QGIS for Forest Management

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Suchita Sharma
Pratiksha Kale
Namrata Pandey
Abhishek Kumar Rai
Danish Khan
N. Sureshkumar

Foreword

Inclusion of modern technology in the day to day management is the need of the hour. Forest managers in the country are very slow to adopt new technologies for the better management of biological resources. QGIS is one of the technologies imparted to officer trainees to adopt them in the field. State Forest Service (SFS) officer trainees of 2020-2022 batch Ms. Suchitra Sharma, Ms. Pratiksha Kale, Ms. Namrata Pandey, Shri. Abishek Kumar Rai, Shri Danish Khan and Shri N. Suresh Kumar under the earnest guidance of Shri. V. Karthick, IFS., Lecturer of Central Academy of State Forest Service, Coimbatore brought out a wonderful handbook on "***QGIS in Forest Management***". The pictorial depiction on different steps involved in QGIS application will be an easy guide to the beginners. It's not only a training manual but also a good guide to the forest managers to learn the application of QGIS in their respective field. The compilation of this handbook done by the authors is commendable. It will further add value to the training and education.

Best Wishes.

V. Thirunavukarasu, IFS
APCCF & Principal
CASFOS, Coimbatore

Preface

This book is intended to make GIS easy for Officer Trainees and Field Staff. QGIS is an open source GIS software and user friendly application. It has many field applications in forestry like Resource documentation, monitoring etc.

A small team of six trainees showing keen interest in QGIS was selected from SFS 2020-2022 Batch. After prolonged discussion with team members, chapters of the book were finalised and trainees were allowed to work on different topics. The results thus obtained were also thoroughly reviewed by the members. The entire exercises were made in different screen shots as per steps and converted into different chapters. Since the trainees were belonging to different states like Jammu and Kashmir, Maharashtra, Tamil Nadu and Uttar Pradesh, this work will further inspire them to choose their specialisation in the field of GIS and serve as resource person in their respective states for GIS works.

Indeed it is a great pleasure to guide such a well informed, motivated and interested team. This work strives to motivate other Officer Trainees of upcoming batches to make further studies in GIS and make GIS user friendly for Field Officers for their forestry applications in the field.

V. Karthick, IFS

Quantum Geographic Information System (QGIS)

CONTENTS

1. QGIS POINT EXERCISE STEPS

Point is the vector data which provides the information about location in the map. Point data analysis provides information about admin headquarter, water holes, fixed points, boundary mapping. Watch tower etc. which is helpful in management of forest operation.

Name and Type of Selected Line Feature.
Add Raster Layer of GeoreferencedToposheet.

↓

Create shape file of selected layer

↓

Toposheet - Select the required field

↓

Symbology and change the size
and colour of Point Symbol

↓

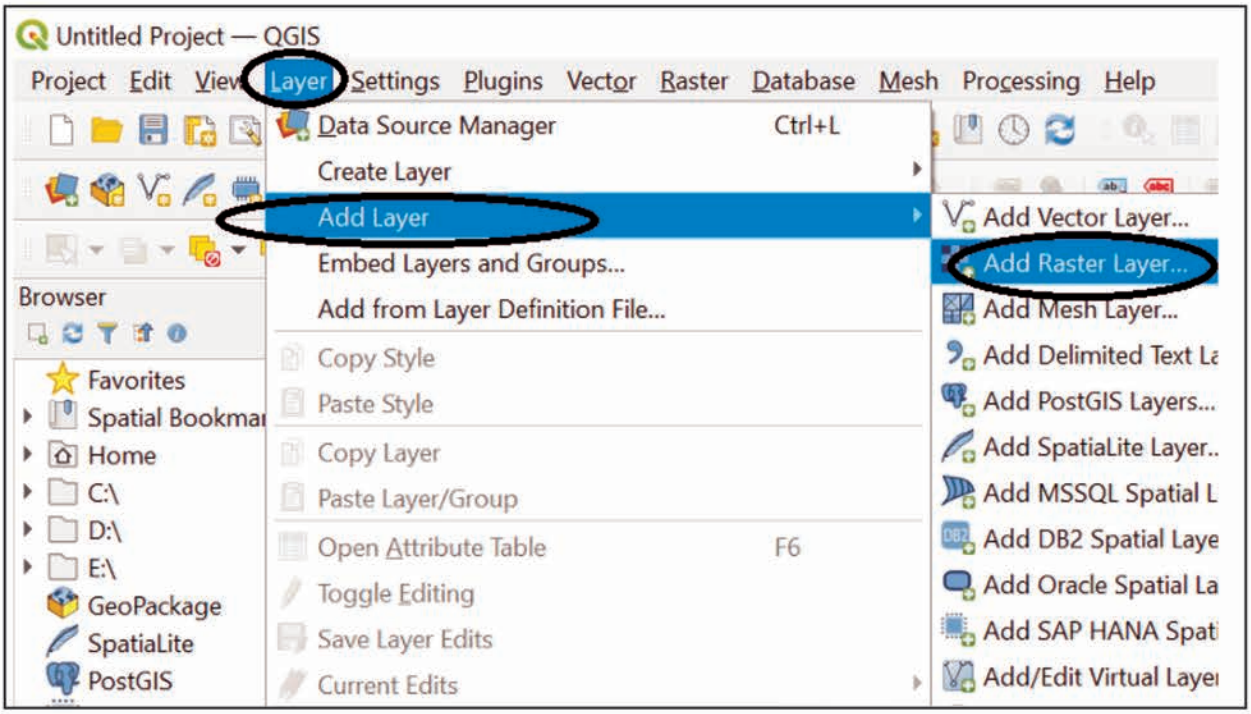
Select the Point,
give name and type of selected Point feature

↓

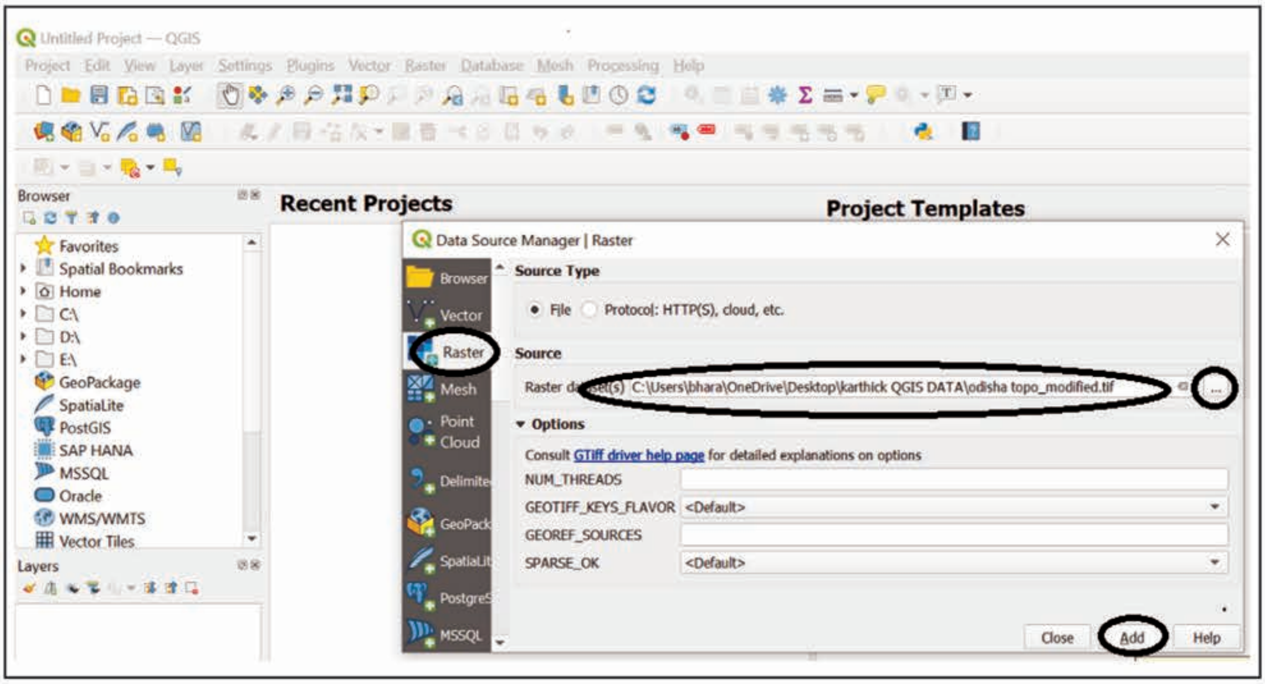
Colour of Line Symbol -
Stop editing and save the attributes.
Open attribute table and open field calculator
to calculate different attribute Data. Stop and Save it.

STEP 1 : To Add Raster Layer of Georeferenced Toposheet

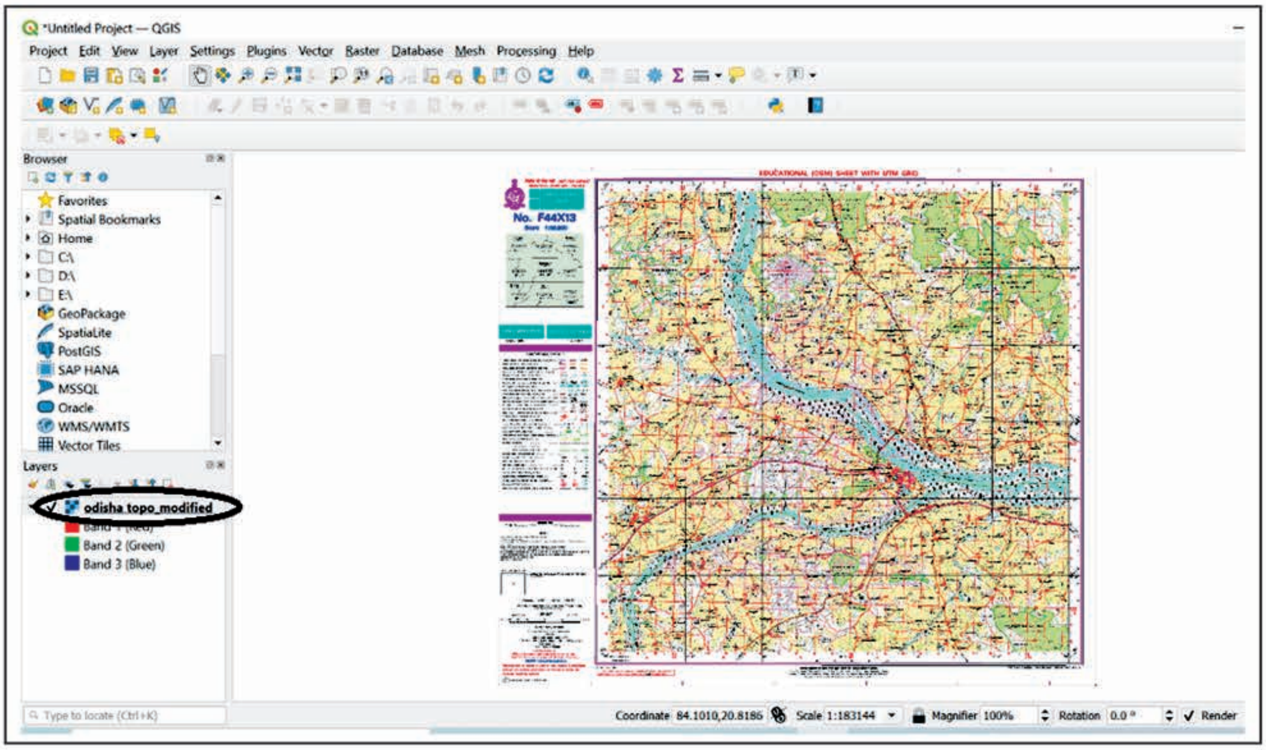
Click Layer >> Add Layer >> Add Raster Layer



Step 2 : Select Georeferenced Toposheet from the Folder and Click Add

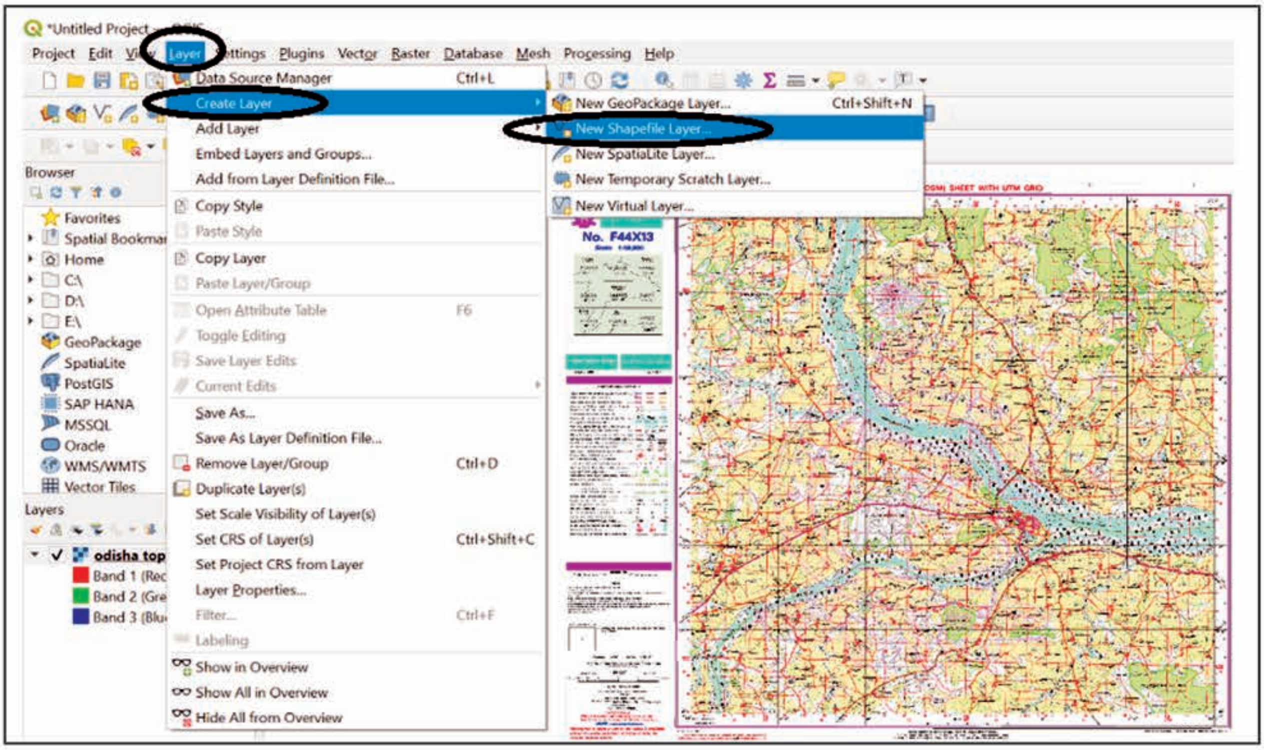


Georeferenced Toposheet added as a Layer

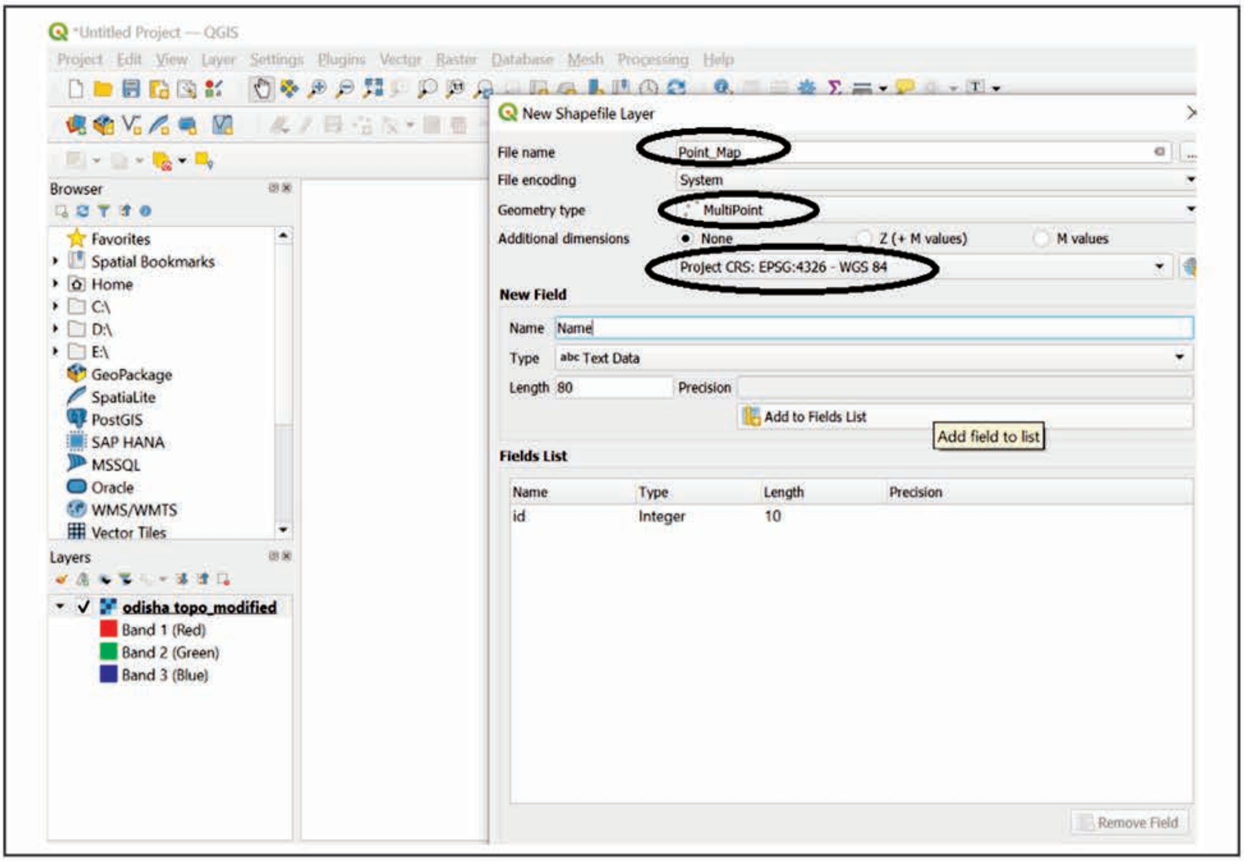


STEP 3: To create Shape file for Point exercise

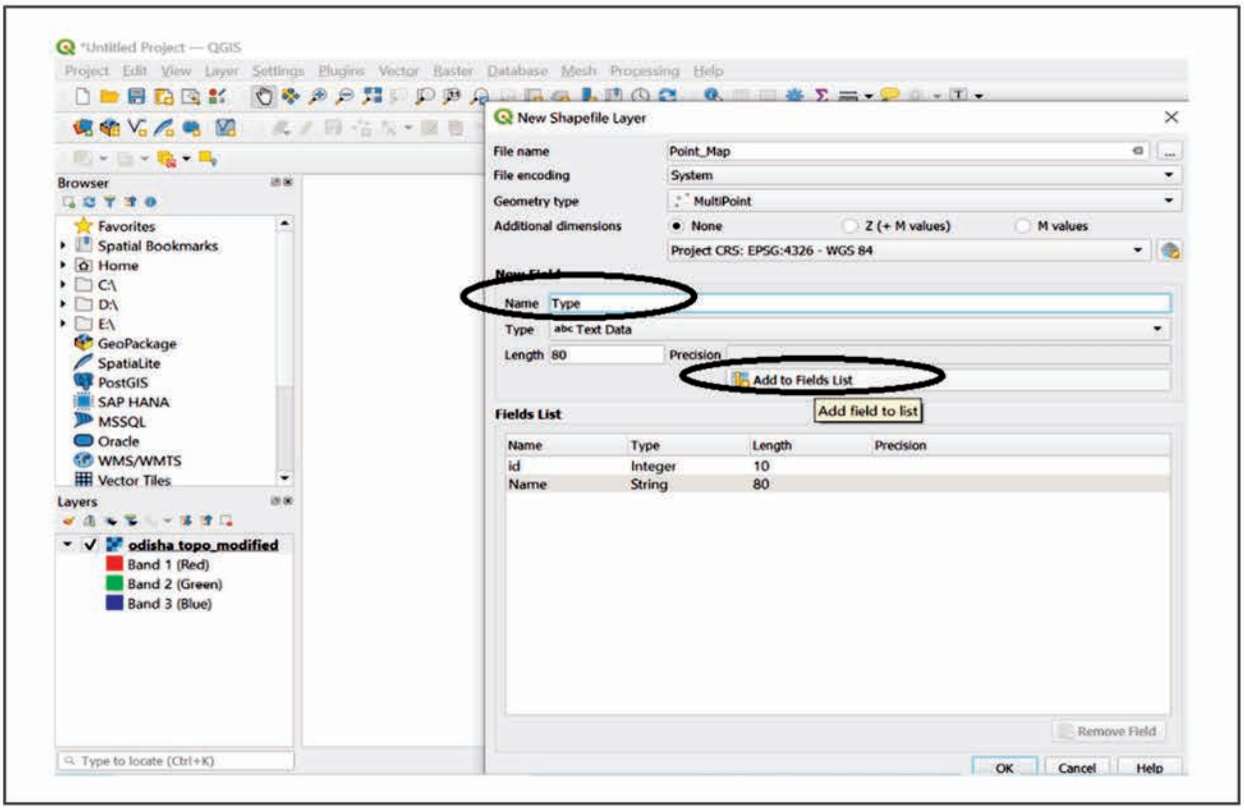
Click Layer >> Create Layer >> New Shape File Layer

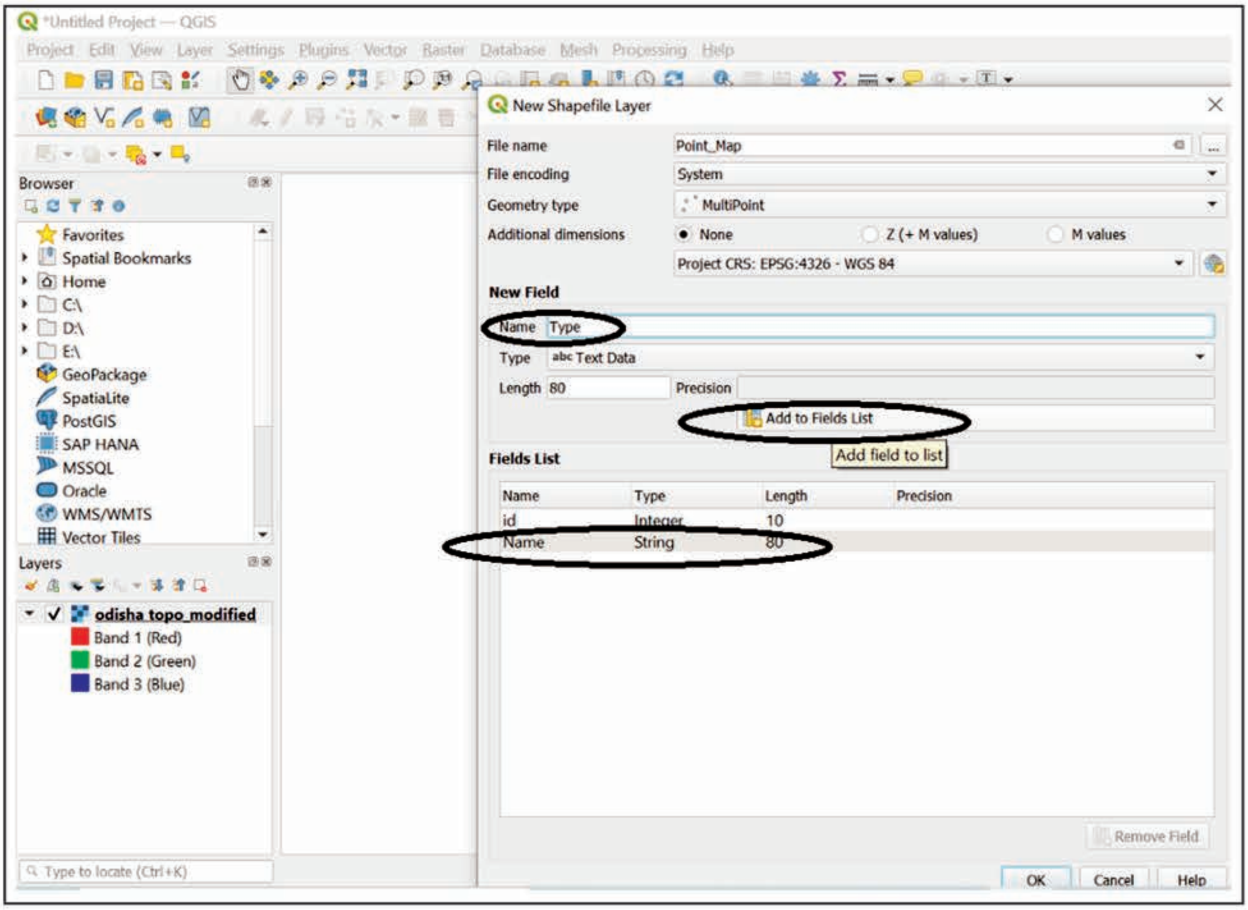


STEP 4 : Select Name >> Geometric Type as Multi Point



Step 5 : Give New Field Name >> Type and Add to Fields List >> Remove ID already given in Field List >> Click Ok




*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Mesh Processing Help
New Shapefile Layer
File name Point_Map
File encoding System
Geometry type MultiPoint
Additional dimensions None Z (+ M values) M values
Project CRS: EPSG:4326 - WGS 84
New Field
Name Type
Type abc Text Data
Length 80 Precision
Add to Fields List
Add field to list
Fields List
Name Type Length Precision
id Integer 10
Name String 80
Remove Field
OK Cancel Help
Browser
Favorites
Spatial Bookmarks
Home
C:\
D:\
E:\
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
WMS/WMTS
Vector Tiles
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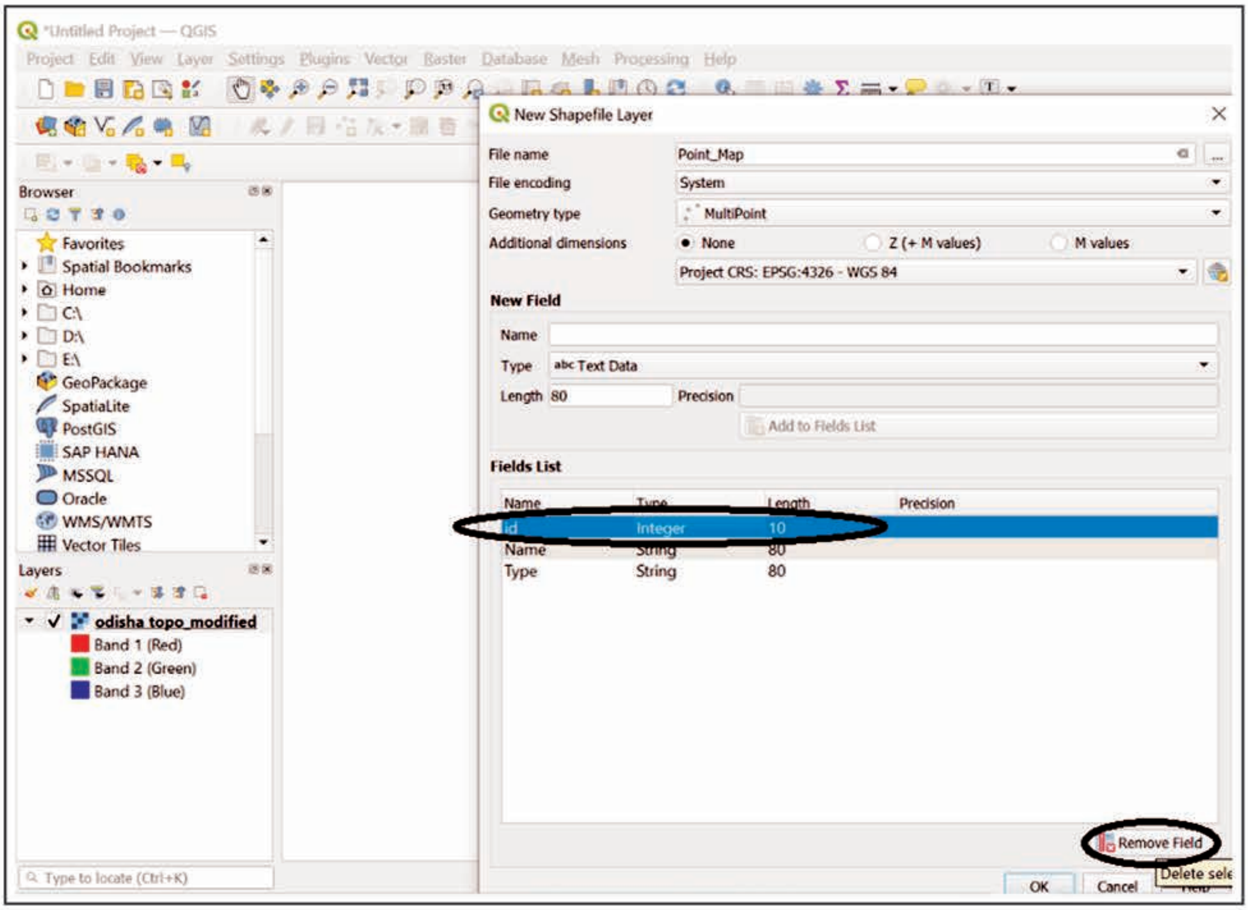
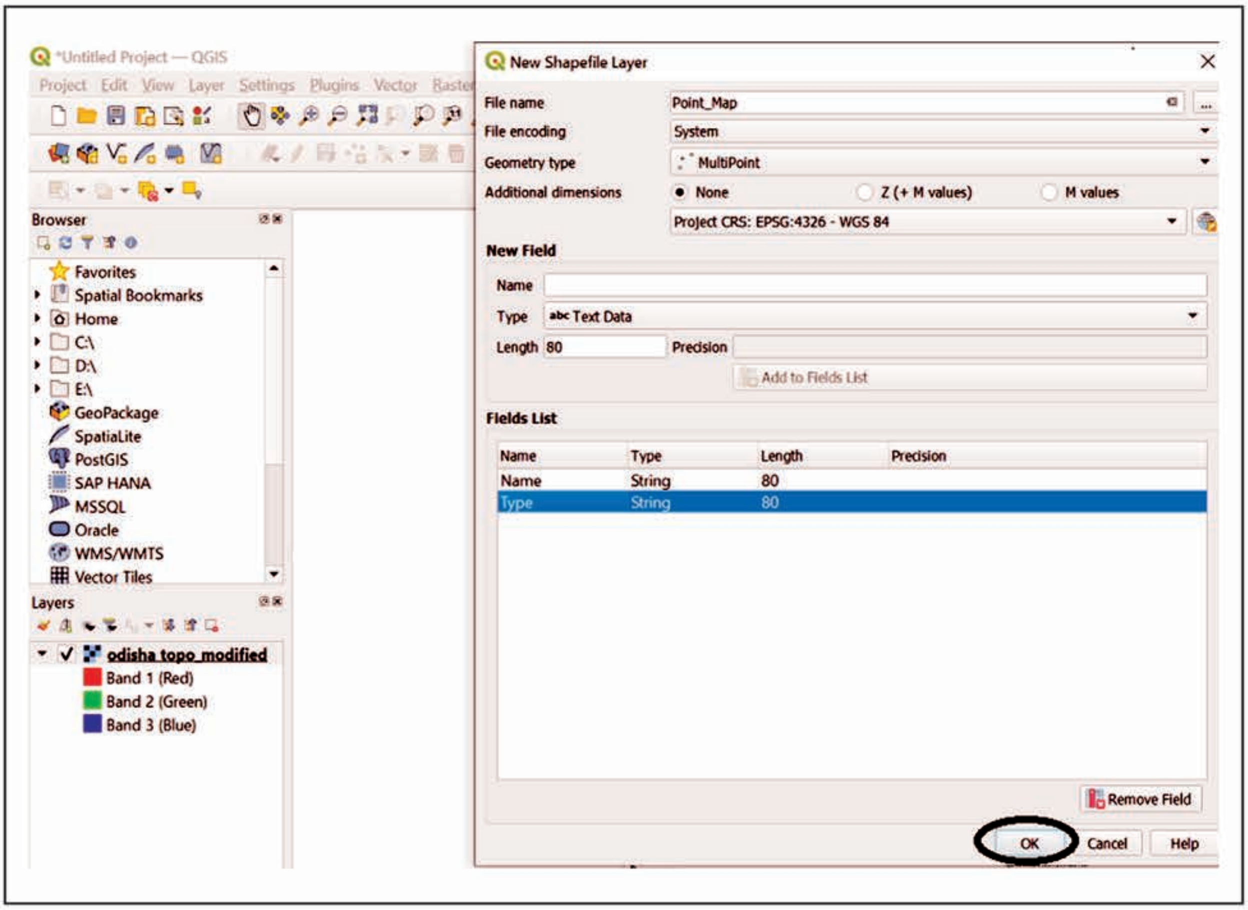
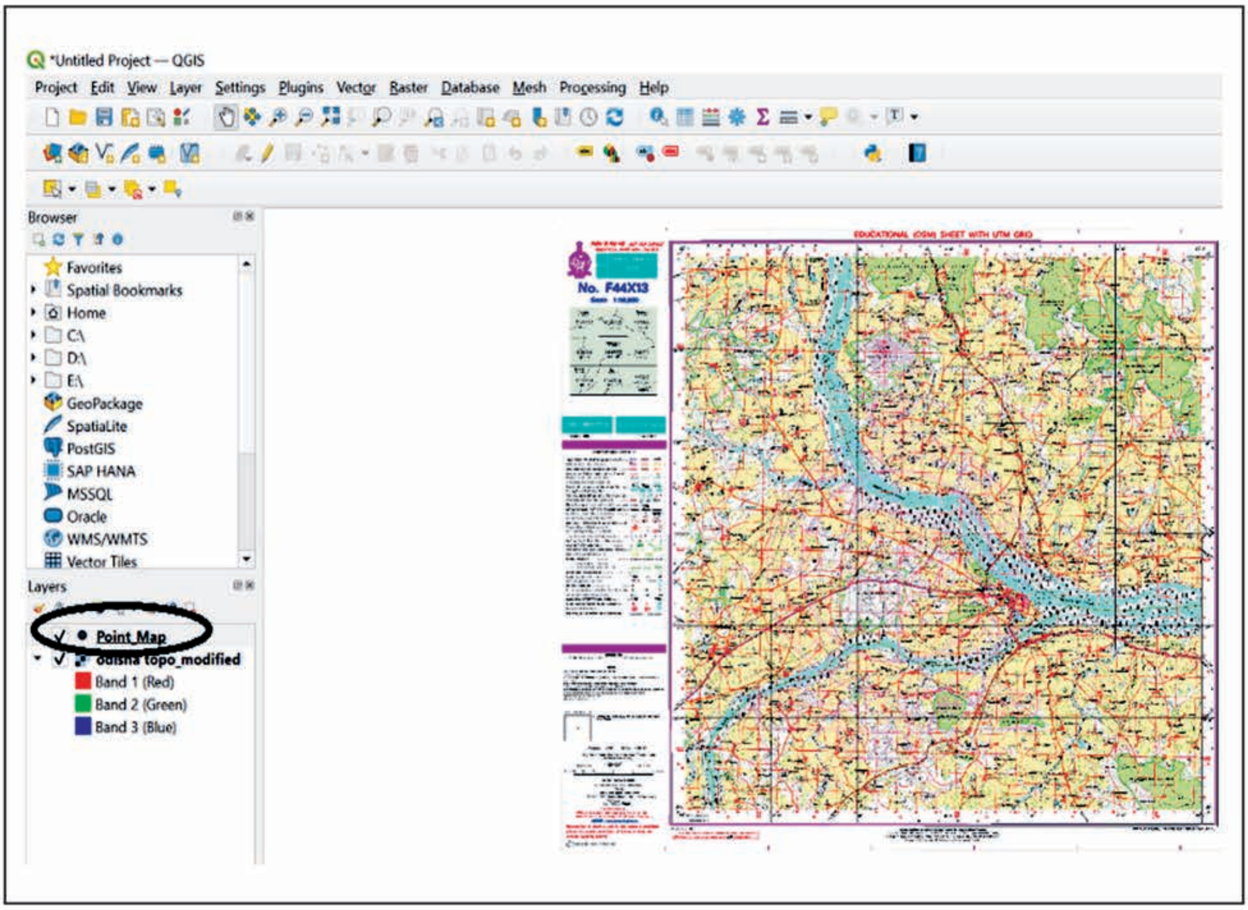
odisha topo modified
Band 1 (Red)
Band 2 (Green)
Band 3 (Blue)
Type to locate (Ctrl+K)


*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Mesh Processing Help
New Shapefile Layer
File name Point_Map
File encoding System
Geometry type MultiPoint
Additional dimensions None Z (+ M values) M values
Project CRS: EPSG:4326 - WGS 84
New Field
Name
Type abc Text Data
Length 80 Precision
Add to Fields List
Fields List
Name Type Length Precision
id Integer 10
Name String 80
Type String 80
Remove Field
Delete sele
OK Cancel
Browser
Favorites
Spatial Bookmarks
Home
C:\
D:\
E:\
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
WMS/WMTS
Vector Tiles
Layers
odisha topo modified
Band 1 (Red)
Band 2 (Green)
Band 3 (Blue)
Type to locate (Ctrl+K)

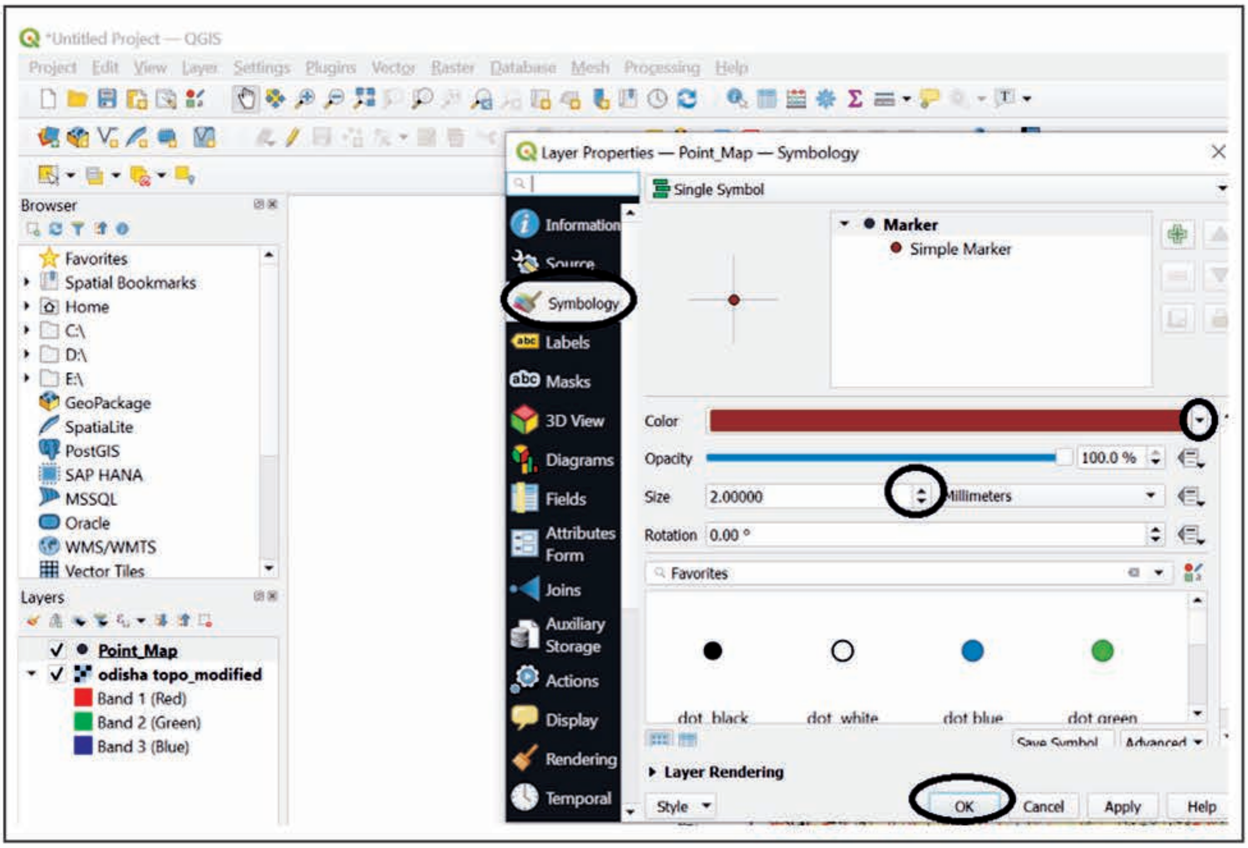


Point Layer has been Created

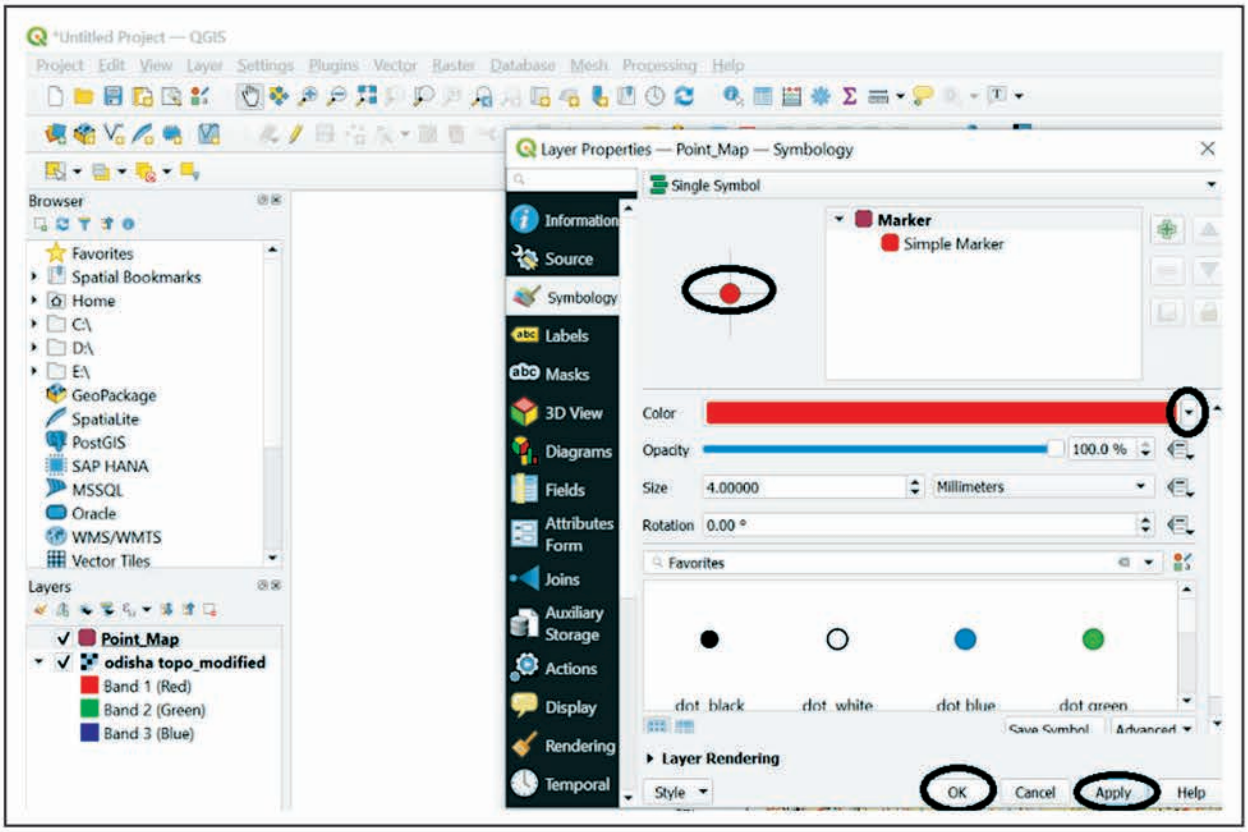


STEP 6: To change the Colour and Size of Point Symbol

Click on point symbol >> Select your colour and size >> apply >> click ok.

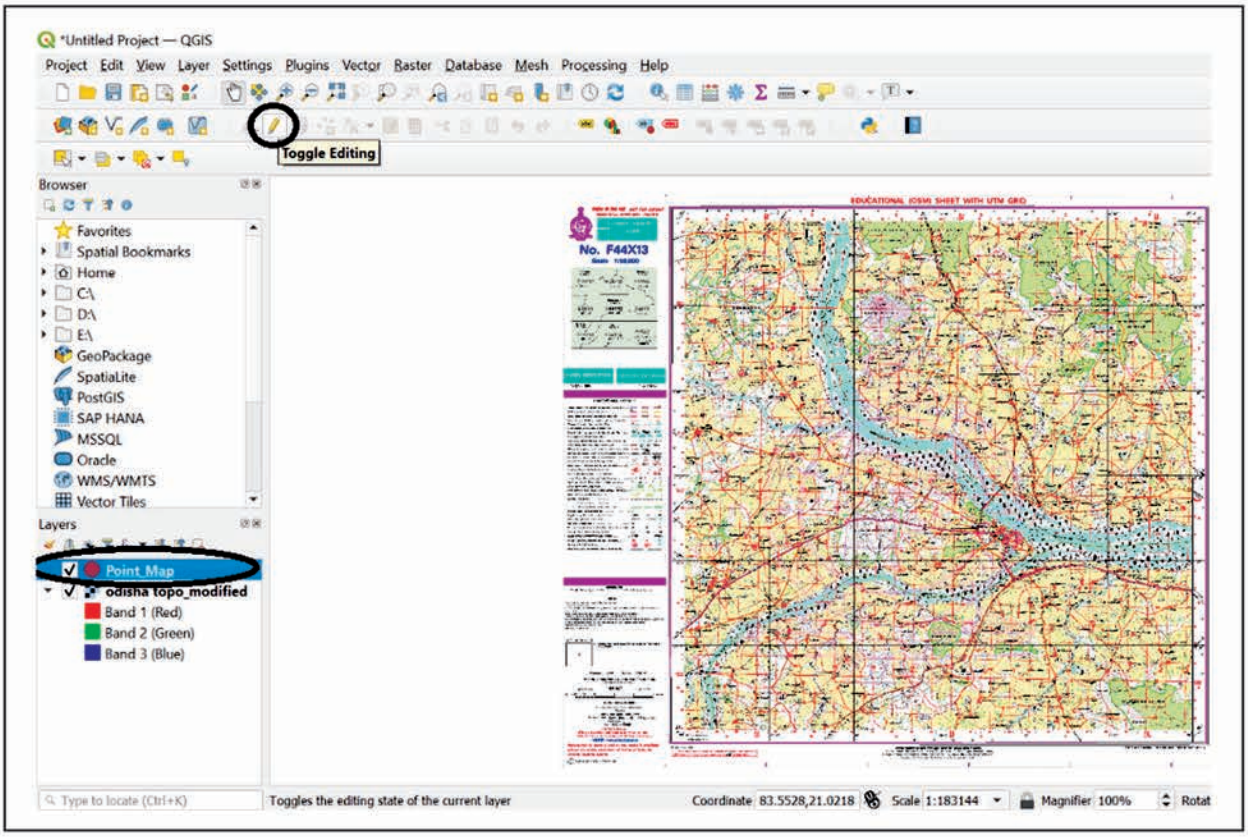


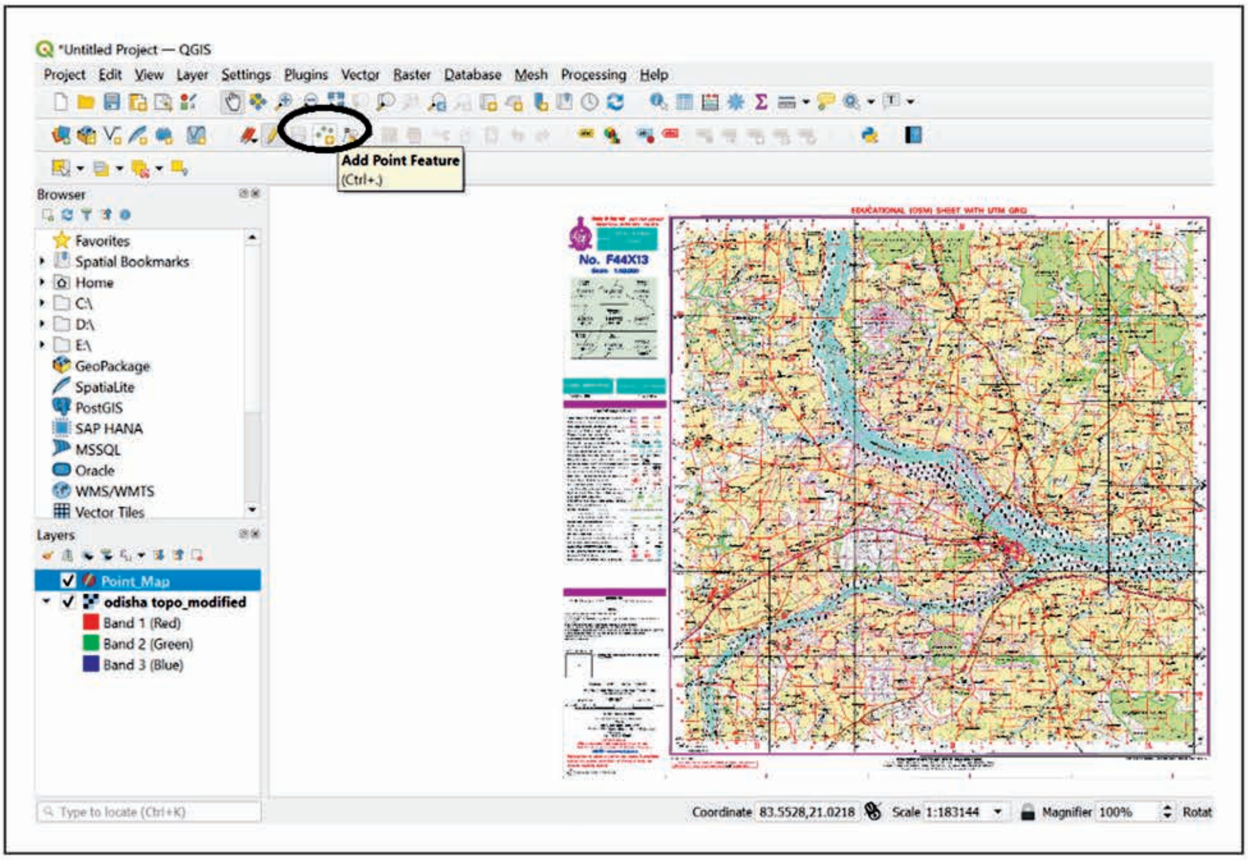
Colour and size selected

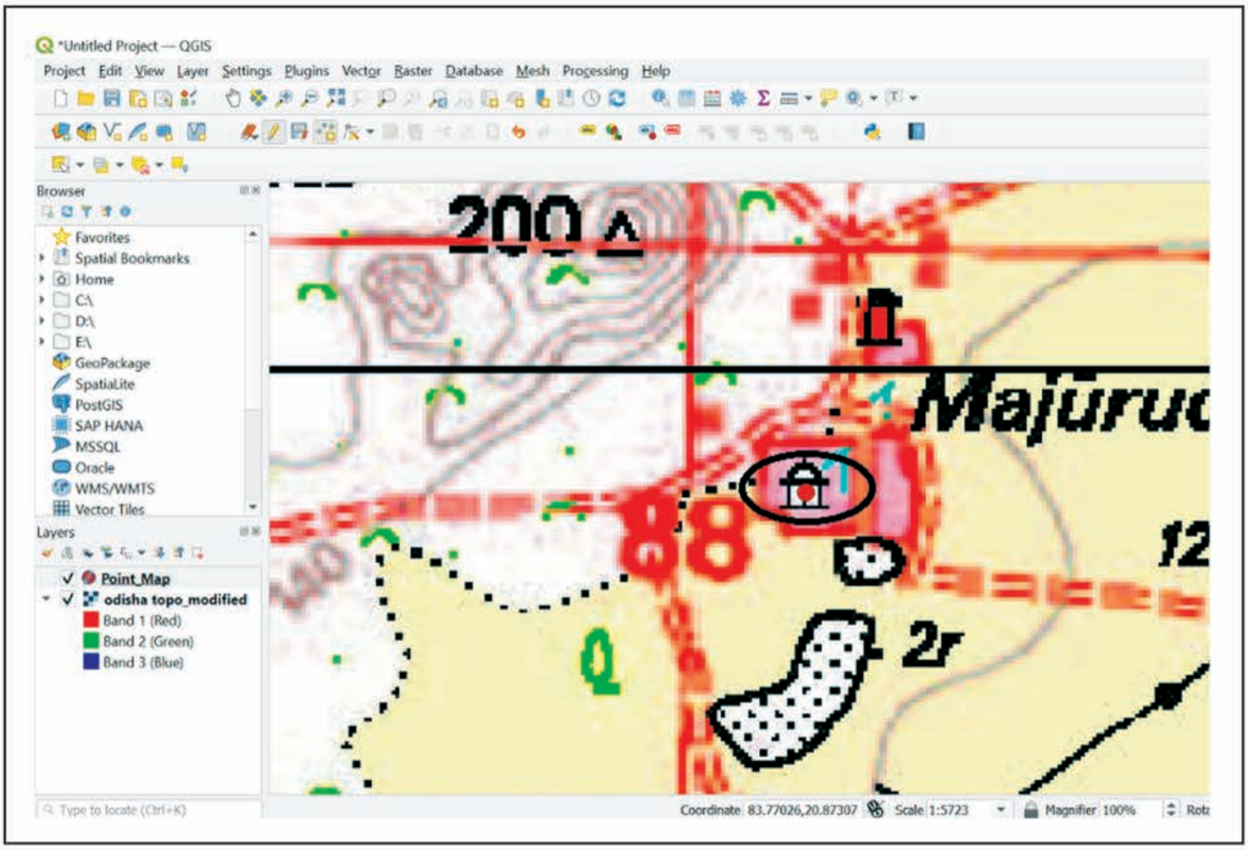


STEP 7 : Start Toggle Editing and Select Multi Point Option for Marking Point on Toposheet

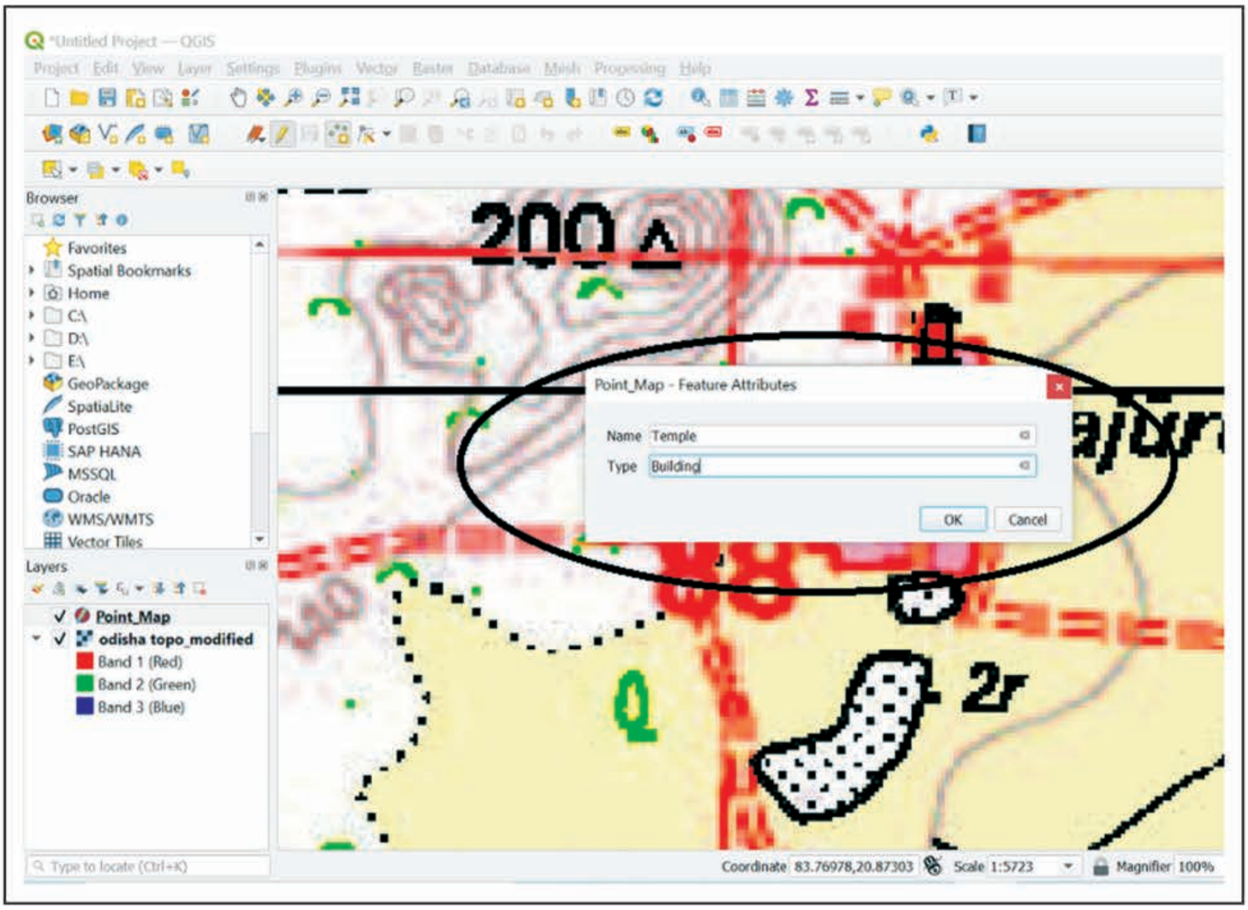
Click Toggle editing >> Add Point features >> Mark the Point on the Map



