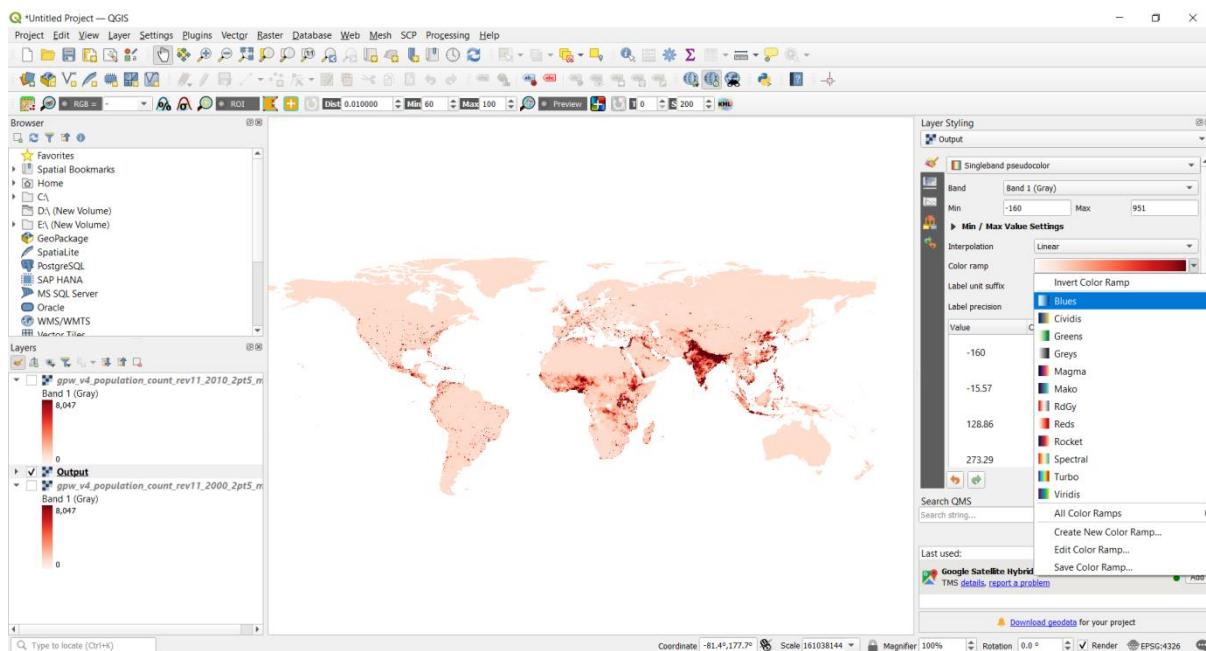
- In Raster Calculator Double Click First 2010 Population then Select minus (-) from the operators and then Double Click 2000 Population and give the Output Layer Name and Set the path and Click on Ok.



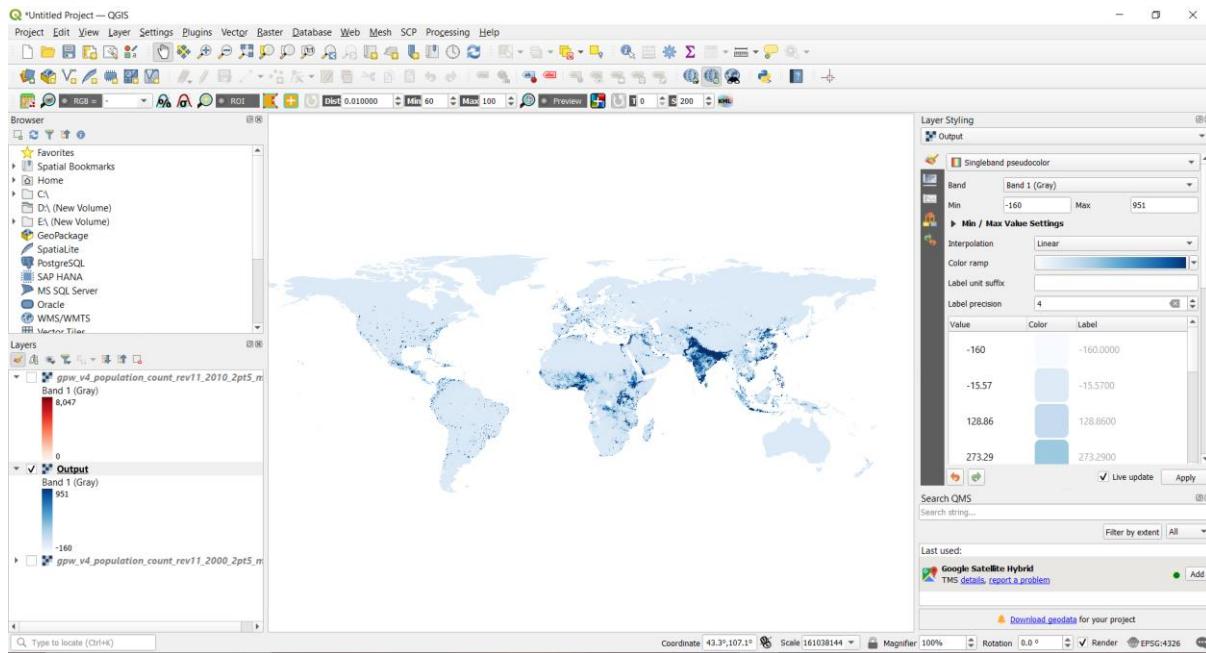
Step 7: Now Uncheck both the population layer and Select your new output layer.



- 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



Step 8: 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