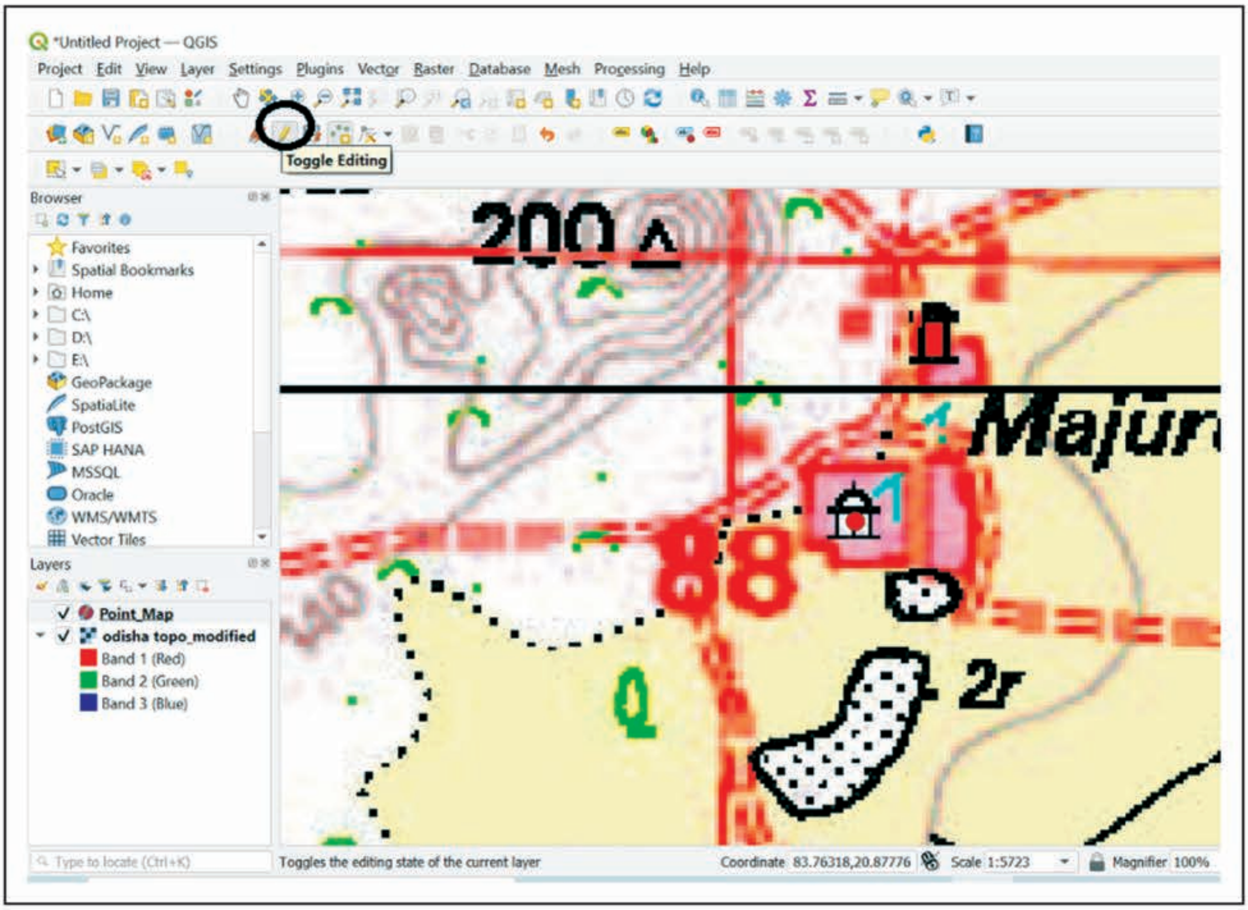


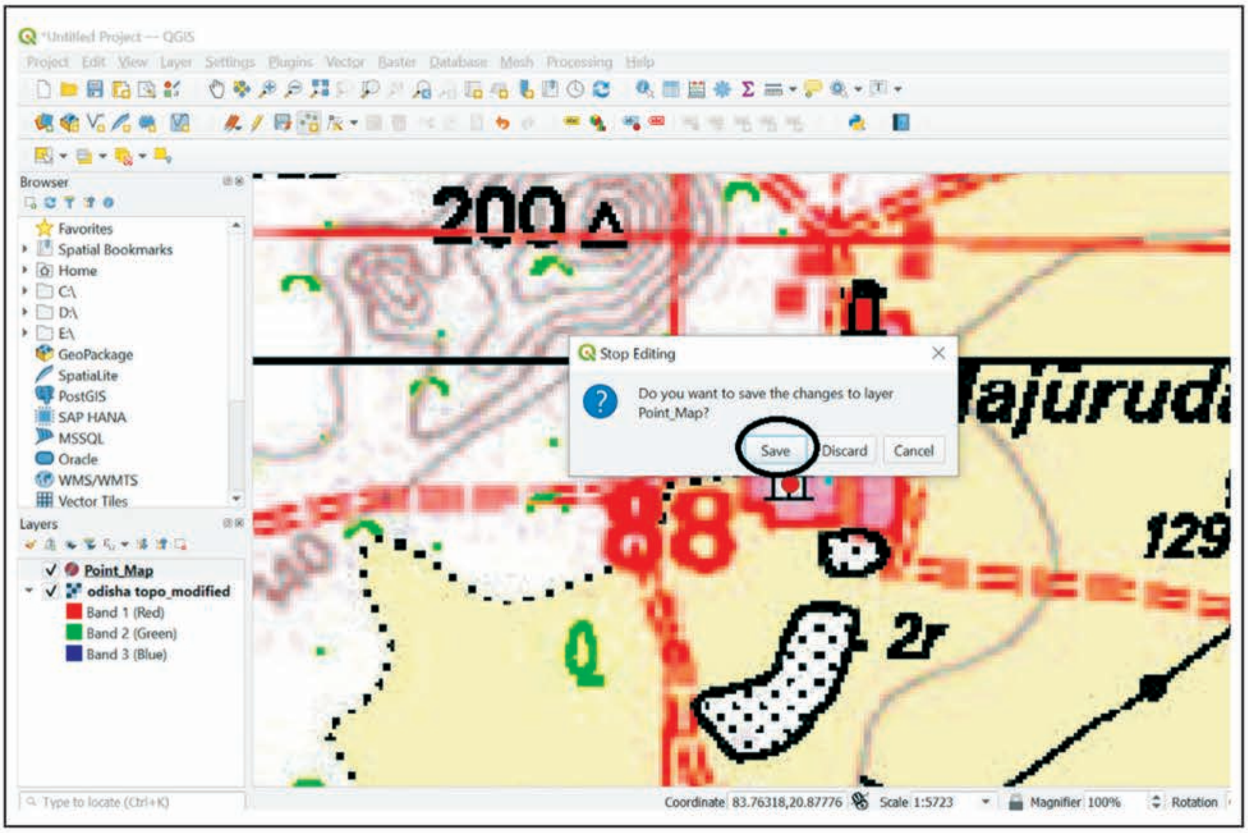


STEP 8 : NOW RIGHT CLICK ON SELECTED POINT FEATURE TO GIVE NAME AND TYPE CLICK OK



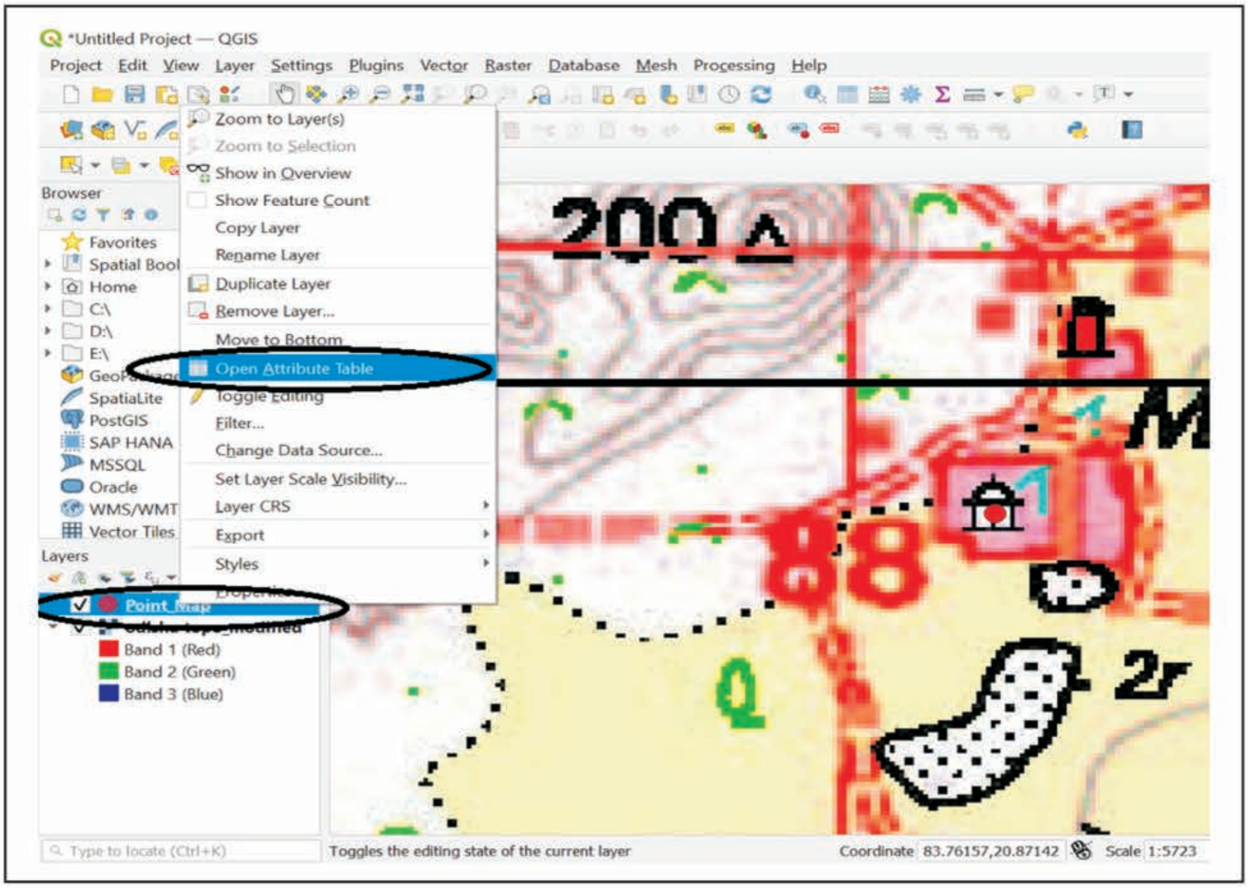
STEP 9: TO STOP EDITING CLICK TOGGLE EDITING AND SAVE THE ATTRIBUTES



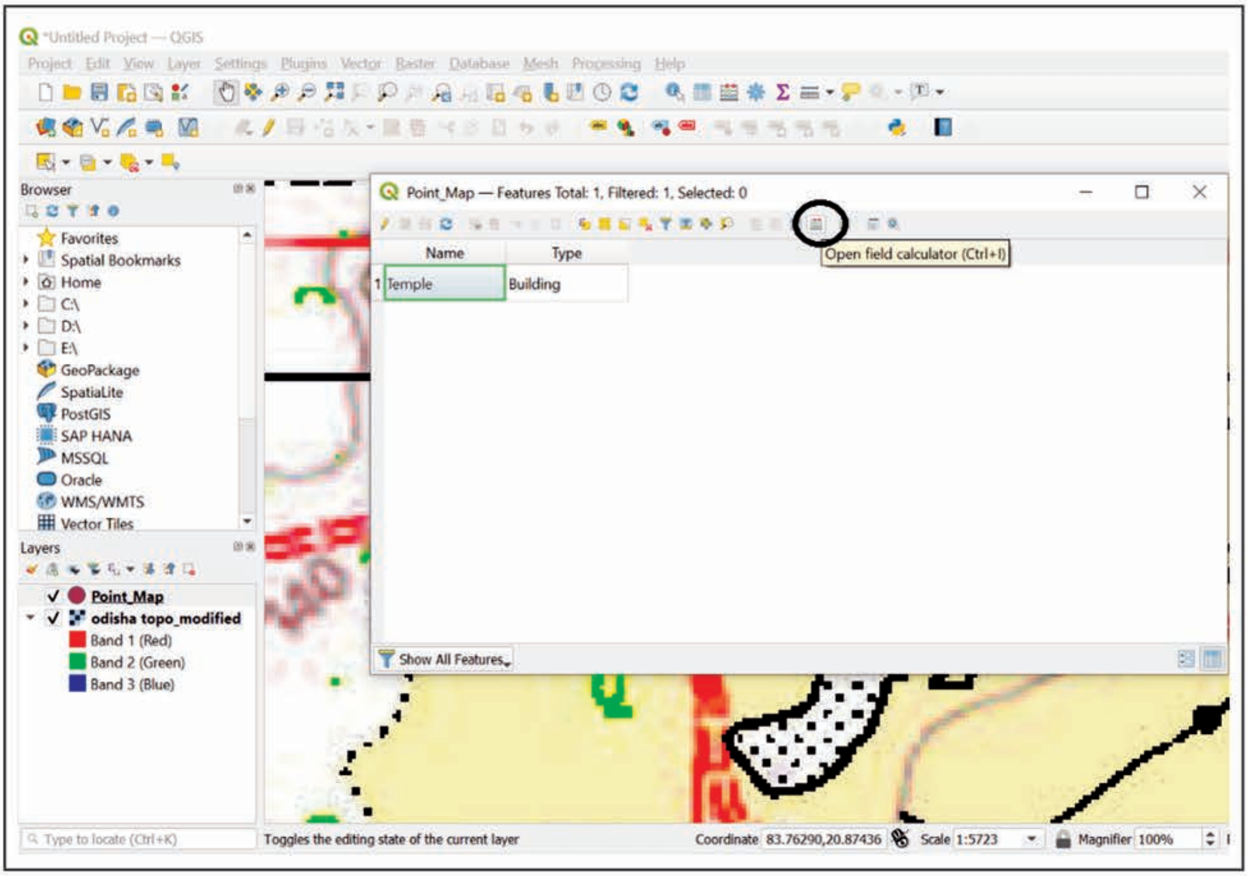


STEP 10: OPEN ATTRIBUTE TABLE

Right Click on point layer and open attribute table



STEP 11: OPEN FIELD CALCULATOR



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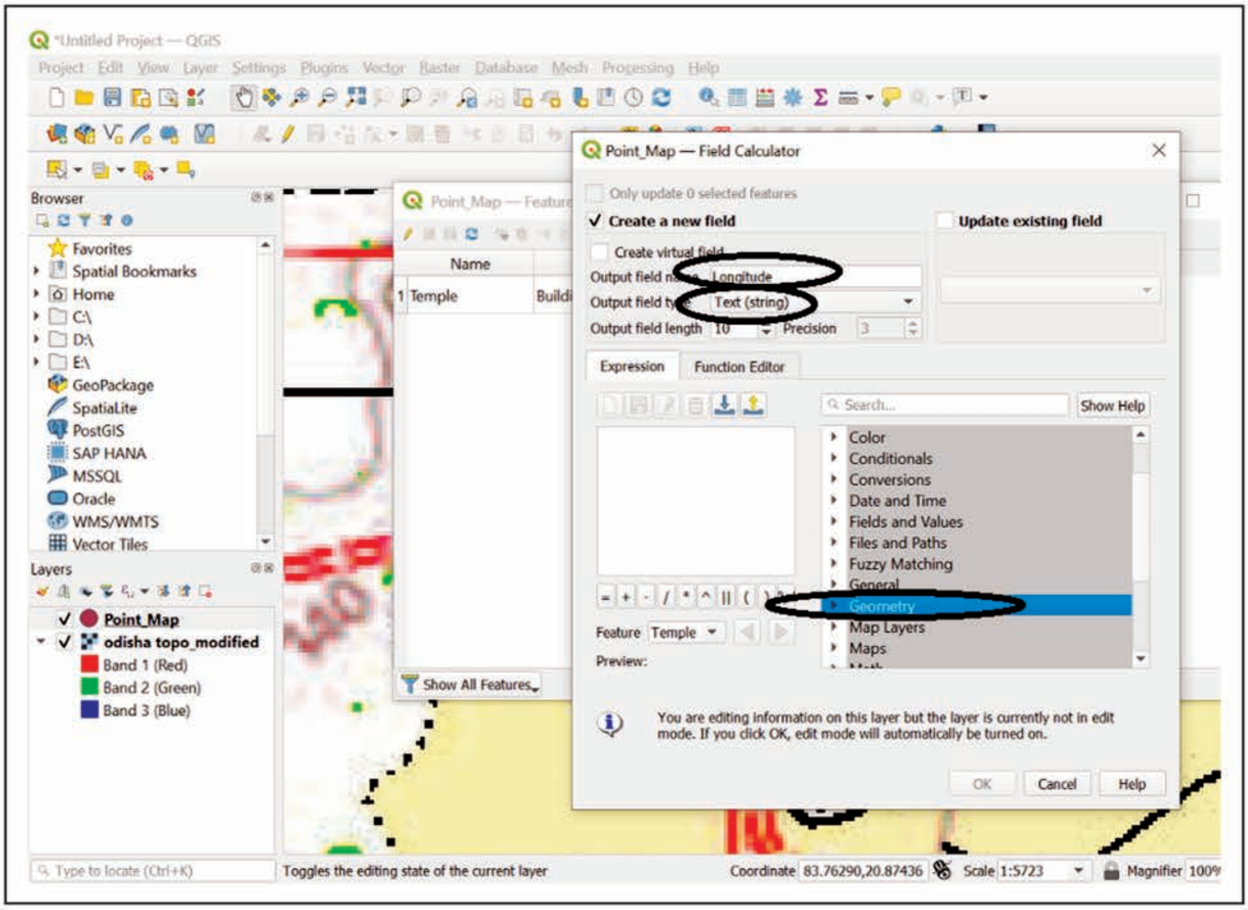
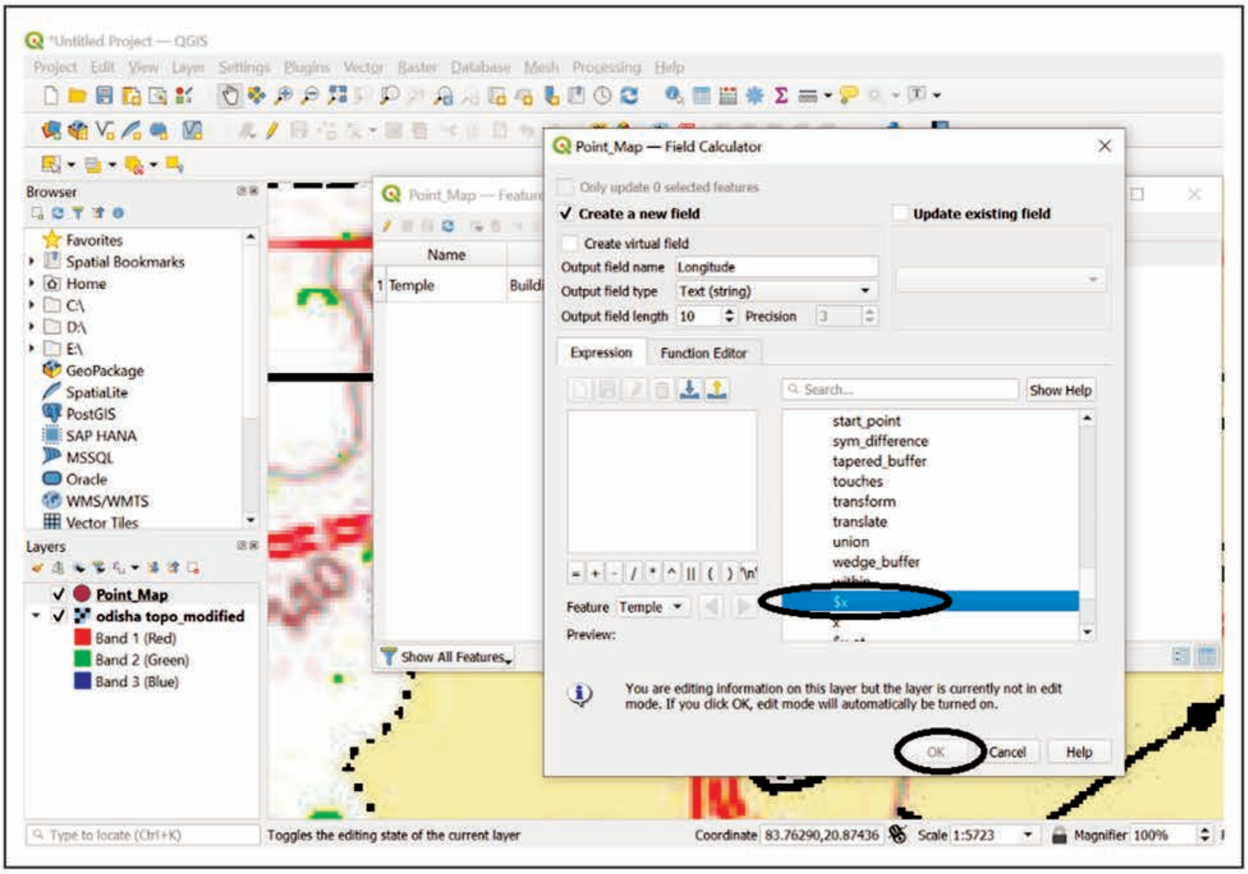
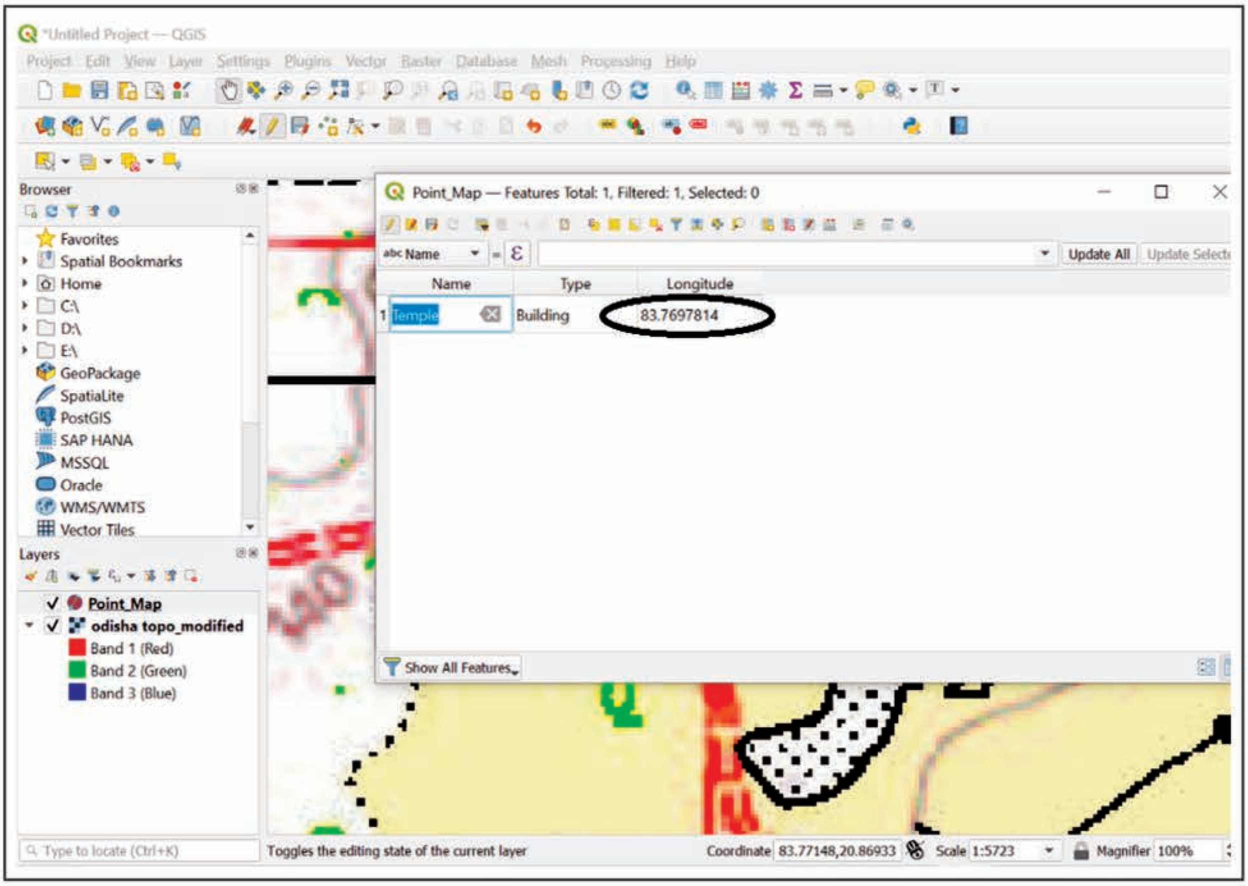
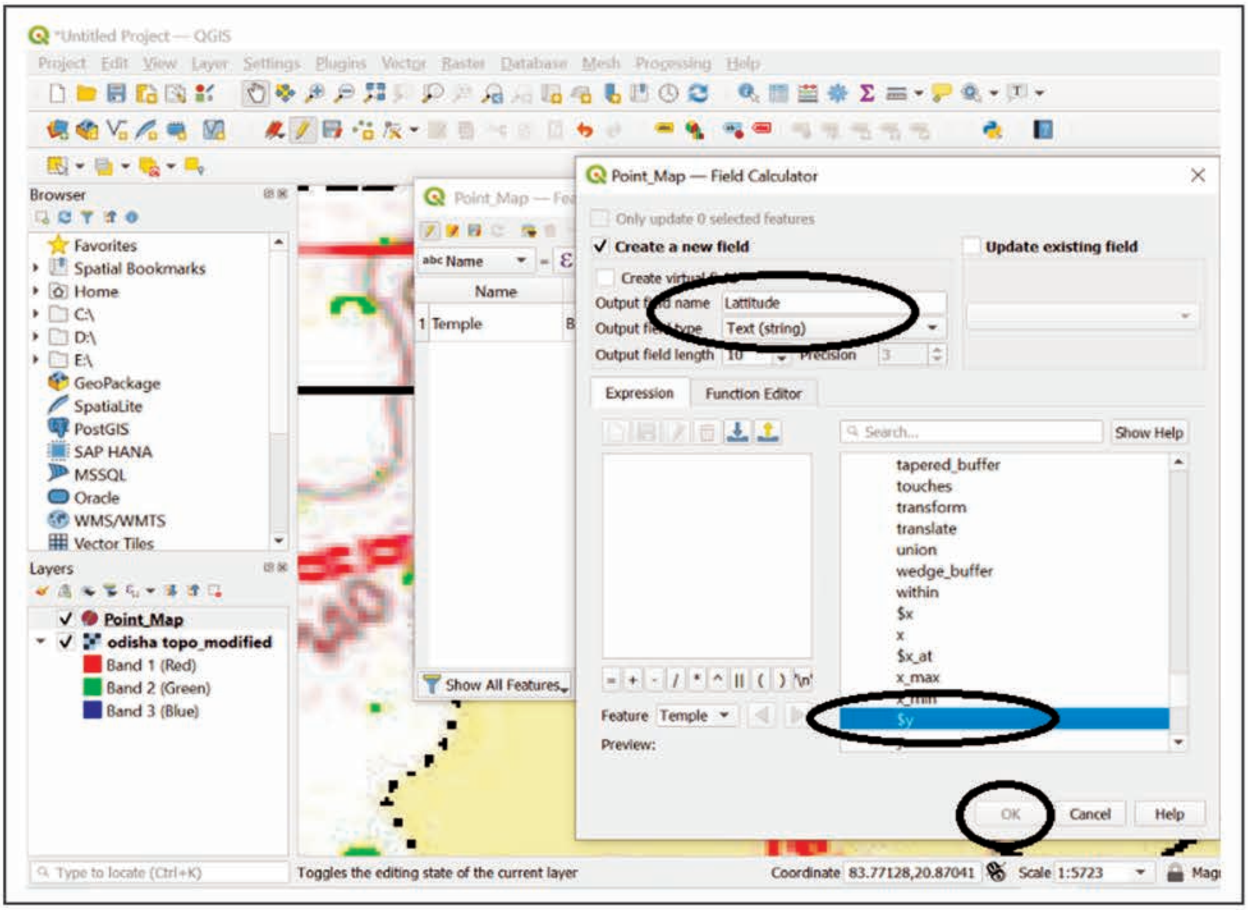
STEP 12: ADD LONGITUDE AND LATTITUDE AND FIELD TYPE AS TEXT (STRING)

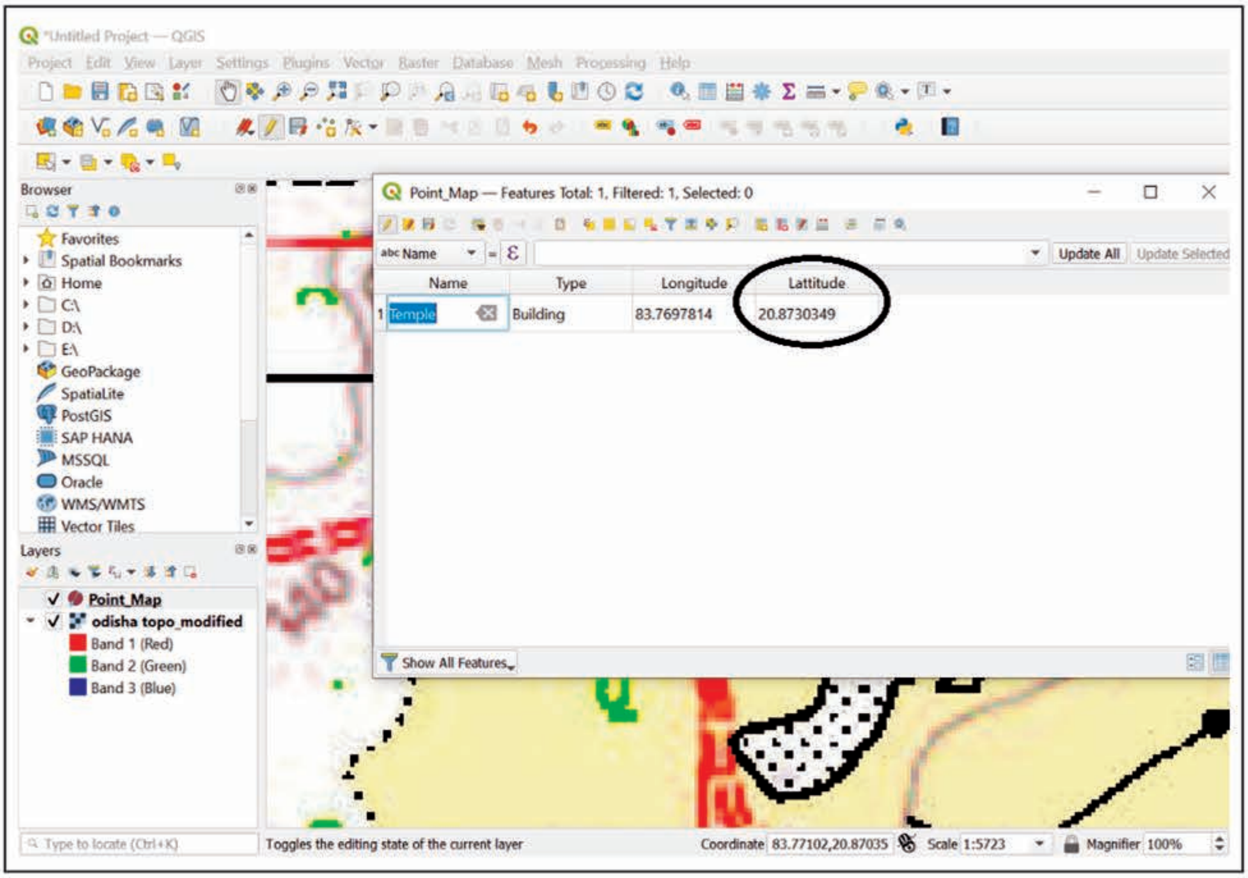
Now click on geometry >> double click on $x for longitude and $y for latitude



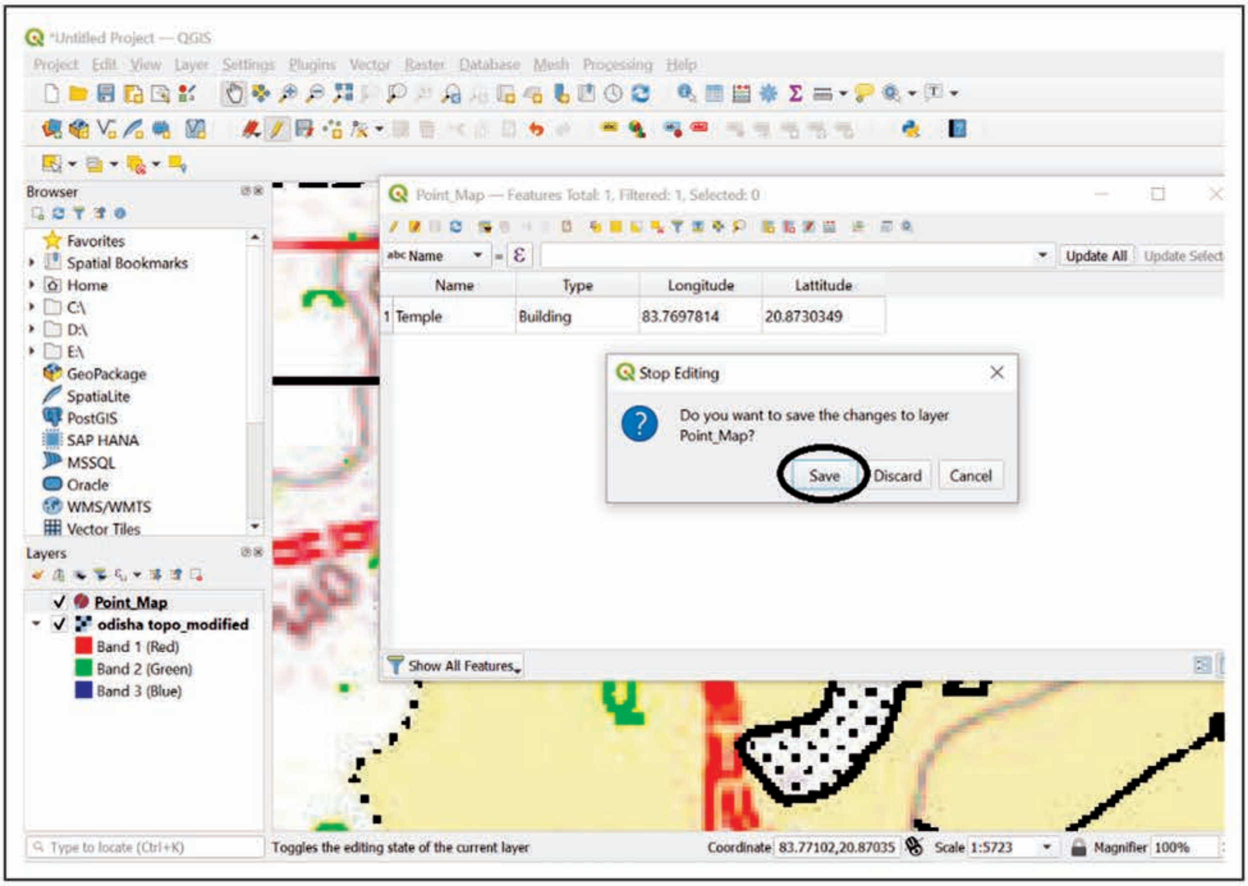



*Untitled Project — QGIS
Point_Map — Features Total: 1, Filtered: 1, Selected: 0
Name
Type
Longitude
Temple
Building
83.7697814
Show All Features
Toggles the editing state of the current layer
Coordinate 83.77148,20.86933
Scale 1:5723
Magnifier 100%


*Untitled Project — QGIS
Point_Map — Field Calculator
Only update 0 selected features
Create a new field
Update existing field
Output field name Lattitude
Output field type Text (string)
Output field length 10
Precision 3
Expression
Function Editor
$y
OK
Cancel
Help
Feature Temple
Preview:
Toggles the editing state of the current layer
Coordinate 83.77128,20.87041
Scale 1:5723

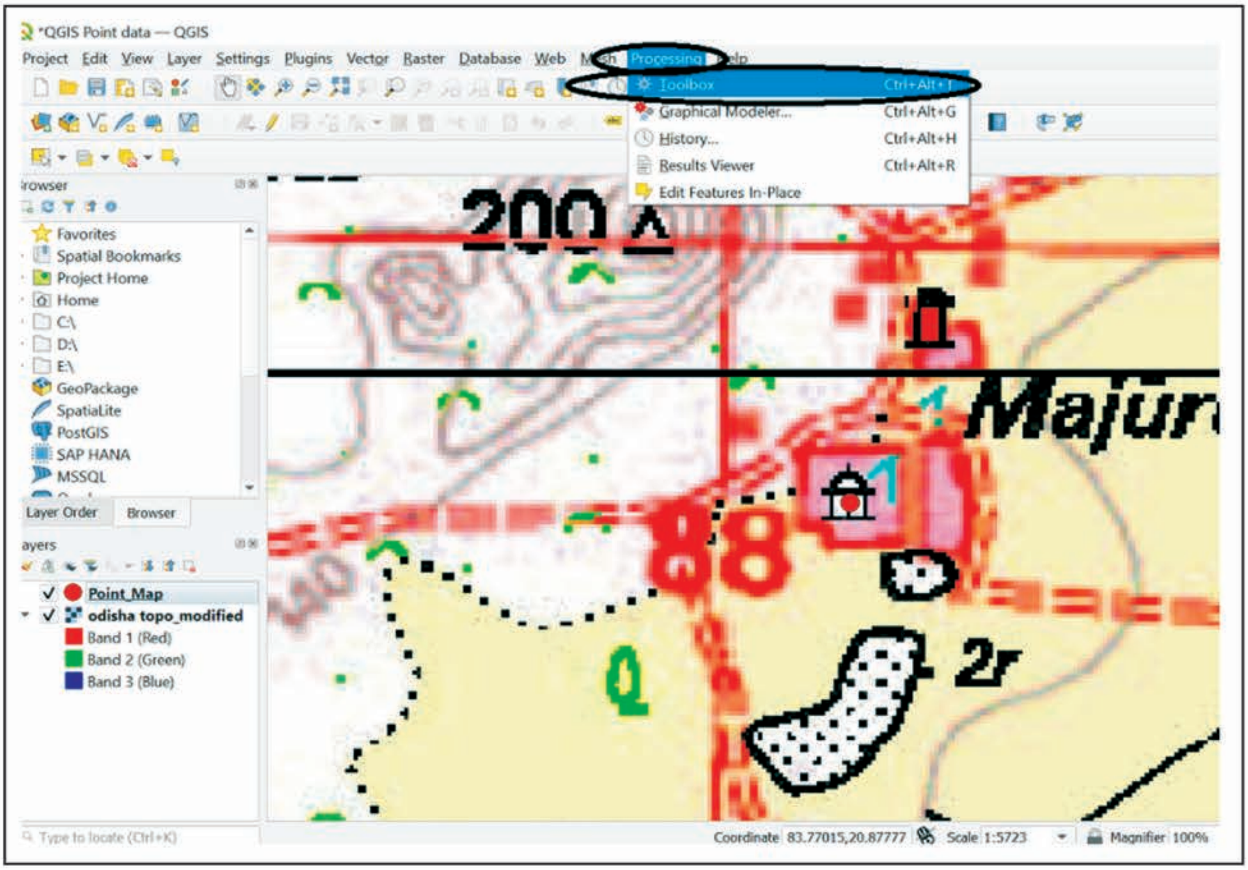


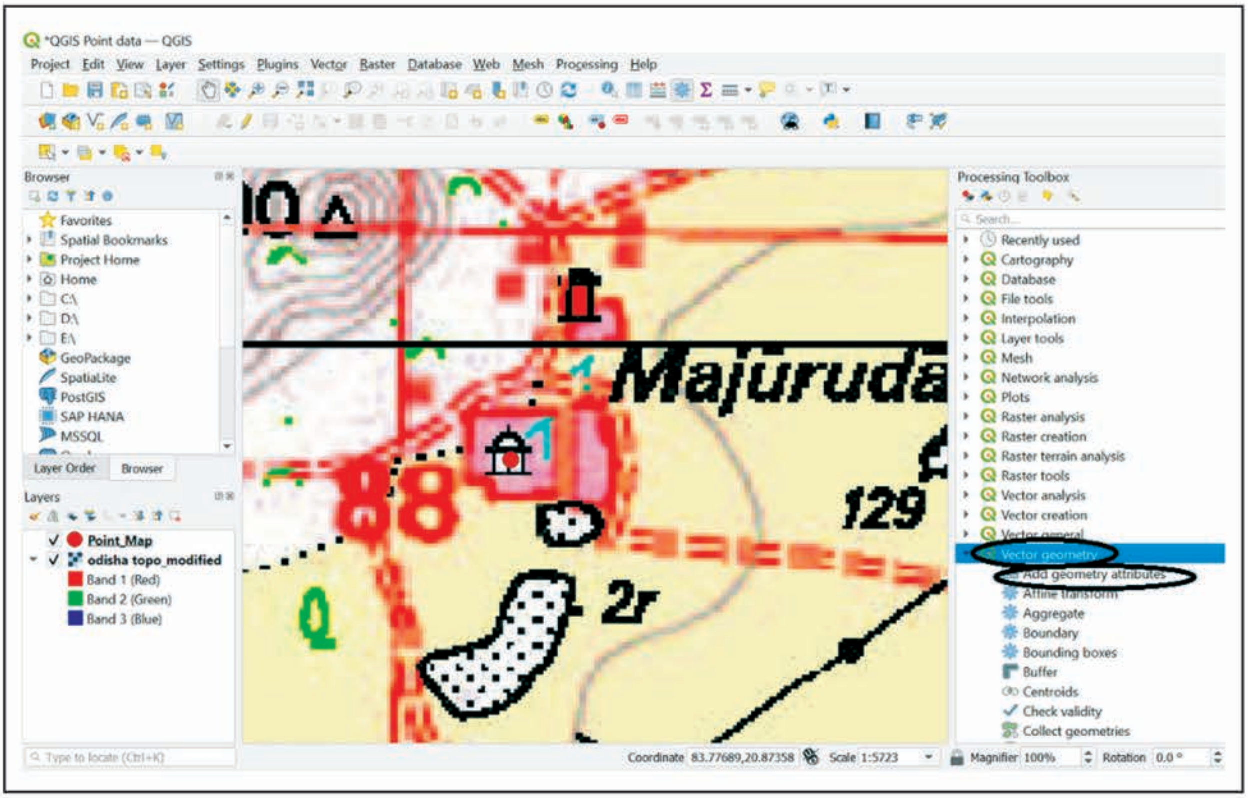
STEP 13 : STOP THE EDIT BY CLICKING TOGGLE KEY AND SAVE THE FIELD AND THEN SAVE THE PROJECT



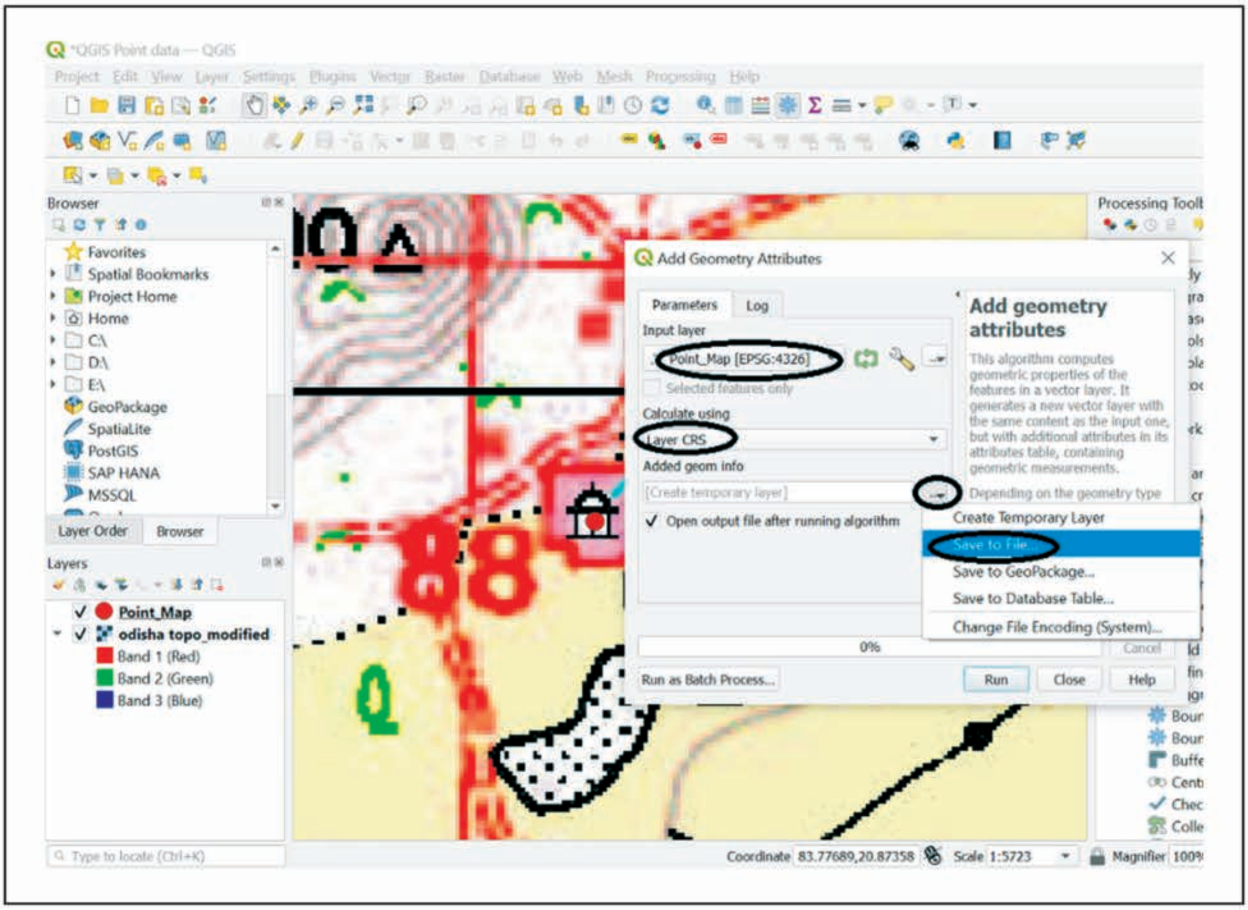
STEP 14: OTHER WAY OF ADDING GEOCORDINATE THROUGH ADD GEOMETRY FROM VECTOR GEOMETRY

Click processing >> Toolbox >> click vector geometry >> add geometry attributes

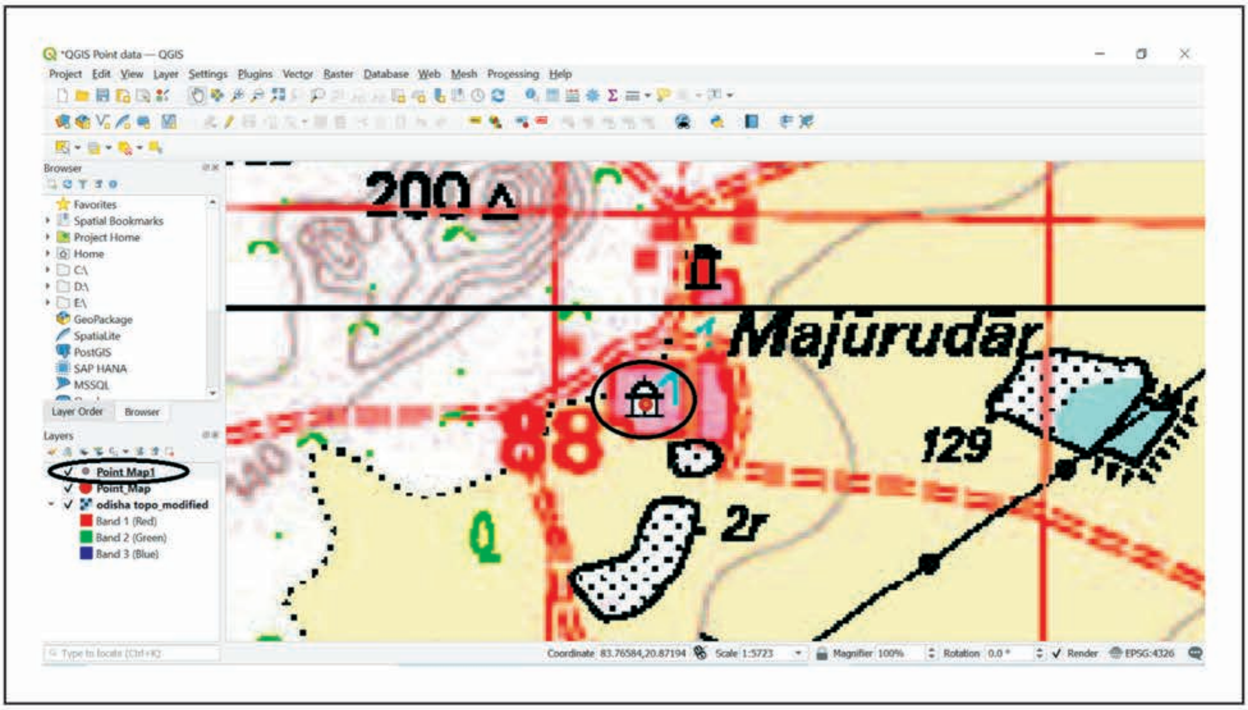


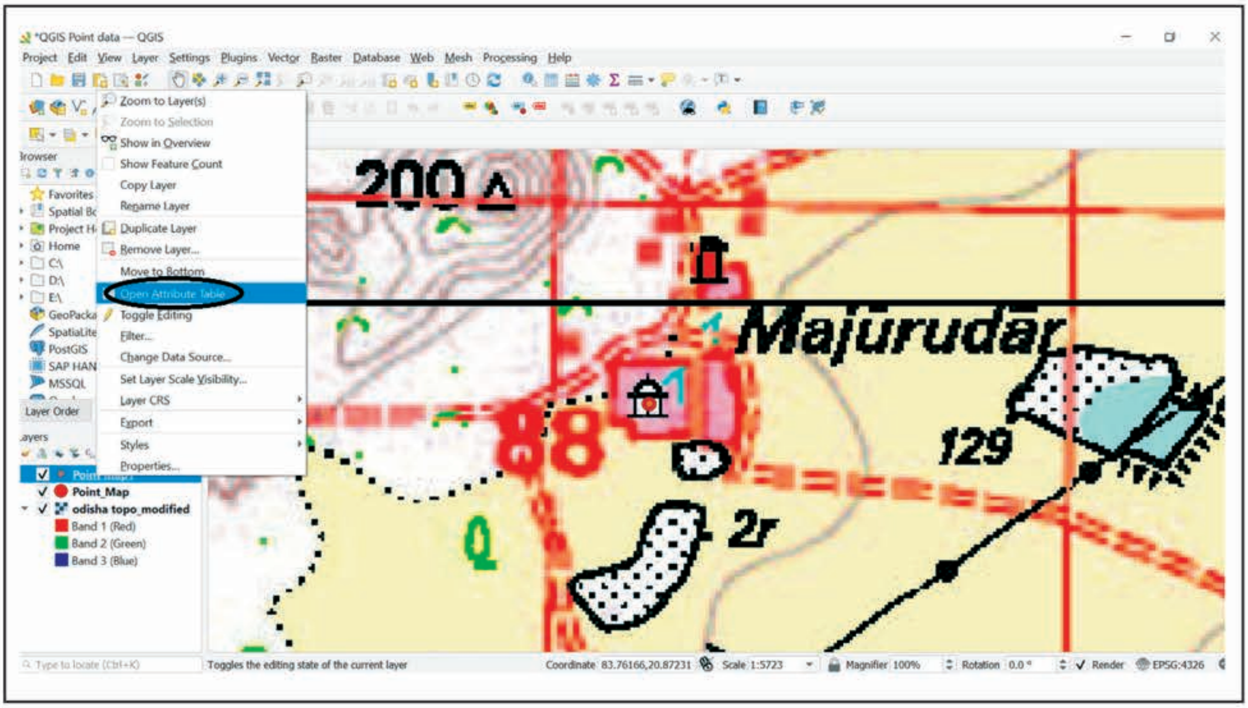


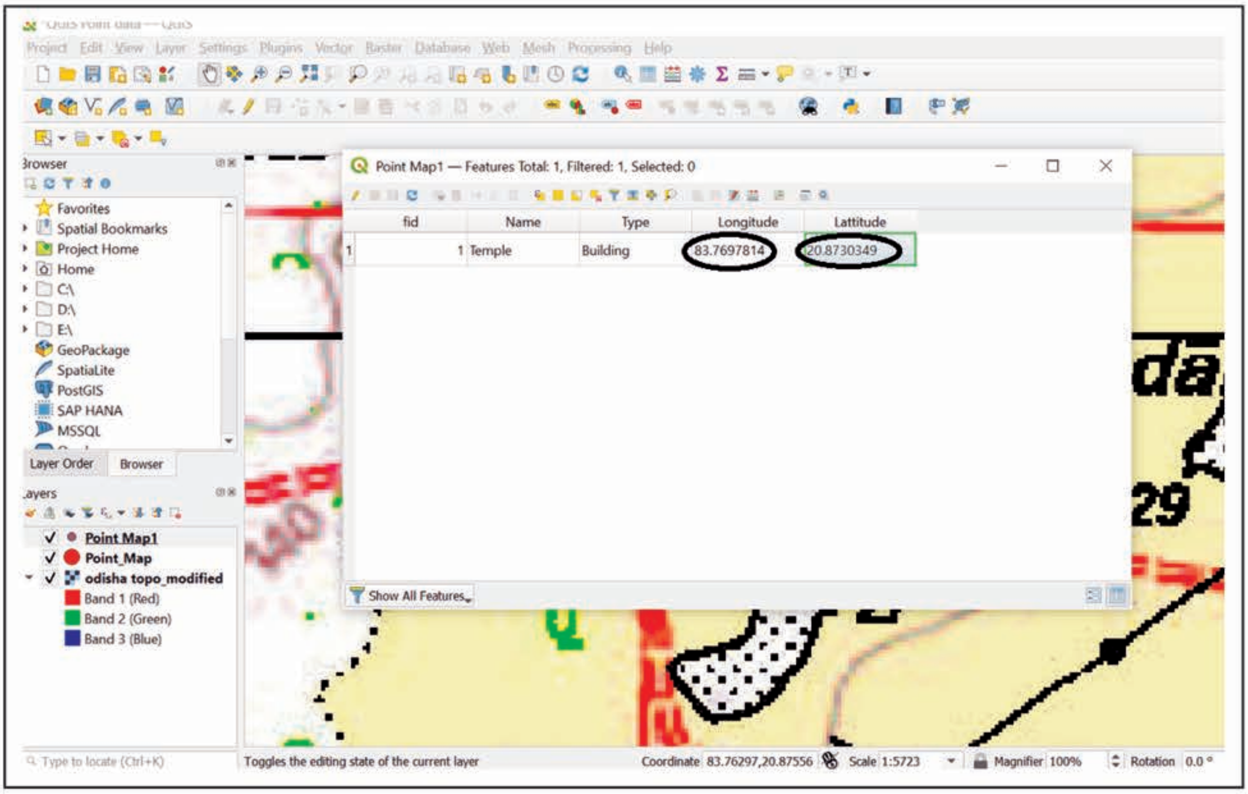
Now create temporary layer by saving file and run



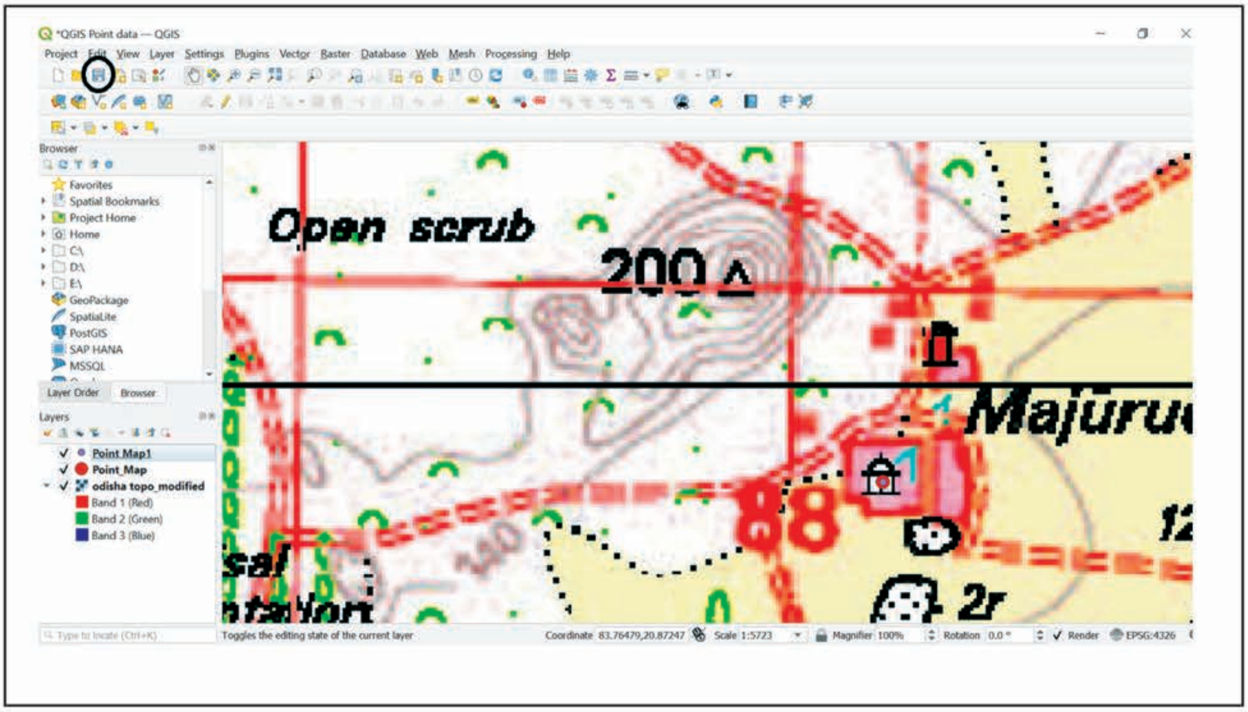
Temporary layer has been created, now check for latitude and longitude by opening attribute table of newly created layer.







SAVE THE PROJECT



Keywords:

Vector : Represents real world features, in form of points, line and polygon. It has length, shape and direction and defined by coordinates.

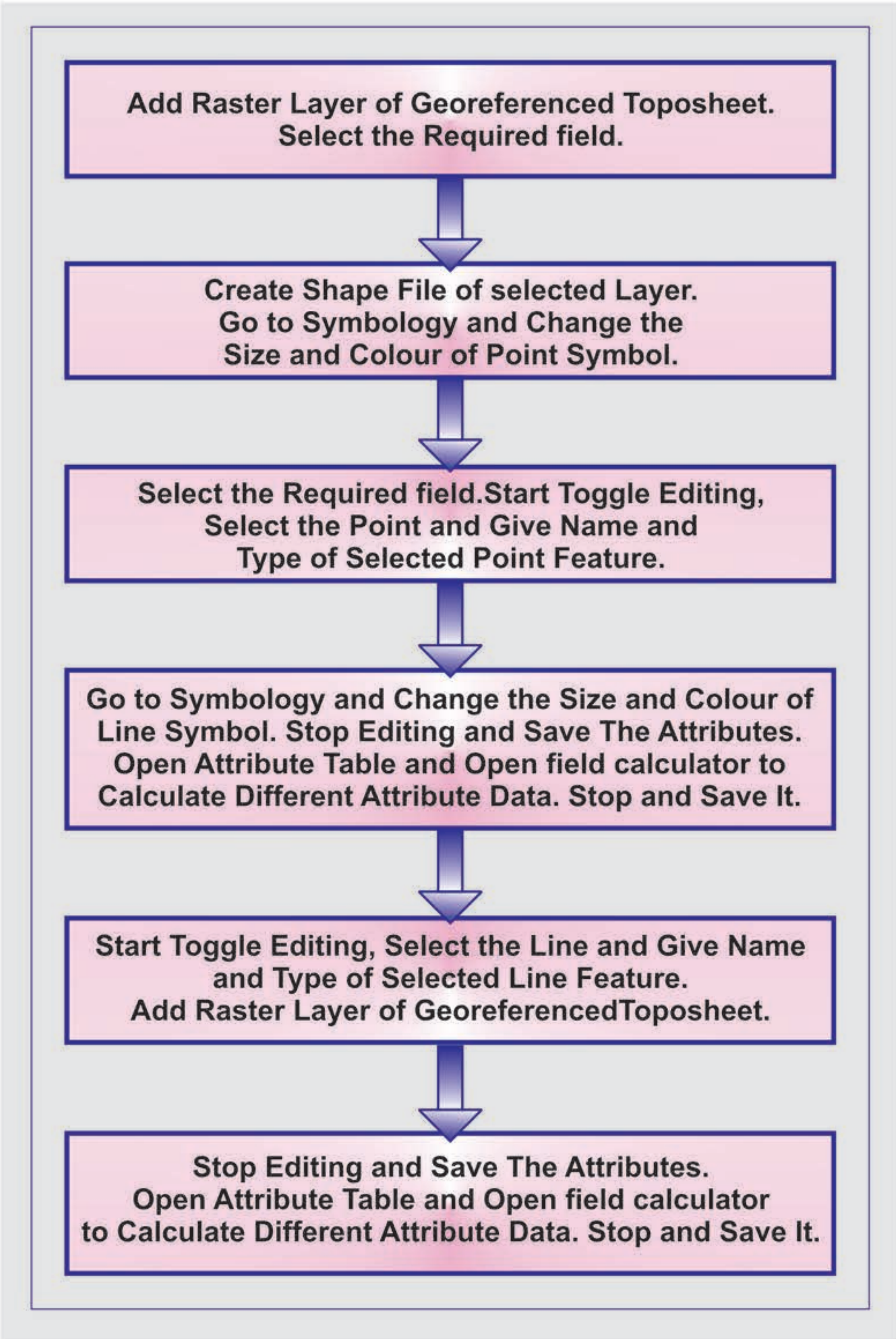
Shape file : It is a geo-spatial vector data format for storing the geometric location and attribute information of geographical features.

Georeferenced Toposheet : This is a toposheet which is ground coordinated using ground control points with the help of GPS.

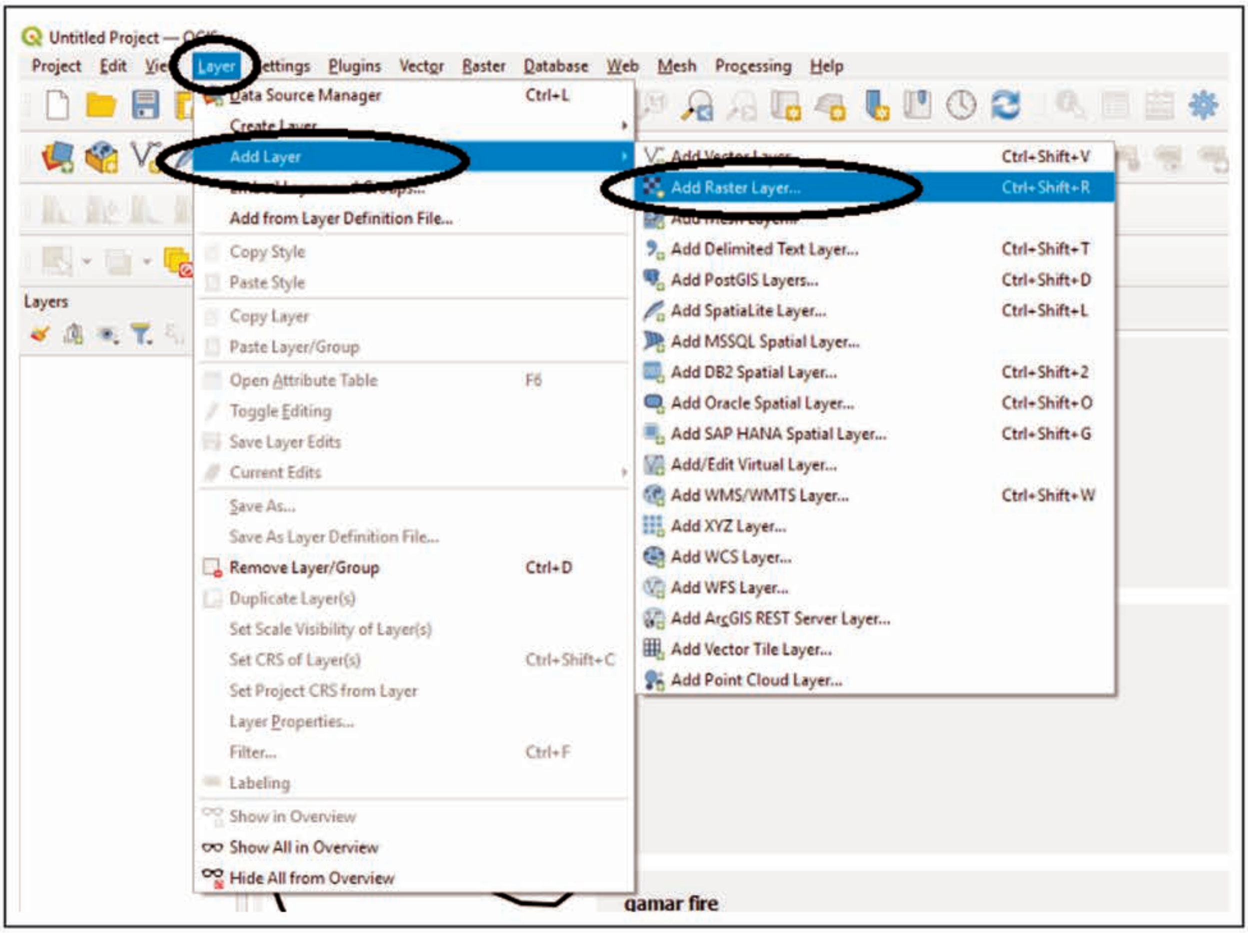
Attribute Data : It is the information provided in tabular format which contains spatial data in form of text alpha numeric symbols, integers etc.

2. Making Line on Toposheet

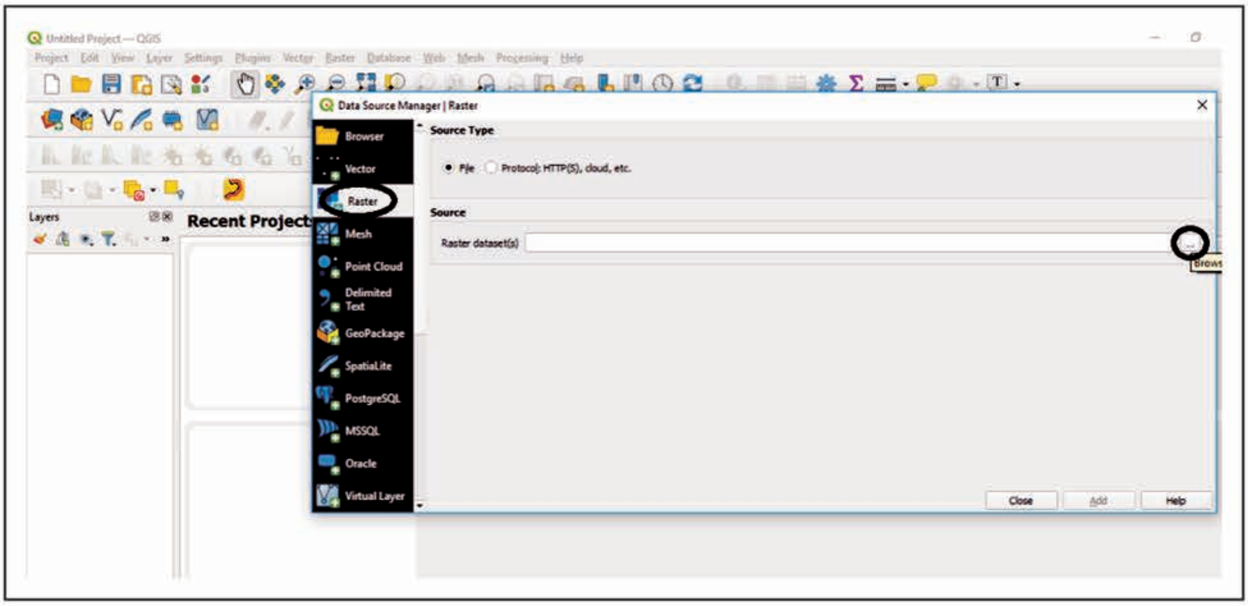
Line is the vector data which provides the information about Length of line features in the map. Line data analysis provides information about Roads, railways, rivers, electricity lines, pipe lines etc. which is helpful in management of forest operation.

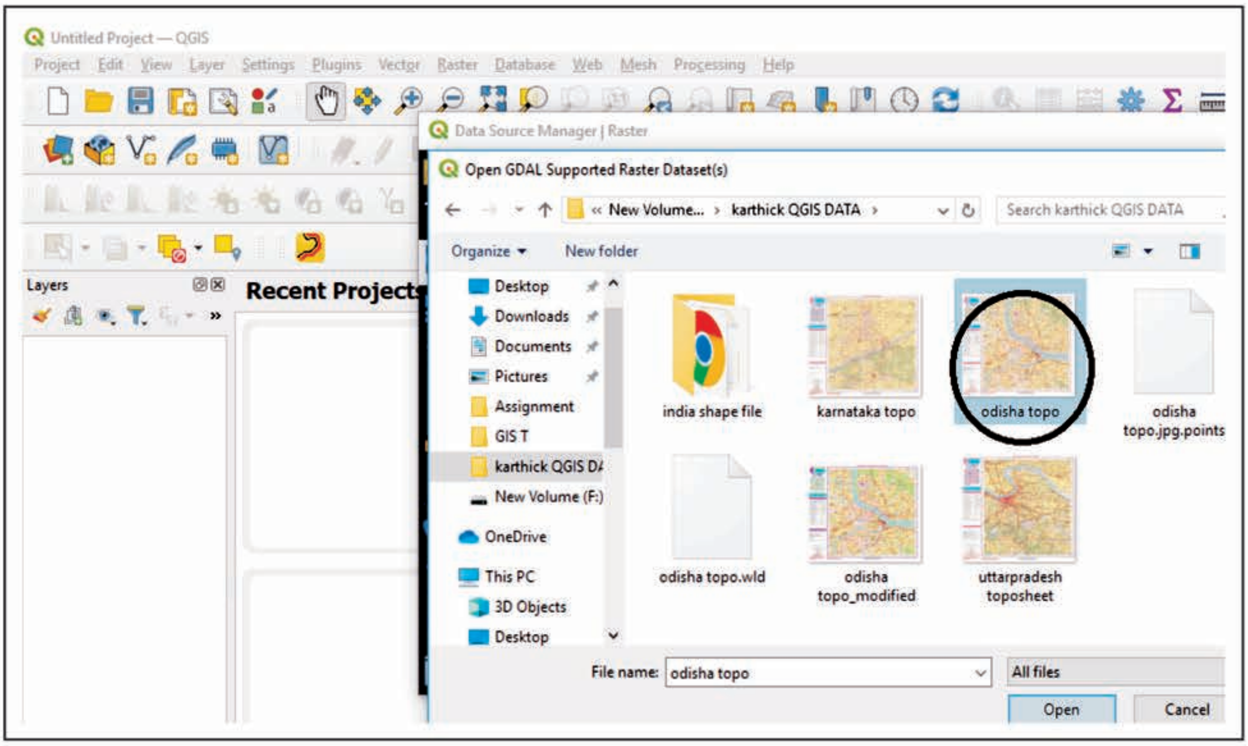


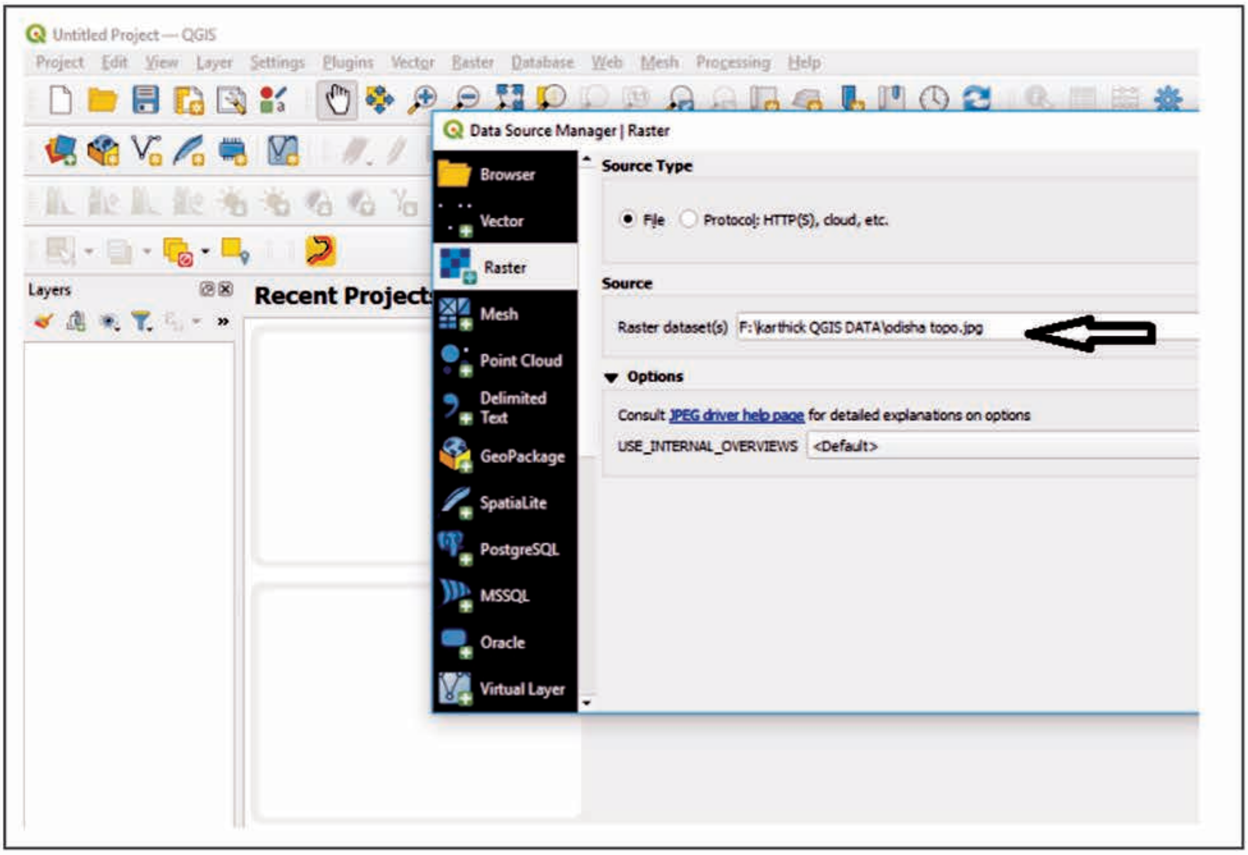
Step 1 : Open GIS software and click on "Layer"Select "Add Layer" and click "Add Raster Layer"

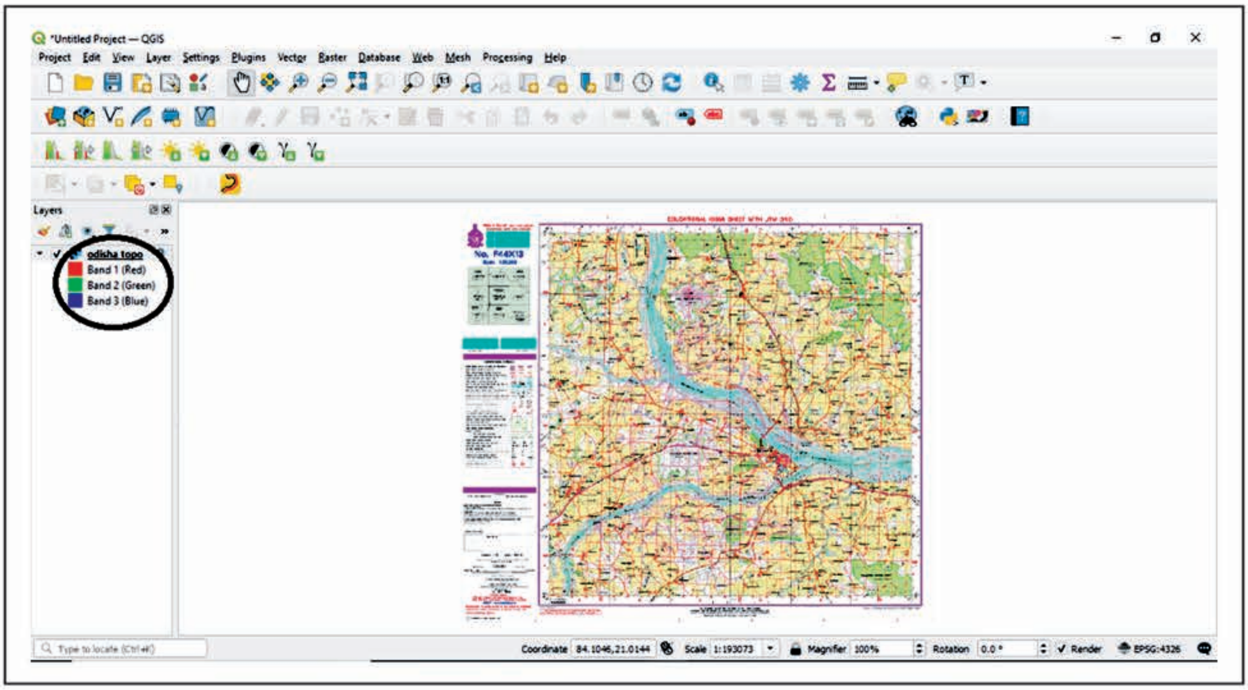


Step 2 : Add Raster File. Example: Odisha Topo

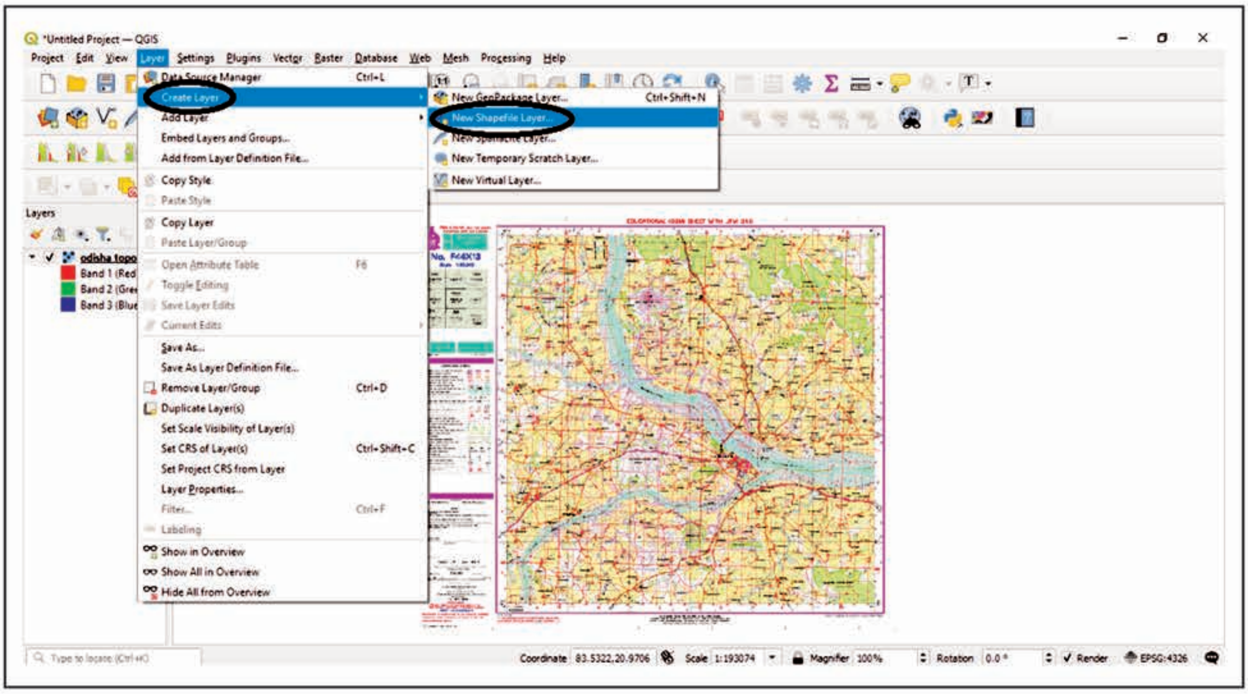



Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Data Source Manager | Raster
Open GDAL Supported Raster Dataset(s)
« New Volume... › karthick QGIS DATA ›
Search karthick QGIS DATA
Organize
New folder
Layers
Recent Projects
Desktop
Downloads
Documents
Pictures
Assignment
GIS T
New Volume (F:)
OneDrive
This PC
3D Objects
Desktop
india shape file
karnataka topo
odisha topo
odisha topo.jpg.points
odisha topo.wld
odisha topo_modified
uttarpradesh toposheet
File name:
odisha topo
All files
Open
Cancel


Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Data Source Manager | Raster
Layers
Recent Projects
Browser
Vector
Raster
Mesh
Point Cloud
Delimited Text
GeoPackage
SpatiaLite
PostgreSQL
MSSQL
Oracle
Virtual Layer
Source Type
File
Protocol: HTTP(S), cloud, etc.
Source
Raster dataset(s)
F:\karthick QGIS DATA\odisha topo.jpg
Options
Consult JPEG driver help page for detailed explanations on options
USE_INTERNAL_OVERVIEWS
<Default>

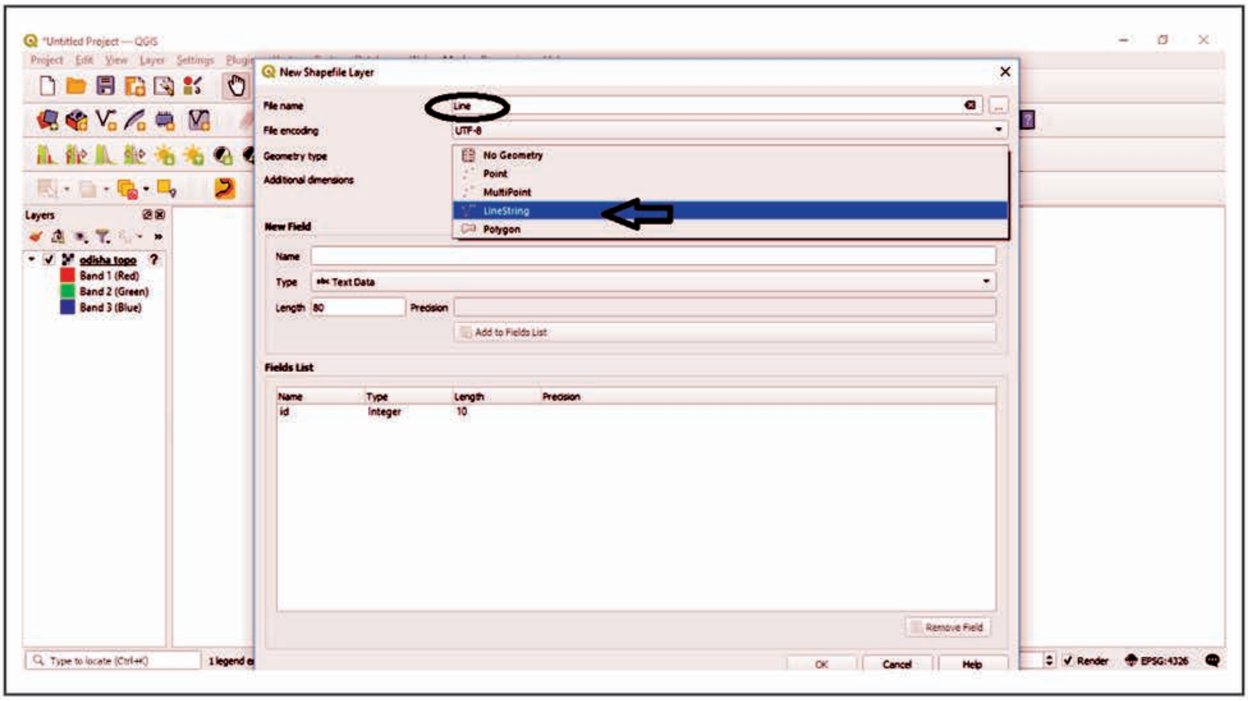


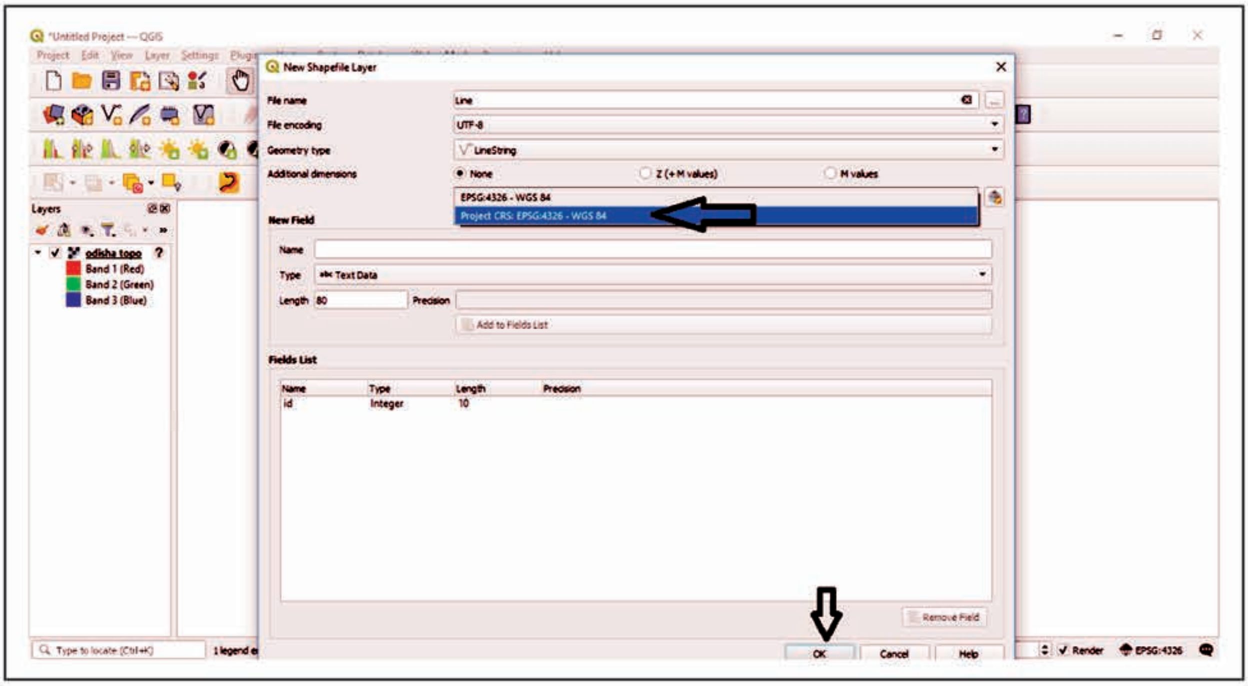
Step 3: After adding Toposheet, click "Layer" and select "Create Layer" and click "New Shapefile Layer"



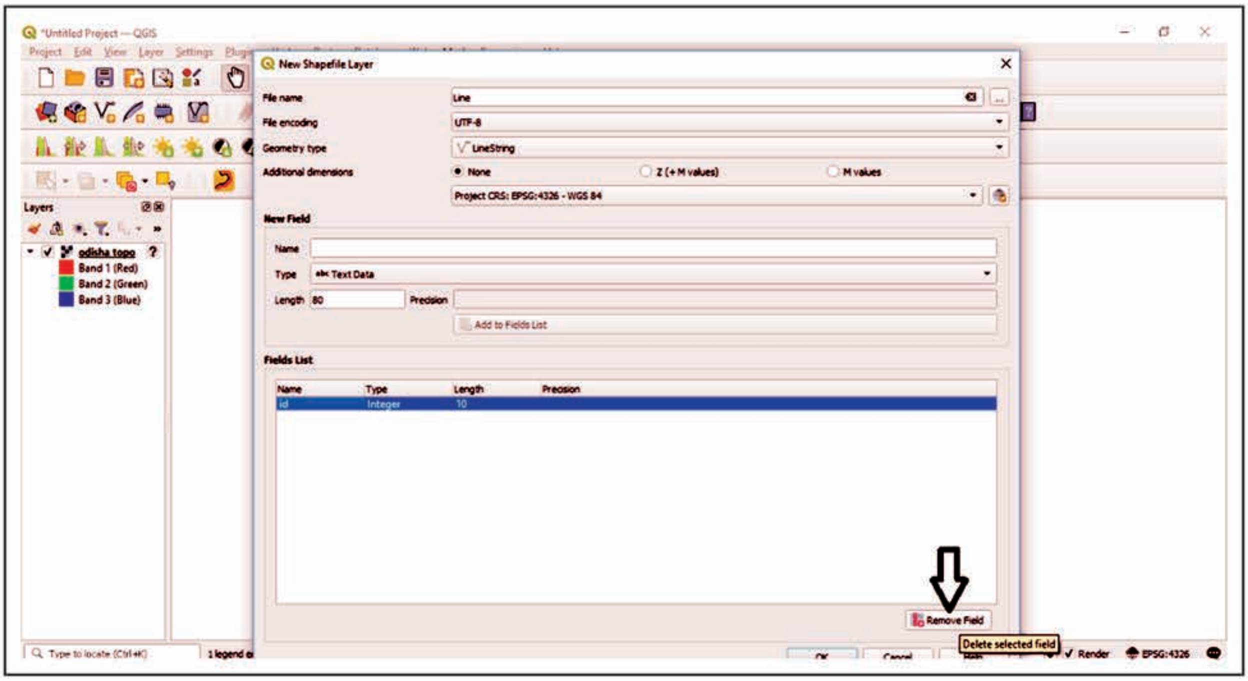
Step 4: Enter the following details in popup window:

File Name: 'Line' for example
Geometry type: Linestring (Select Coordinate system as Project CRS:EPSG:4326 - WGS 84)



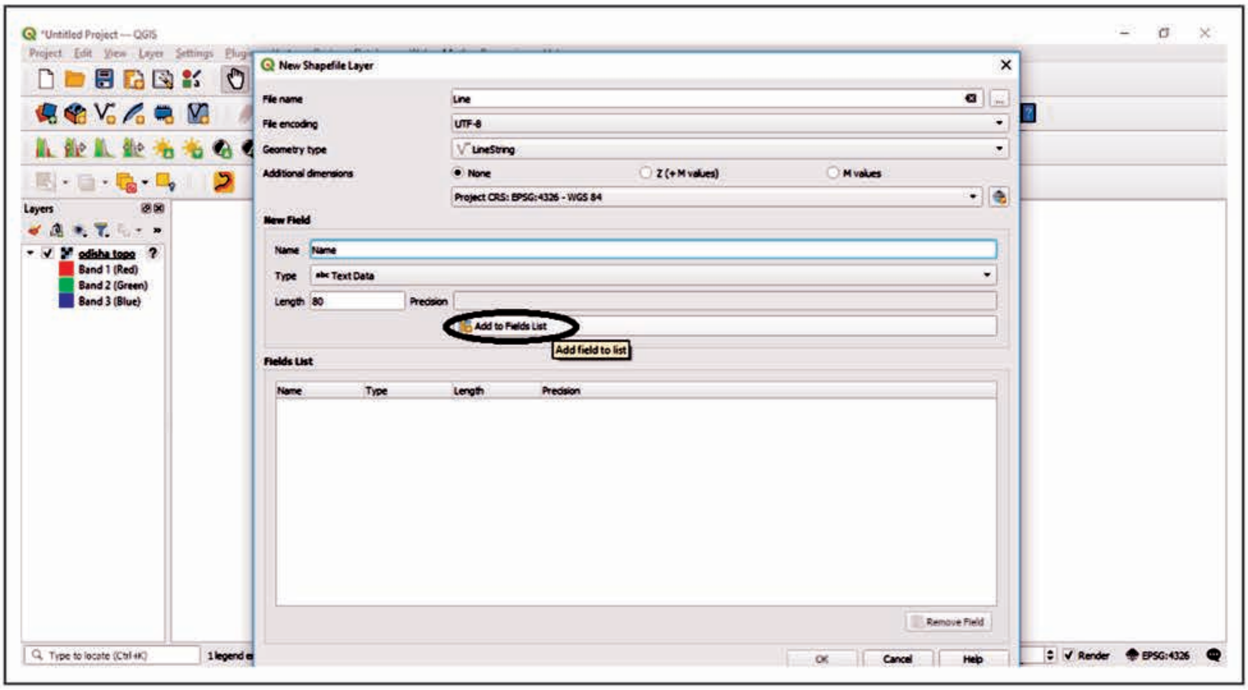


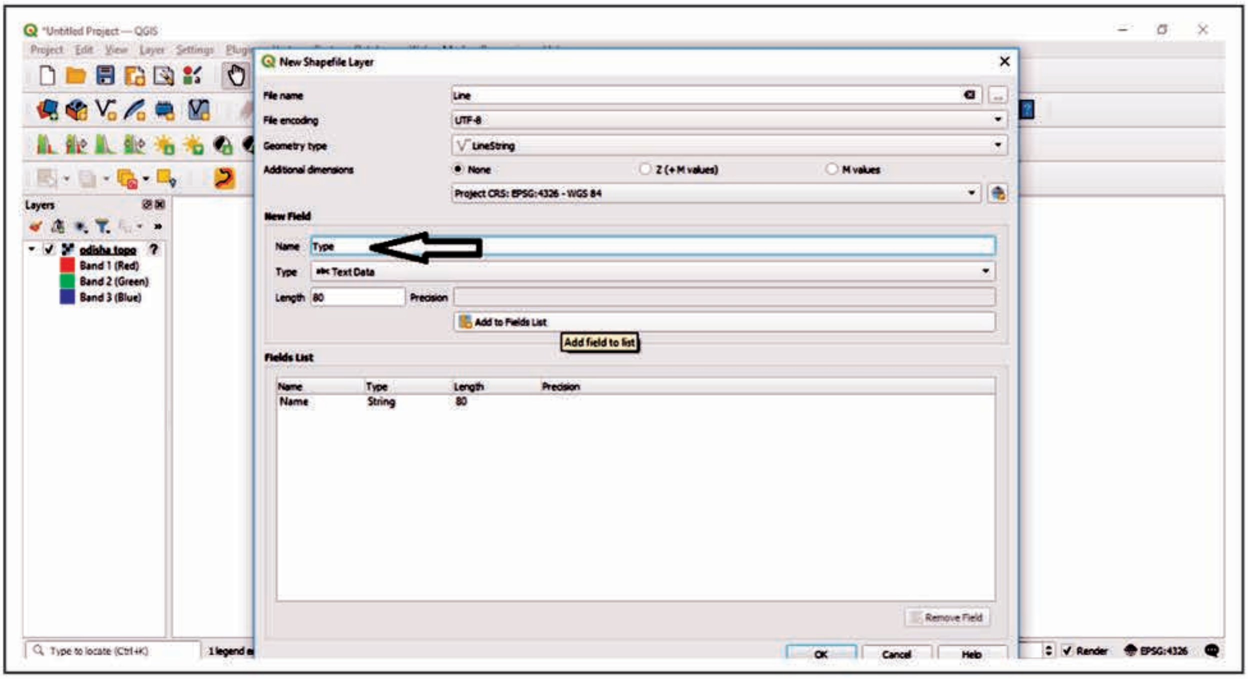
<u>Step 5</u>: Select the id entry in field list and remove the field



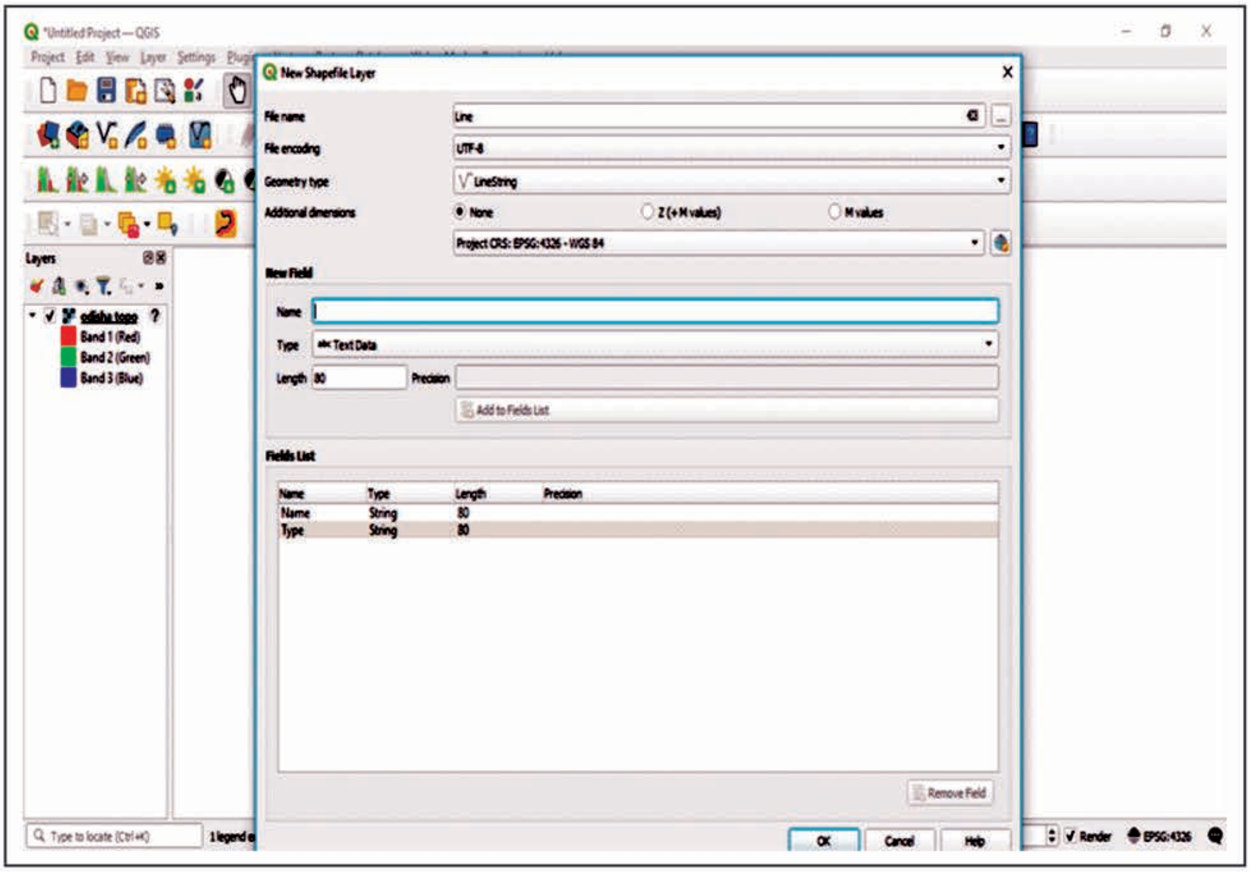
<u>Step 6</u>: New Field: Enter Name: Example 'Name'

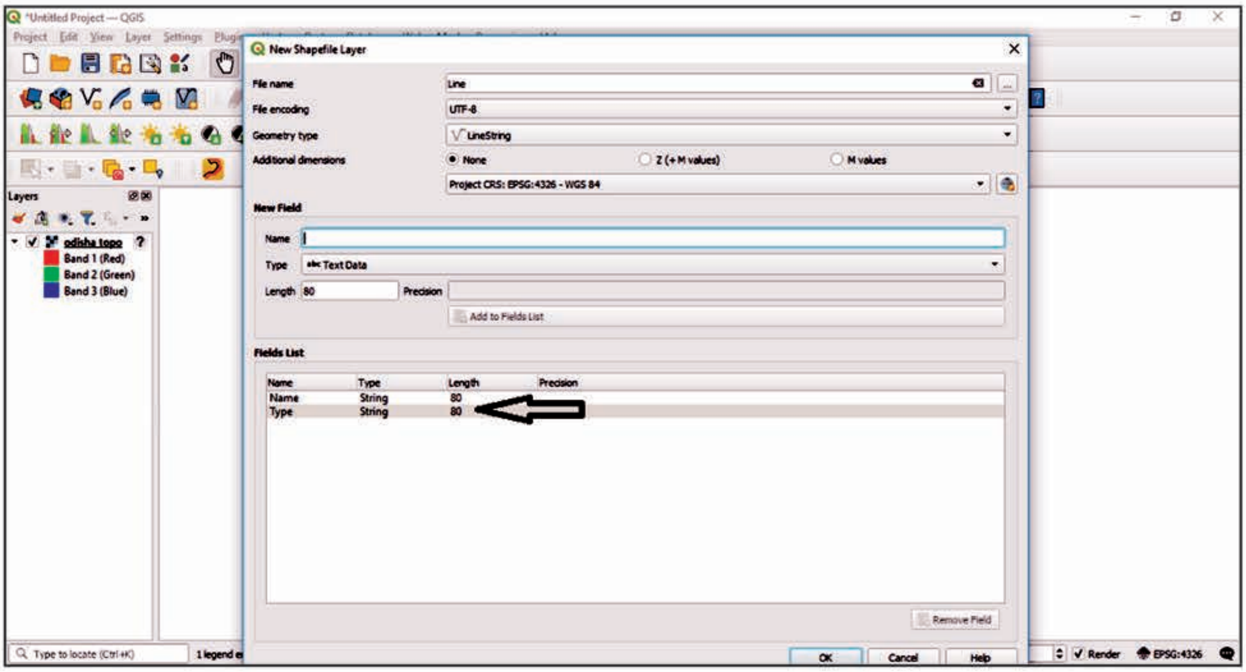
Select Type: Text Data Select 'Add to field list'.



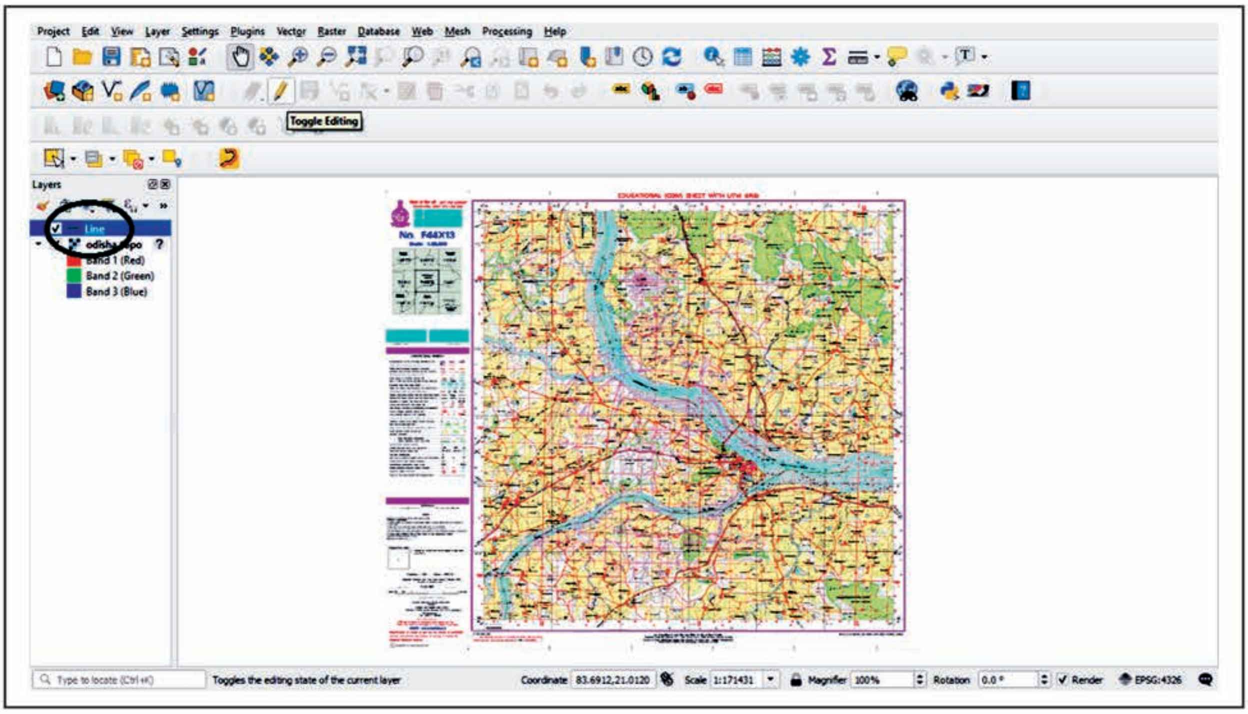


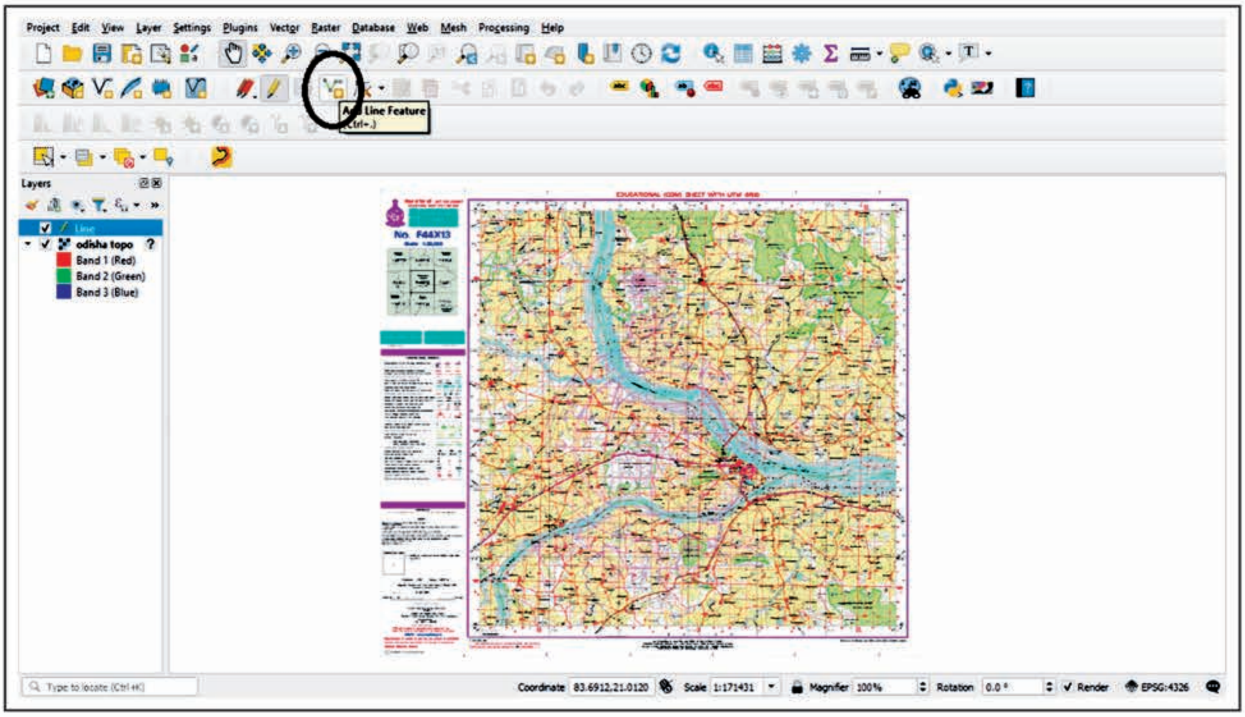
Click OK





Step 7 : Select the “Toggle editing” and click the “Add line feature”

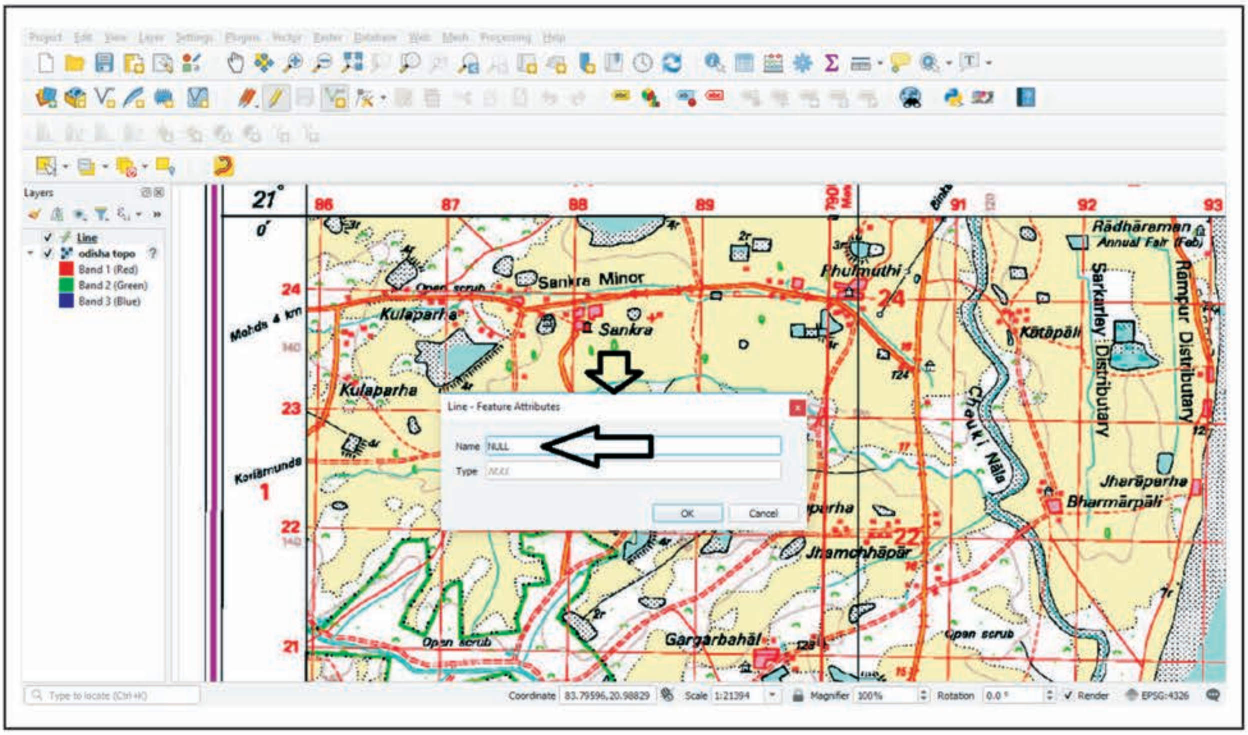


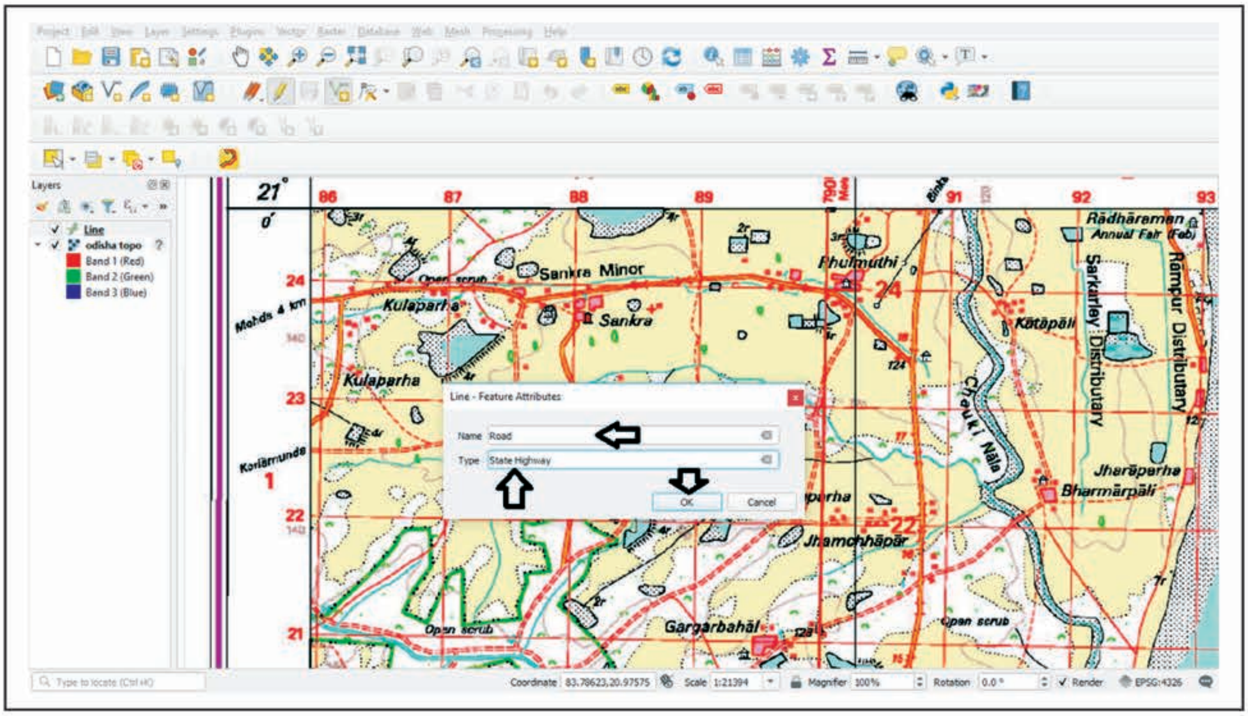


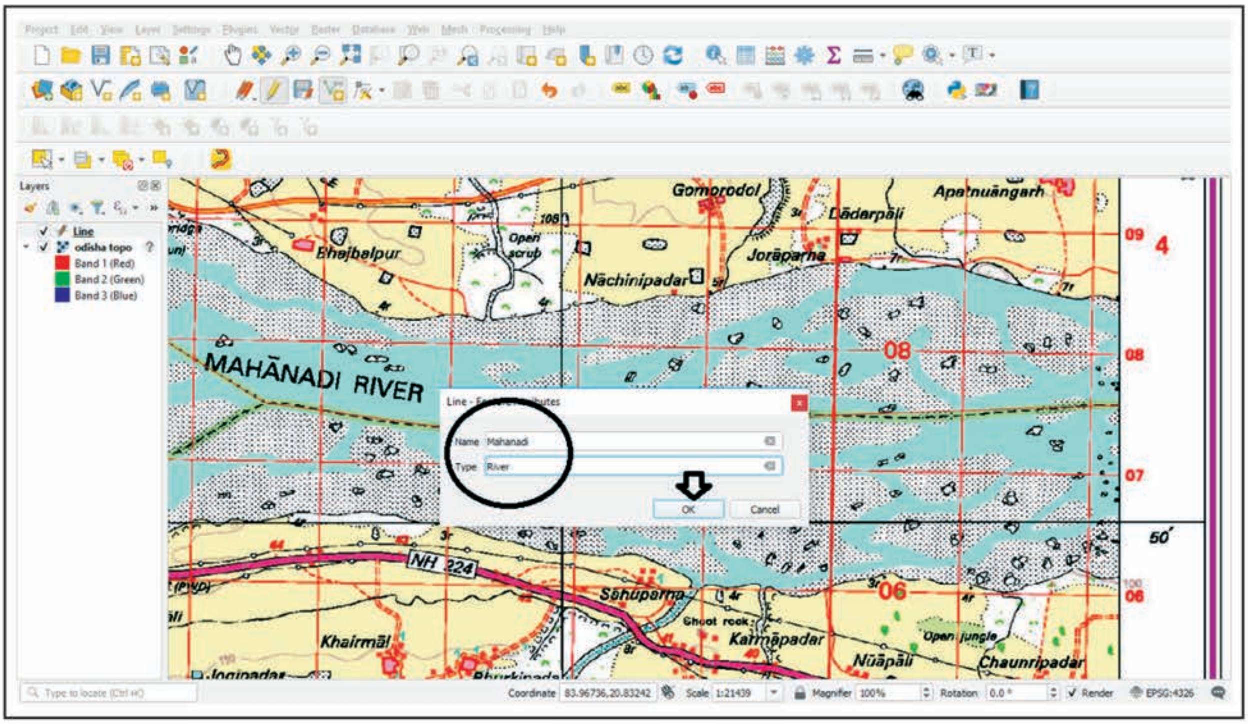
Step 8: Drew the Line on the Toposheet and Right click on the mouse. In Popup window make following entries:

Name: Give name of the Line, for example Road, Mahanadi.

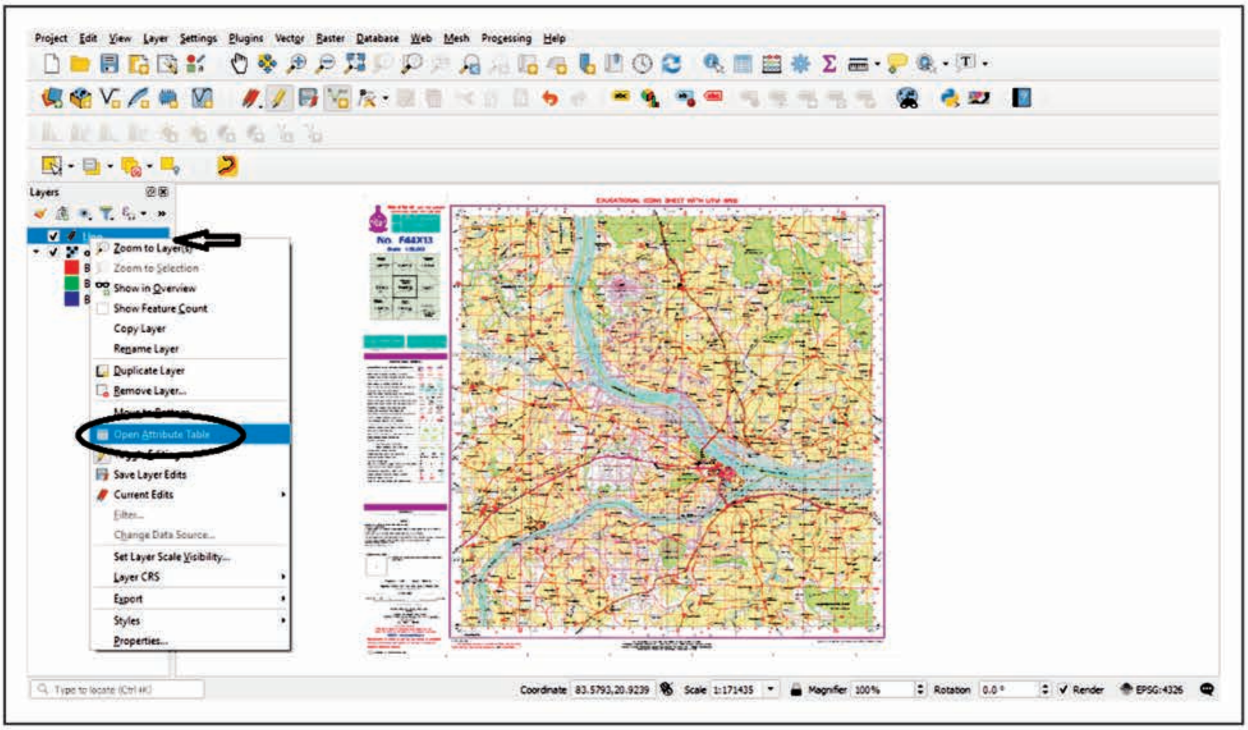
Type : enter the type, for example State Highway, river and select ok.

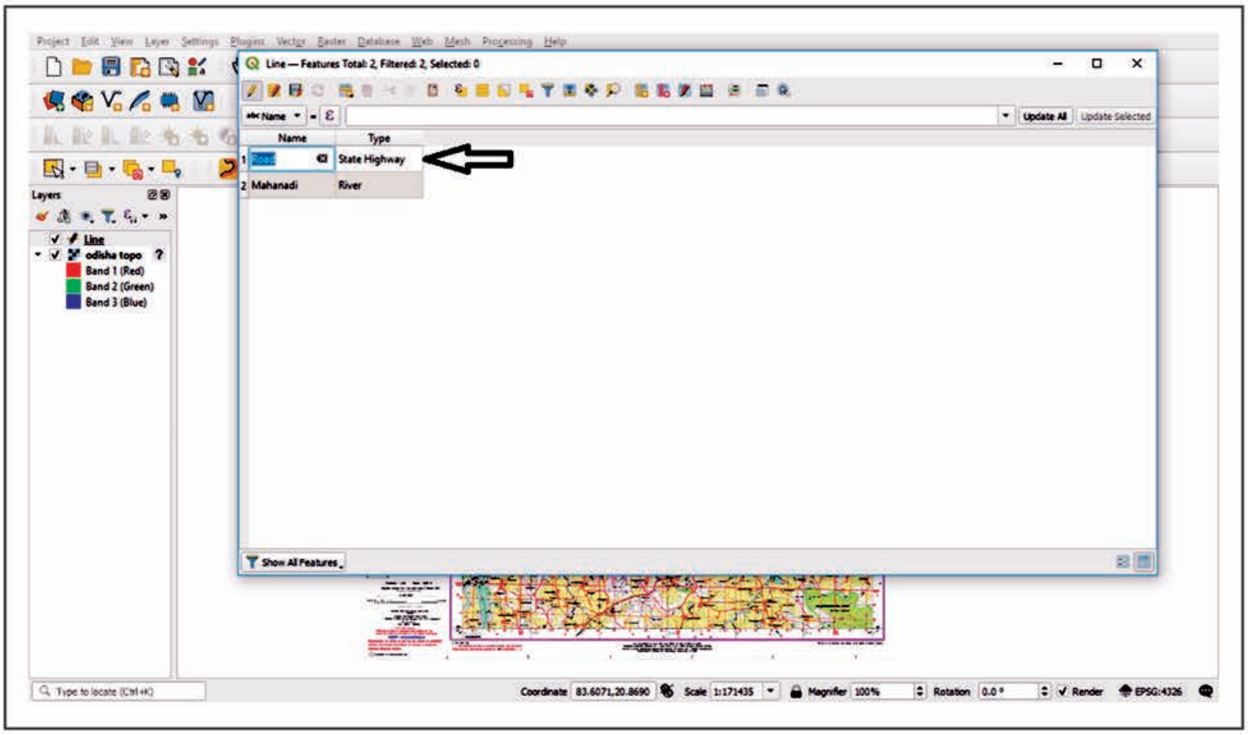



Line - Feature Attributes
Name
Road
Type
State Highway
OK
Cancel
Sankra Minor
Sankra
Kulaparha
Chauki Nala
Sarkarley Distributary
Rampur Distributary
Gargarbahal

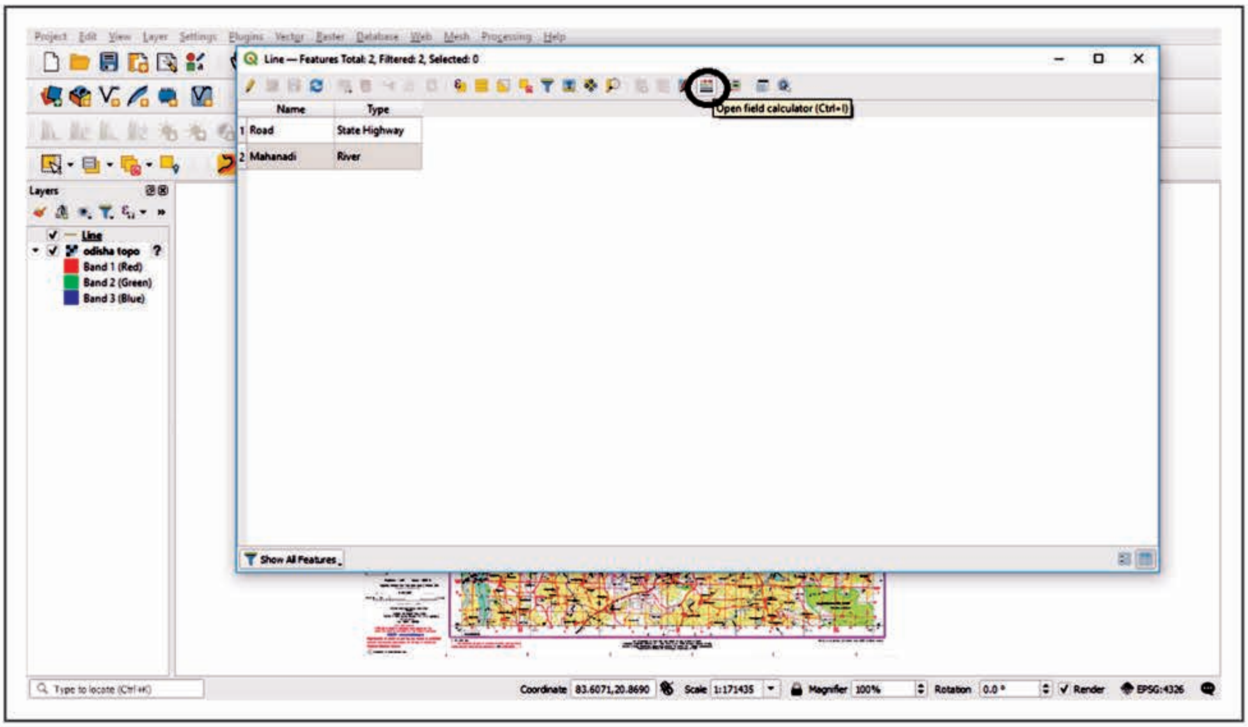

Name
Mahanadi
Type
River
OK
Cancel
MAHĀNADI RIVER
NH 224
Bhajbalpur
Khairmāl
Chaunripadar

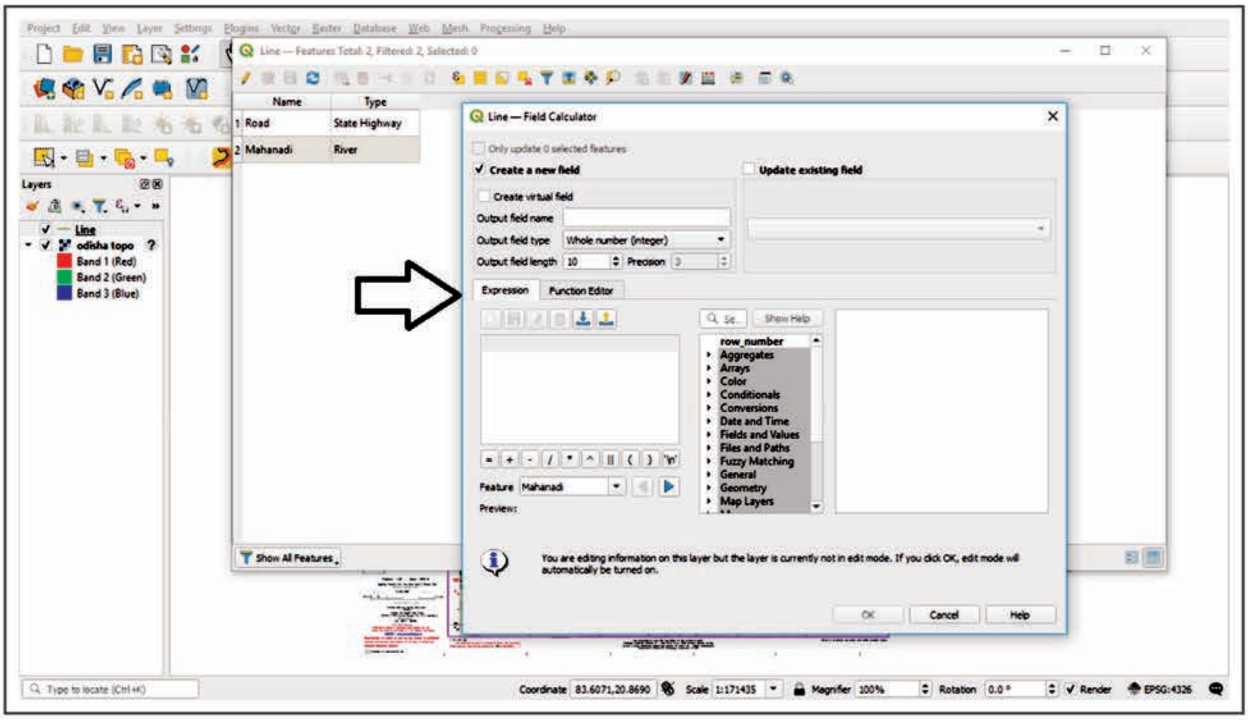
Step 9: After finishing line right click on 'line shapefile' under layers and 'Open Attribute Table' and click the 'Save' tool



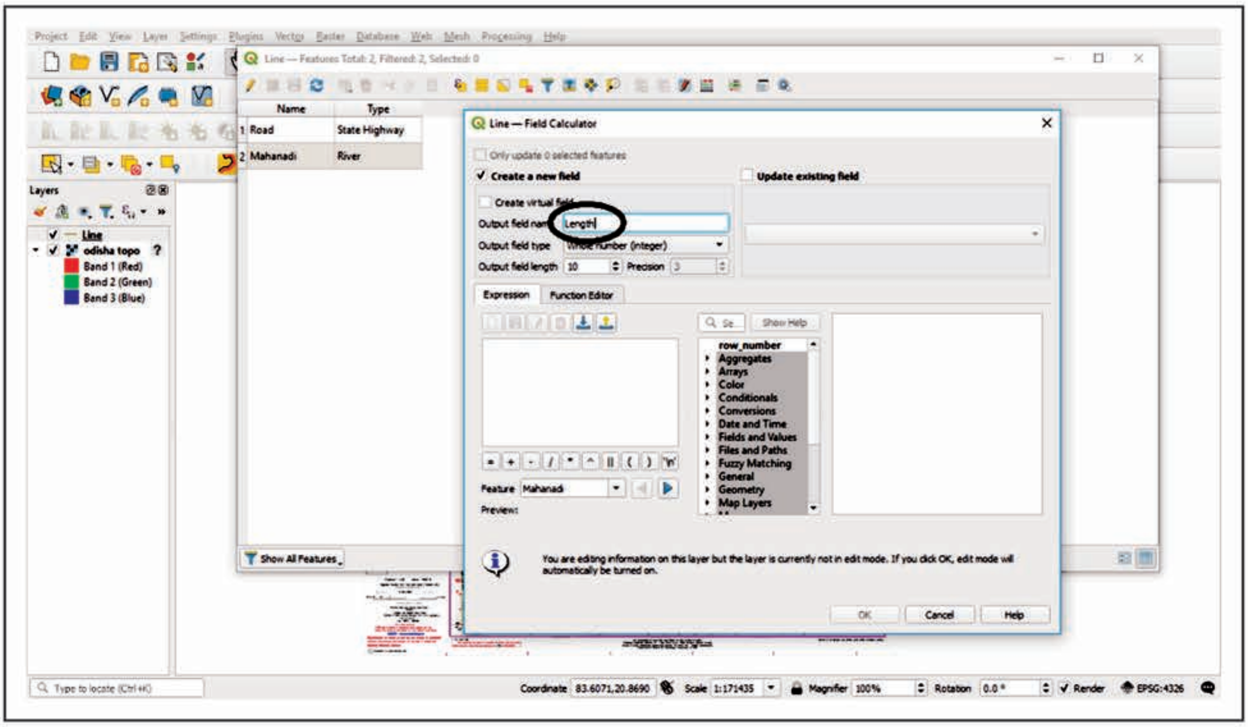


Step 10: Select the 'Open field calculator' tool

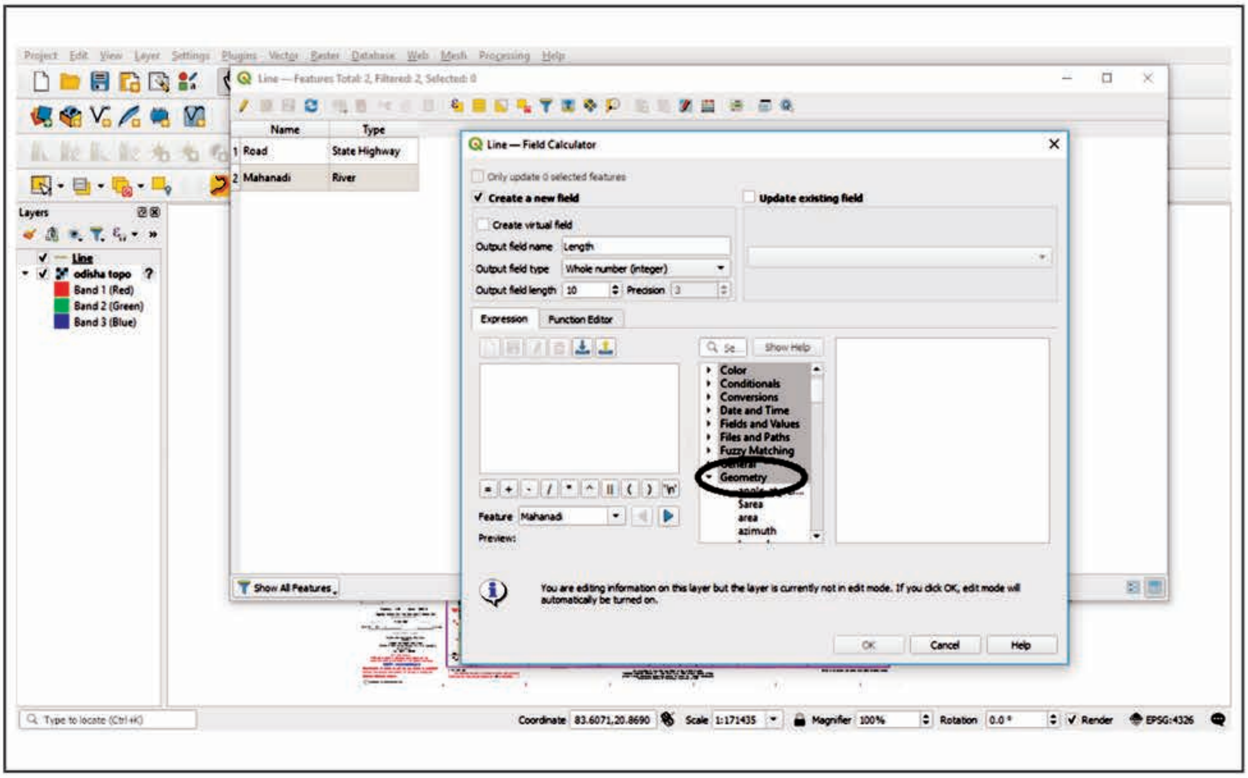


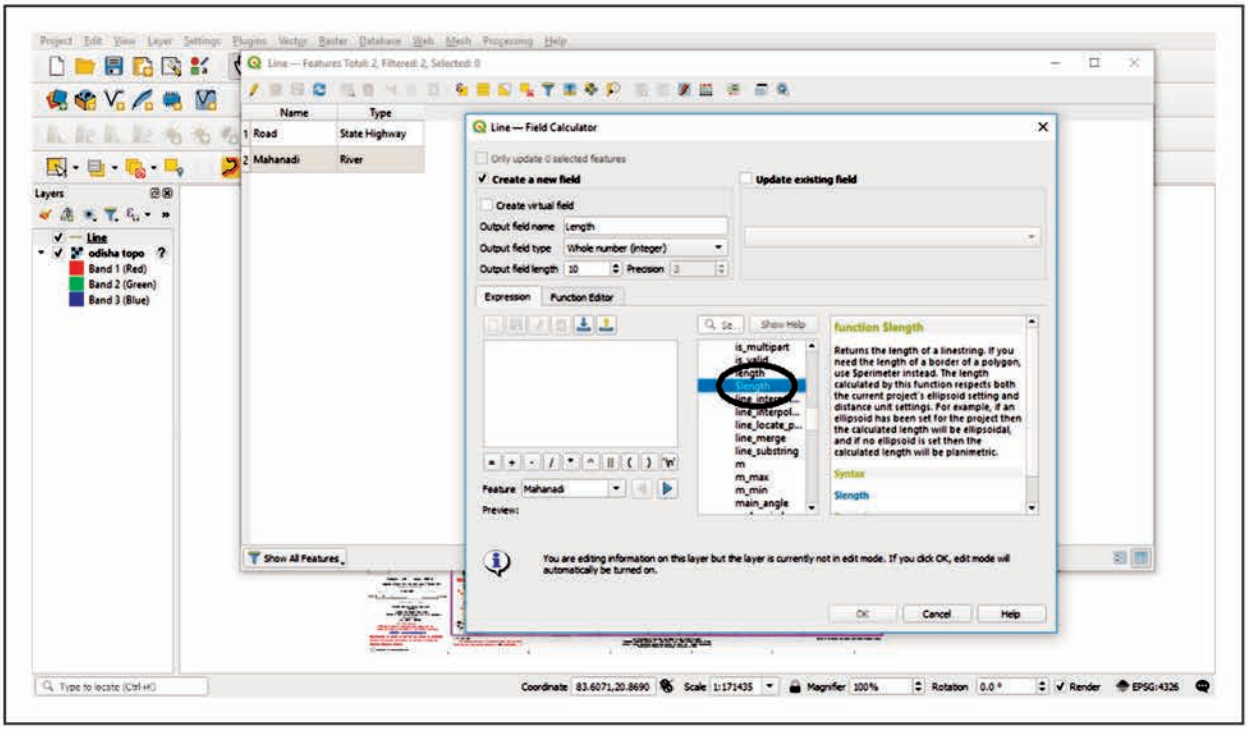


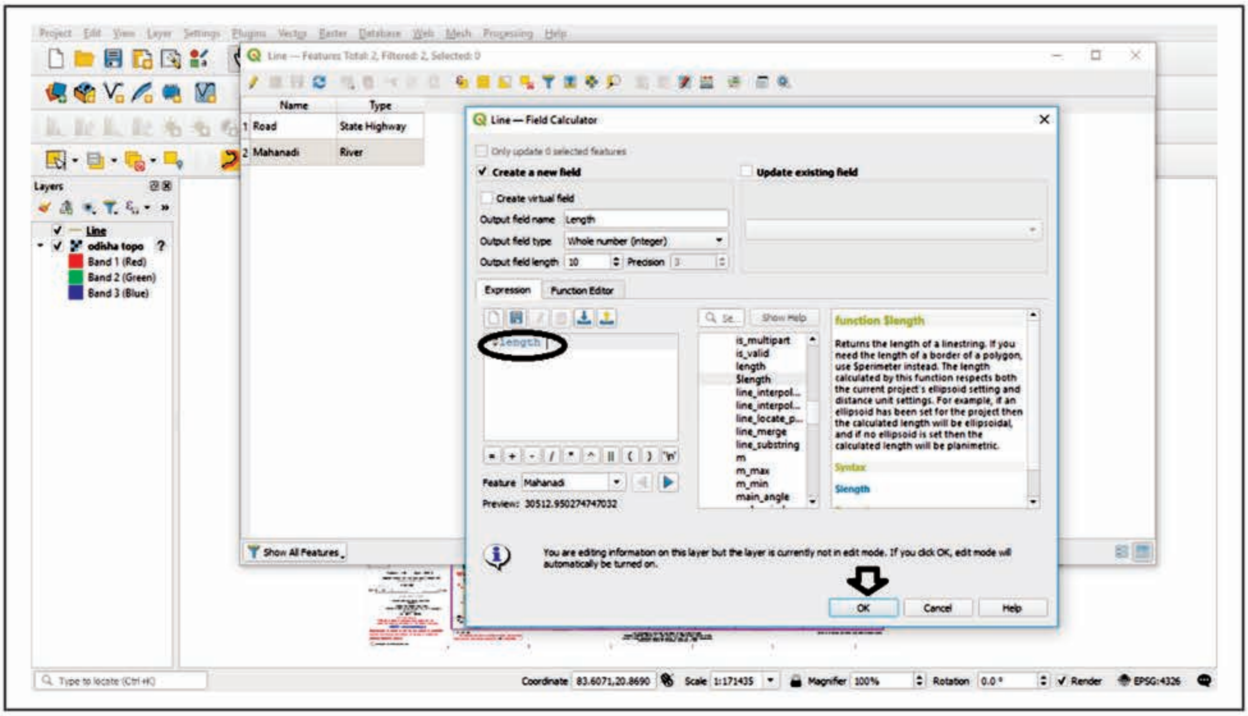
Step 11: In order to calculate the length of the field :In Field Calculator, Check 'Create a new field', Give Output field name: 'Length'



Step 12: Click the 'Geometry' tool in the row number and Double click "$length" tool.

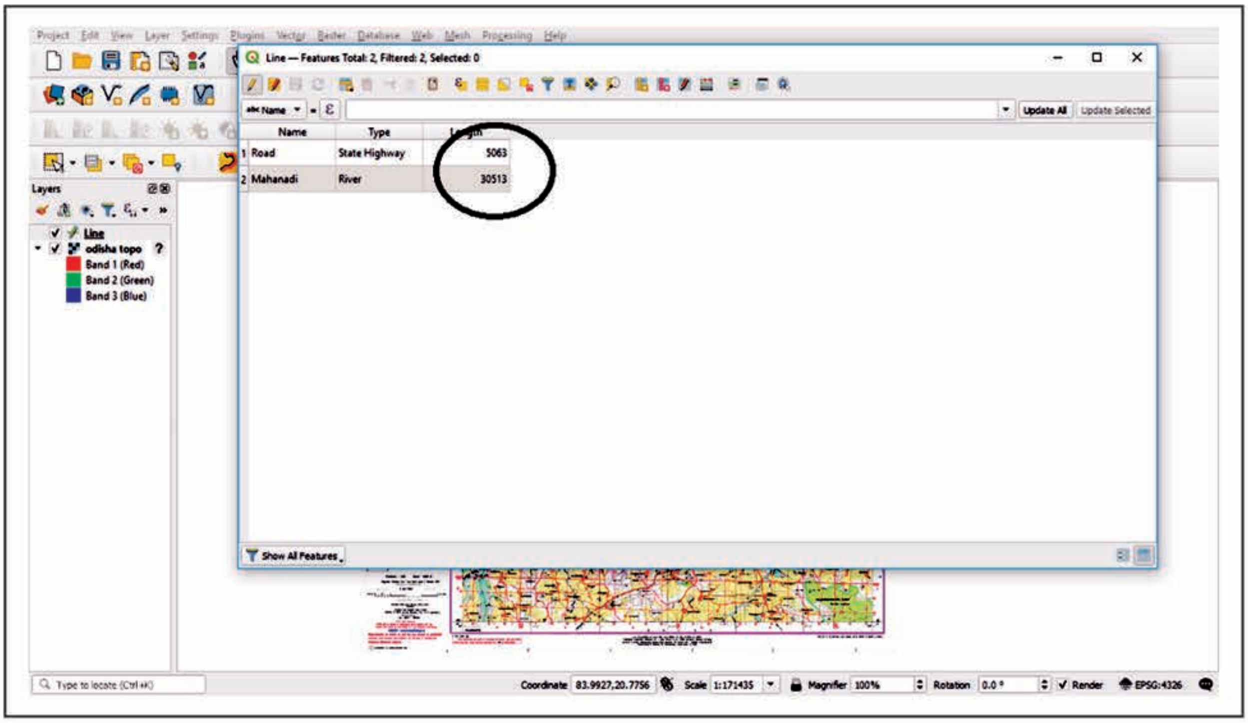




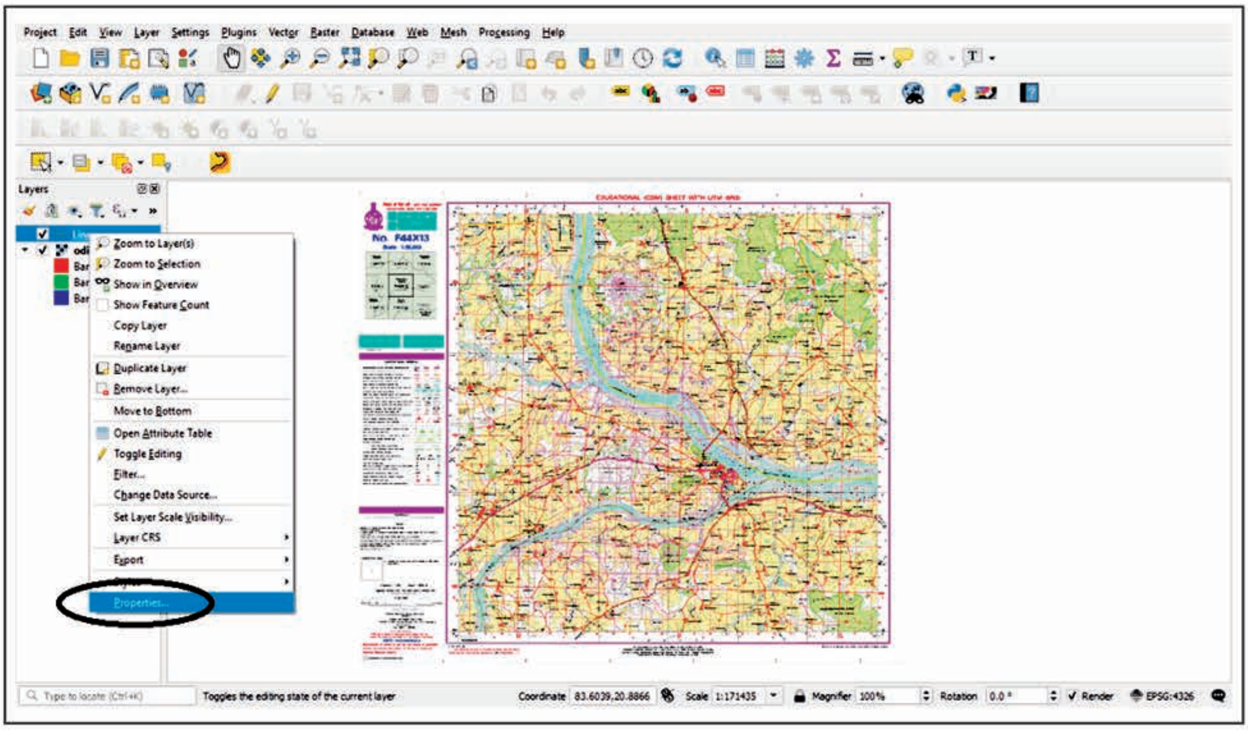


Close the Popup window.

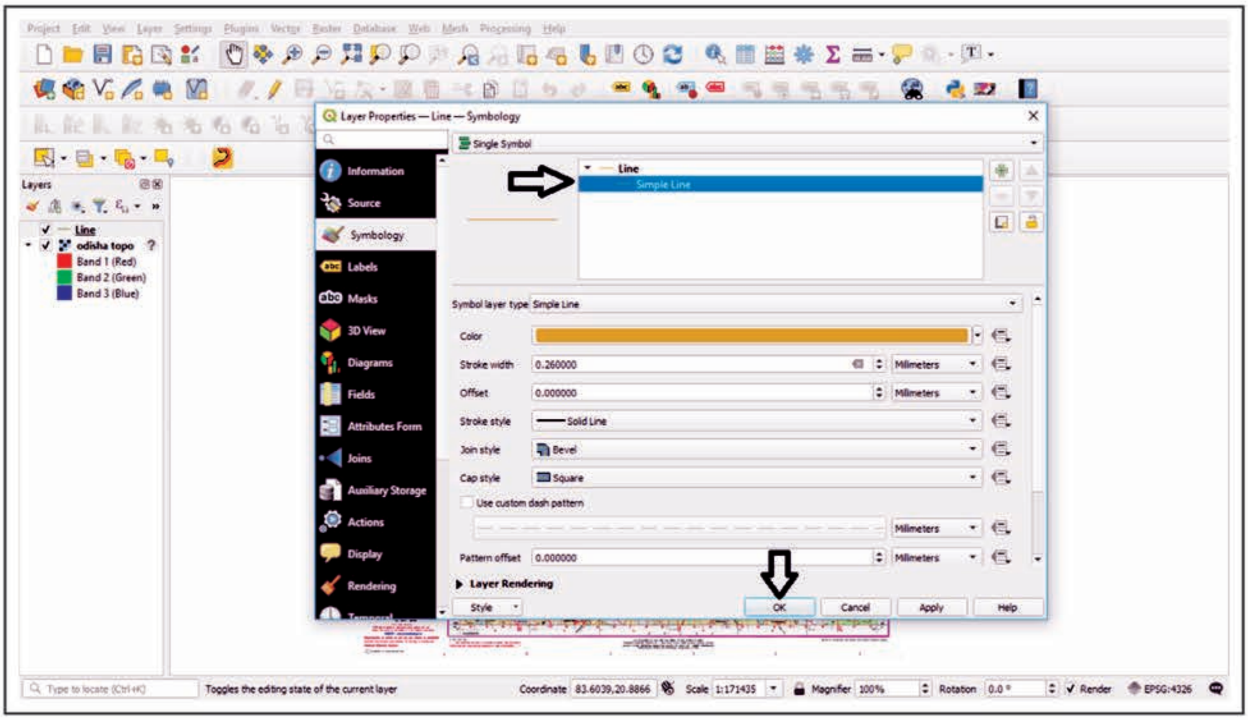
We can see the calculated length of the line in Attribute Table.

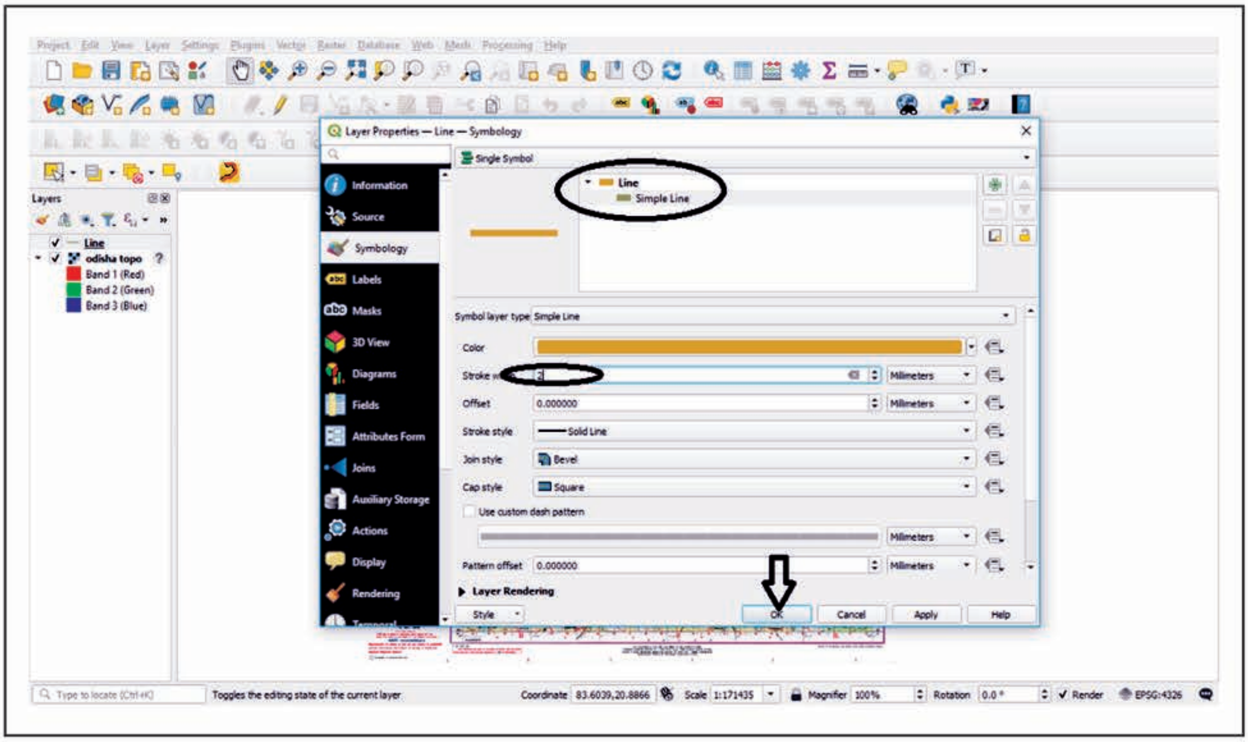


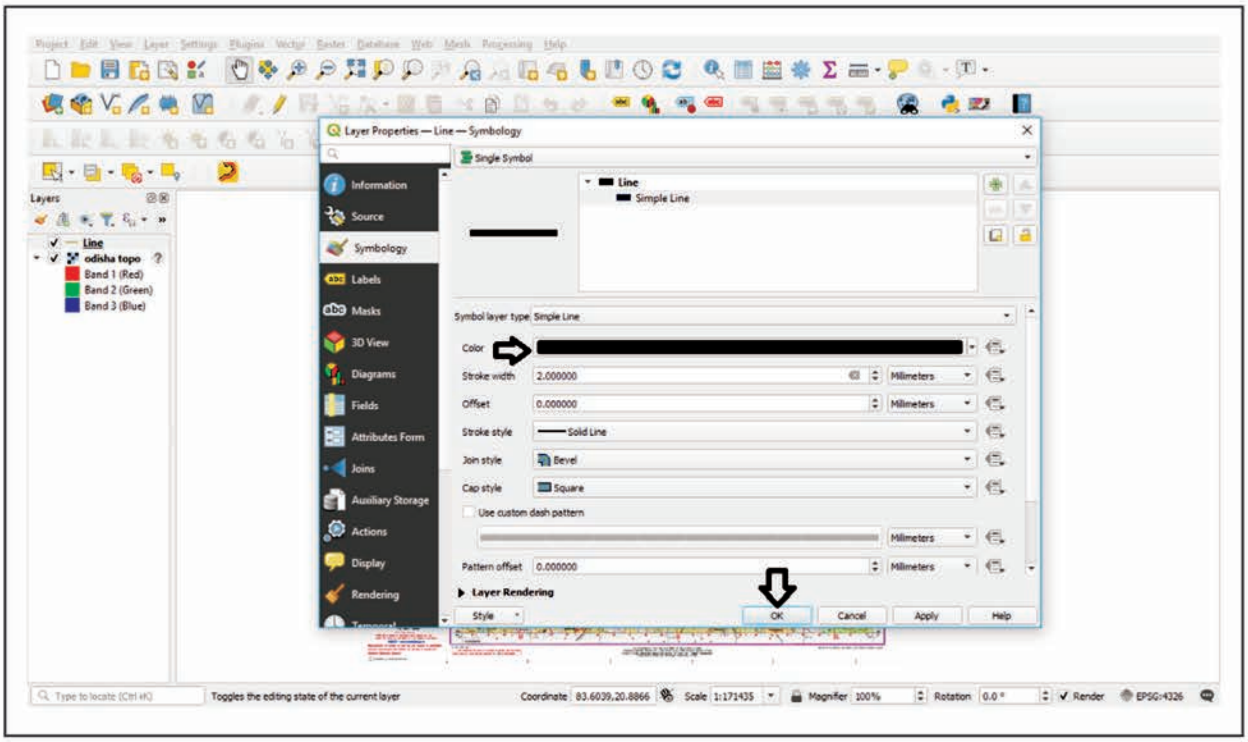
Step 13: After finishing Attribute table, we can change the property of the line if we need. Double Click "Line shapefile" and select 'properties'.



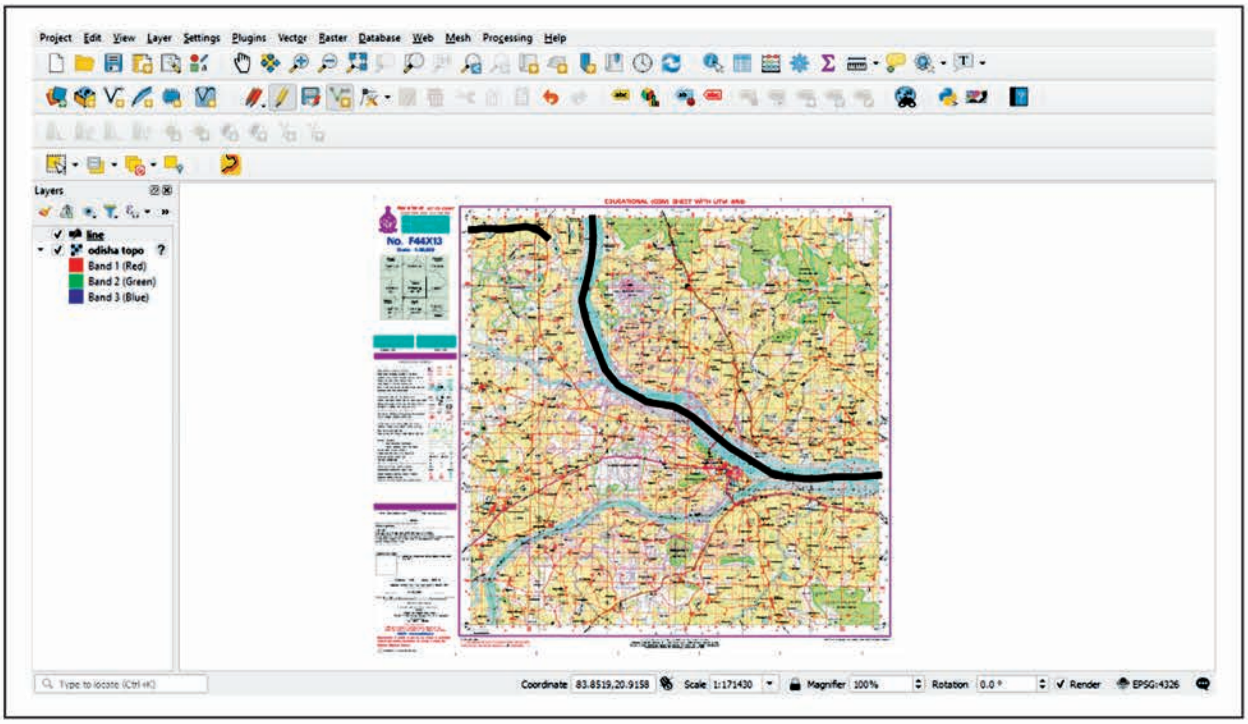
In Popup window we can make the following entries:
Click 'Symbology',Select the 'Simple Line' tool we can change the color of the line, stroke width of the line,..etc.





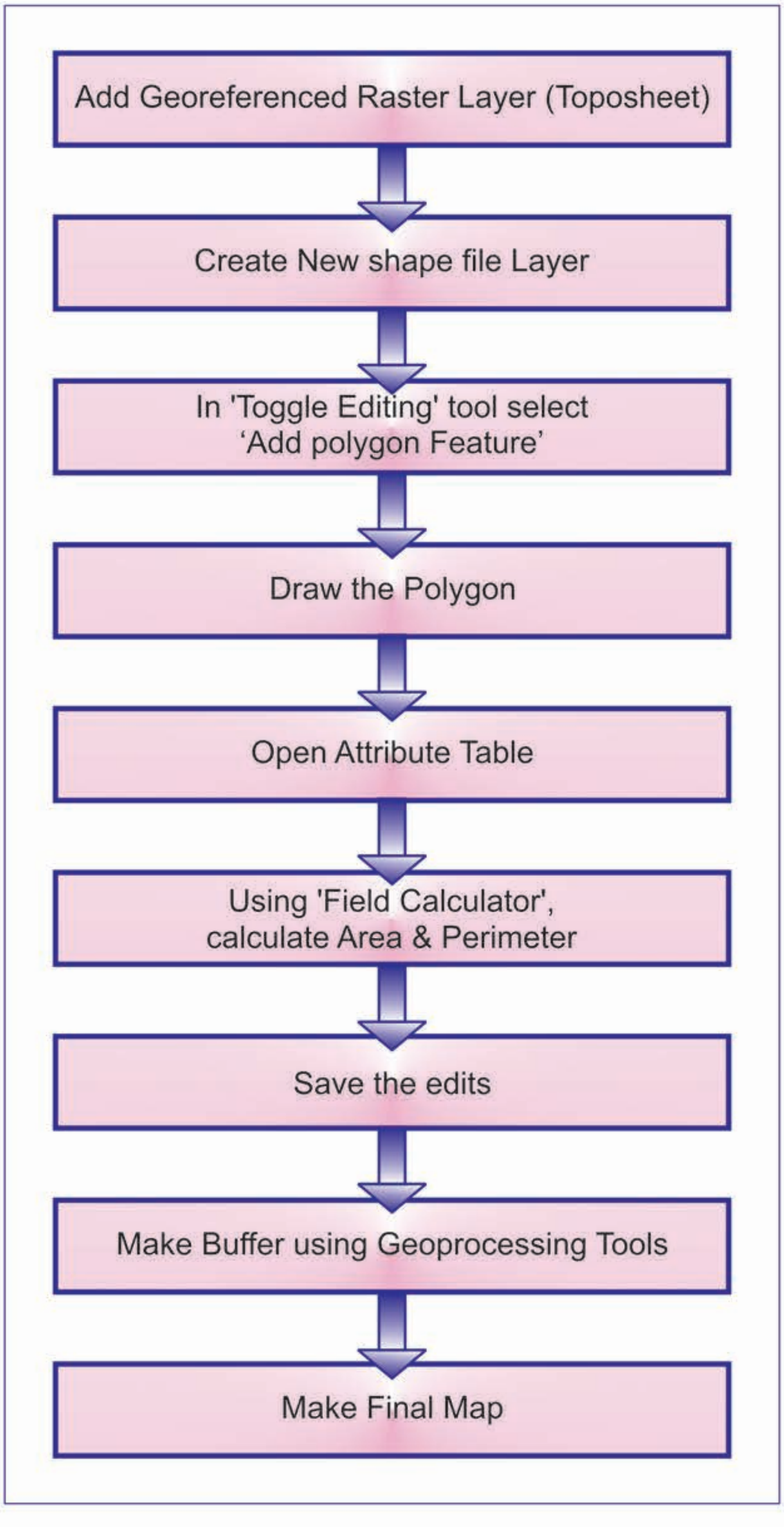


After changing the properties click OK.



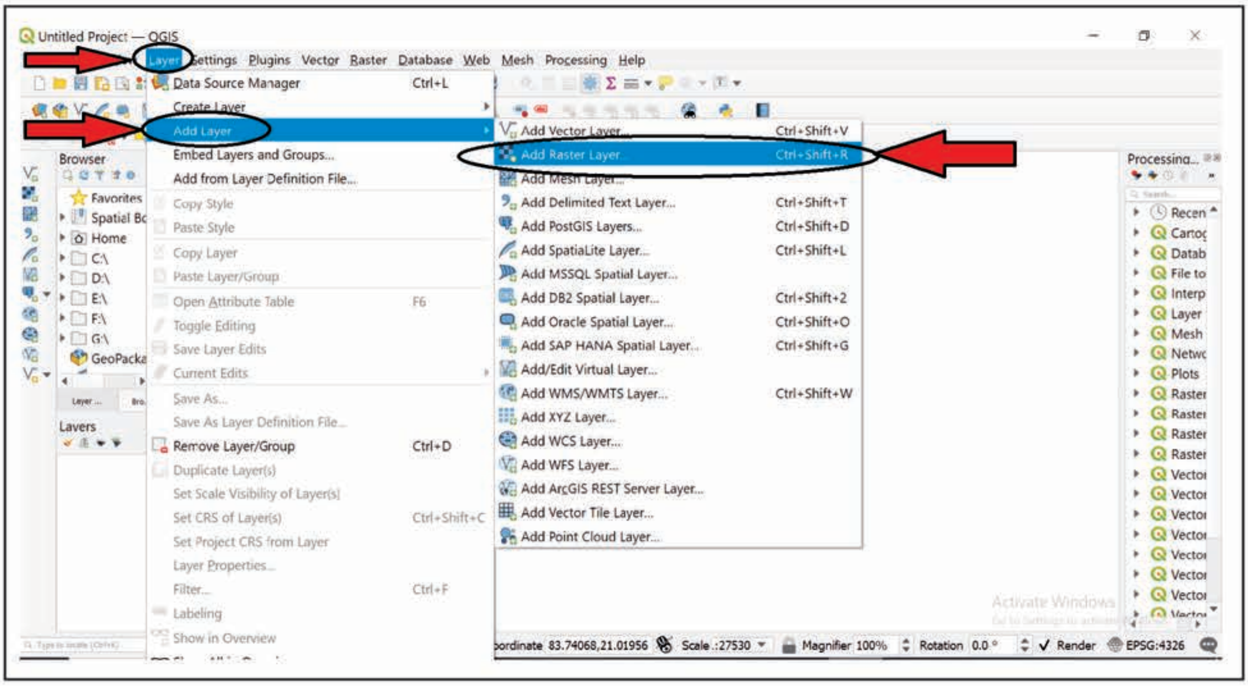
3. Making a Polygon (Vector Data) on Toposheet

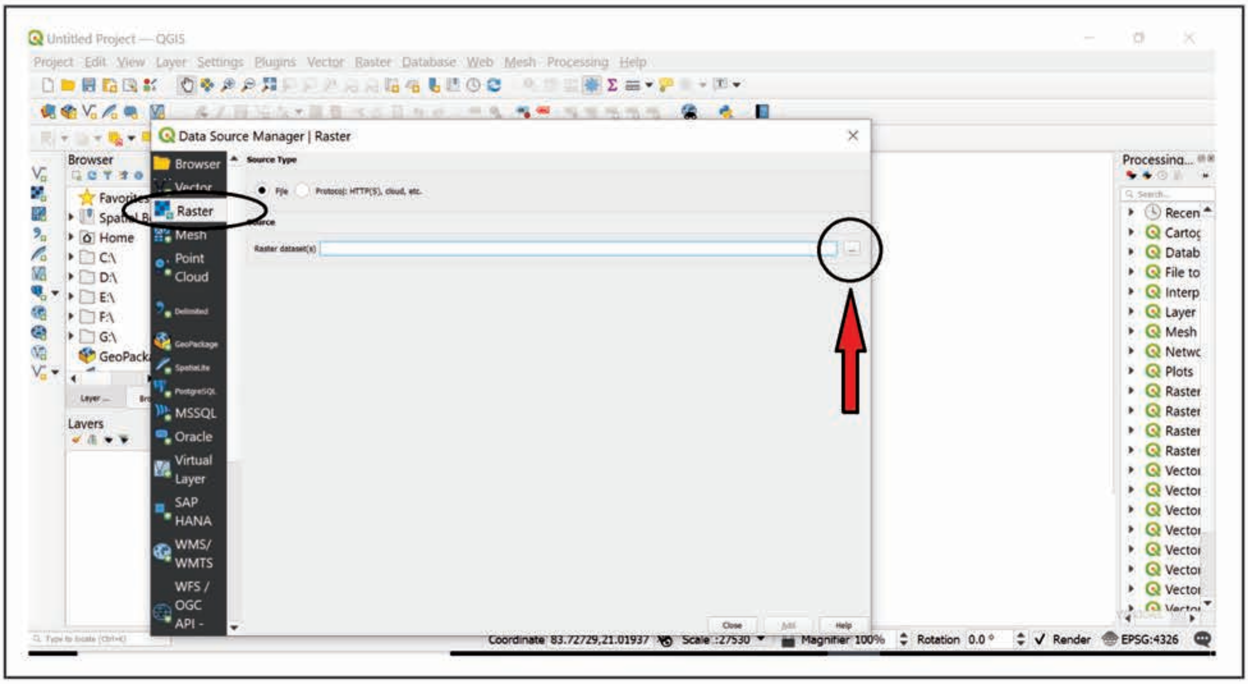
Polygons are used to represent areas such as the boundary of a land, lake, forest or protected area. Polygon features are two dimensional and therefore can be used to measure the area and perimeter of a geographic feature.

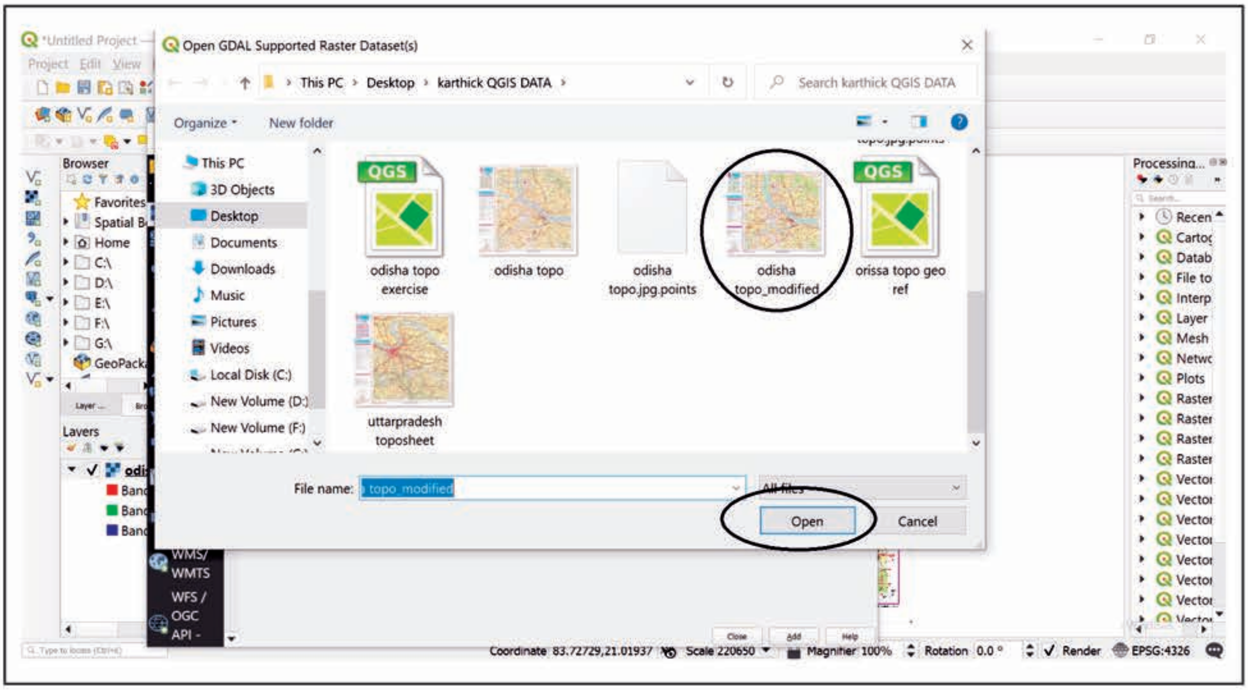


Making a Polygon (Vector Data) on Toposheet

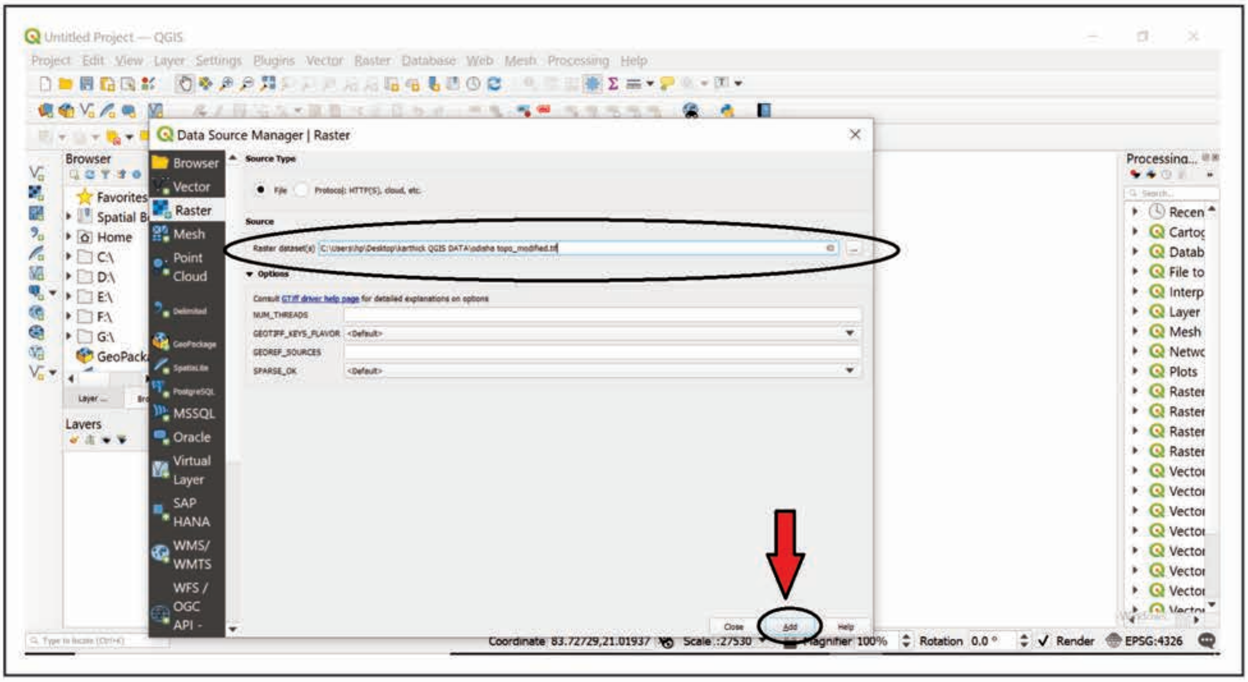
Step 01: To add Raster file (Toposheet),
Click'Layer' and then click 'Add Layer' and Add Raster Layer(Toposheet).





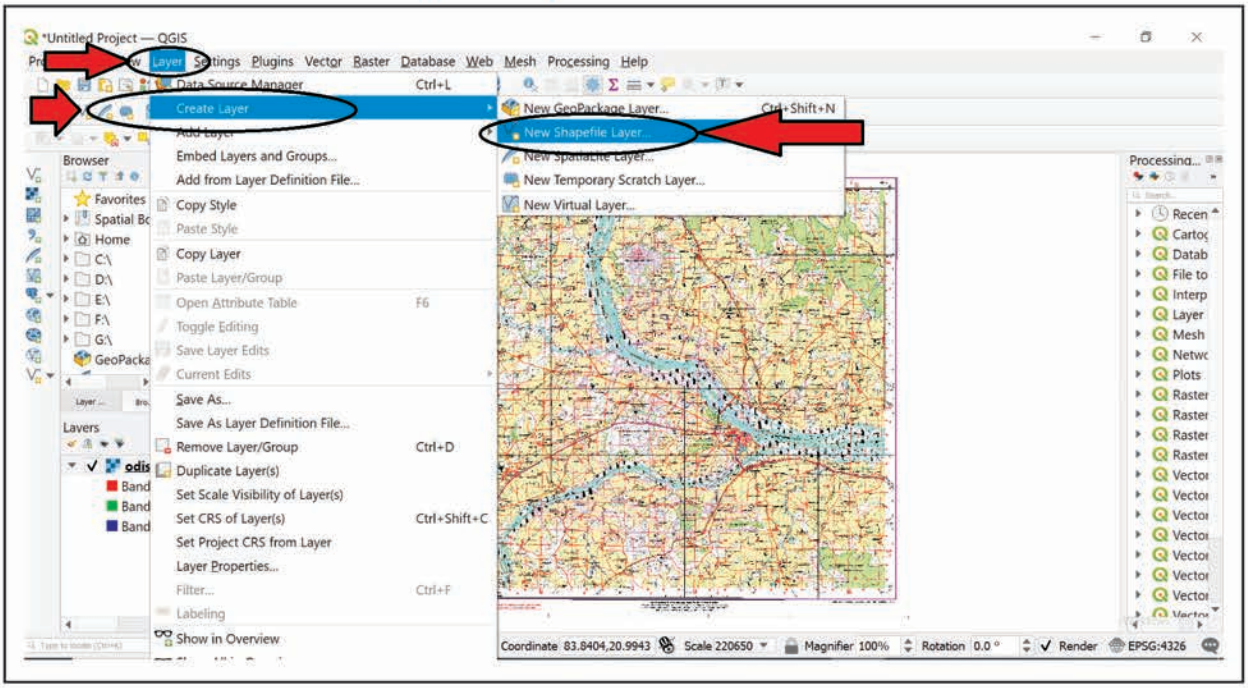


Open GDAL Supported Raster Dataset(s)
This PC › Desktop › karthick QGIS DATA ›
Search karthick QGIS DATA
Organize
New folder
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
New Volume (D:)
New Volume (F:)
odisha topo exercise
odisha topo
odisha topo.jpg.points
odisha topo_modified
orissa topo geo ref
uttarpradesh toposheet
File name:
topo_modified
All files
Open
Cancel
Browser
Favorites
Home
GeoPackage
Layers
Processing...
Coordinate 83.72729,21.01937
Scale 220650
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326



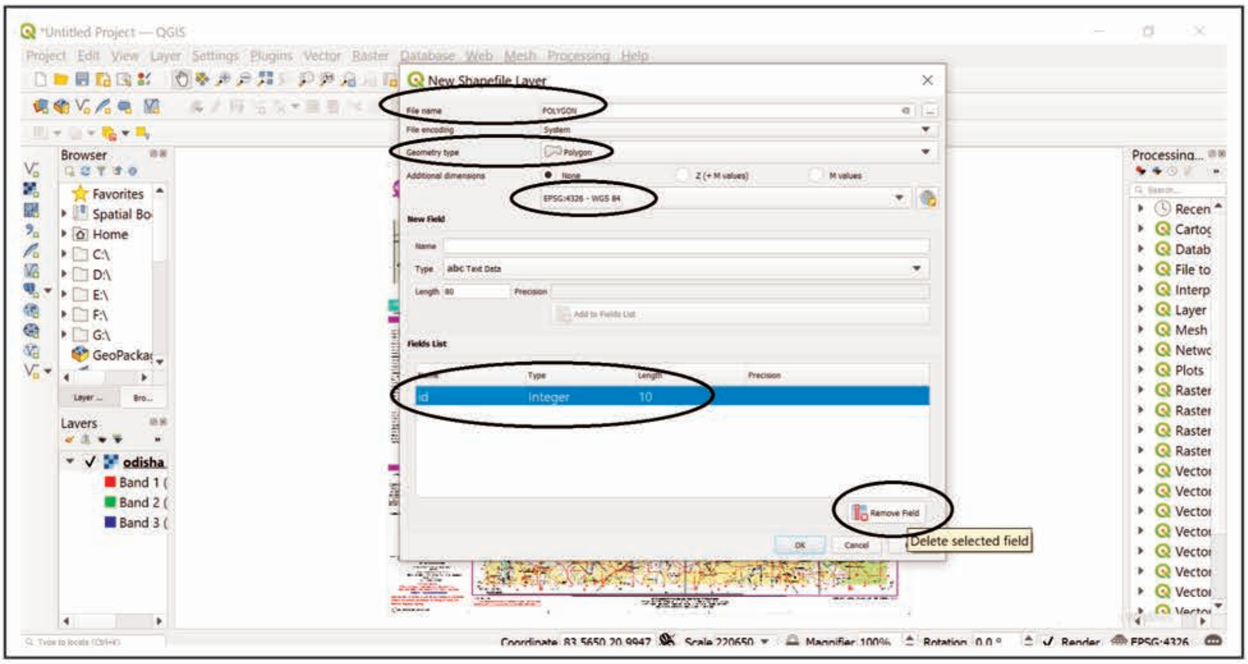
Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Data Source Manager | Raster
Browser
Vector
Raster
Mesh
Point Cloud
MSSQL
Oracle
Virtual Layer
SAP HANA
WMS/ WMTS
WFS / OGC API -
Source Type
File
Protocol: HTTP(S), cloud, etc.
Source
Options
Close
Add
Help
Layers
Processing...
Coordinate 83.72729,21.01937
Scale 1:27530
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326

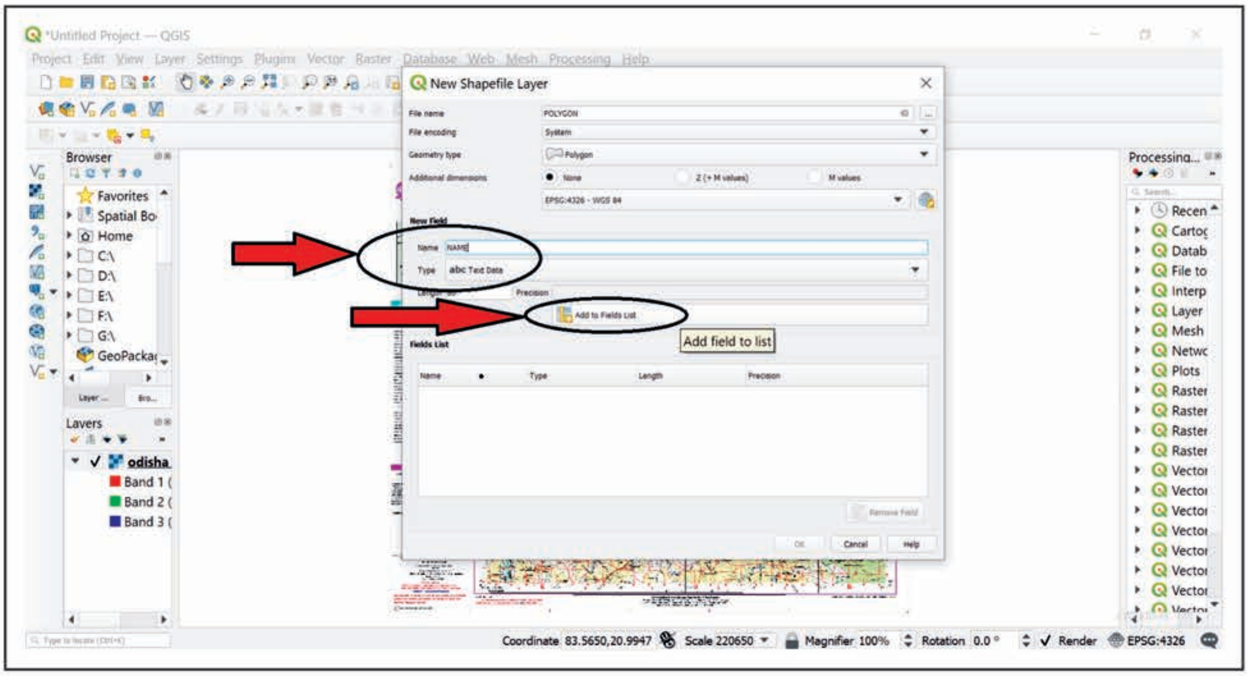
Step 02 : Now Click on 'Layer' option on toolbar, select 'Create Layer' and then 'New shapefile Layer'.



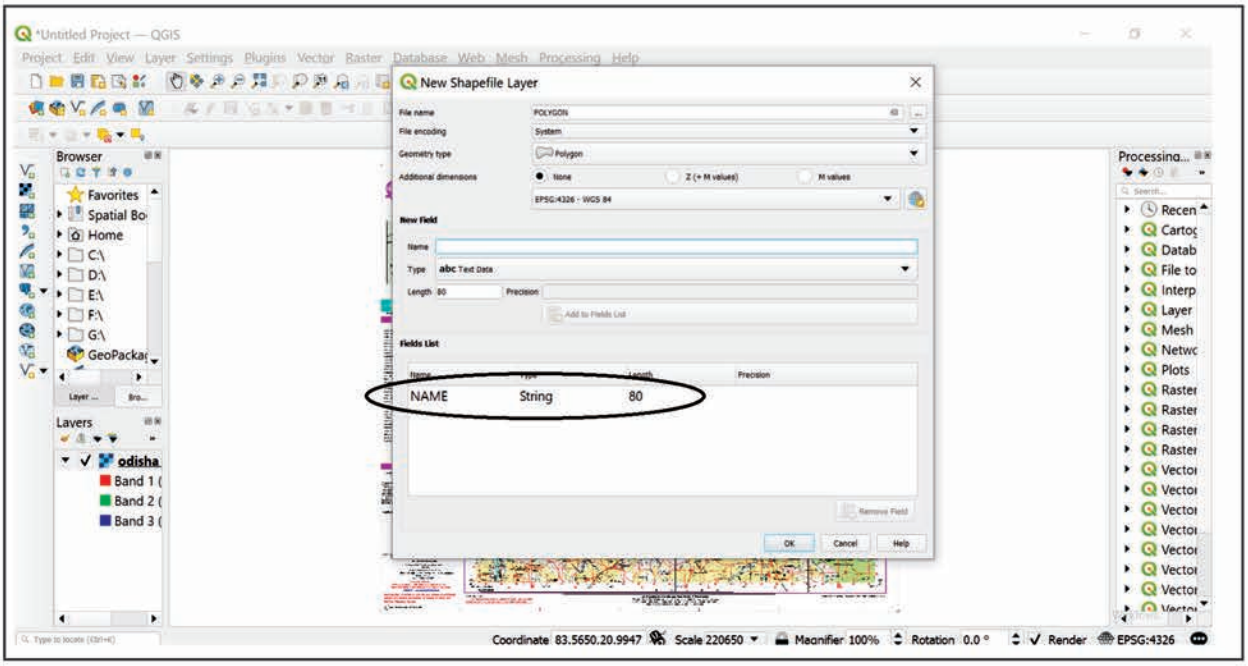
Step 02: Select the id entry and remove the field.
Enter following details in Popup window:
File Name: 'polygon' for example.
Geometry type: Polygon.
(Select Coordinate system as WGS 84)

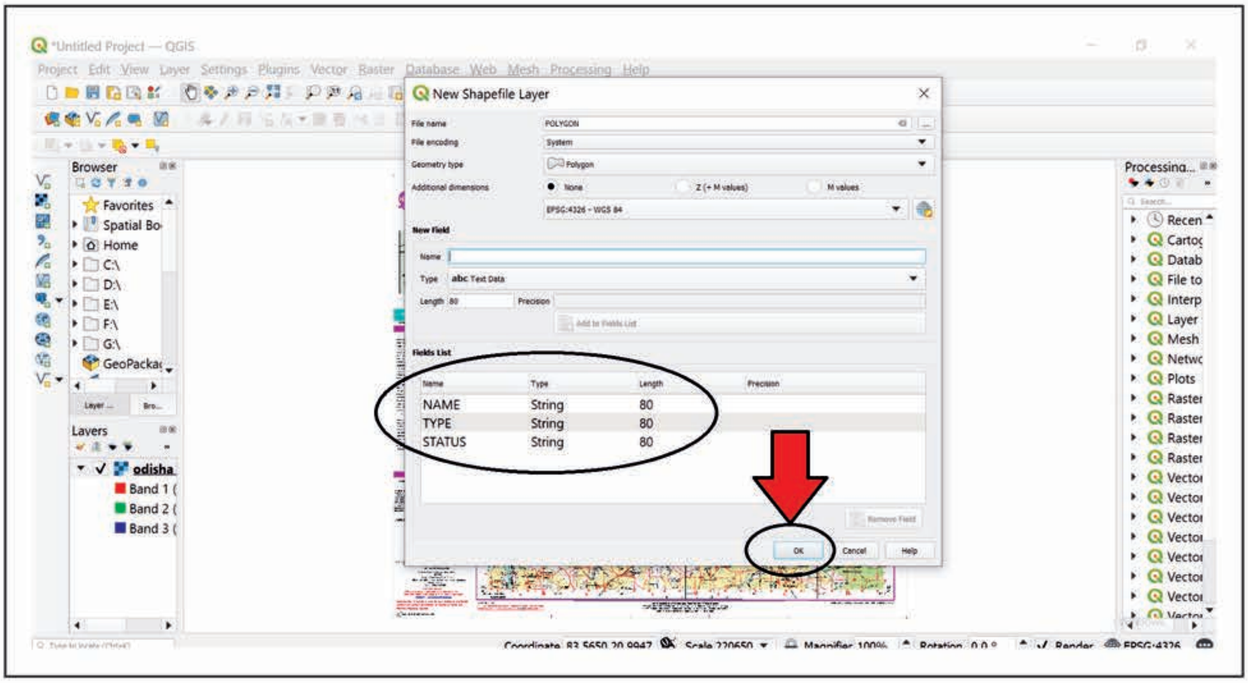
New Field:
Name: 'Name'
Type: 'Text'



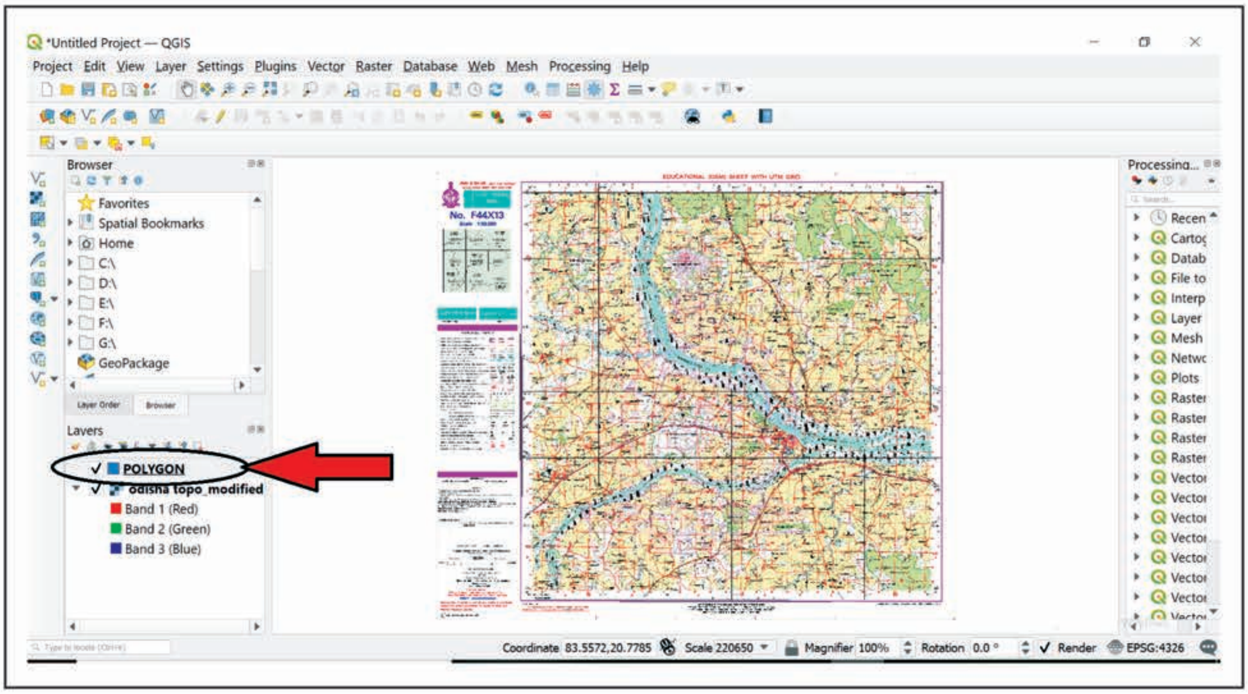


You can make new entries for Attribute table of a polygon like 'Type', Status' defining the data type to be added.

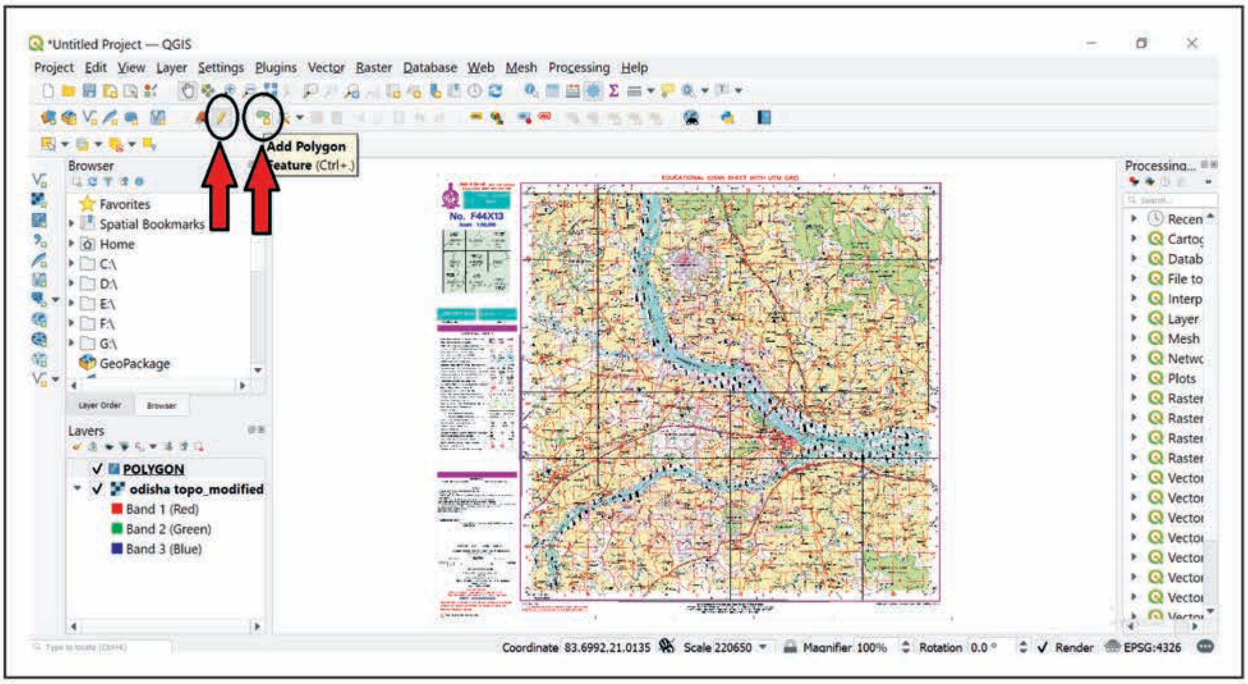




You can see new shape file in Layers panel

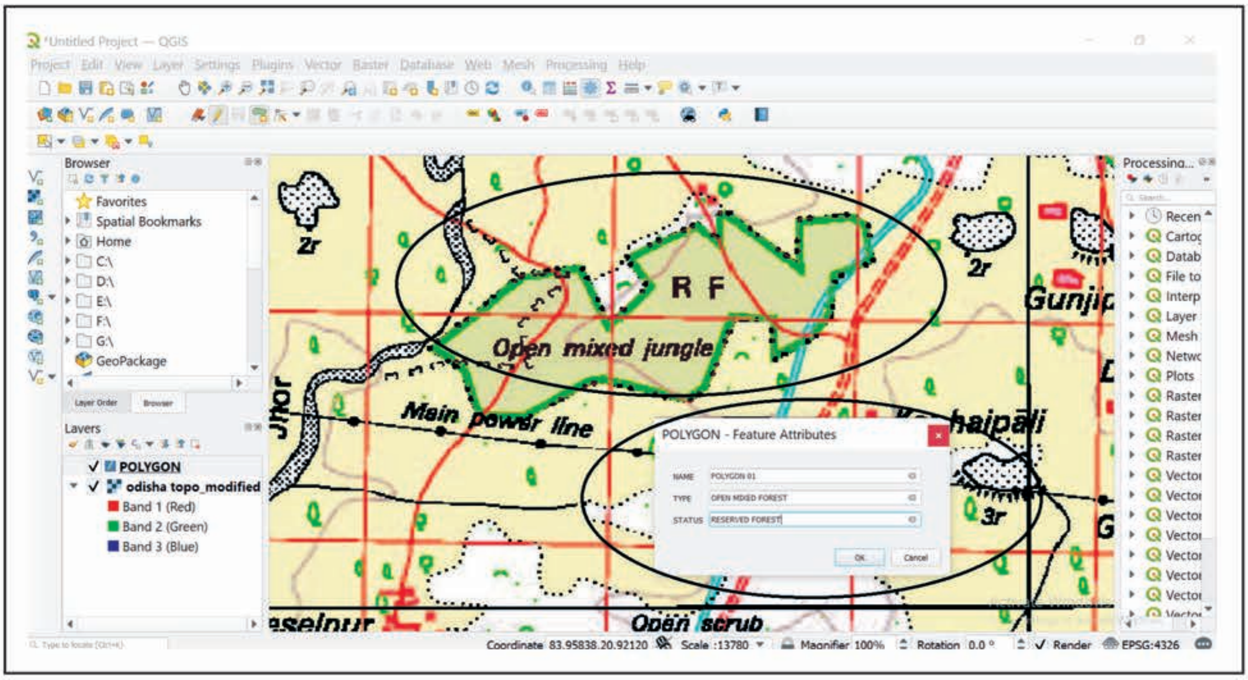


Step 03: Editing the vector layer: Click on 'Toggle Editing' tool and then select 'Add polygon Feature'tool.

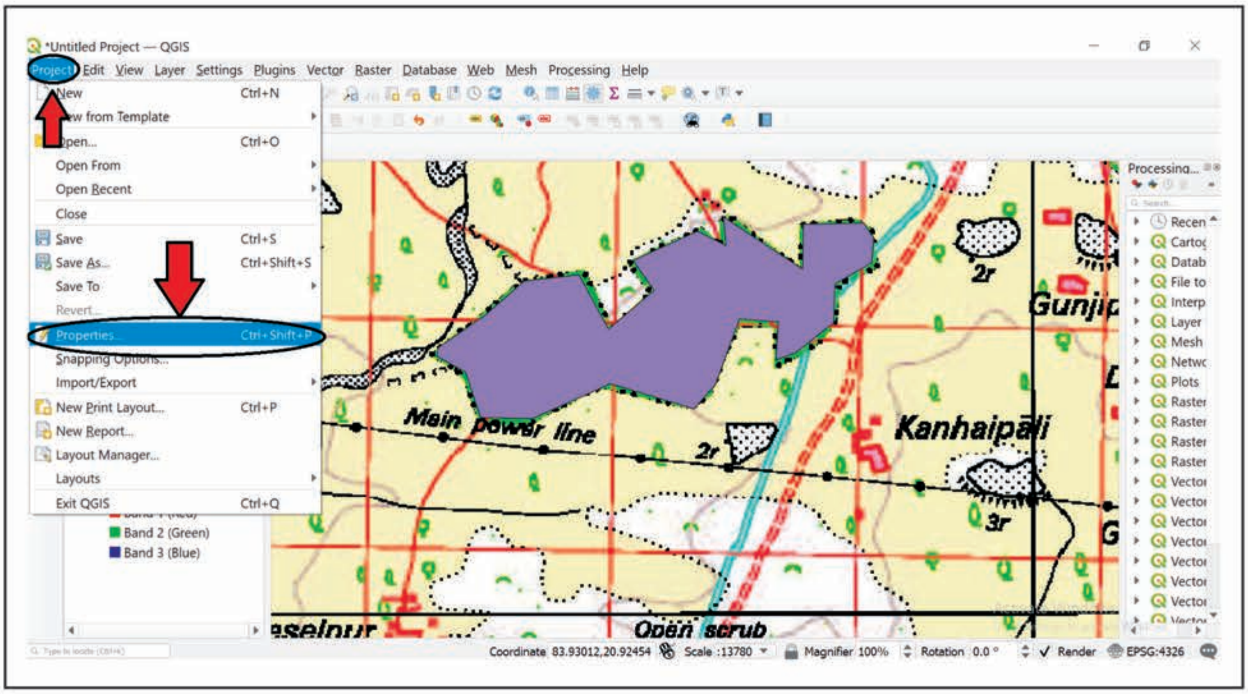


Step 04: In Popup window make following enteries:
Name: Give name of Polygon, for example polygon 01, ABC Reserved Forest etc.
Type: For example :- Open Mixed Forest.
Status: Reserved Forest.

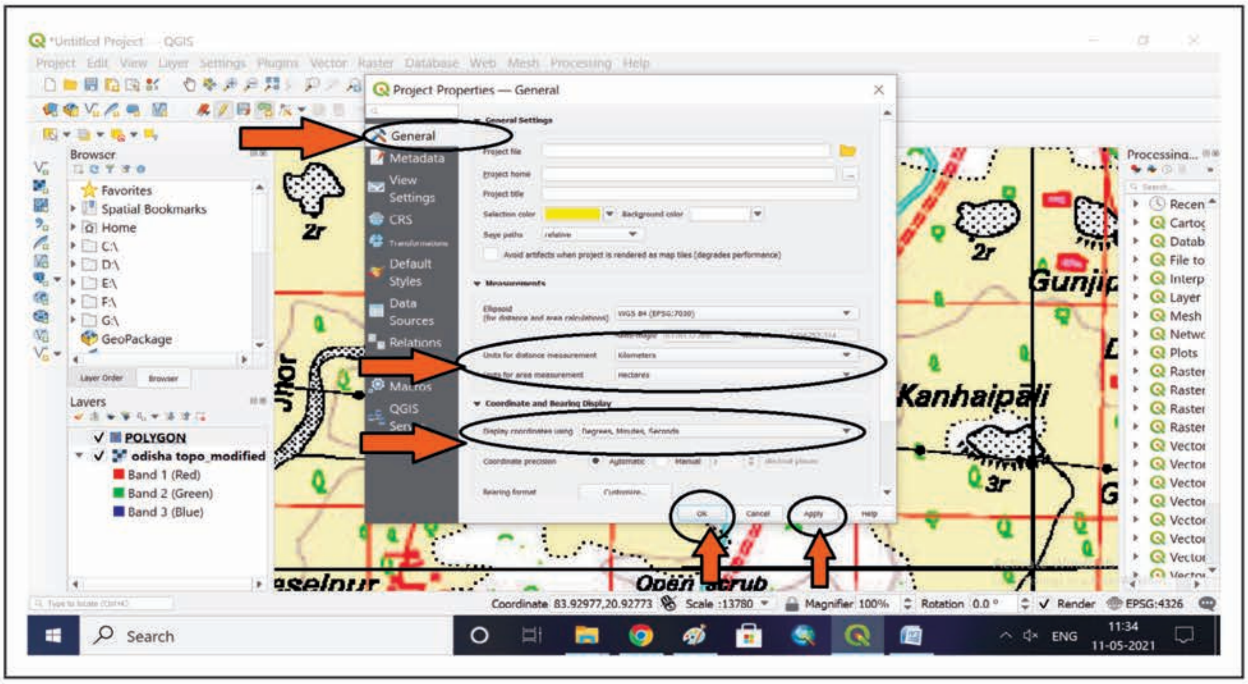
And Draw the Polygon.



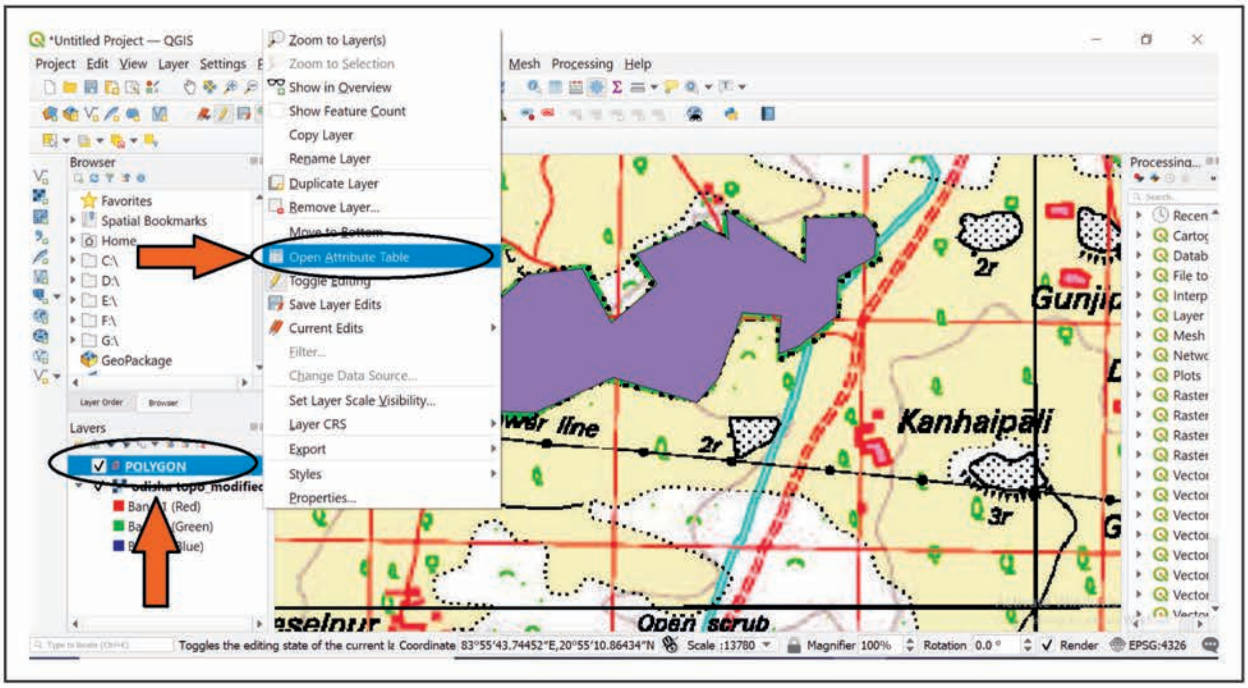
Step 05: After finishing Polygon Click 'Project', select 'Properties'.



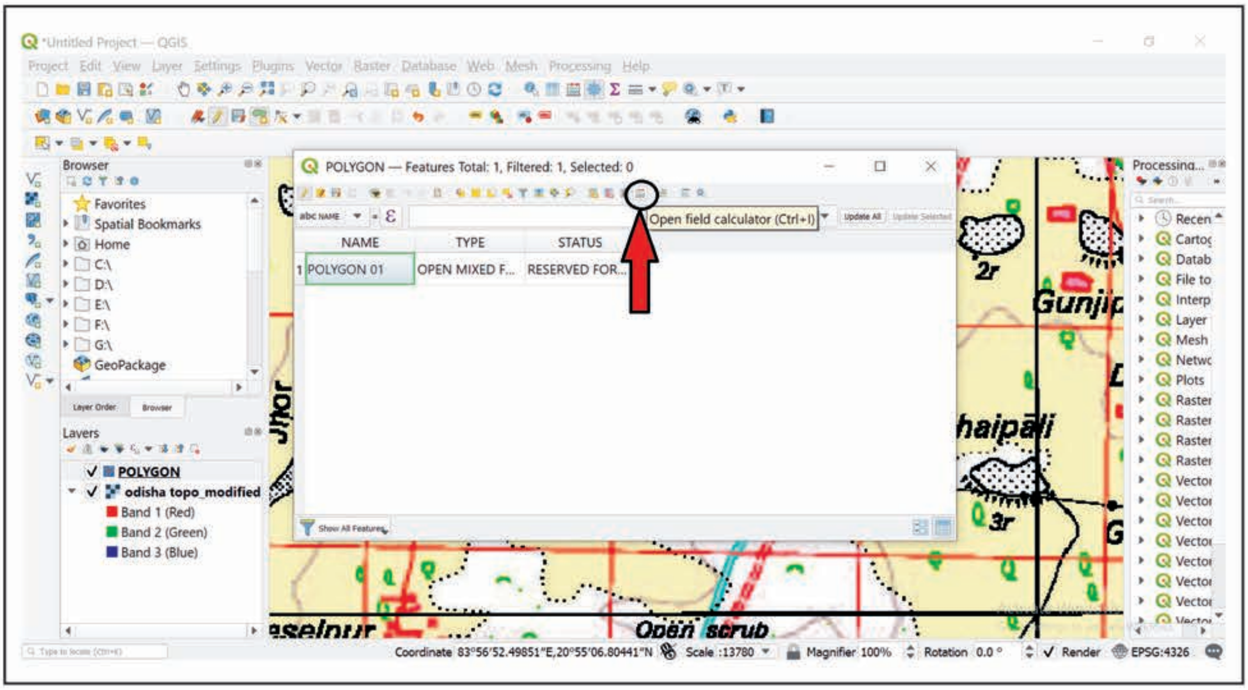
Choose units of measurements: For example:
Distance: Meters
Area: Hectares.
Coordinates: Degrees Minutes Seconds



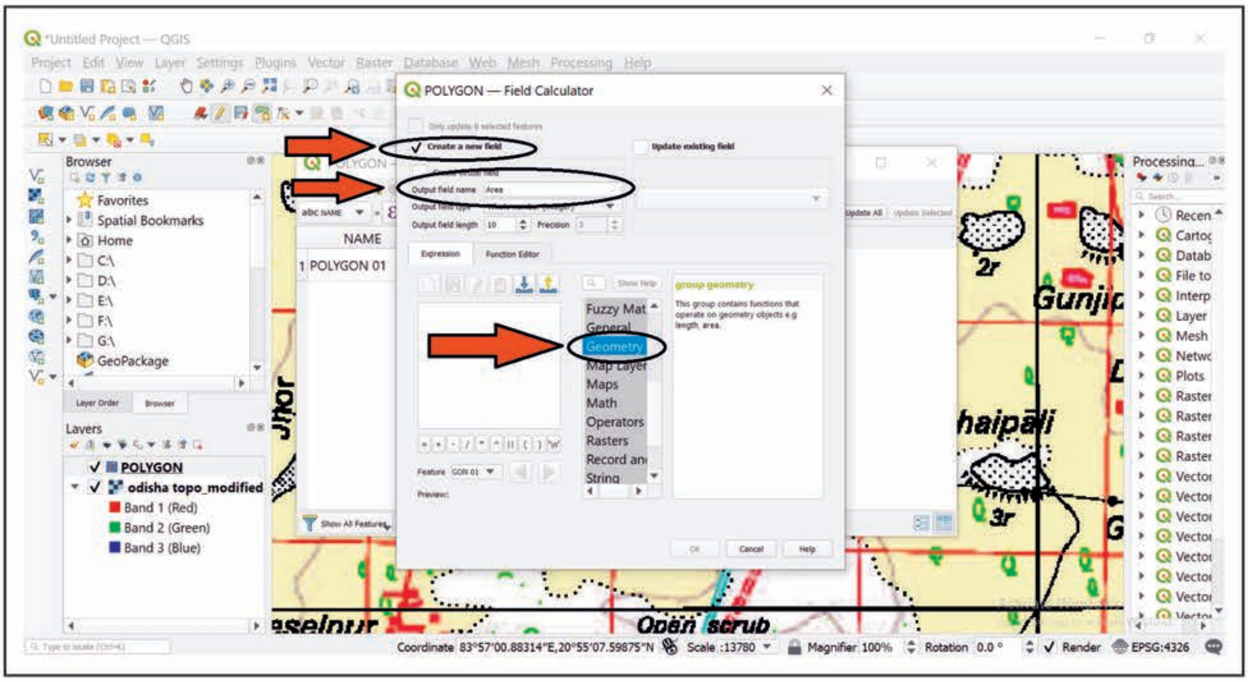
Step 06: Right click on **polygon shapefile** under 'Layers' and **'Open Attribute Table'**.



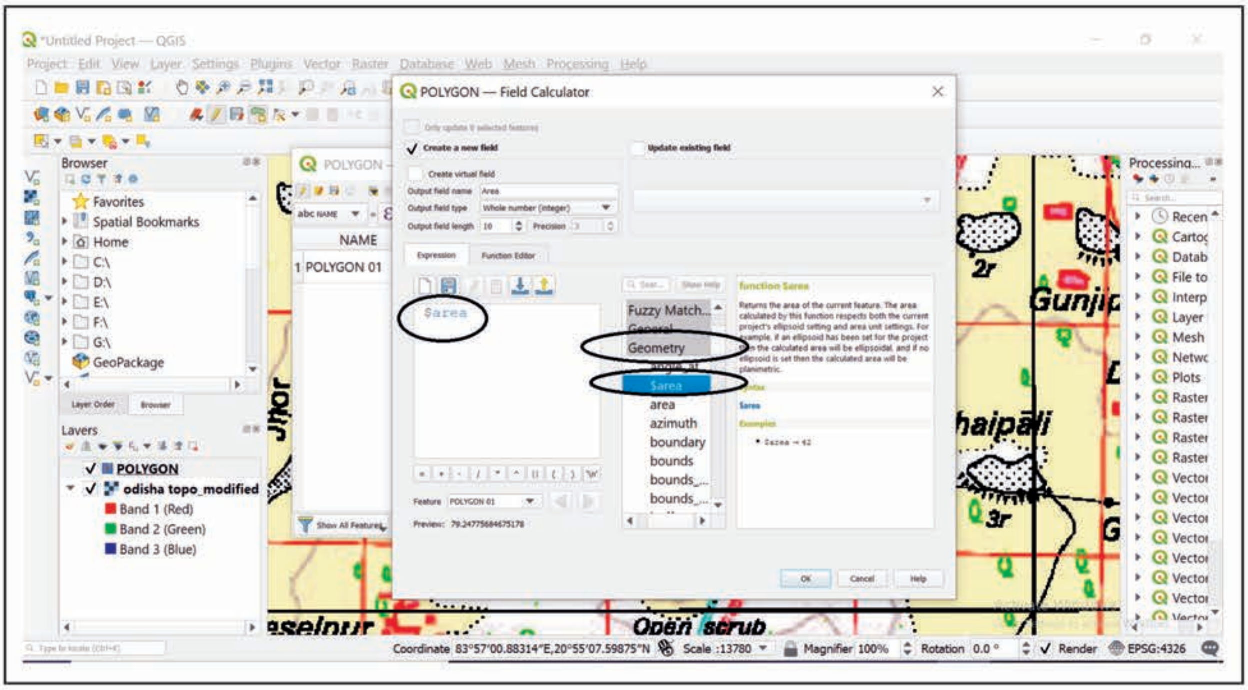
Step 07: In **Attribute Table** click on **'Field Calculator'** tool



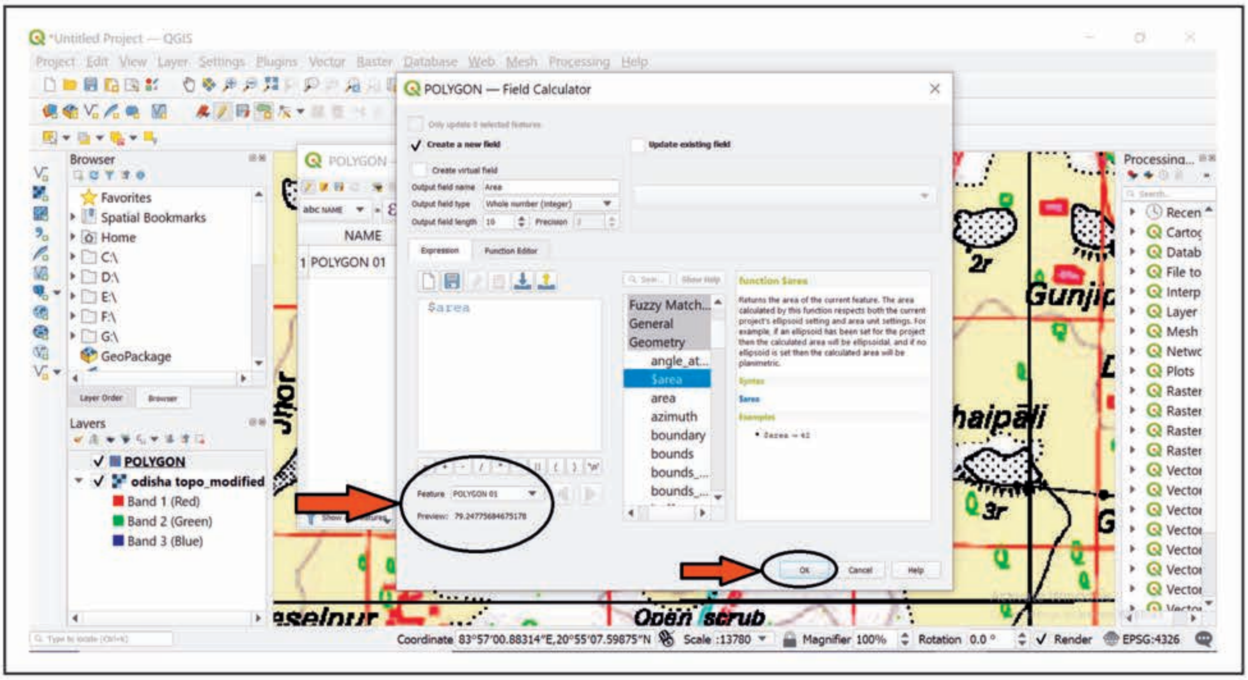
Step 08: In Field Calculator, Check 'Create a new field'
Give Output field name: 'Area'
Double click on 'Geometry' option



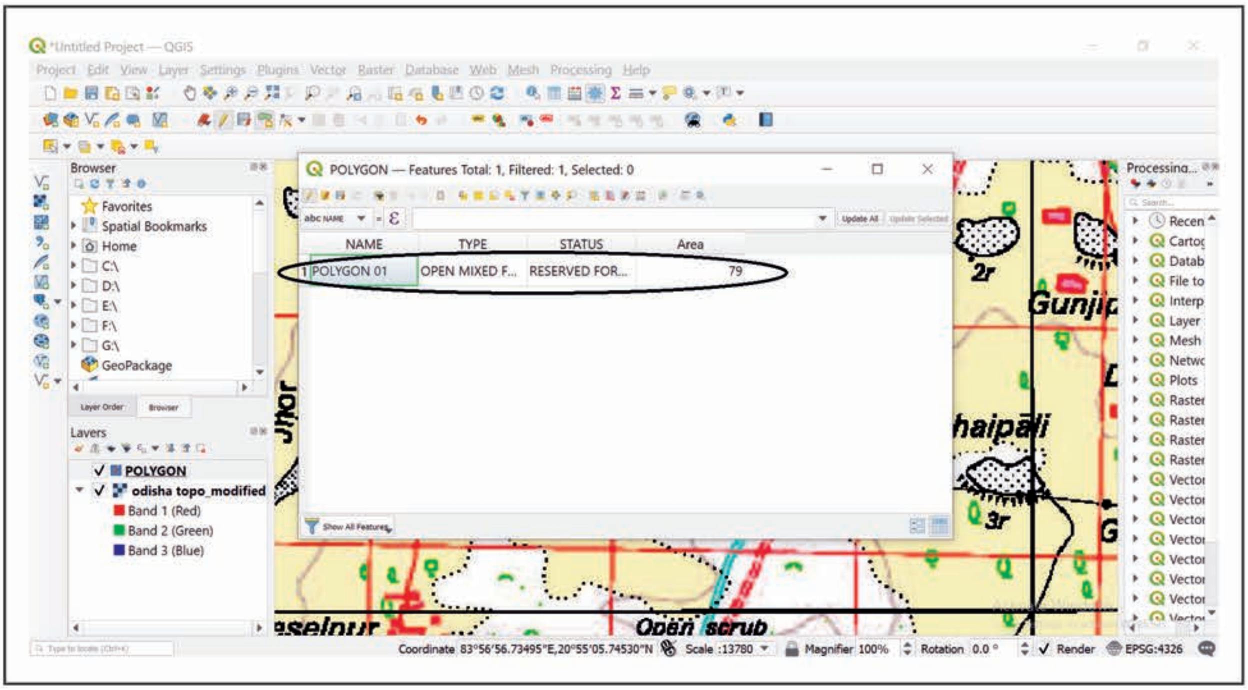
Step 09. Select '$area' under Geometry option by double clicking over it.



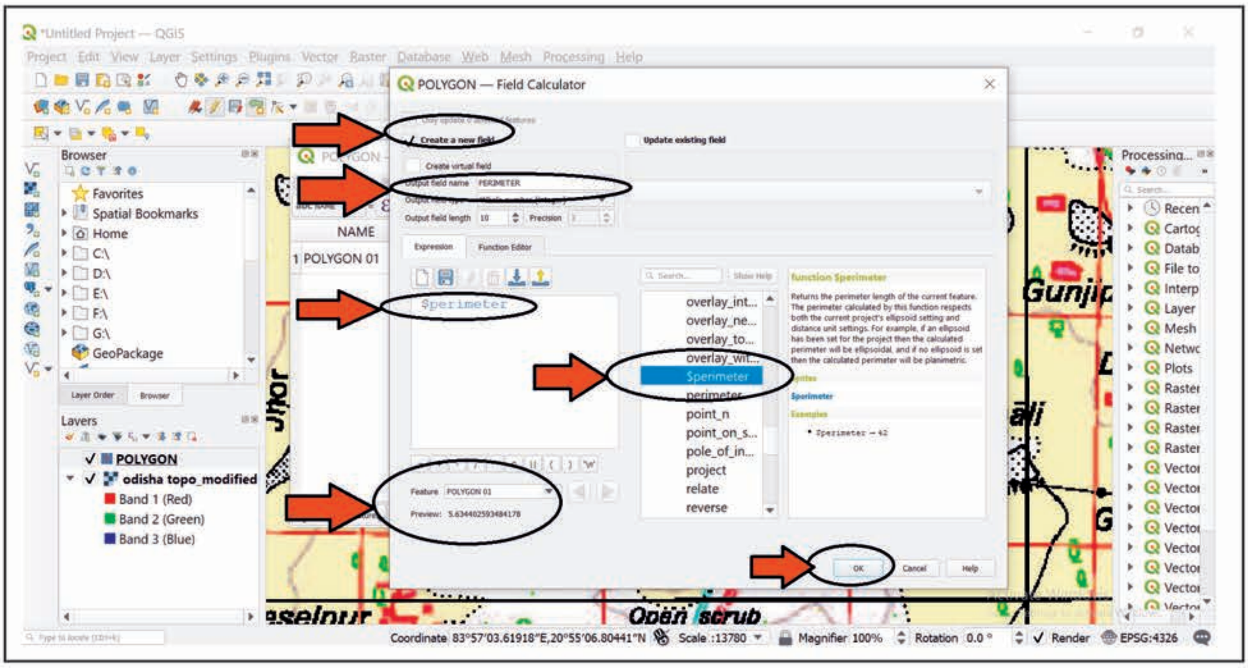
You can see the Area of polygon in left corner.

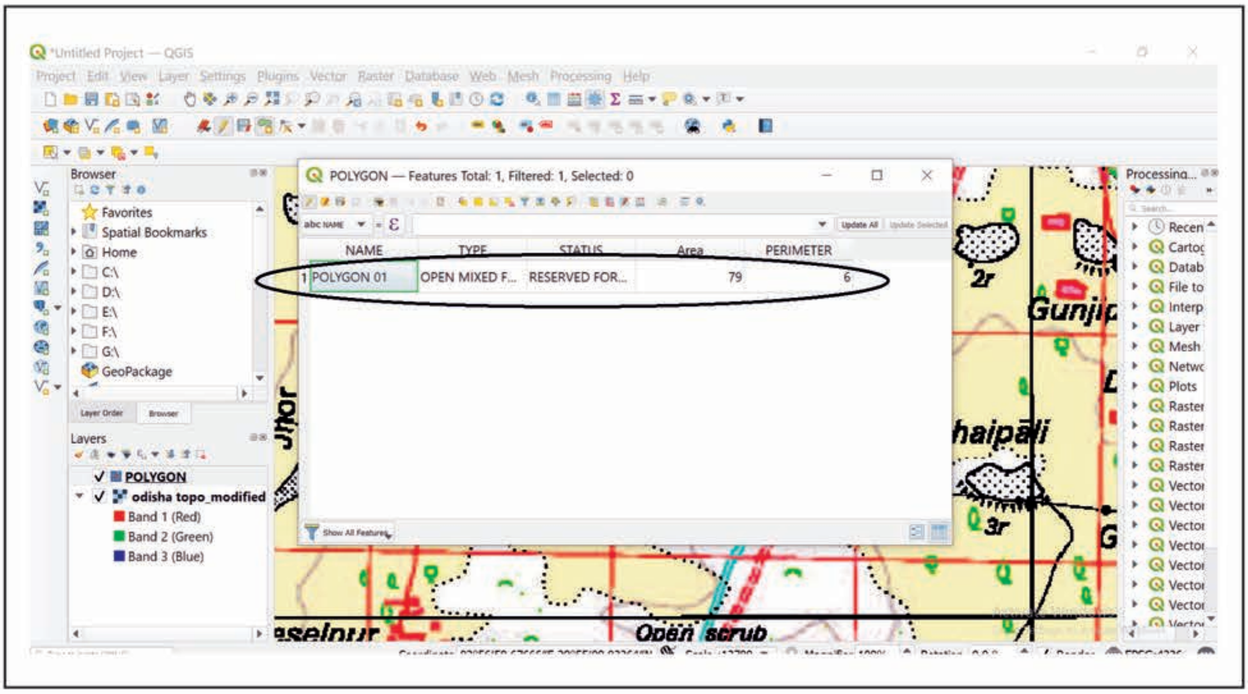


Click OK to Close the Window.
You can see the calculated Area of Polygon in Attribute Table.

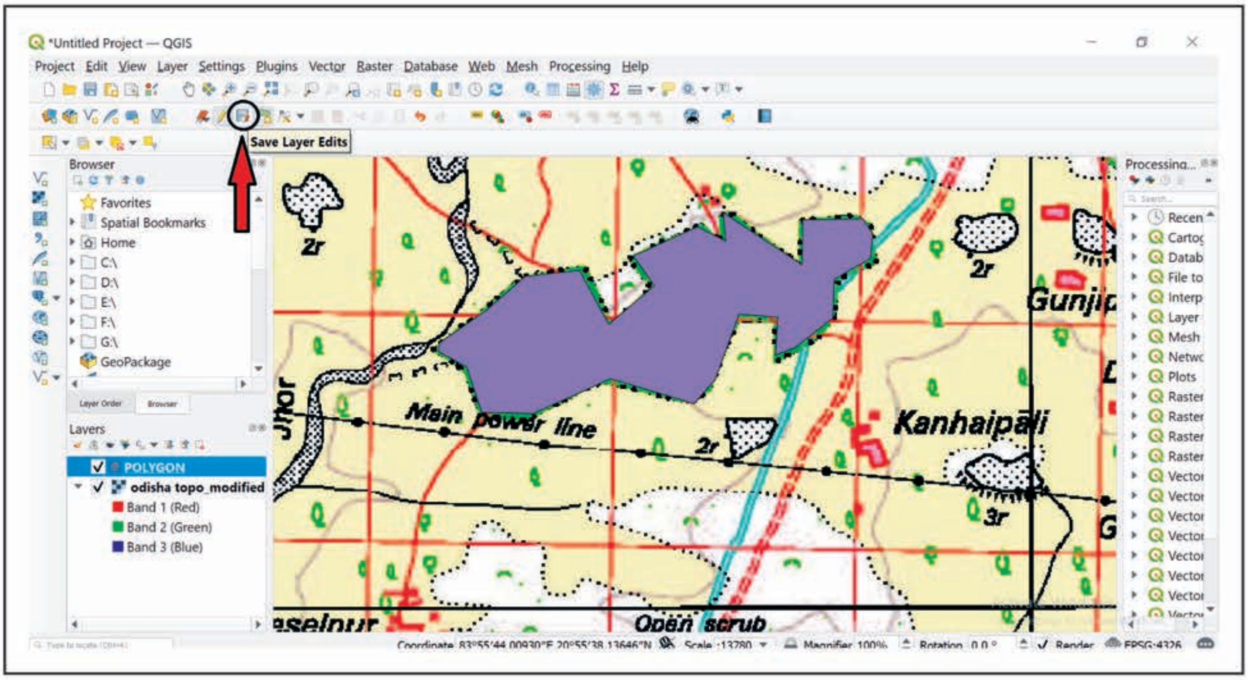


Step 10: **To Calculate the Perimeter of Polygon again**
Click the 'Field Calculator Tool' icon and Repeat the Above Steps for Perimeter.

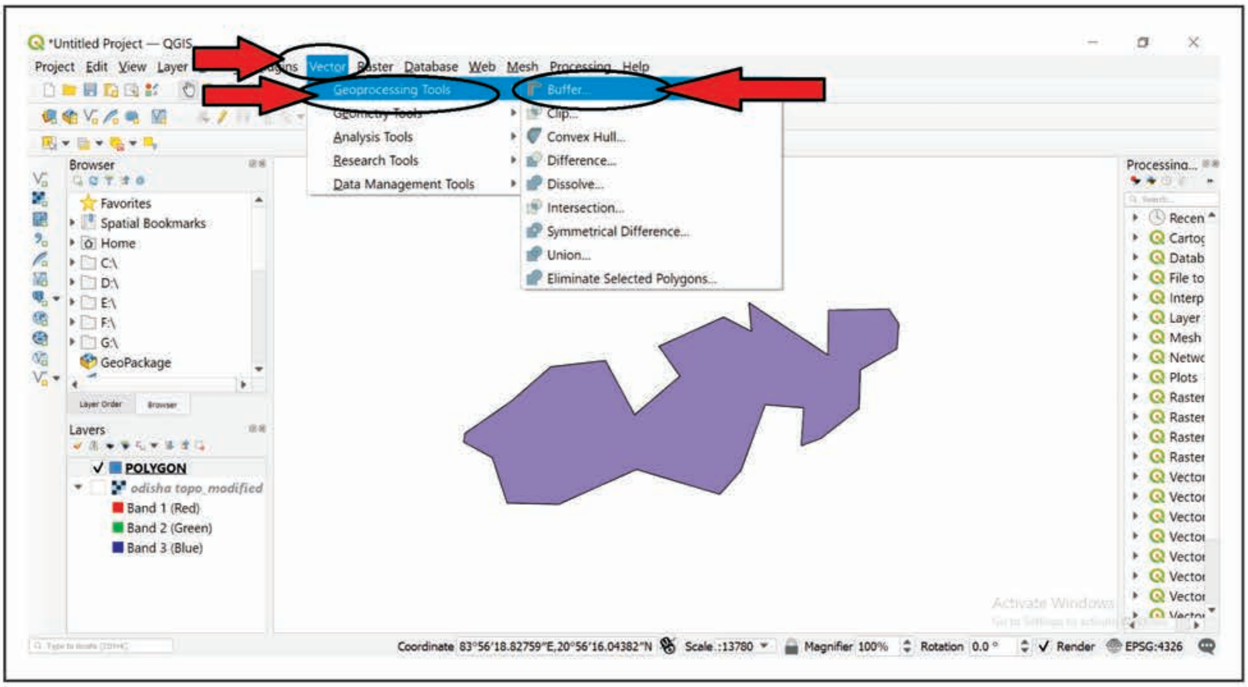




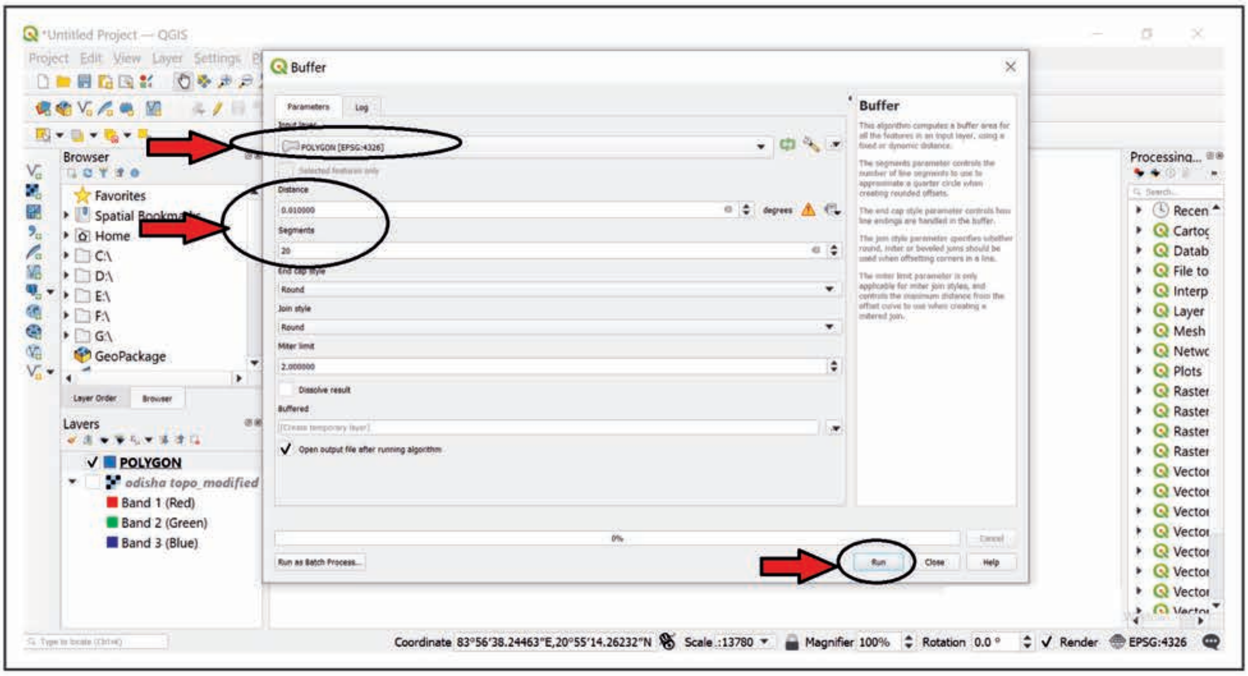
Step 11: Save the edits by Clicking on 'Save tool'



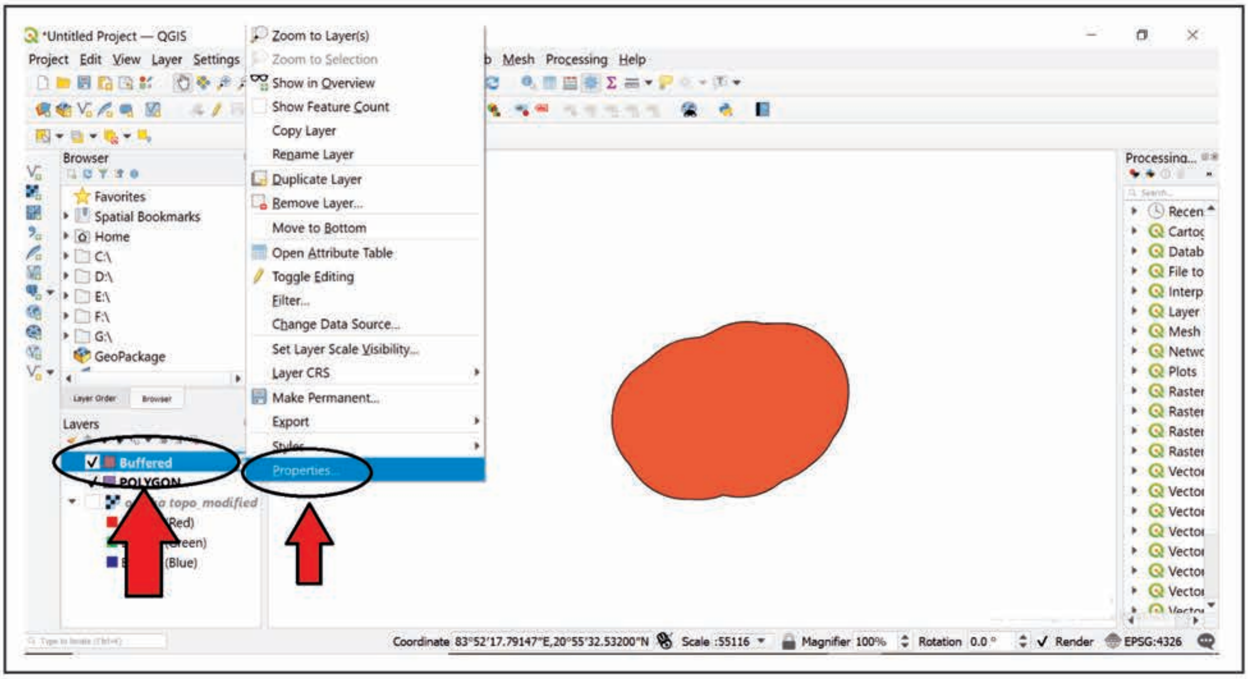
Step 12: To Make Buffer around the Polygon drawn, uncheck all the unnecessary layers first. Click on 'Vector', Select 'Geoprocessing Tools' and select 'Buffer'.



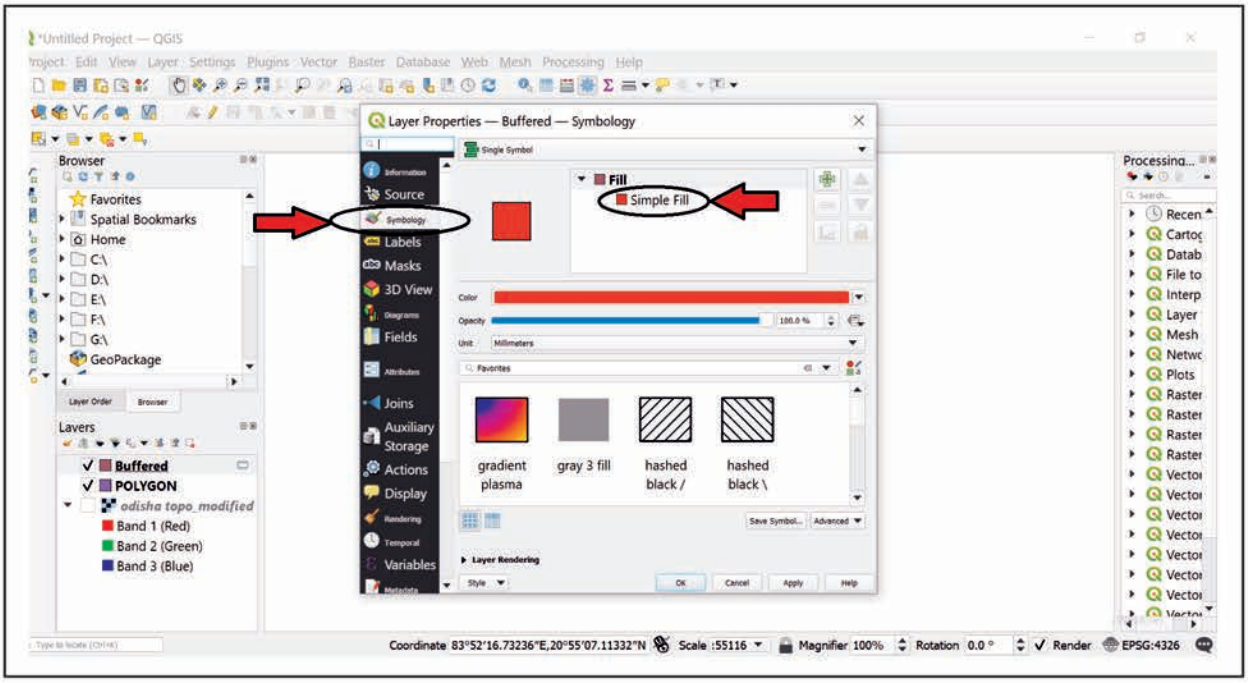
Step 13: In Buffer popup Window, give Distance in Degrees (1°=110 km). Give Segment No. as per requirement, for example 20. Click 'Run'.



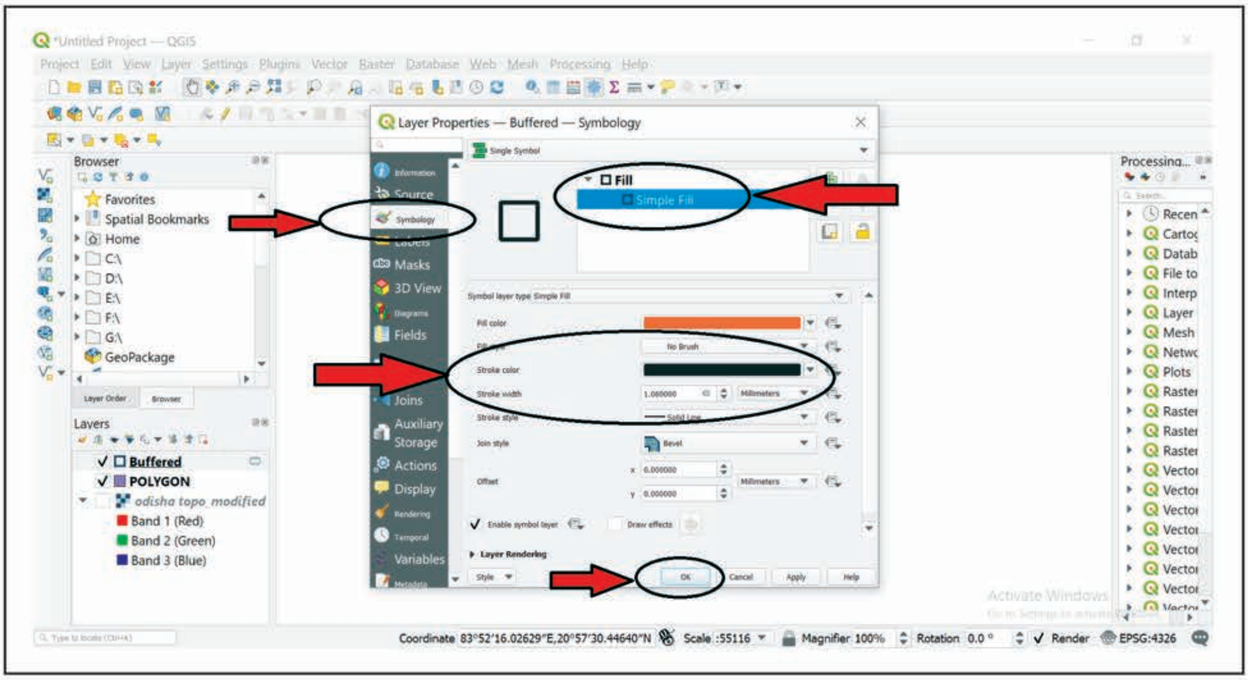
To change the Buffer shadowing (Symbology), Right Click the 'Buffered' Layer. Select 'Properties'.



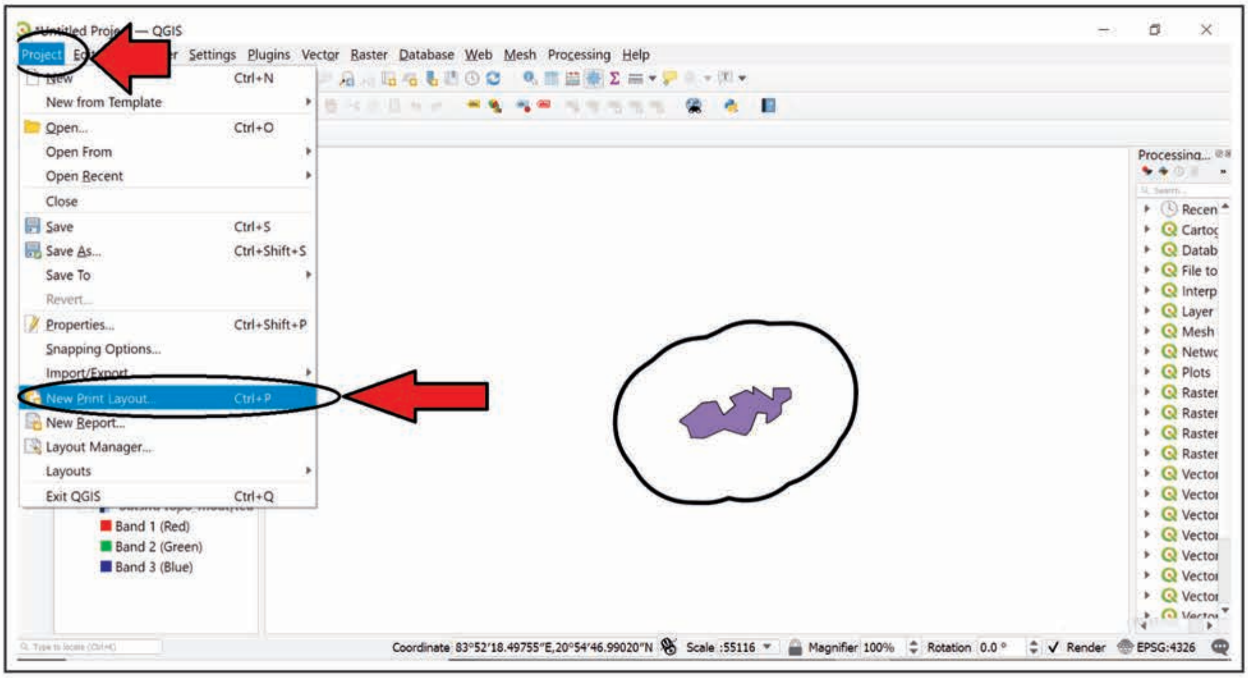
In 'Symbology' option Double Clicks the 'Simple fill'.



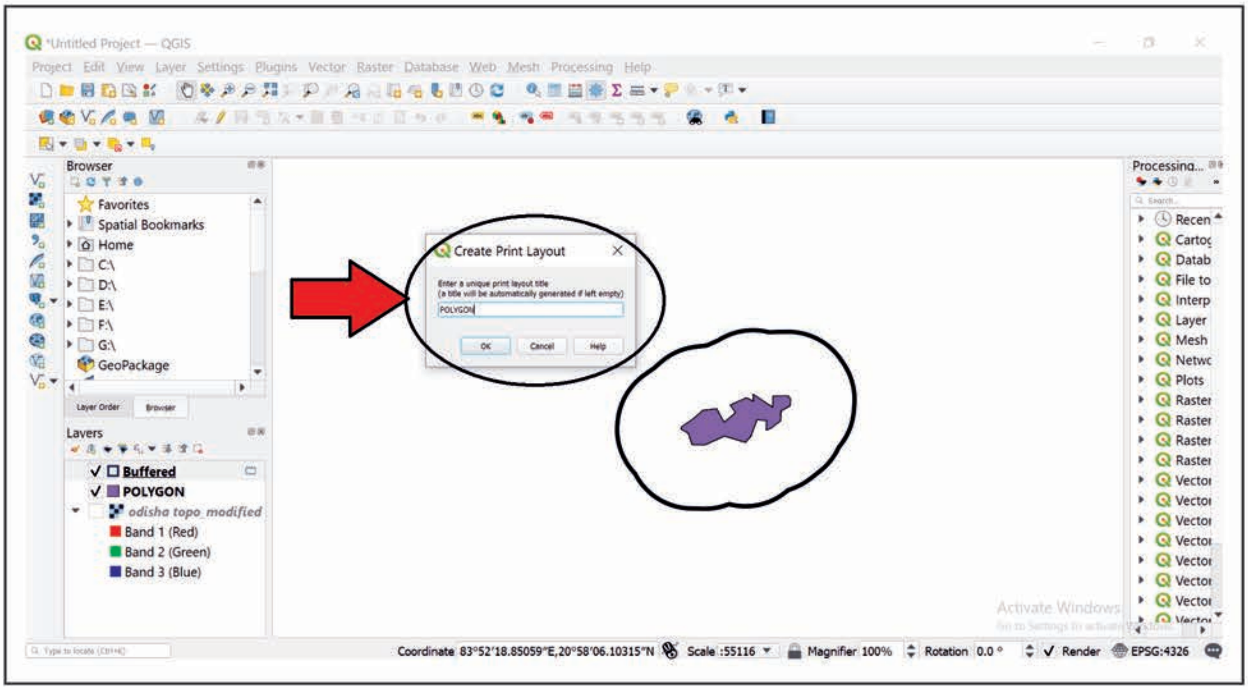
Select the 'No Brush' in 'Fill Style' option and change 'Stroke width' as per requirement. Click Ok.



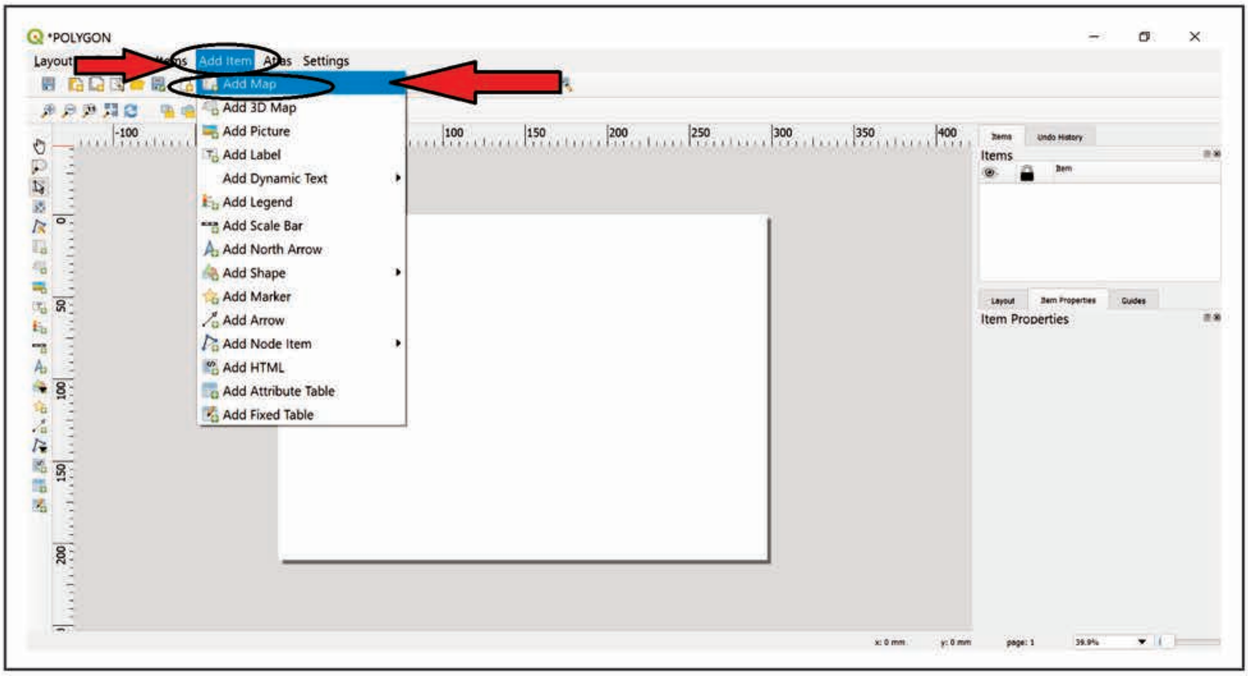
Step 14: Click 'Project' and Select 'New Print Layout' Option.



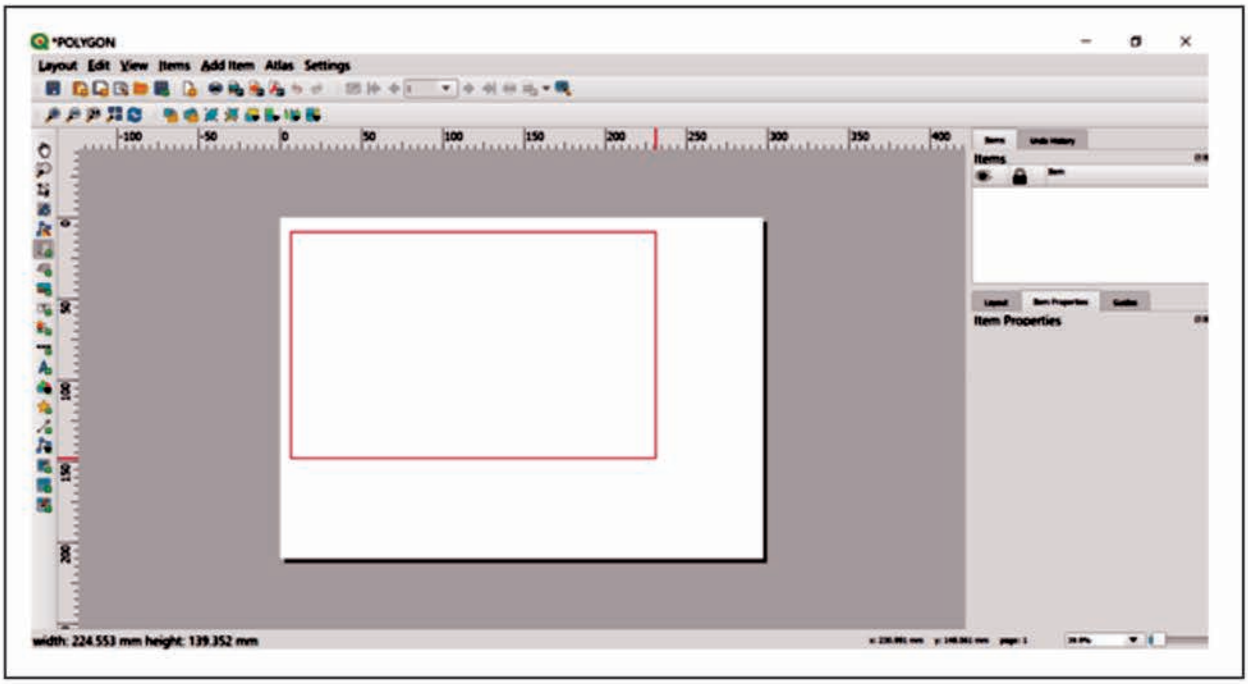
Give the Name of File in Popup window. For Example 'Polygon'. Click Ok.



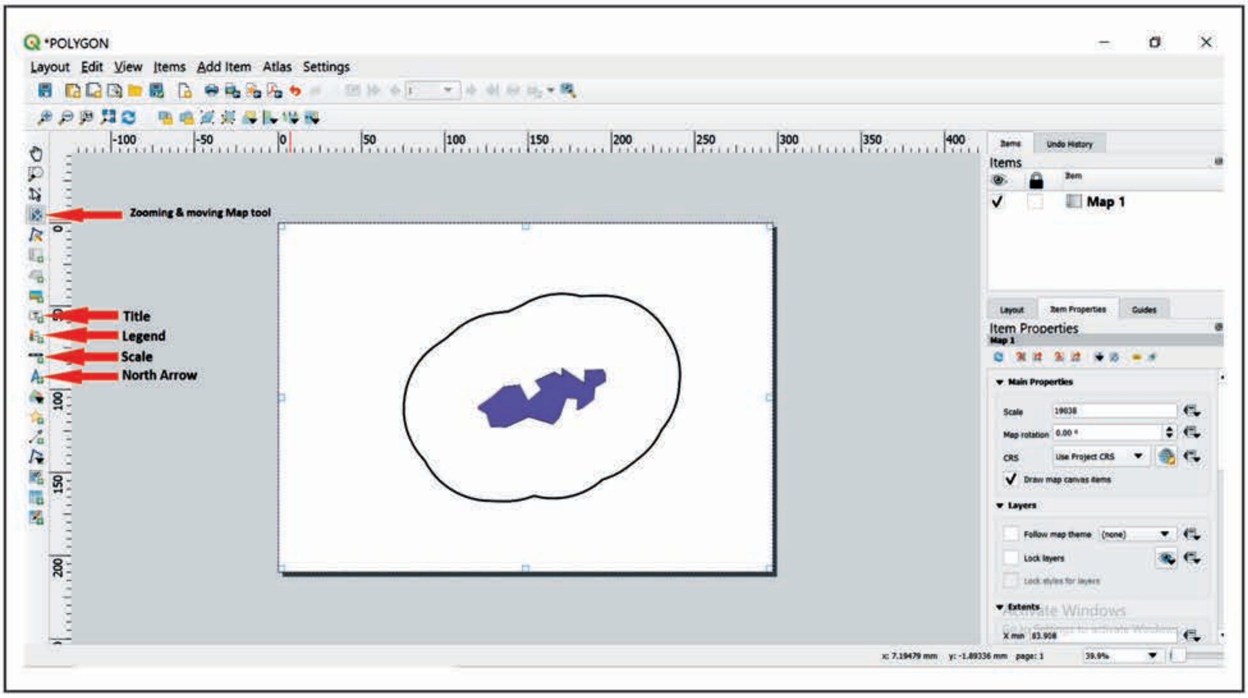
Step 15: Click on **'Add item'** and then select **'Add Map'**.

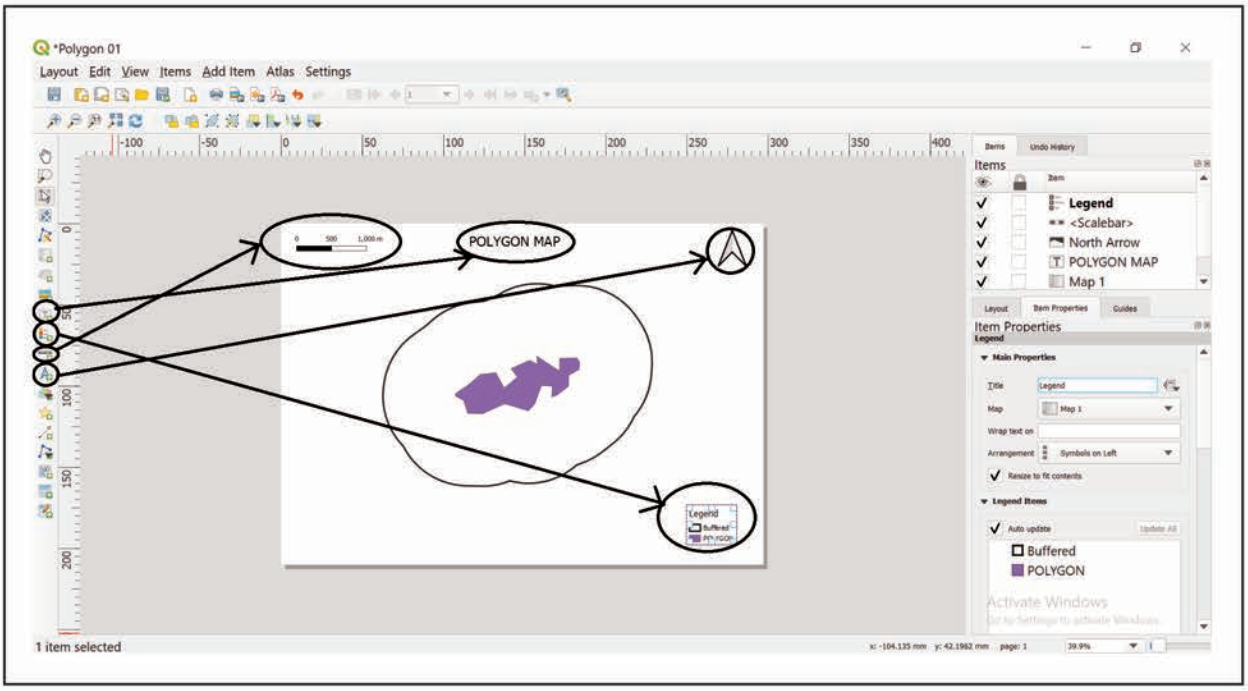


Step 16: Click and drag to add the map.

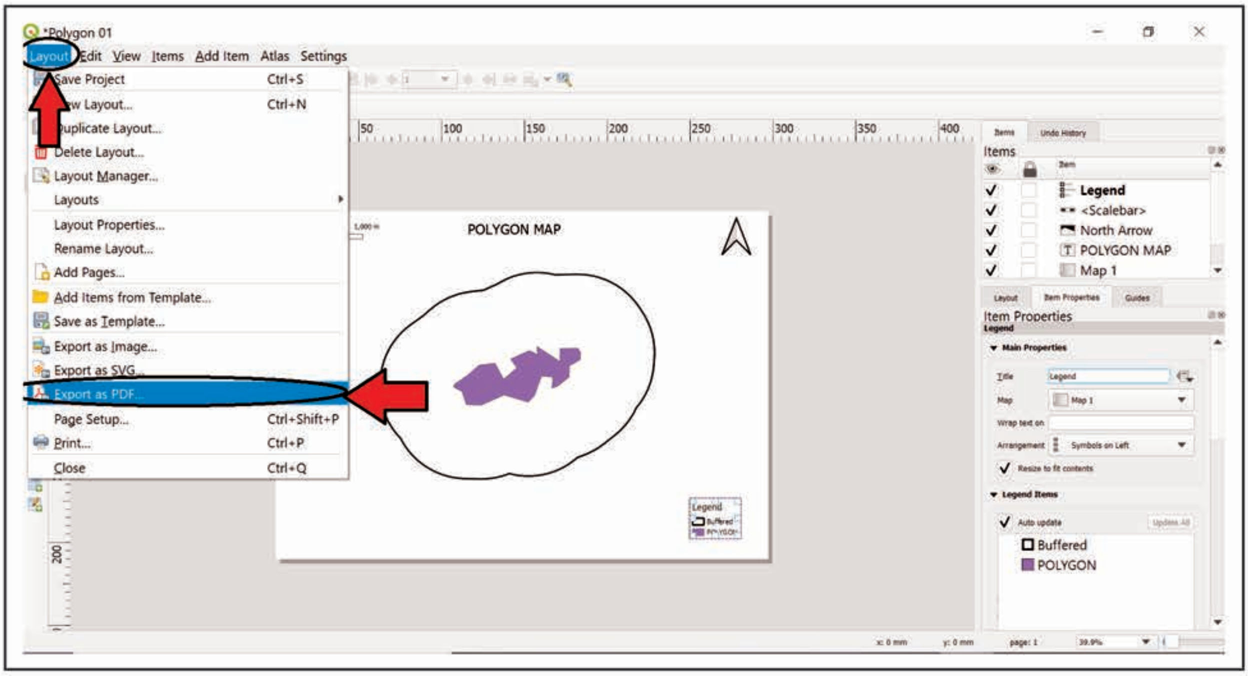


Step 17: Add **Title**, **Legend**, **Scale** and **North Arrow** by doing necessary respective editings

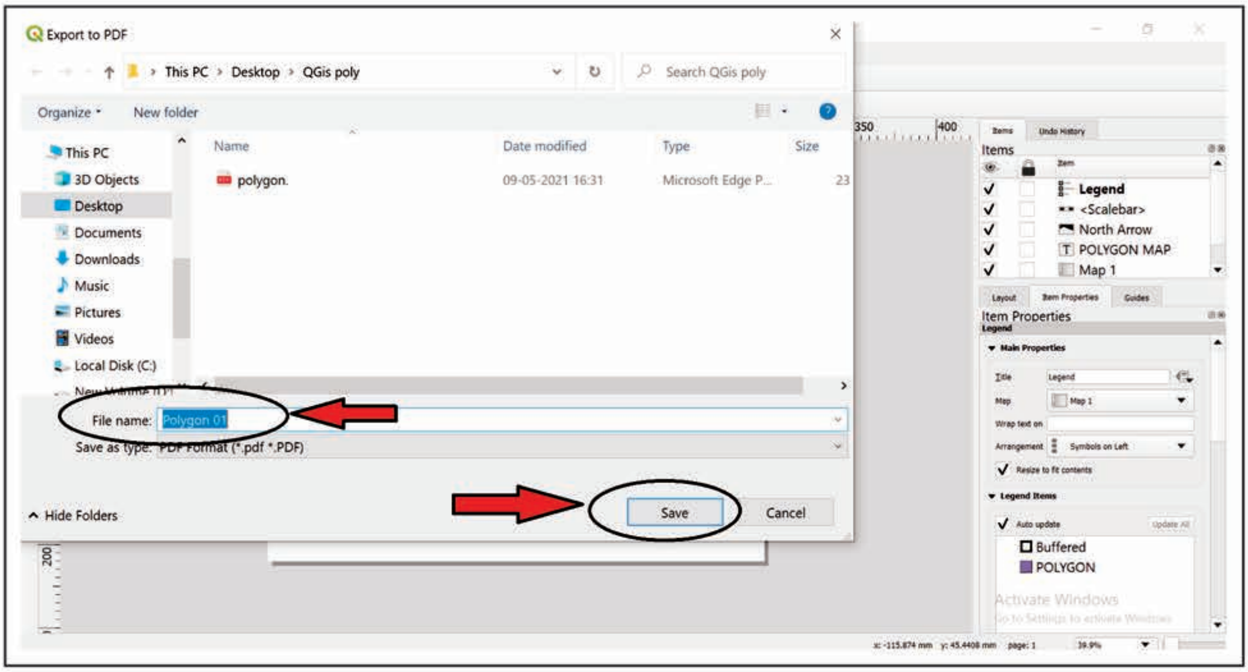




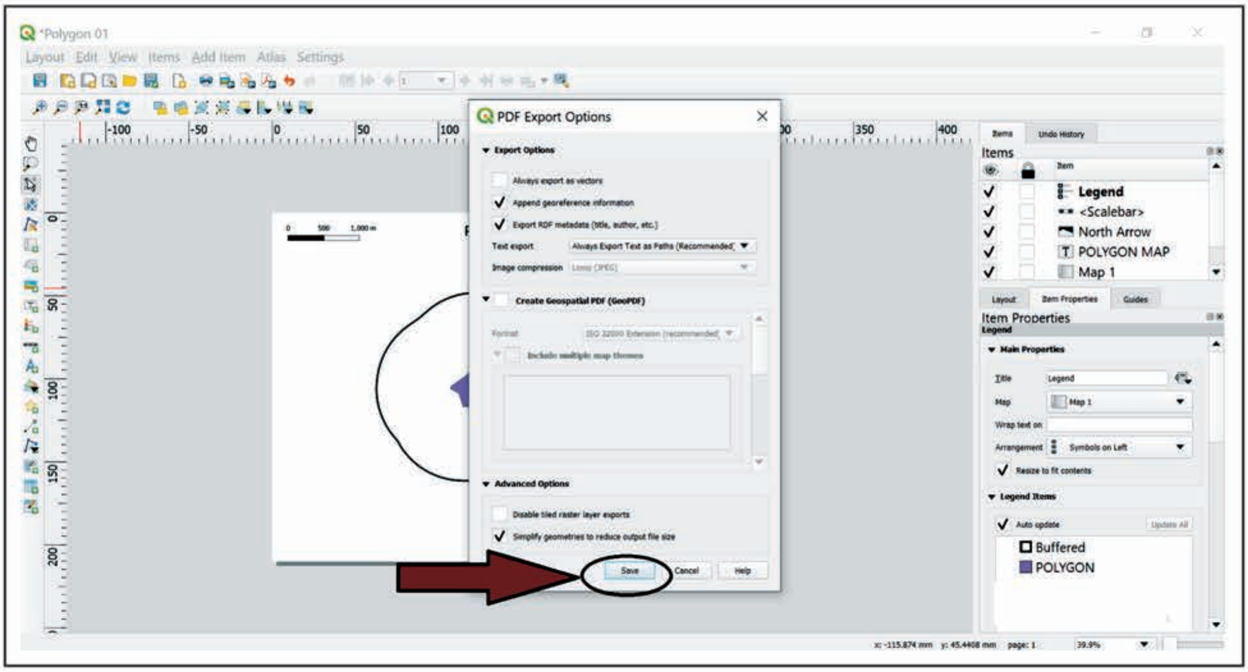
Step 18: To Make PDF of the Map, Click on 'Layout' and then 'Export as PDF'



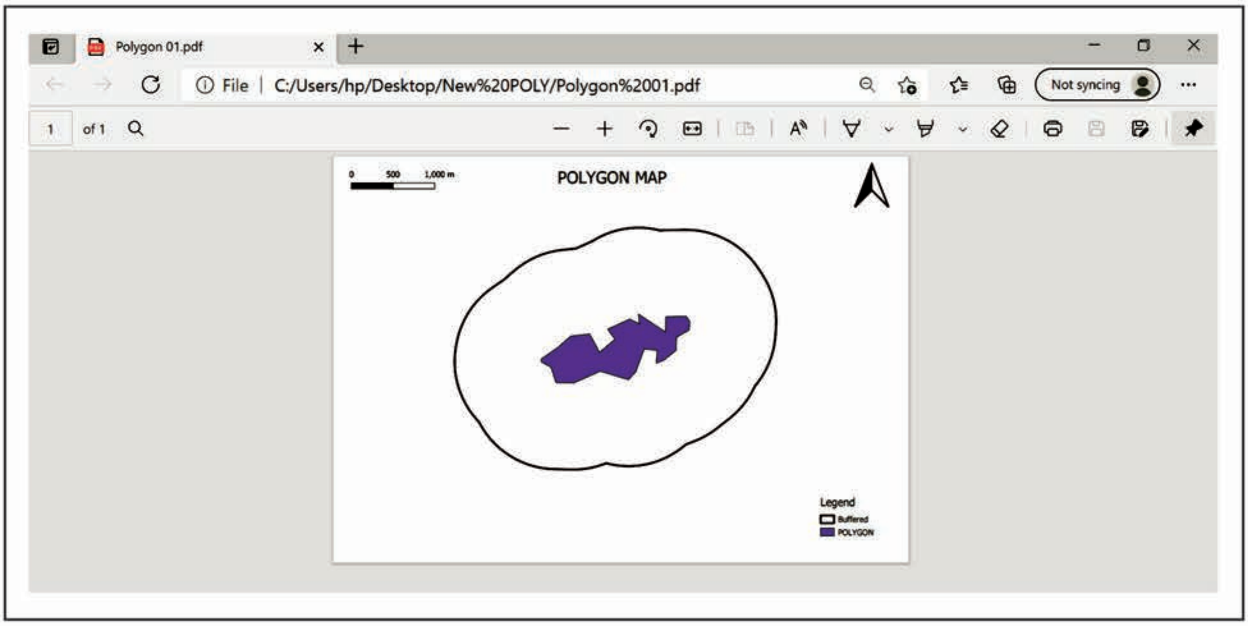
Step 19: Give the file name and Select 'Save as type': PDF Format.



Click 'Save'in popup window:

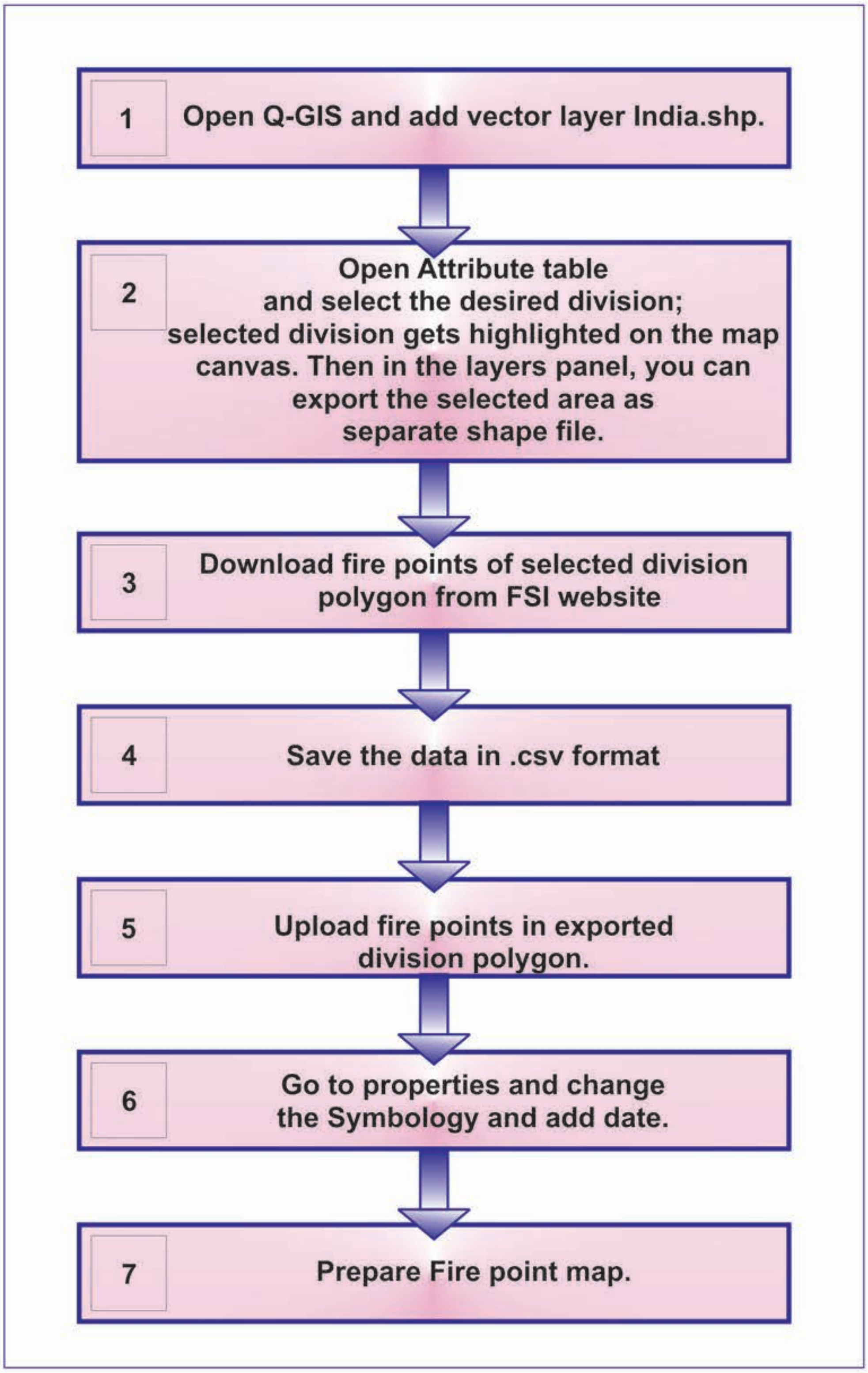


Map PDF File:



4. Creating a Firepoint map of a particular Forest Division on Q-GIS

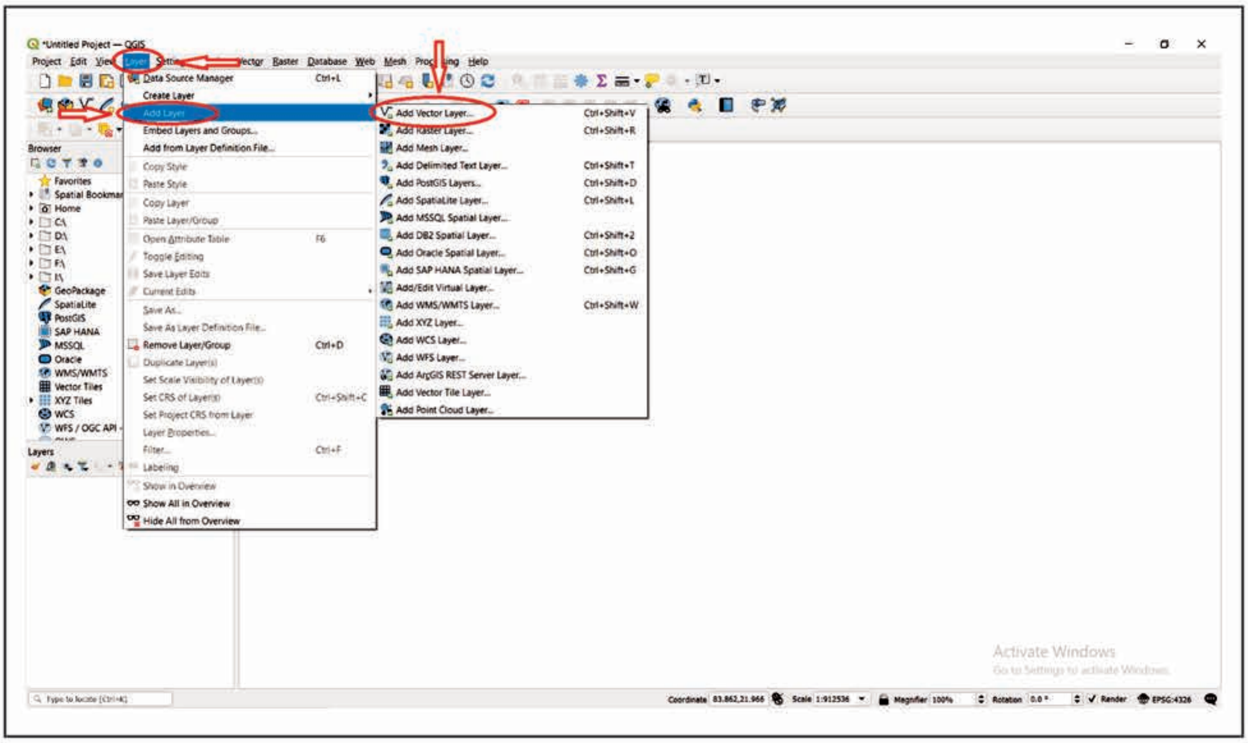
Forest Survey of India is agency for monitoring forest fire in India. It is very simple to create a forest fire map of a division using open source software like QGIS. The fire data is available free from the FSI Website. The available fire data can be plotted on the administrative boundary of particular division or region of interest and the map can be composed for better understanding of the fire situation in the field. Downloading of fire points from FSI website, composing it as map is dealt in this exercise.



Step 1. Add India map shape file on Q-GIS.

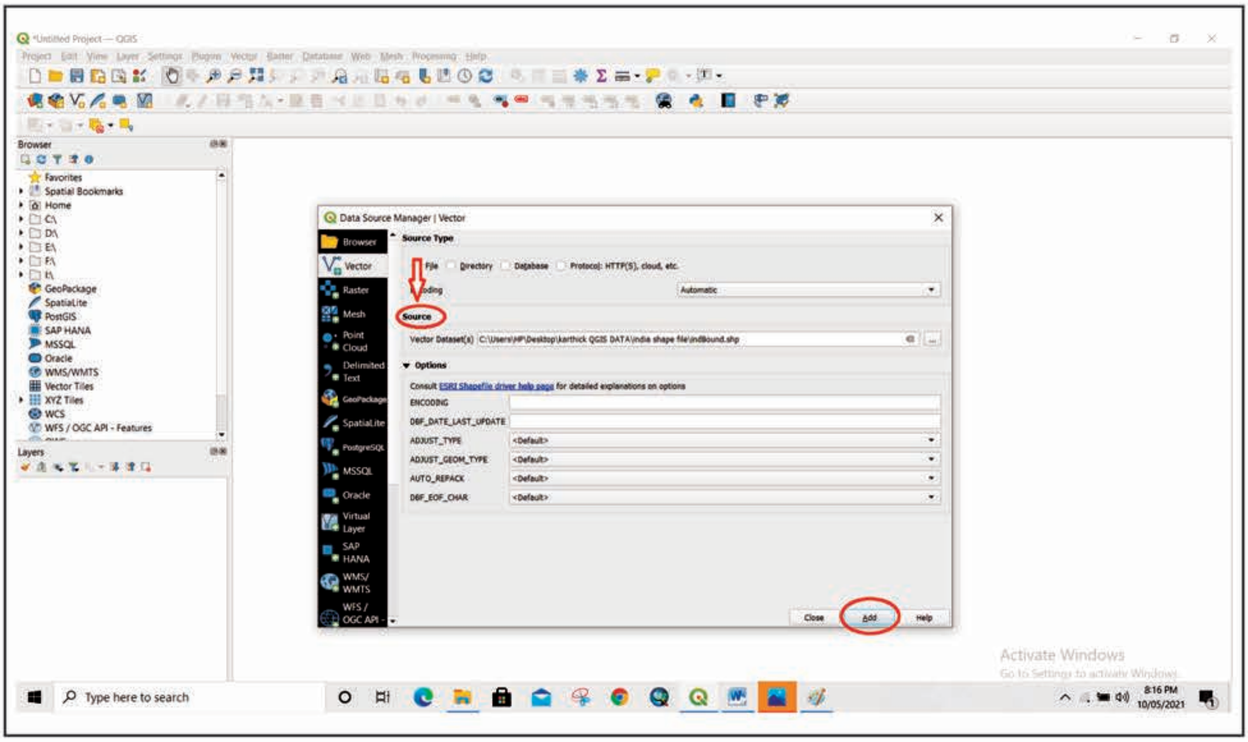
i. Open Q-GIS software and click on Layer.

ii. Select Add Layer and click Add Vector Layer

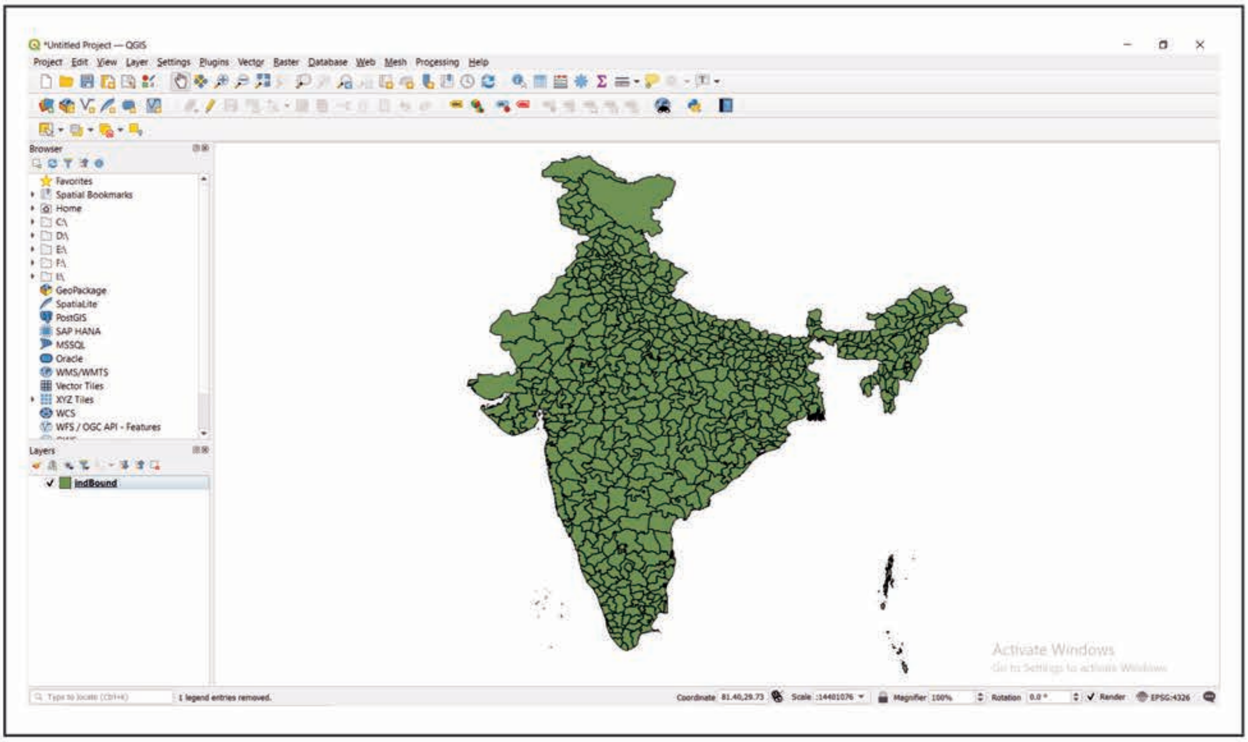


iii. Add Vector File from Source Vector Dataset(s). For example Indiabound.shp

iv. Click Add



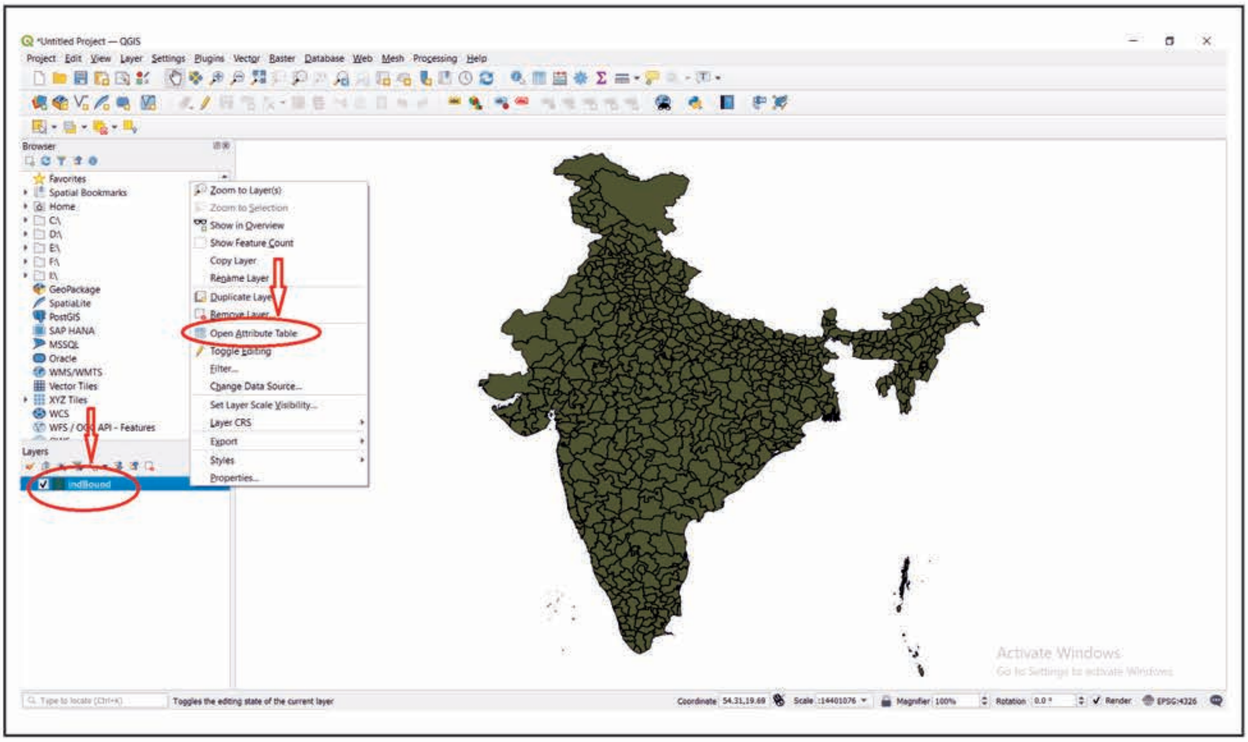
v. The added Shapefile will appear like this.



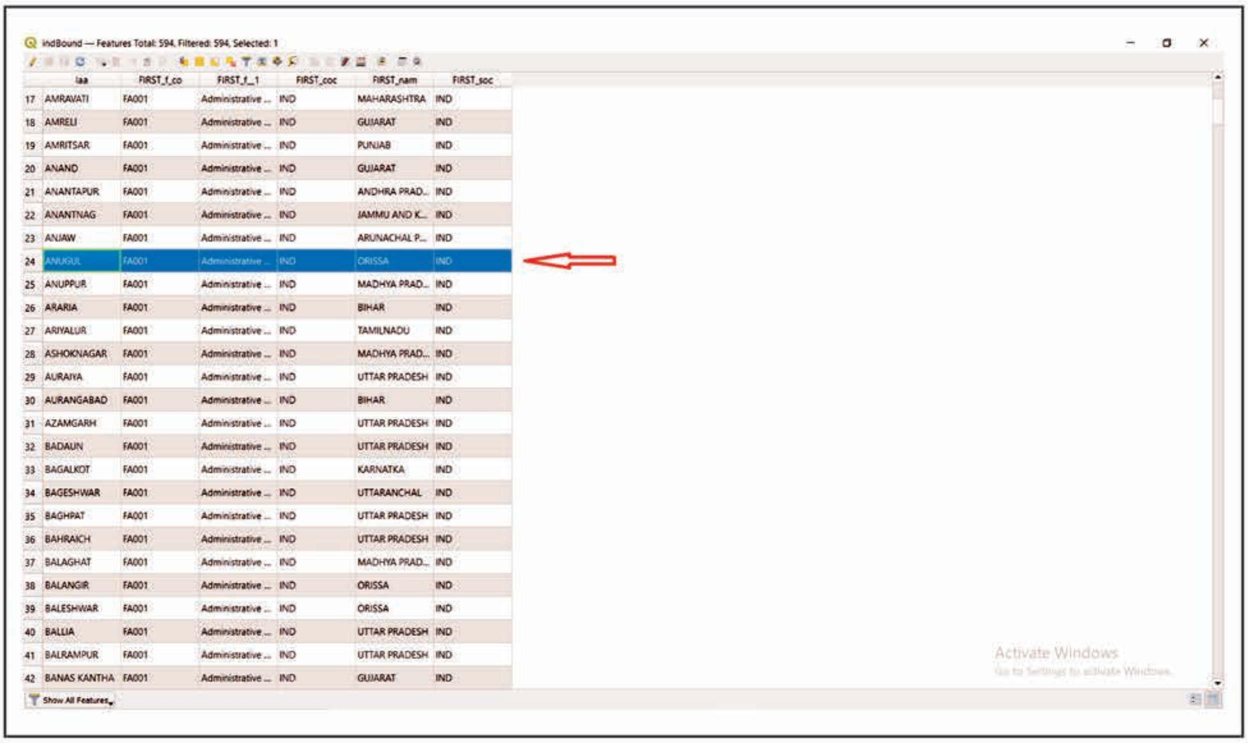
Step 2. Take out particular Forest Division map from India shape file

i. Right click on the layer India.shp

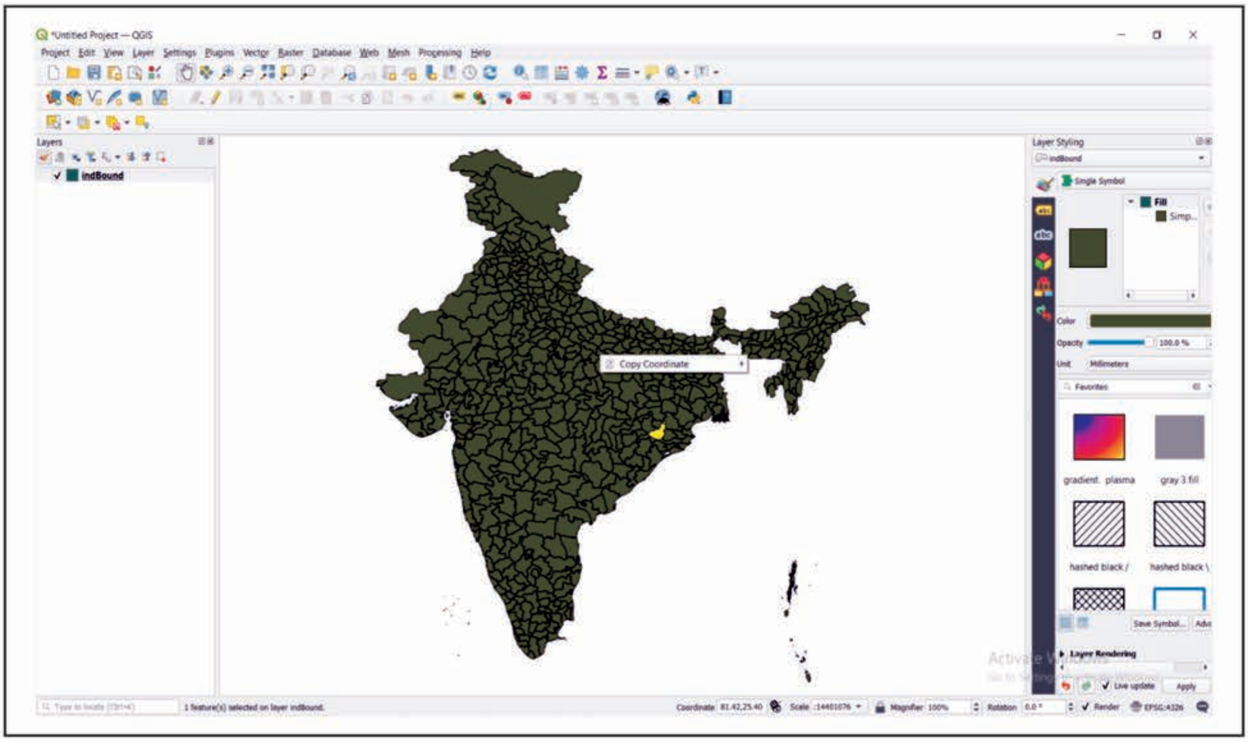
ii. Click on Open Attribute Table



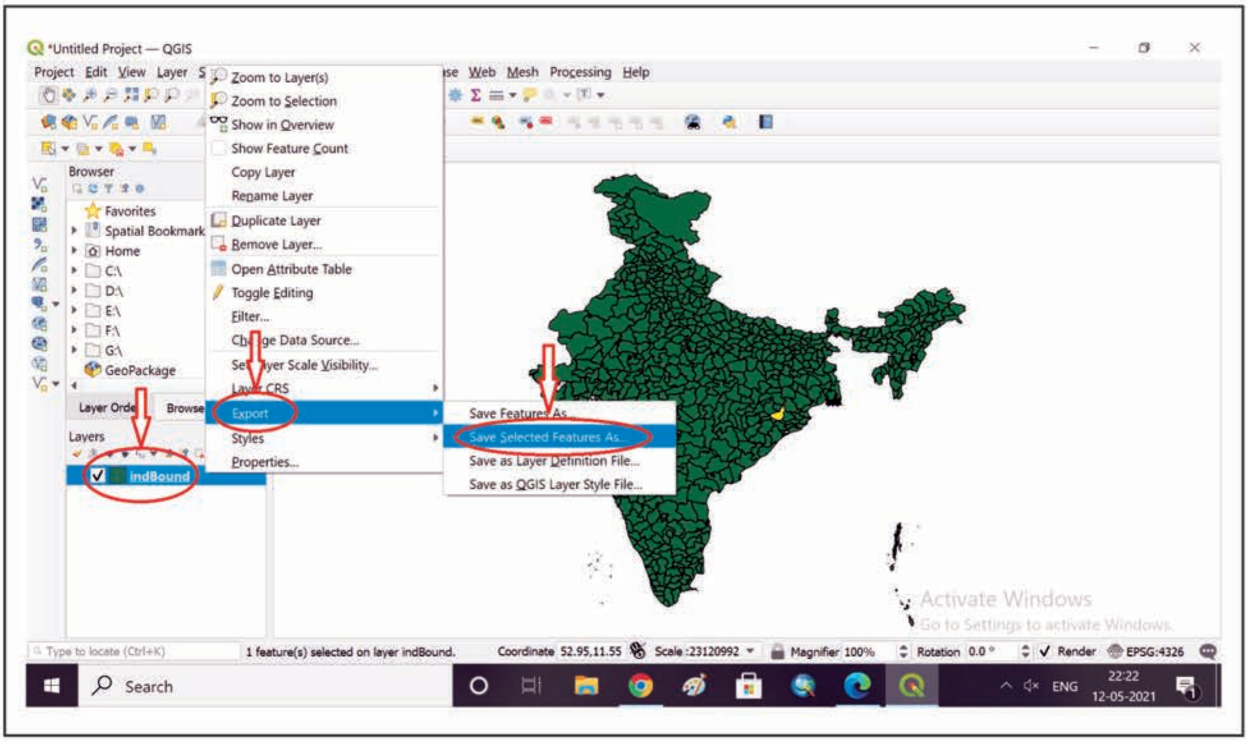
iii. A list of Forest divisions throughout India will be displayed.
Select a particular Forest division by clicking it.



iv. The selected Forest division will be highlighted on India map.

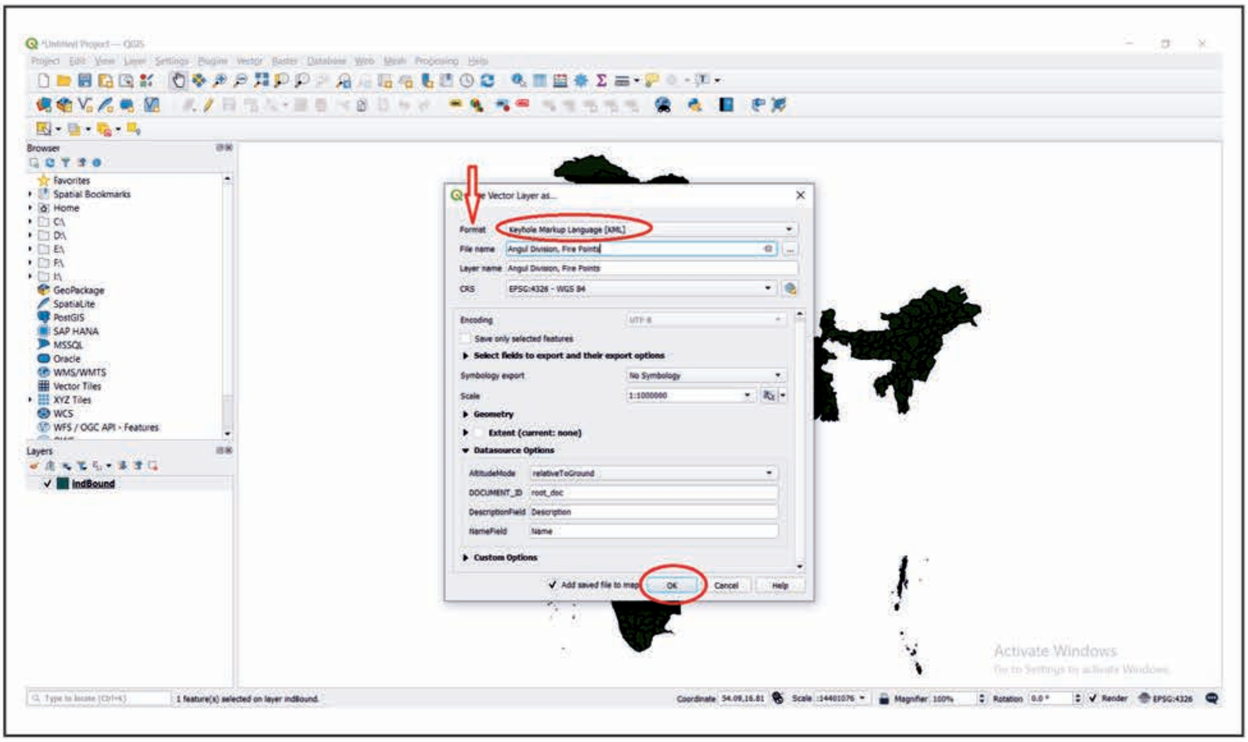


v. Right click on Layer and select Export
vi. Select Save Selected Features as

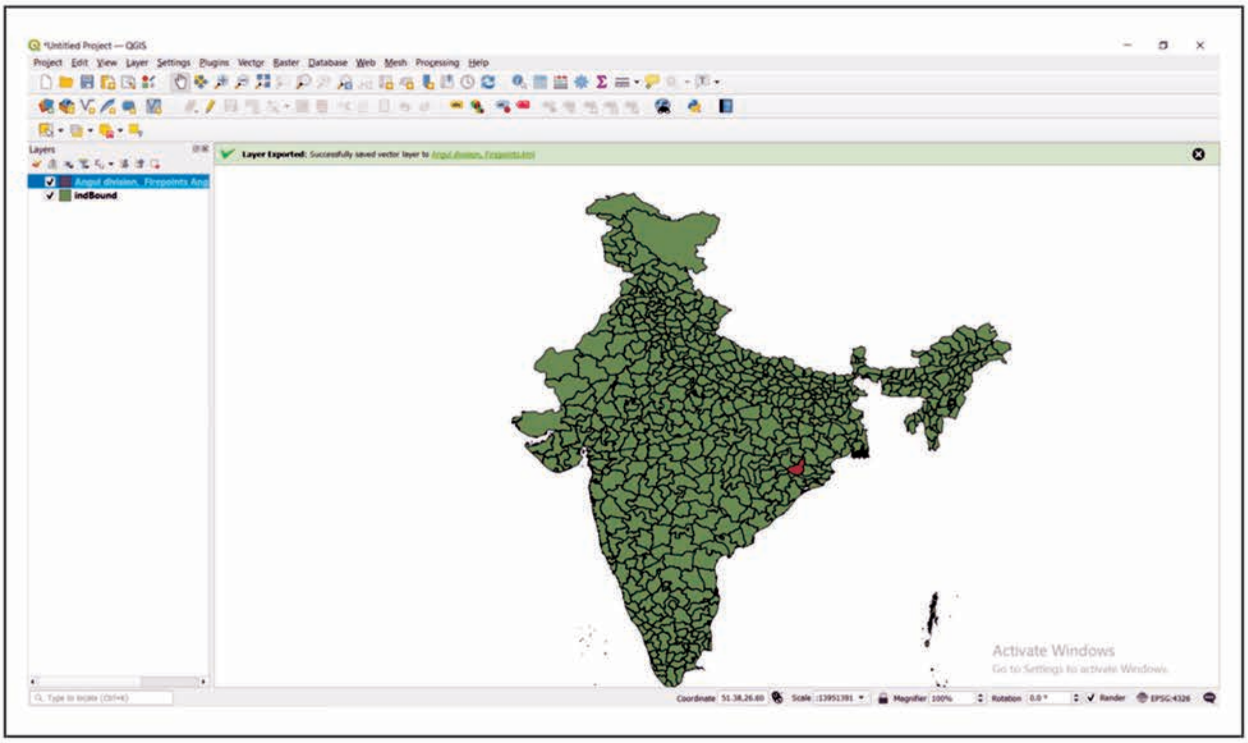


vii. A new pop-up window will appear.
Select the Format as Keyhole Markup Language [KML]/.shp or any desired format.
Give the respective File and Layer name
Select the CRS as EPSG:4326 – WGS 84
Check the option add saved file to the map

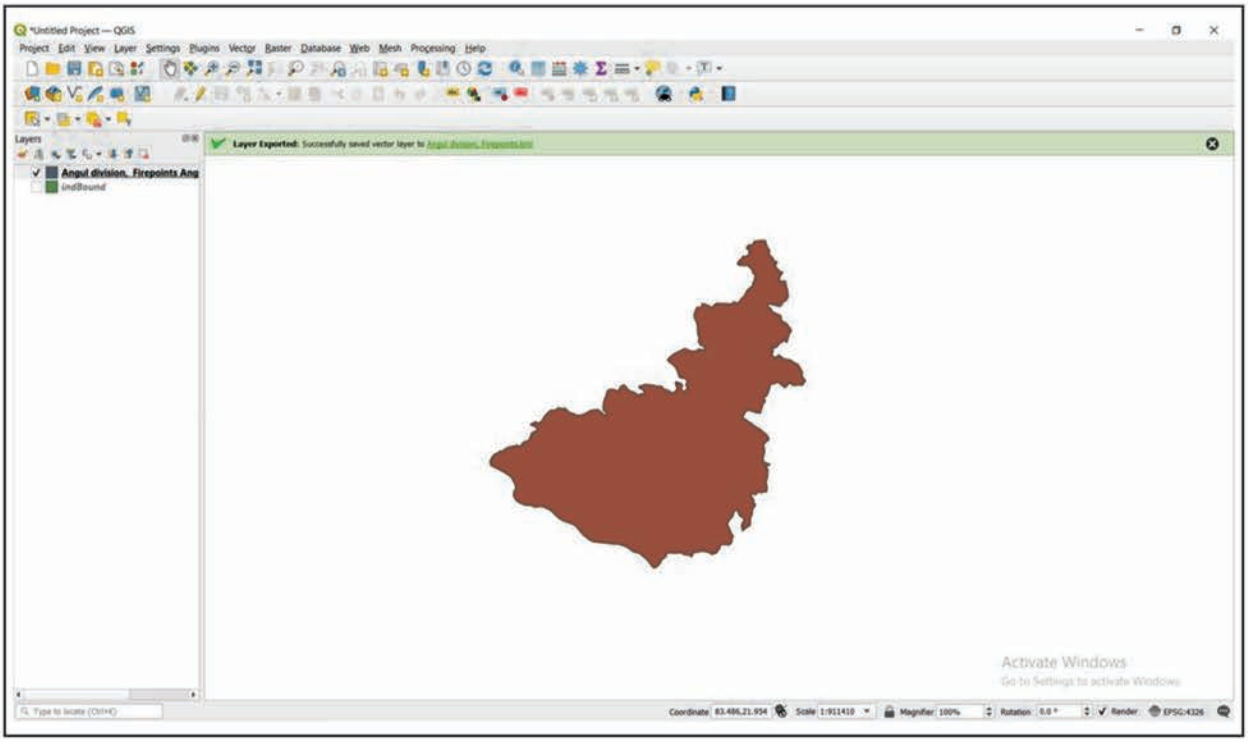
viii. Click OK.



ix. The particular Forest Division will be exported and now two layers viz. India shapefile and selected forest division can be seen on left panel.



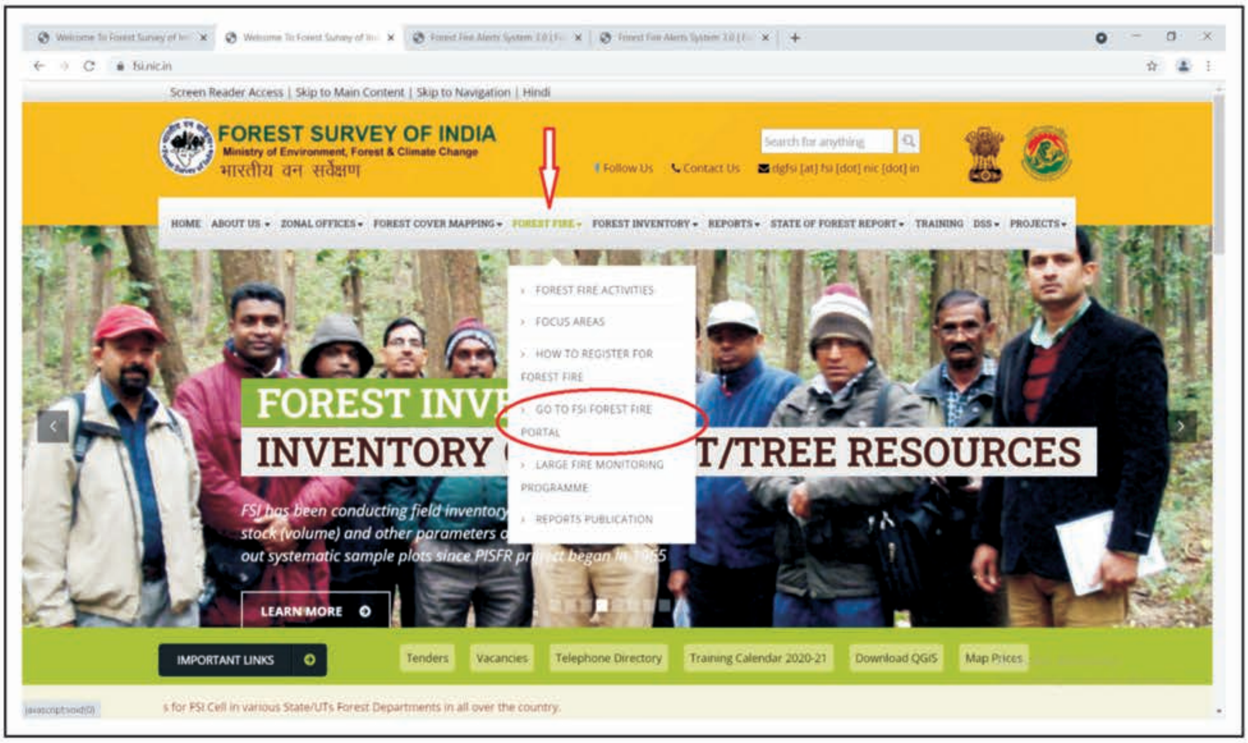
x. Uncheck the India shapefile to view the selected Forest division.



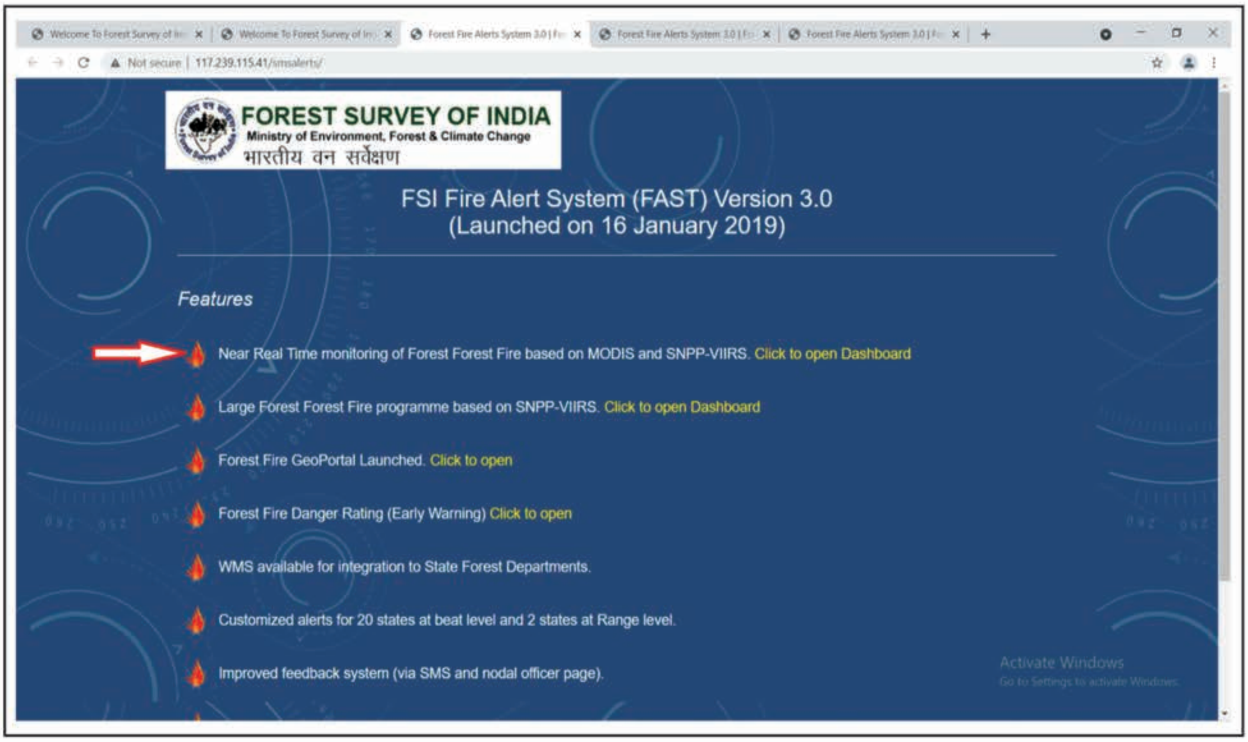
Step 3 : Download the Fire points for the selected Forest division from Forest Survey of India (FSI) website

i. Go to FSI website by following the link https://www.fsi.nic.in

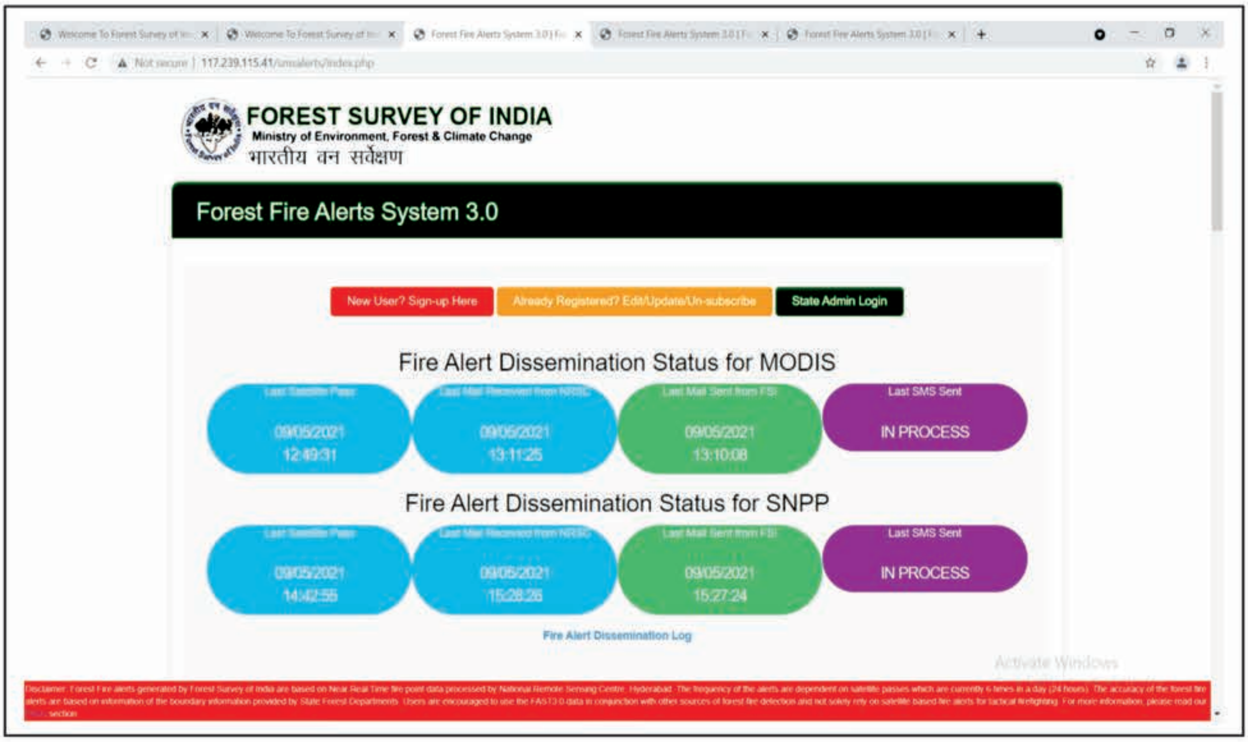
ii. Click FOREST FIRE and select GO TO FSI FOREST FIRE PORTAL.



iii. Click on the Feature- Near Real time monitoring of Forest Fire based on MODIS and SNPP-VIRS to open Dashboard.

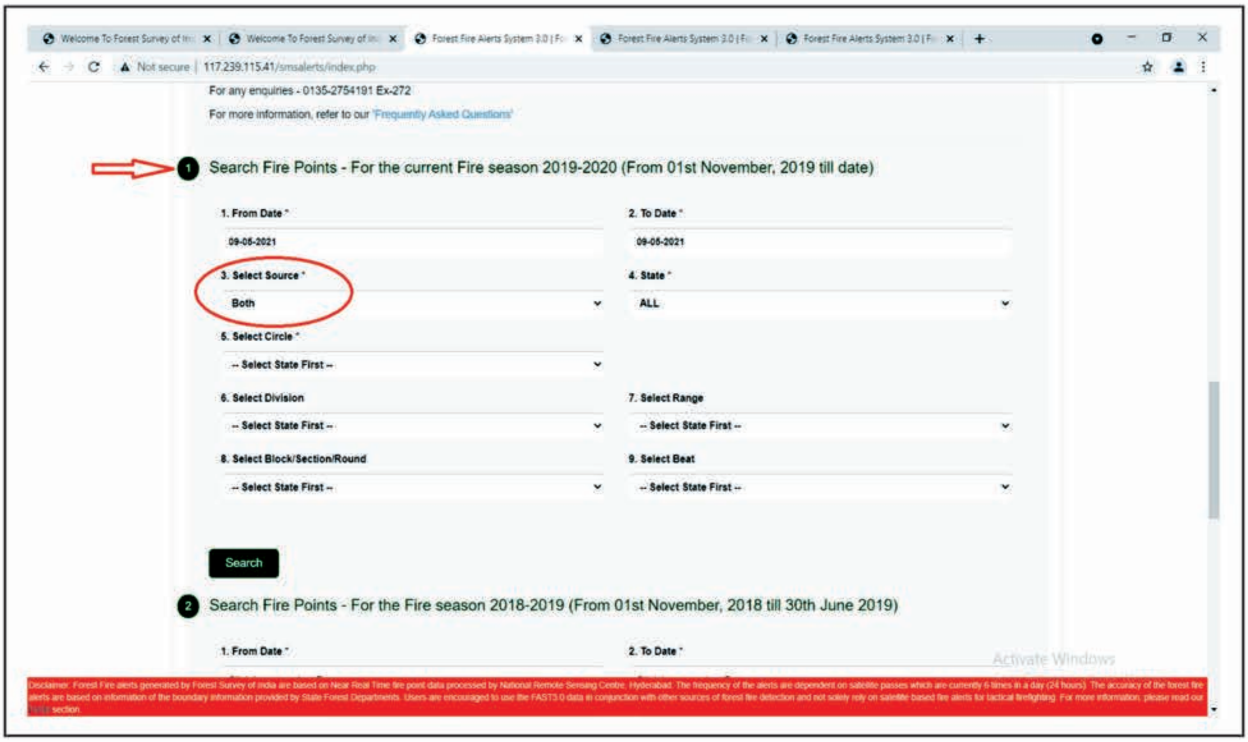


iv. A window with Forest Fire Alerts System 3.0 will open.

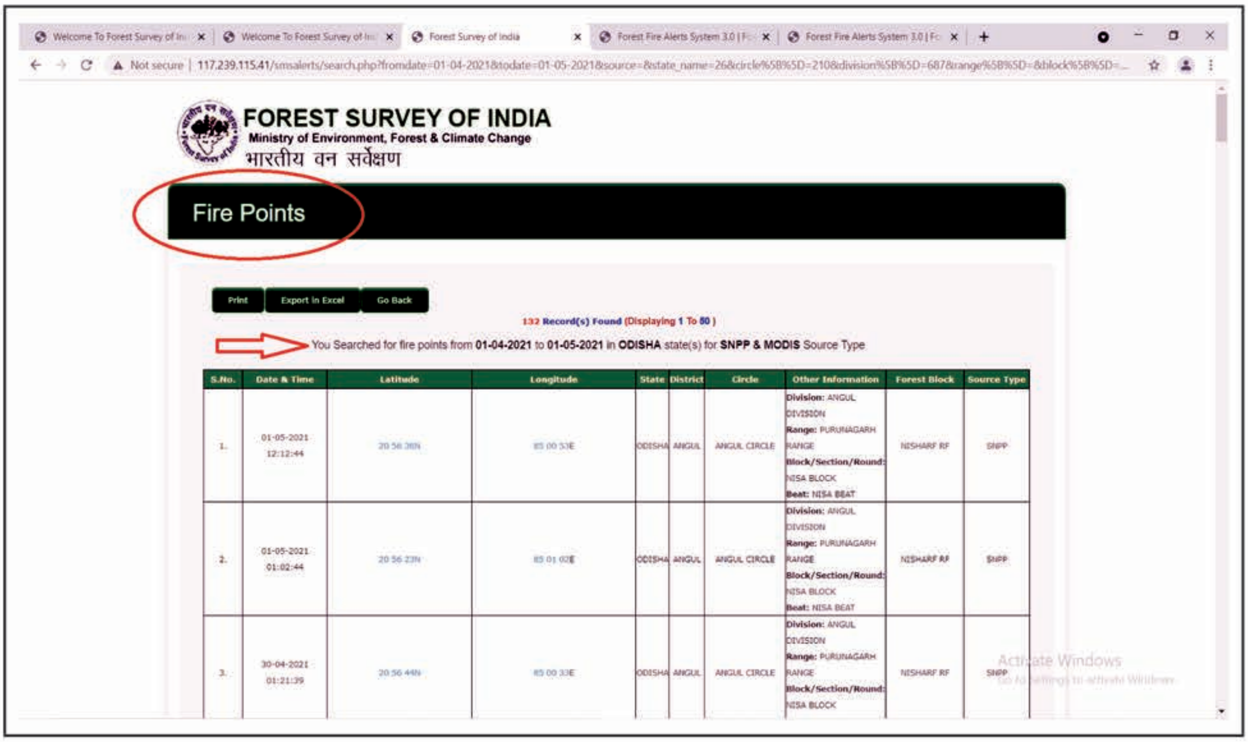


v. Scroll down the window. It will take you to Search Fire Points - For the current Fire season 2019-2020 (From 01st November, 2019 till date) or any of the past Fire incidences.

vi. Select the period for which the FirePoint data is required; Select source as Both and select a particular State, Circle, Division and Range. Click Search

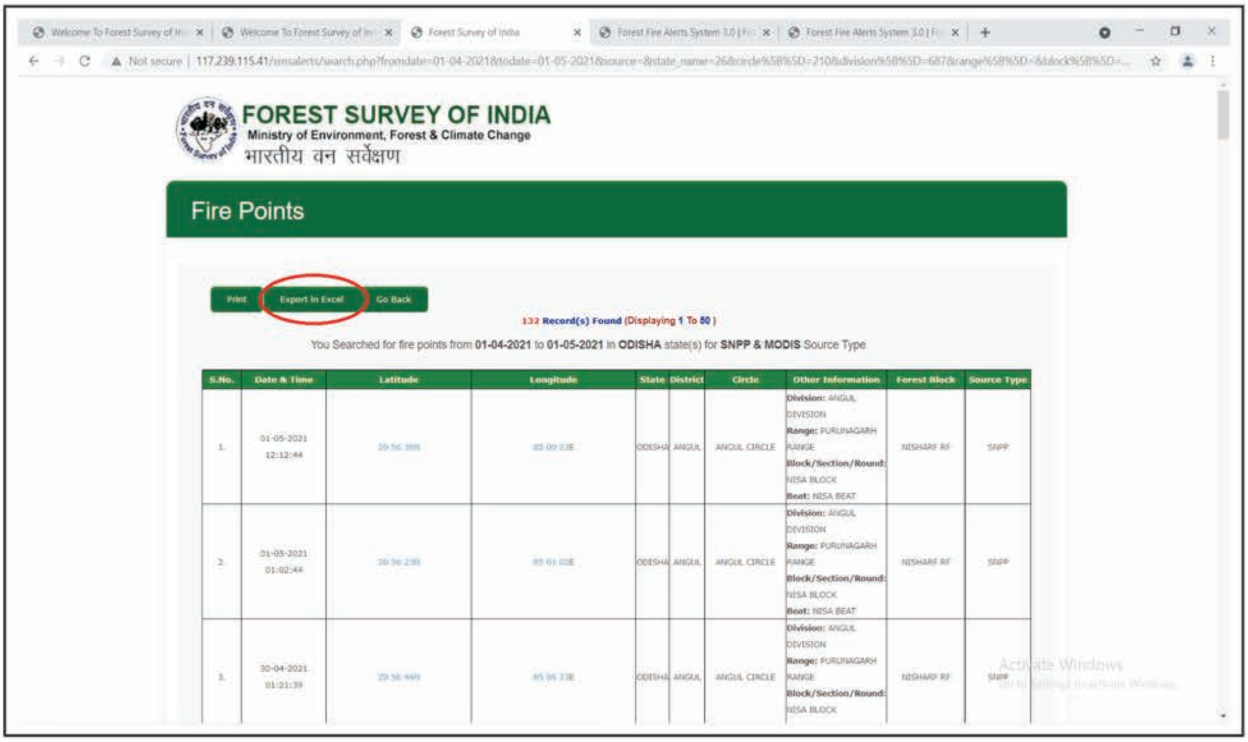


vii. The requisite Fire Points for a particular time period will be displayed.



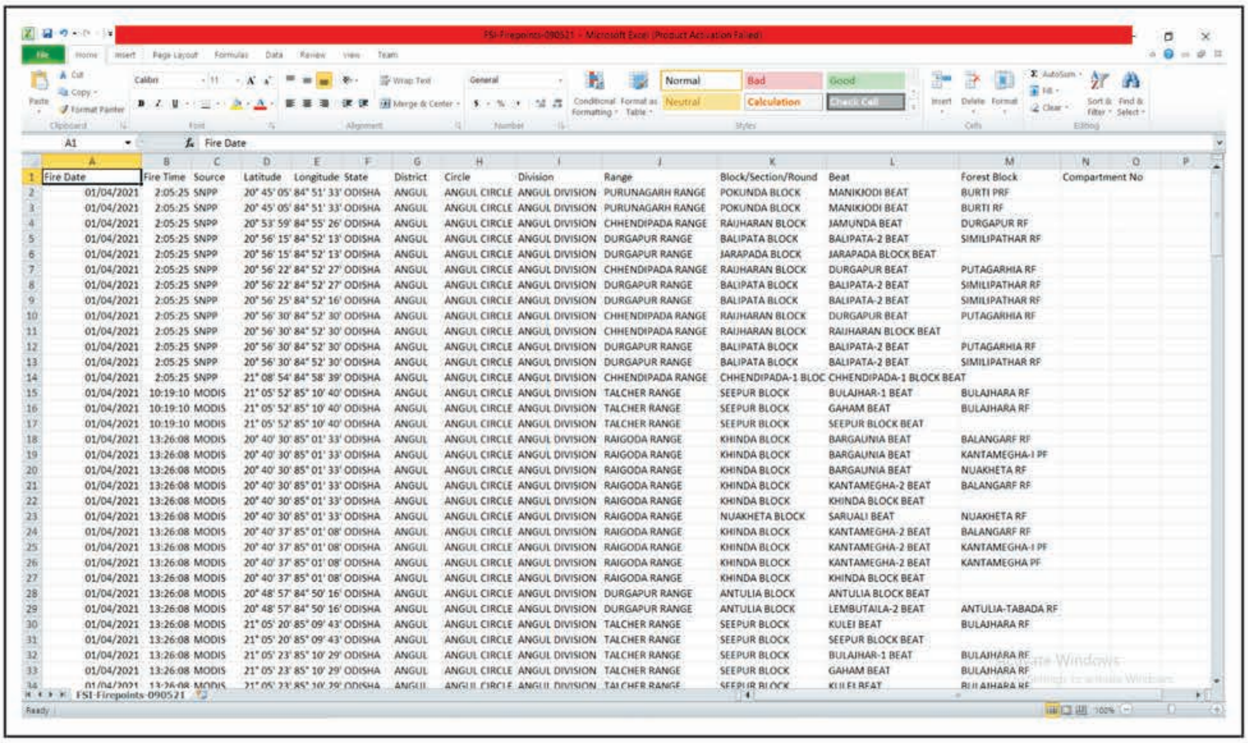
viii. Export the Fire Points in Excel by Clicking Export in Excel.

The Fire Points will be downloaded in Excel.

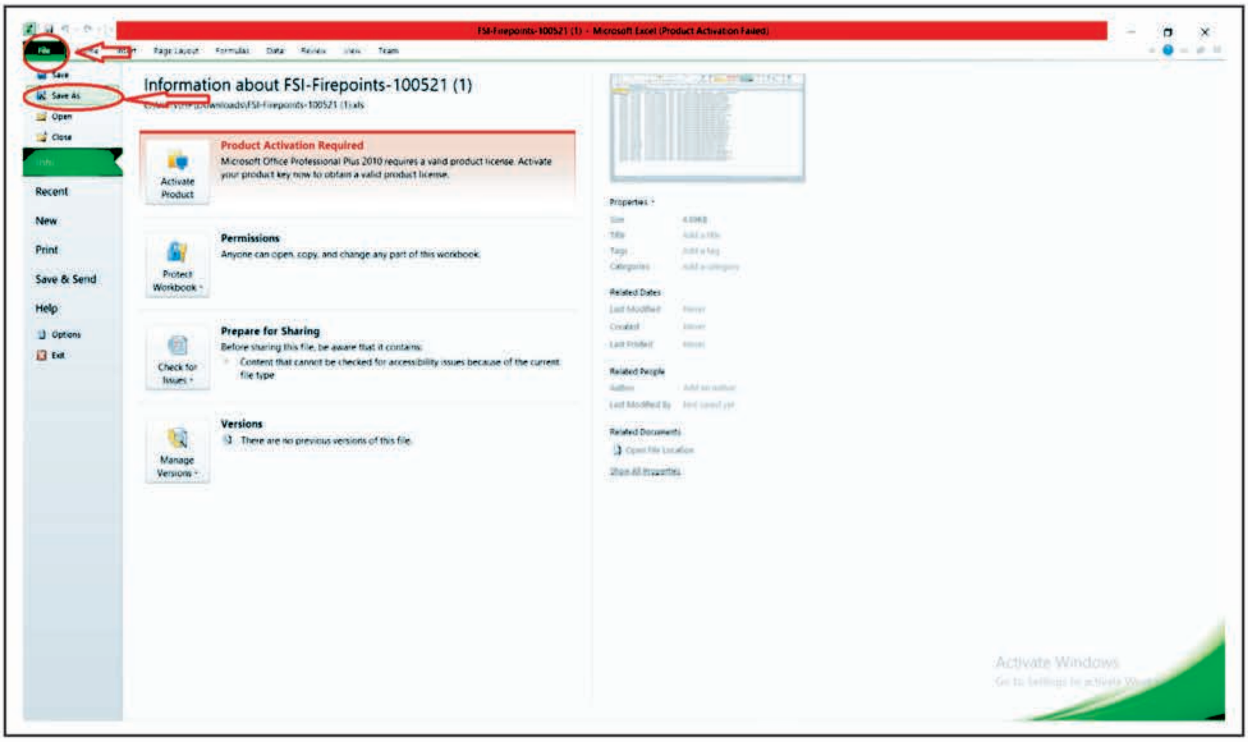


Step 4 : Make .CSV File.

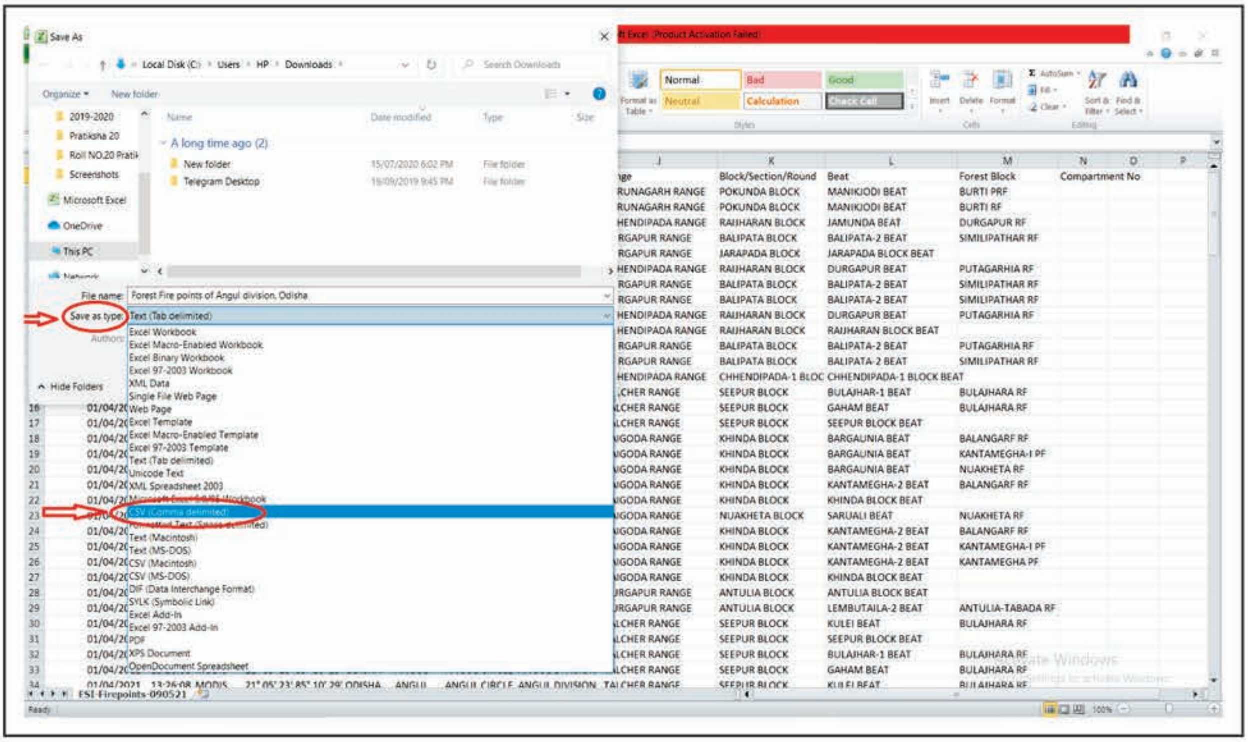
i. Open the Fire Points in Excel.



ii. Click on File and Select Save as

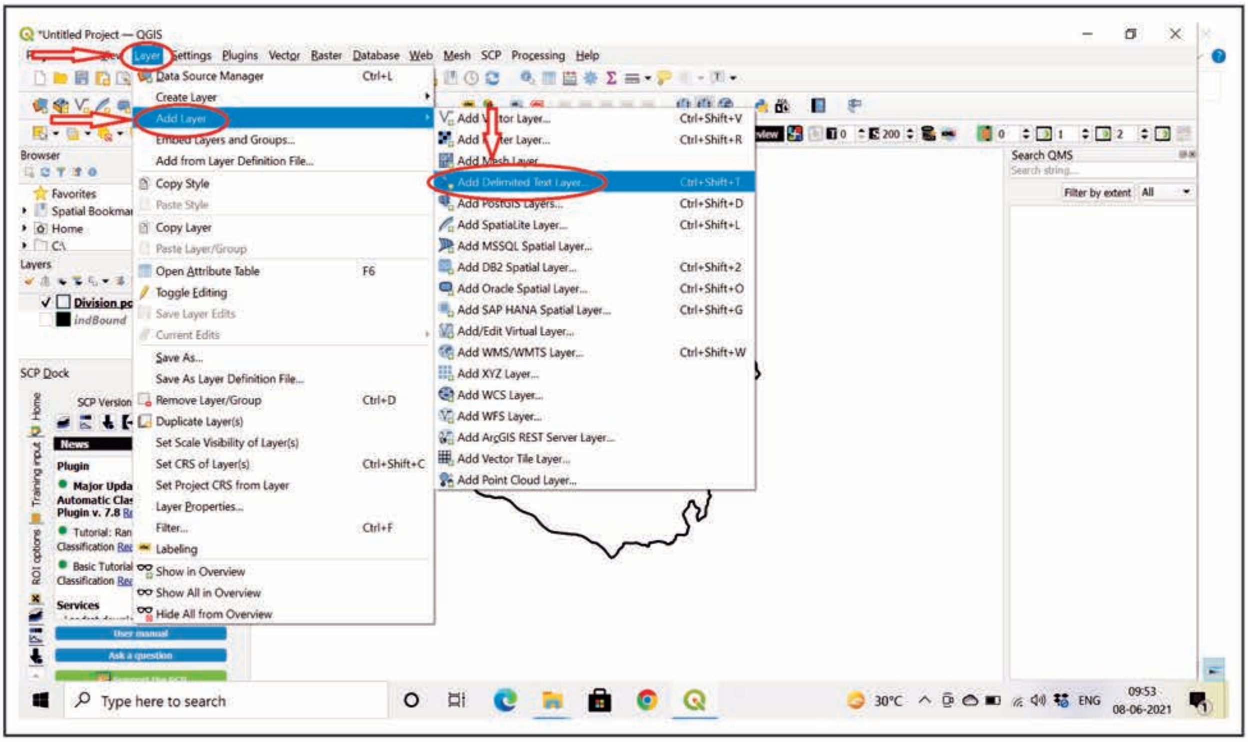


iii. Click the Drop down arrow in Save as type and select CSV (Comma delimited). The file will be saved in CSV format.



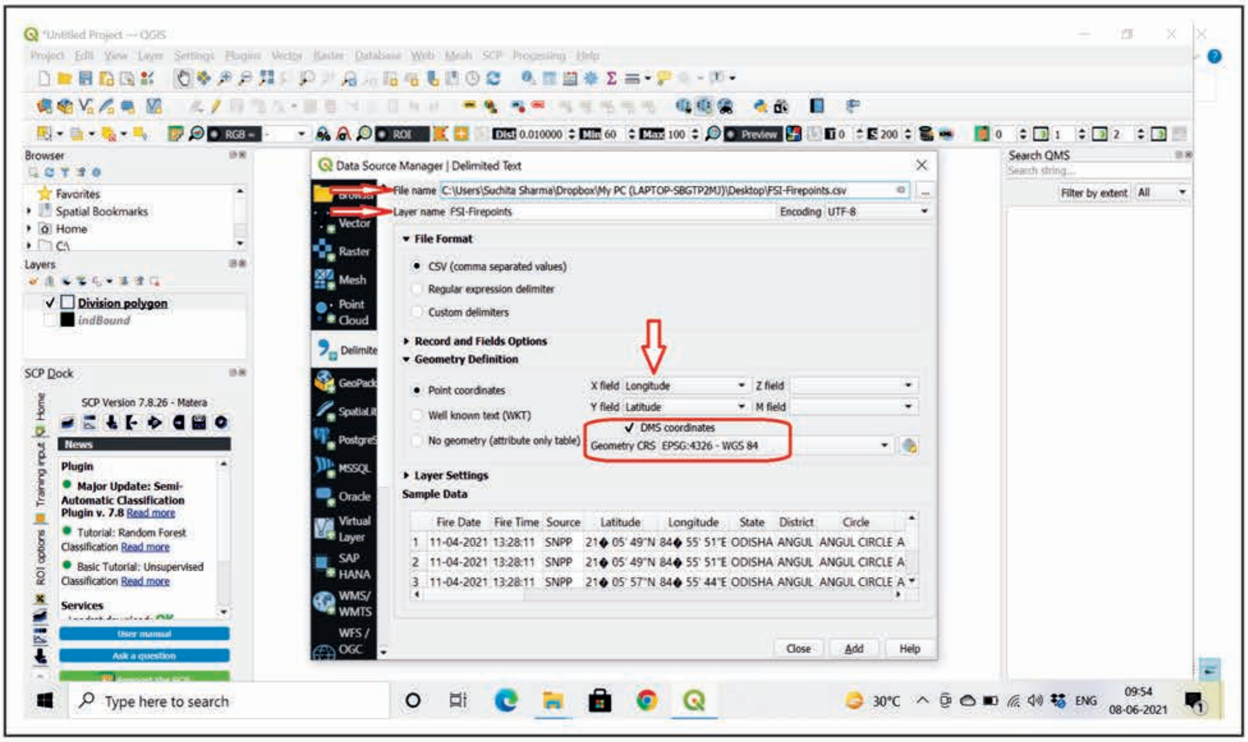
Step 5. Uploading Fire Points on the exported Division polygon

I. Go to Layer; Click Add Layer and Select Add Delimited Text Layer.

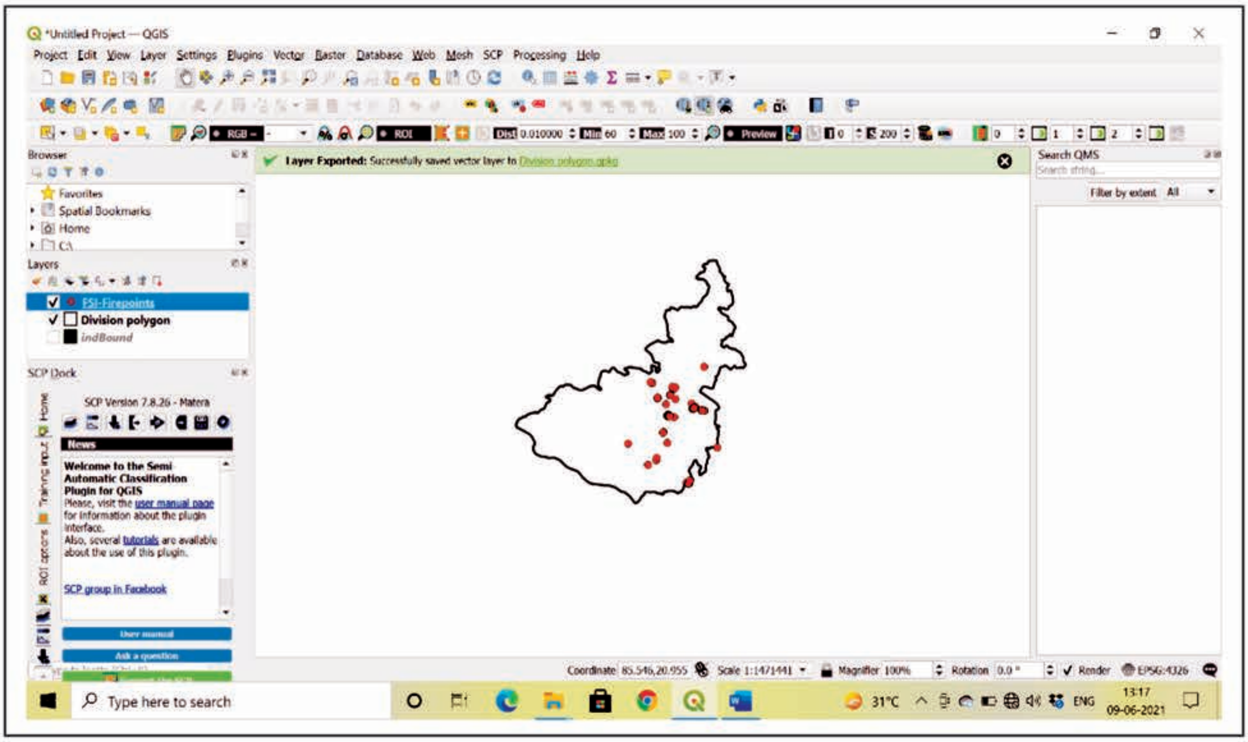


ii. A Delimited Text Window will open.

- Select Delimited Text on the left panel
- Enter the File name as Saved CSV file of firepoints of a particular division and Layer name
- Save the File Format as CSV (Comma Separated Values)
- In Geometry Definition check Point coordinates
- Select X field in point coordinates as Longitude and Y field as Latitude
- Check DMS coordinates
- In Geometry CRS, select Project CRS: EPSG:4326 – WGS
- Click Add.



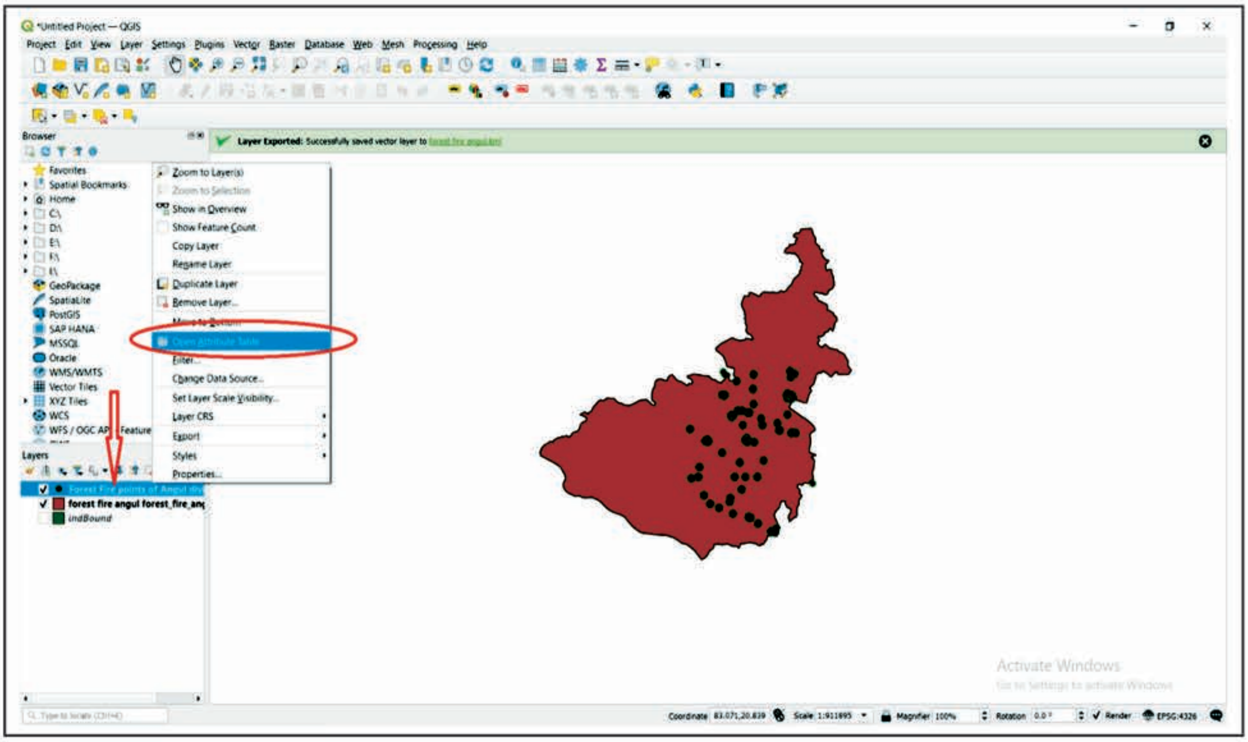
iii. Fire Points will be added in selected Forest division map.



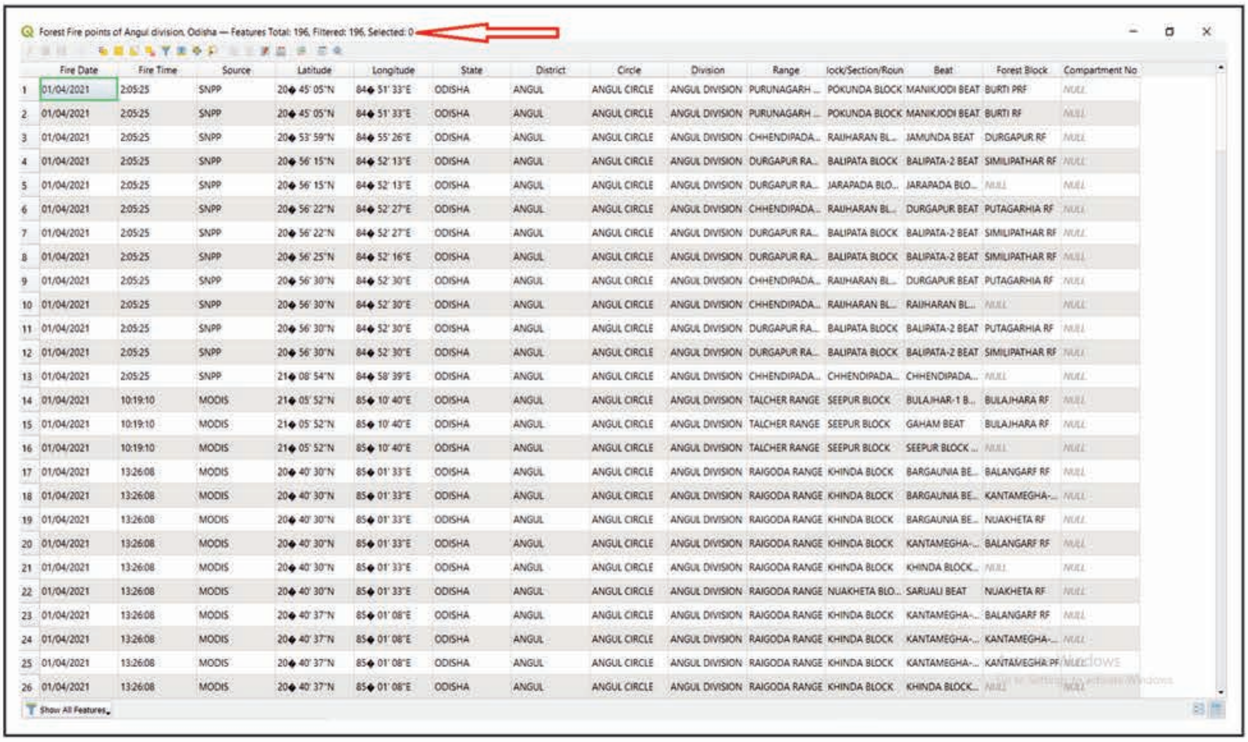
Step 6 : Checking the Attribute table

i. Right Click on added Forest Points Layer

ii. Click on Open Attribute Table



iii. The Attribute Table of Fire Points will be displayed



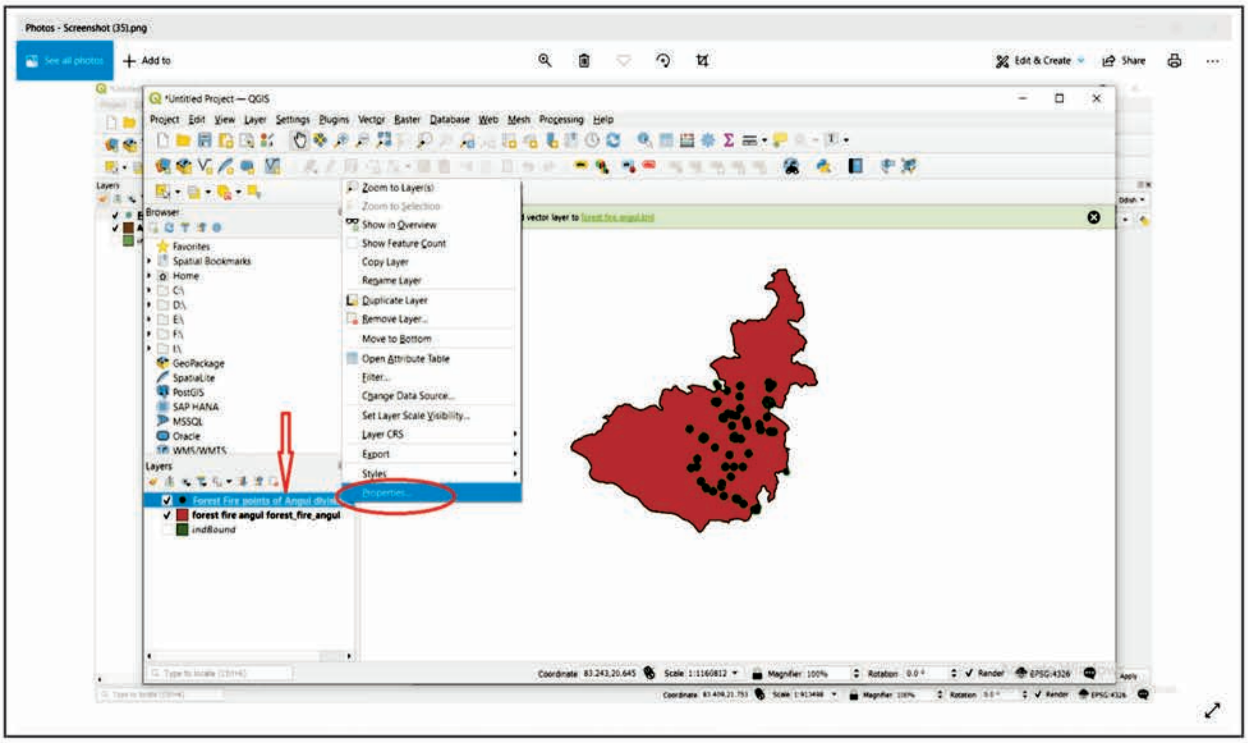
Forest Fire points of Angul division, Odisha — Features Total: 196, Filtered: 196, Selected: 0

	Fire Date	Fire Time	Source	Latitude	Longitude	State	District	Circle	Division	Range	lock/Section/Roun	Beat	Forest Block	Compartment No
1	01/04/2021	2:05:25	SNPP	20◆ 45' 05"N	84◆ 51' 33"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	PURUNAGARH ...	POKUNDA BLOCK	MANIKJODI BEAT	BURTI PRF	NULL
2	01/04/2021	2:05:25	SNPP	20◆ 45' 05"N	84◆ 51' 33"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	PURUNAGARH ...	POKUNDA BLOCK	MANIKJODI BEAT	BURTI RF	NULL
3	01/04/2021	2:05:25	SNPP	20◆ 53' 59"N	84◆ 55' 26"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	CHHENDIPADA...	RAIJHARAN BL...	JAMUNDA BEAT	DURGAPUR RF	NULL
4	01/04/2021	2:05:25	SNPP	20◆ 56' 15"N	84◆ 52' 13"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	DURGAPUR RA...	BALIPATA BLOCK	BALIPATA-2 BEAT	SIMILIPATHAR RF	NULL
5	01/04/2021	2:05:25	SNPP	20◆ 56' 15"N	84◆ 52' 13"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	DURGAPUR RA...	JARAPADA BLO...	JARAPADA BLO...	NULL	NULL
6	01/04/2021	2:05:25	SNPP	20◆ 56' 22"N	84◆ 52' 27"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	CHHENDIPADA...	RAIJHARAN BL...	DURGAPUR BEAT	PUTAGARHIA RF	NULL
7	01/04/2021	2:05:25	SNPP	20◆ 56' 22"N	84◆ 52' 27"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	DURGAPUR RA...	BALIPATA BLOCK	BALIPATA-2 BEAT	SIMILIPATHAR RF	NULL
8	01/04/2021	2:05:25	SNPP	20◆ 56' 25"N	84◆ 52' 16"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	DURGAPUR RA...	BALIPATA BLOCK	BALIPATA-2 BEAT	SIMILIPATHAR RF	NULL
9	01/04/2021	2:05:25	SNPP	20◆ 56' 30"N	84◆ 52' 30"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	CHHENDIPADA...	RAIJHARAN BL...	DURGAPUR BEAT	PUTAGARHIA RF	NULL
10	01/04/2021	2:05:25	SNPP	20◆ 56' 30"N	84◆ 52' 30"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	CHHENDIPADA...	RAIJHARAN BL...	RAIJHARAN BL...	NULL	NULL
11	01/04/2021	2:05:25	SNPP	20◆ 56' 30"N	84◆ 52' 30"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	DURGAPUR RA...	BALIPATA BLOCK	BALIPATA-2 BEAT	PUTAGARHIA RF	NULL
12	01/04/2021	2:05:25	SNPP	20◆ 56' 30"N	84◆ 52' 30"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	DURGAPUR RA...	BALIPATA BLOCK	BALIPATA-2 BEAT	SIMILIPATHAR RF	NULL
13	01/04/2021	2:05:25	SNPP	21◆ 08' 54"N	84◆ 58' 39"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	CHHENDIPADA...	CHHENDIPADA...	CHHENDIPADA...	NULL	NULL
14	01/04/2021	10:19:10	MODIS	21◆ 05' 52"N	85◆ 10' 40"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	TALCHER RANGE	SEEPUR BLOCK	BULAJHAR-1 B...	BULAJHARA RF	NULL
15	01/04/2021	10:19:10	MODIS	21◆ 05' 52"N	85◆ 10' 40"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	TALCHER RANGE	SEEPUR BLOCK	GAHAM BEAT	BULAJHARA RF	NULL
16	01/04/2021	10:19:10	MODIS	21◆ 05' 52"N	85◆ 10' 40"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	TALCHER RANGE	SEEPUR BLOCK	SEEPUR BLOCK ...	NULL	NULL
17	01/04/2021	13:26:08	MODIS	20◆ 40' 30"N	85◆ 01' 33"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	RAIGODA RANGE	KHINDA BLOCK	BARGAUNIA BE...	BALANGARF RF	NULL
18	01/04/2021	13:26:08	MODIS	20◆ 40' 30"N	85◆ 01' 33"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	RAIGODA RANGE	KHINDA BLOCK	BARGAUNIA BE...	KANTAMEGHA-...	NULL
19	01/04/2021	13:26:08	MODIS	20◆ 40' 30"N	85◆ 01' 33"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	RAIGODA RANGE	KHINDA BLOCK	BARGAUNIA BE...	NUAKHETA RF	NULL
20	01/04/2021	13:26:08	MODIS	20◆ 40' 30"N	85◆ 01' 33"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	RAIGODA RANGE	KHINDA BLOCK	KANTAMEGHA-...	BALANGARF RF	NULL
21	01/04/2021	13:26:08	MODIS	20◆ 40' 30"N	85◆ 01' 33"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	RAIGODA RANGE	KHINDA BLOCK	KHINDA BLOCK...	NULL	NULL
22	01/04/2021	13:26:08	MODIS	20◆ 40' 30"N	85◆ 01' 33"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	RAIGODA RANGE	NUAKHETA BLO...	SARUALI BEAT	NUAKHETA RF	NULL
23	01/04/2021	13:26:08	MODIS	20◆ 40' 37"N	85◆ 01' 08"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	RAIGODA RANGE	KHINDA BLOCK	KANTAMEGHA-...	BALANGARF RF	NULL
24	01/04/2021	13:26:08	MODIS	20◆ 40' 37"N	85◆ 01' 08"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	RAIGODA RANGE	KHINDA BLOCK	KANTAMEGHA-...	KANTAMEGHA-...	NULL
25	01/04/2021	13:26:08	MODIS	20◆ 40' 37"N	85◆ 01' 08"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	RAIGODA RANGE	KHINDA BLOCK	KANTAMEGHA-...	KANTAMEGHA PF	NULL
26	01/04/2021	13:26:08	MODIS	20◆ 40' 37"N	85◆ 01' 08"E	ODISHA	ANGUL	ANGUL CIRCLE	ANGUL DIVISION	RAIGODA RANGE	KHINDA BLOCK	KHINDA BLOCK...	NULL	NULL

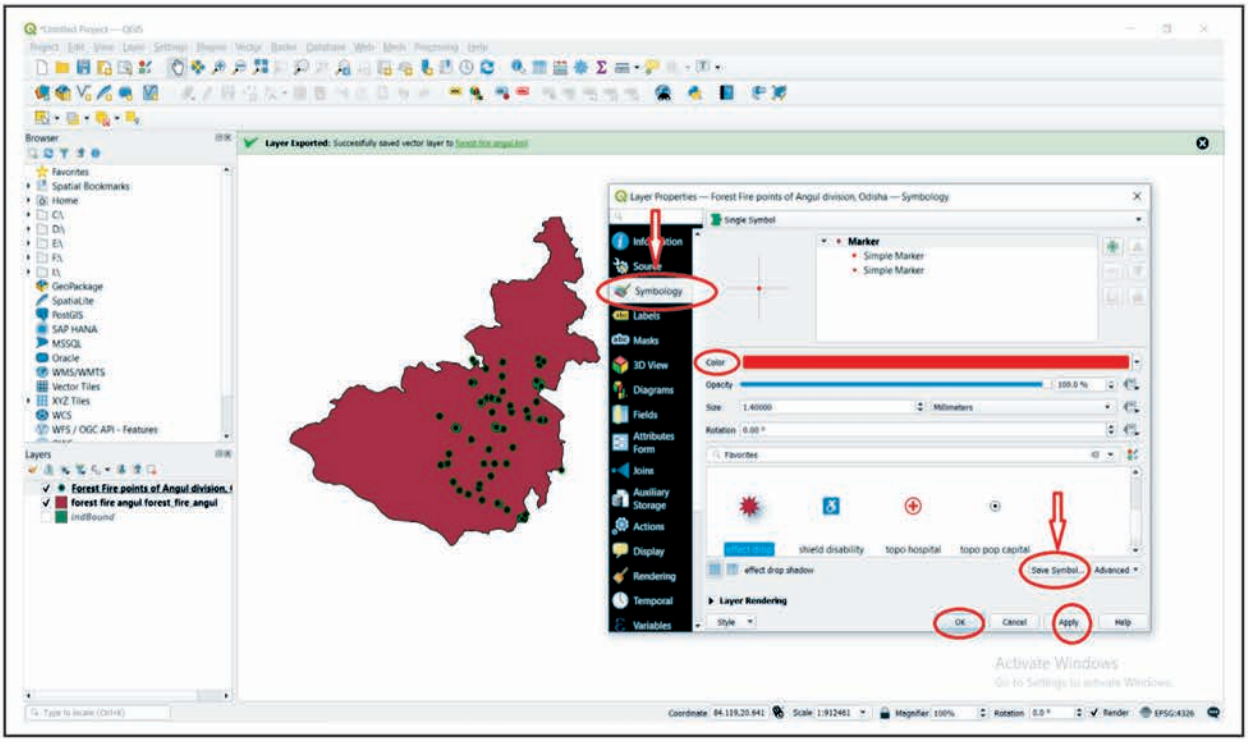
Show All Features

Step 7. Changing the Symbology.

i. Select the Fire Point Layer and Right Click it and select Properties.

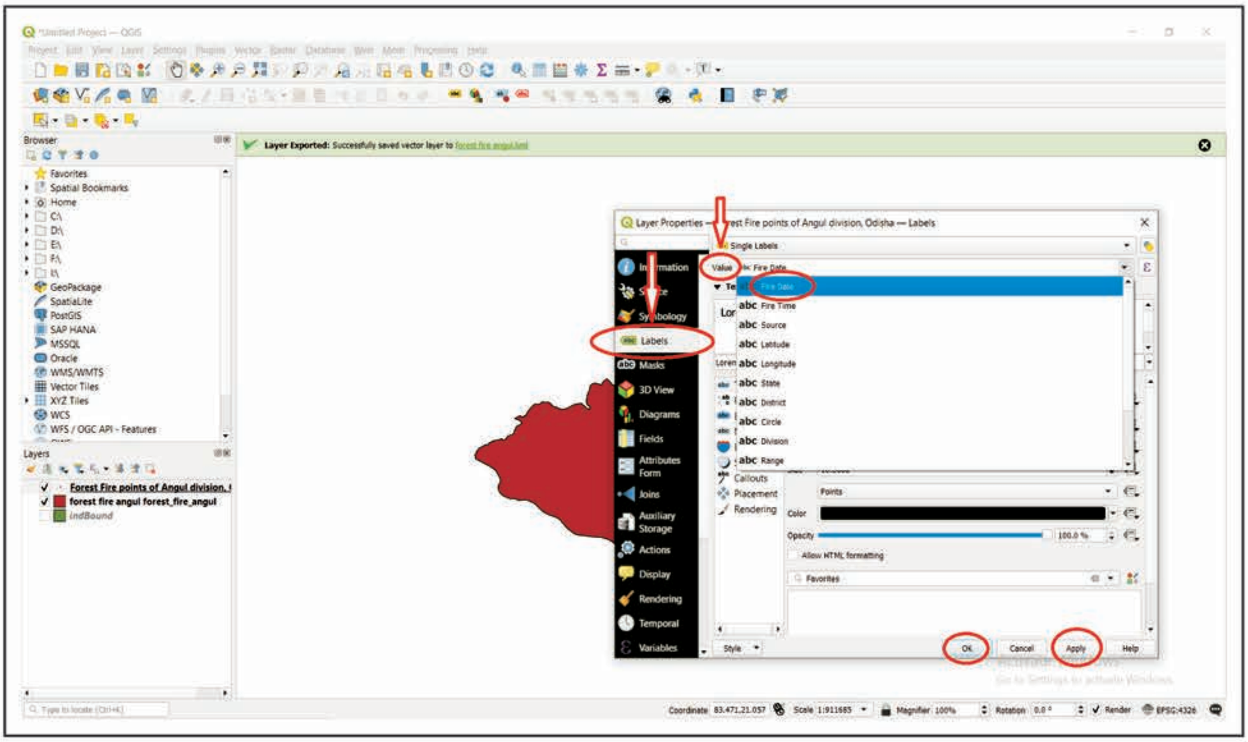


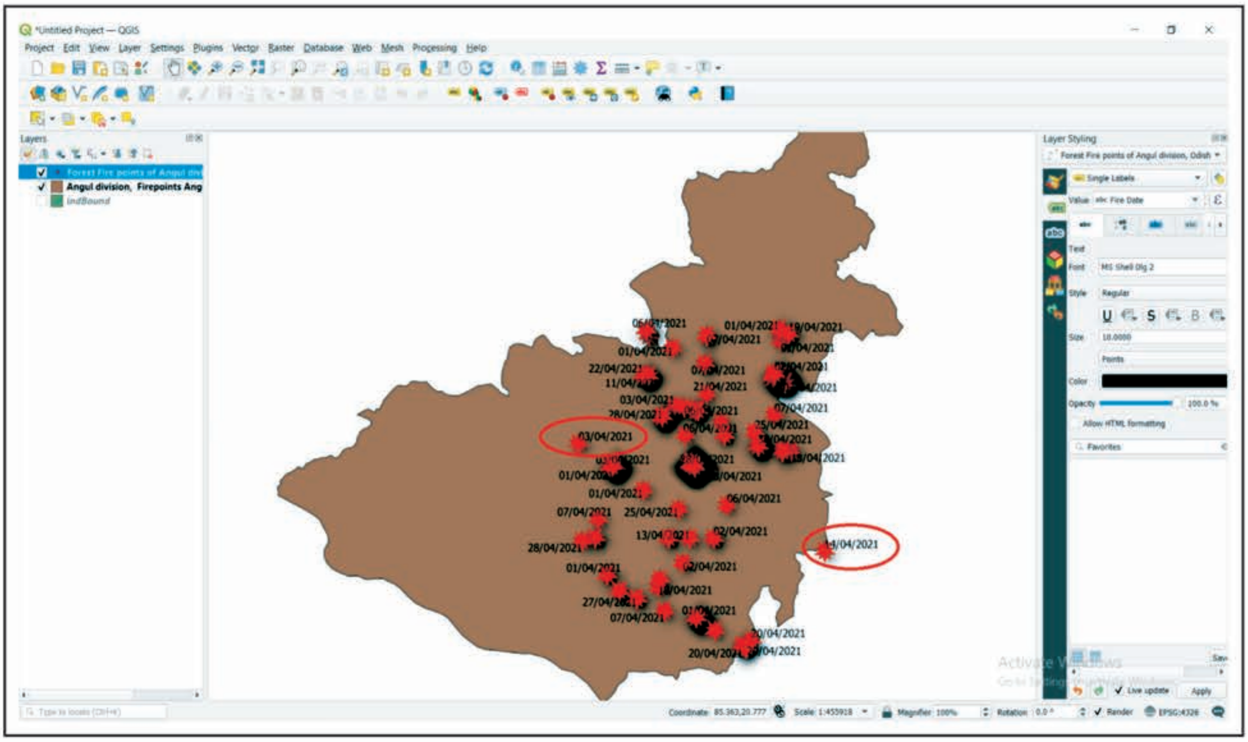
ii. Select Symbology; change the Colour and symbol of Fire Points. Click Save Symbol; Apply and OK



iii. To add the dates of Fire Incidences in the selected division map;
go to the Properties as shown in Step 7(i) and Click on Labels in the left panel.

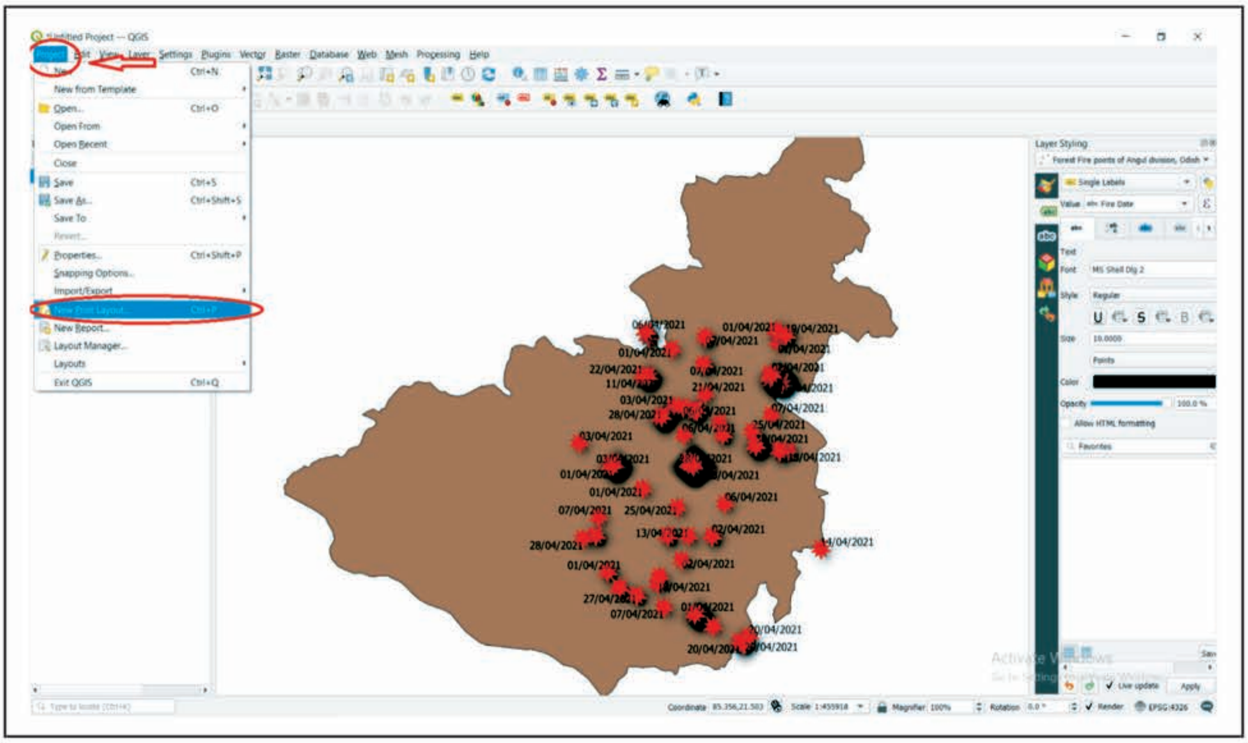
- Go to Value
- In the Drop down menu, select Fire date
- Click Apply and Ok.
- Fire Points with respective dates will appear on the map.



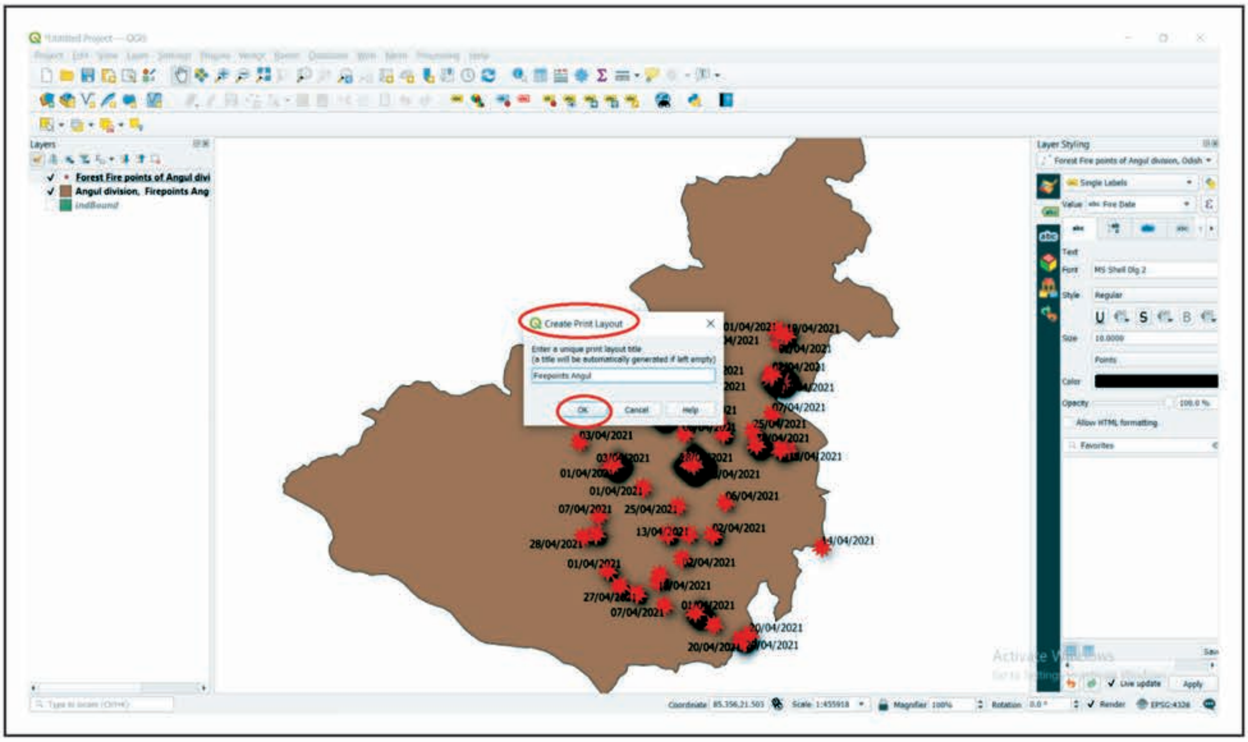


Step 8. Preparation of Map.

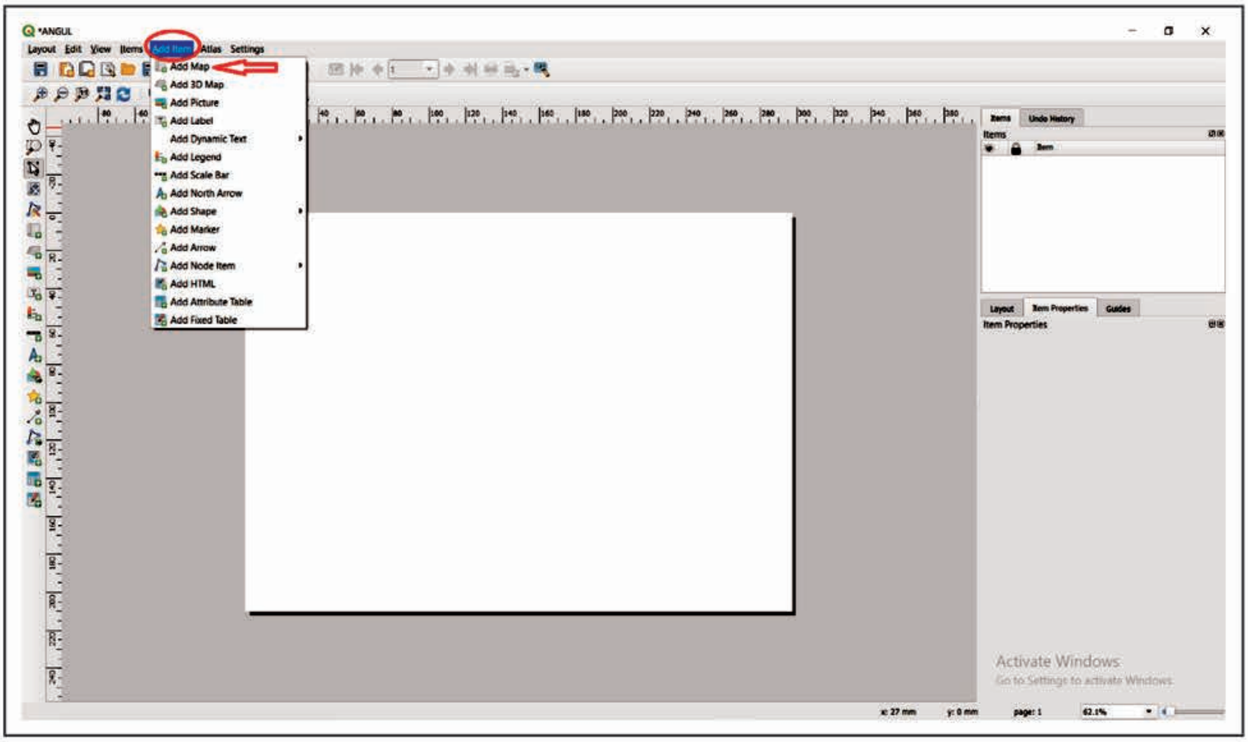
i. Go to Project and Select New Print Layout.



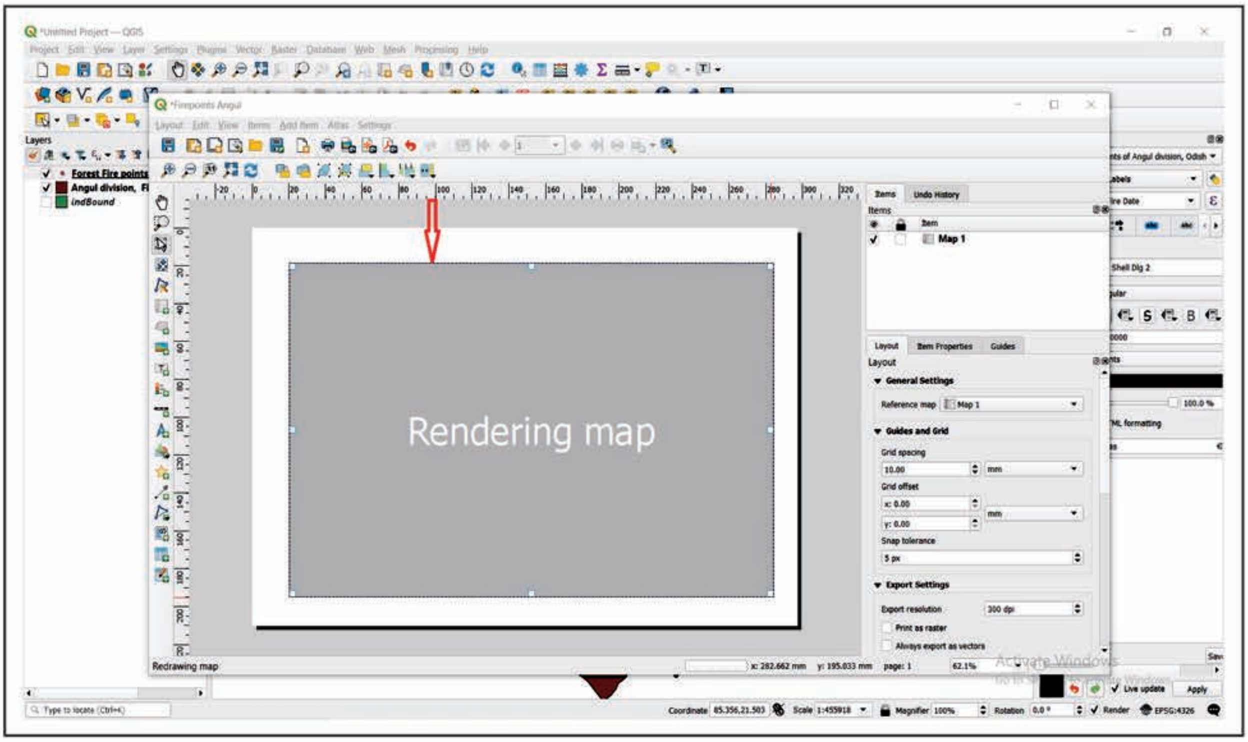
ii. A pop-up window Create Print Layout will open.
Enter a unique print layout title and Click OK.



iii. A new window will open. Select Add Item and click Add Map.



iv. Select at one corner of the map area and drag it so to render and accommodate the Fire Point map.



v. The Fire Point map will appear.

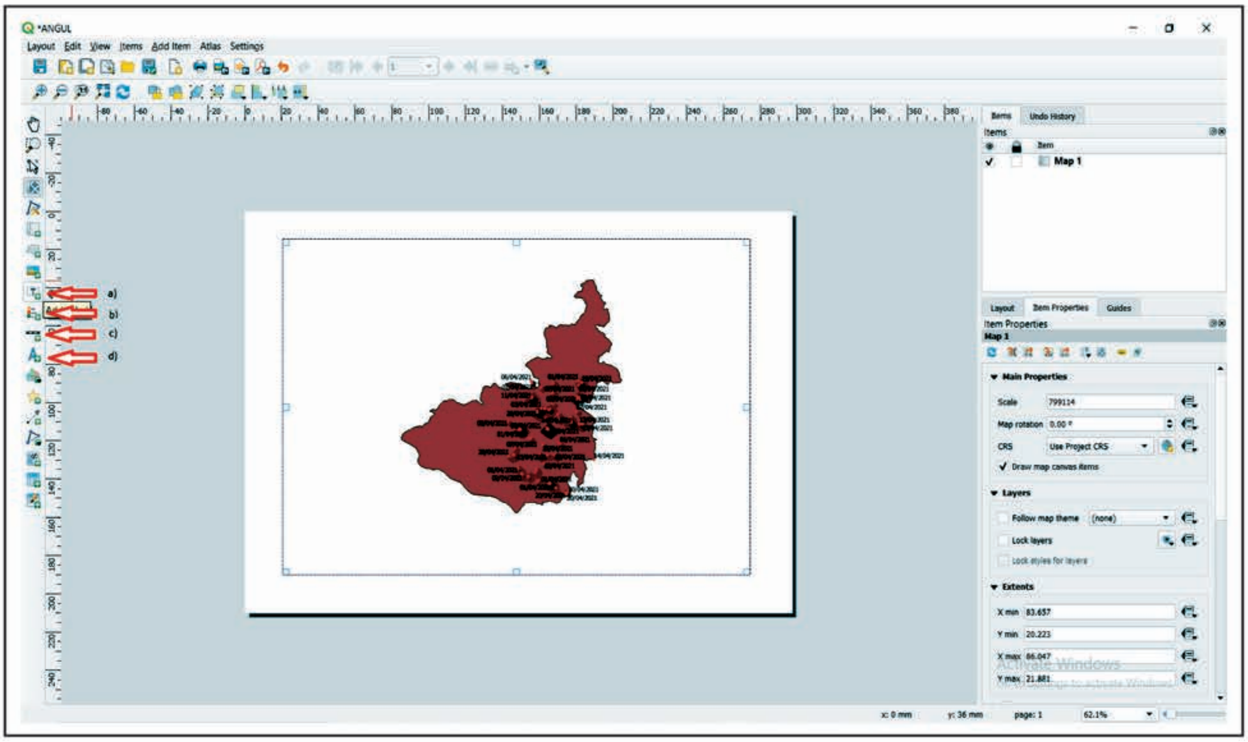
vi. In the Tool Box, Click

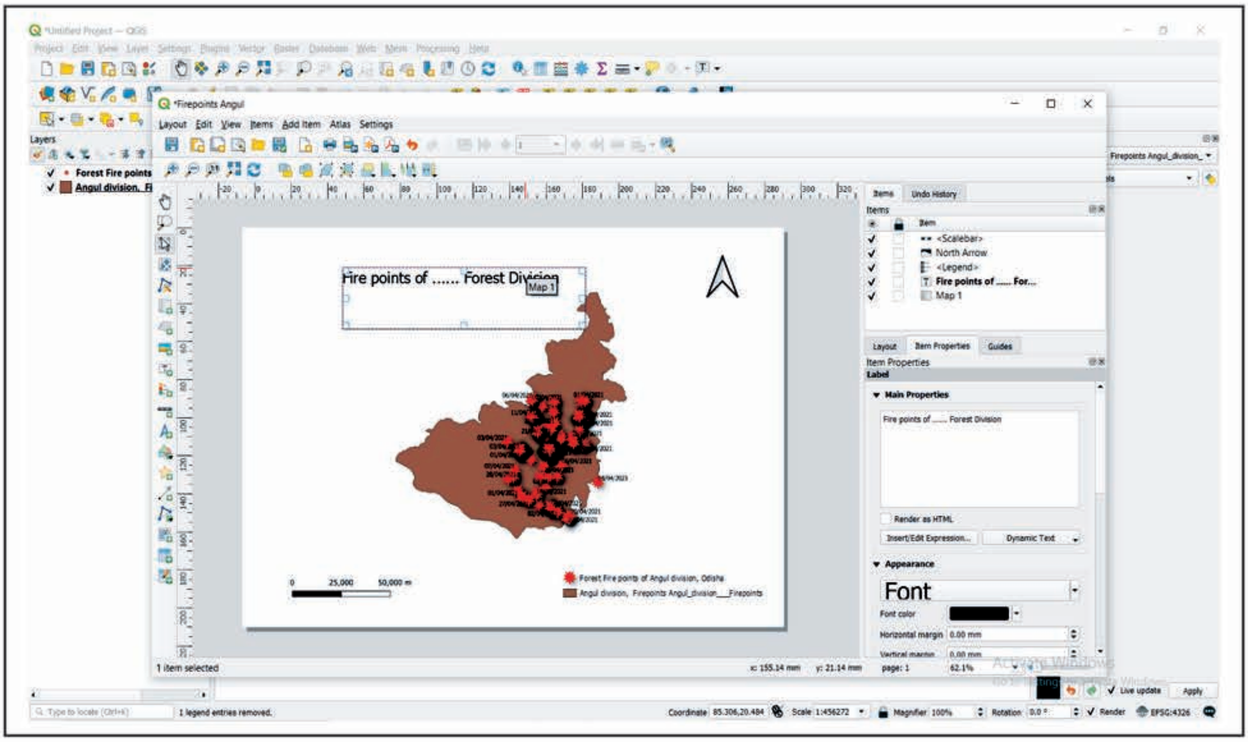
a) to add Label

b) to add Legend

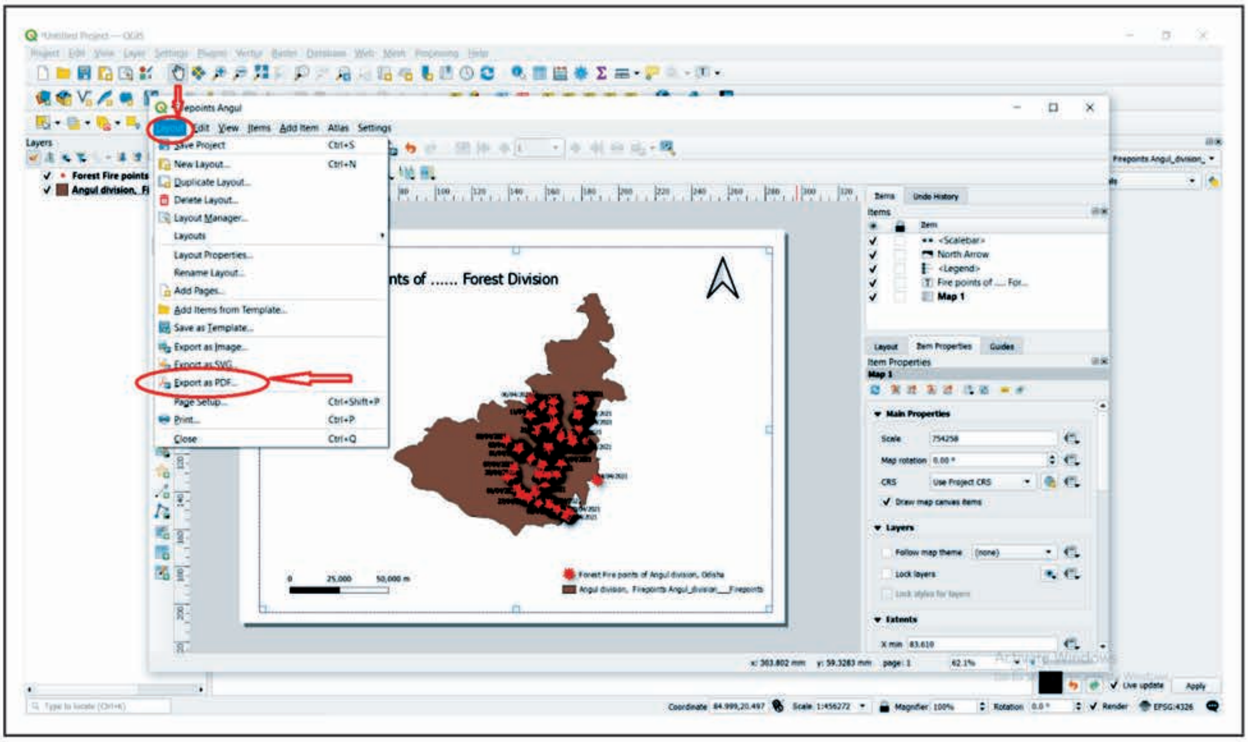
c) to add Scale Bar

d) to add North Arrow.

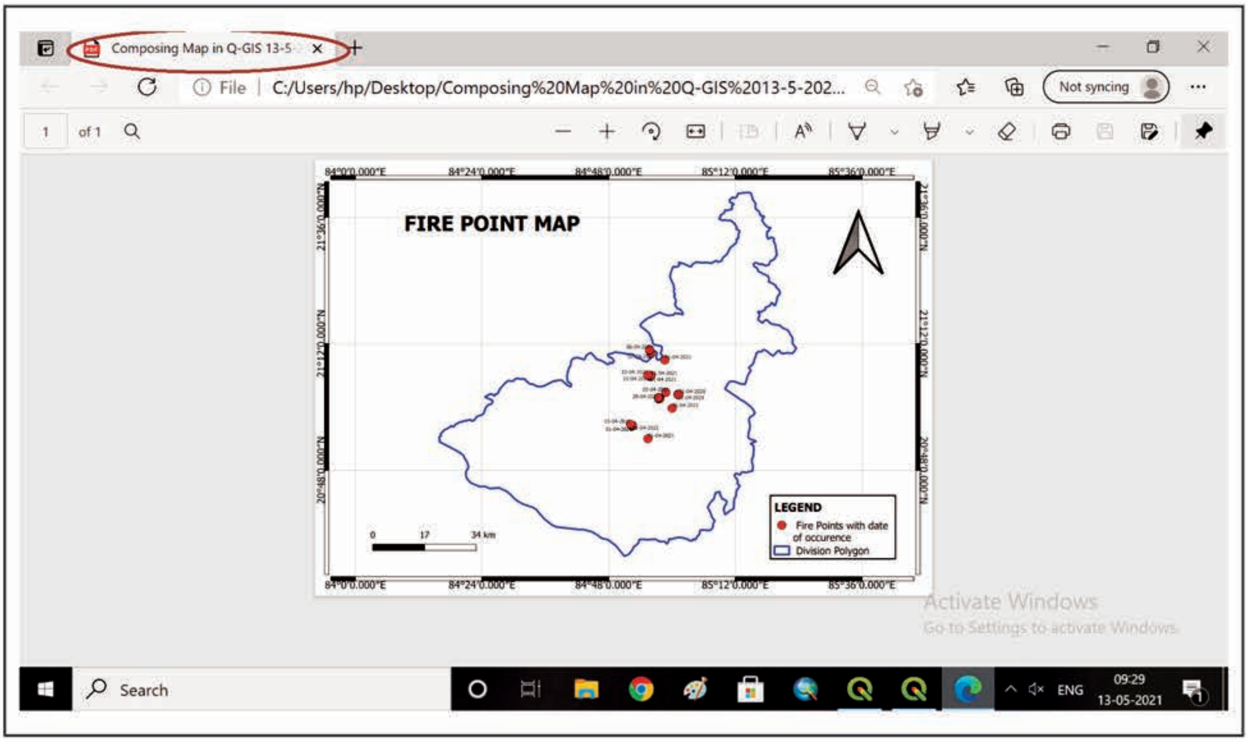




vii. Go to Layout and Select Export as PDF/ image or SVG.

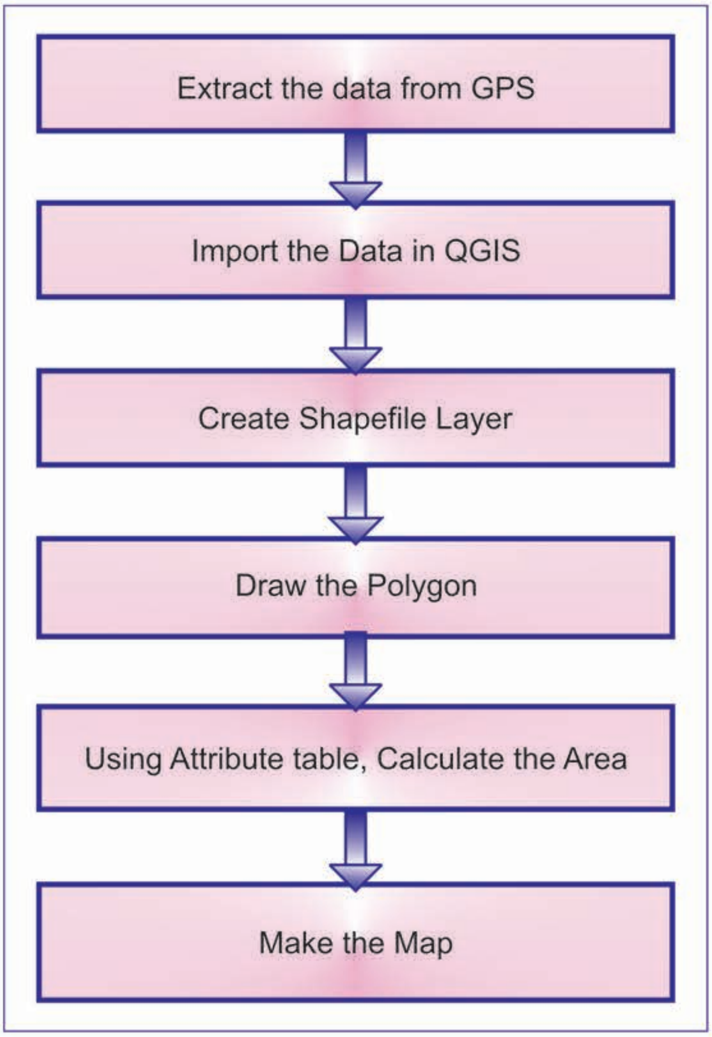


viii. The Fire Point Map will be saved in PDF format.



5. GPS Exercise

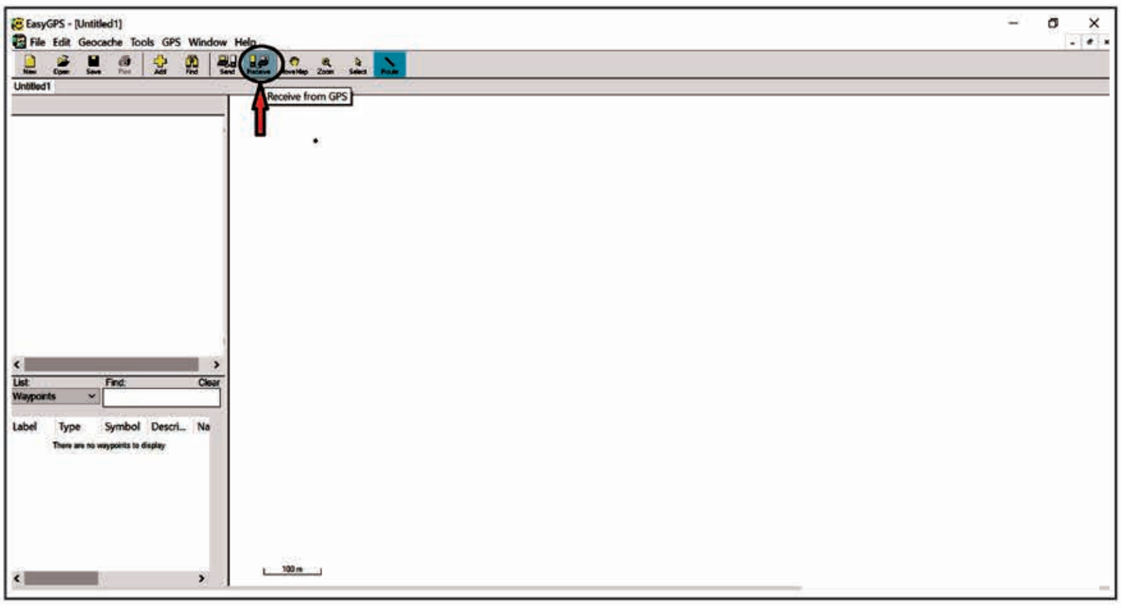
The Global positioning system (GPS) is used in a multiplicity of activities such as tracking the position of wildlife and other forest inhabitants. The GPS helps the forest personnel to navigate through dense forest canopies, making maps and kml files, area measurements, sampling etc.

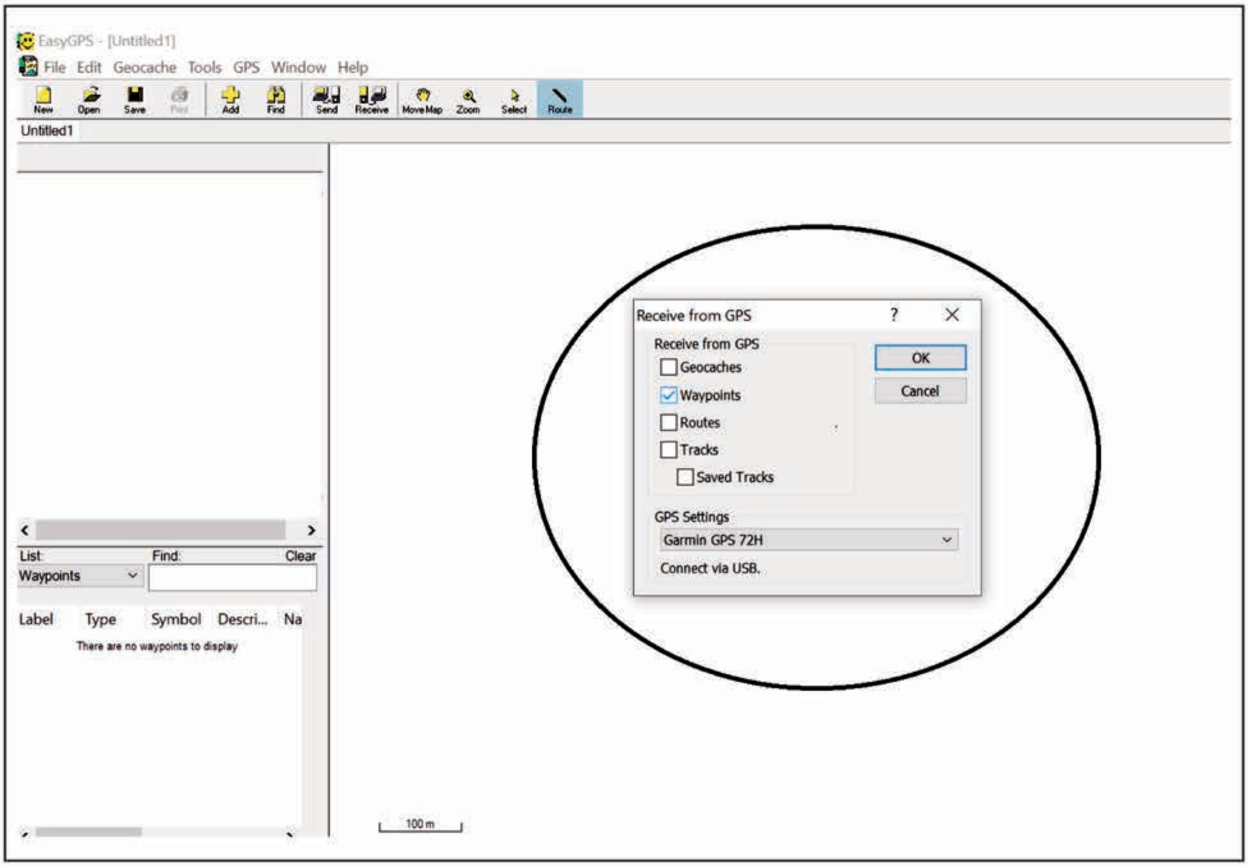


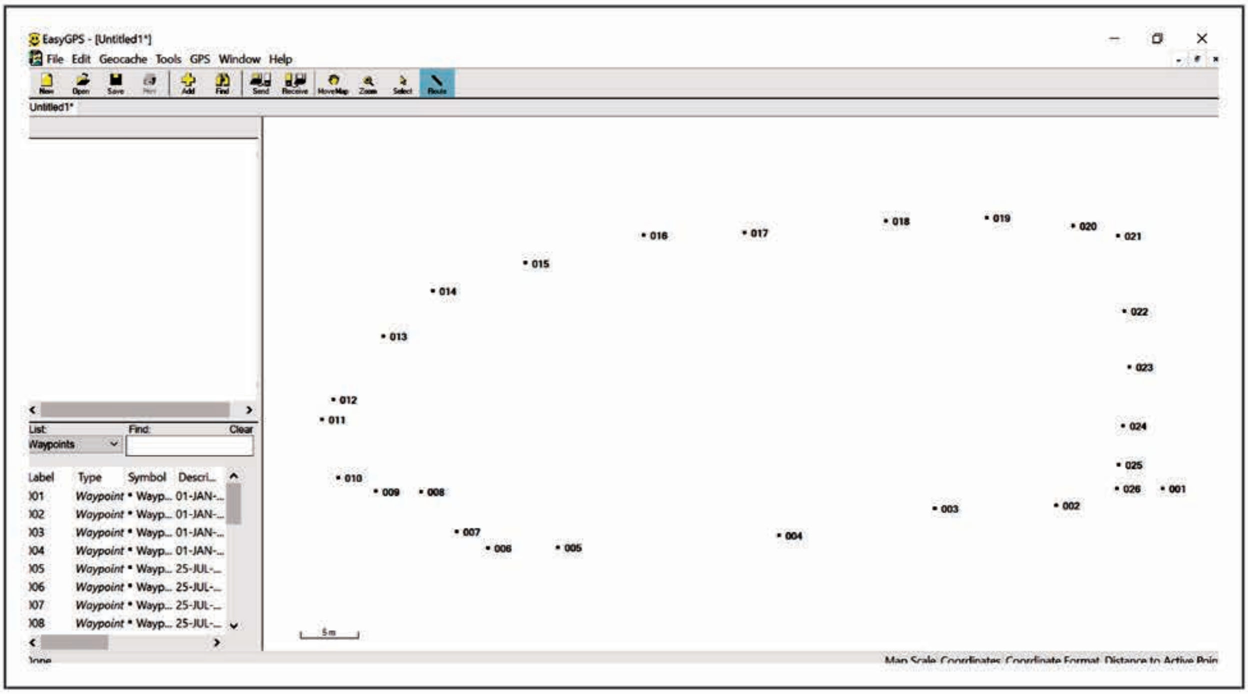
Flow Chart

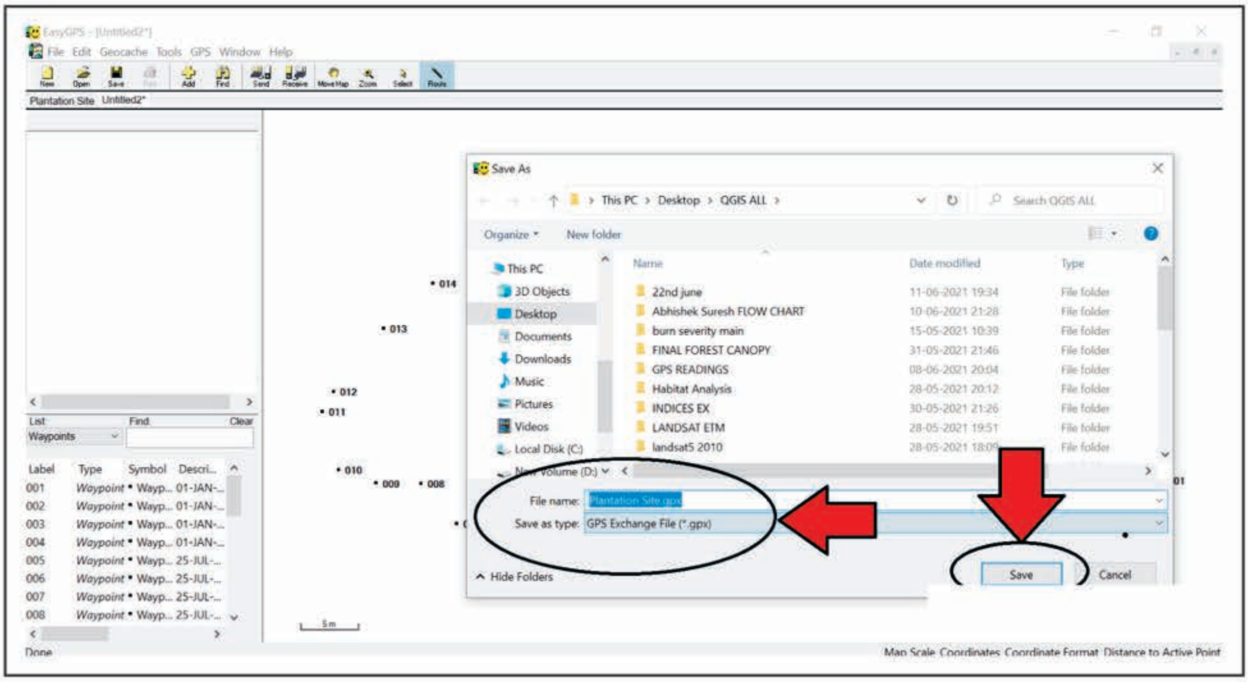
Step 01: Download 'EasyGPS' Software using below given link
https://www.easygps.com/download.asp

Extract/import the GPS Data from GPS device (Using EasyGPS Software) and save it as .gpx file.

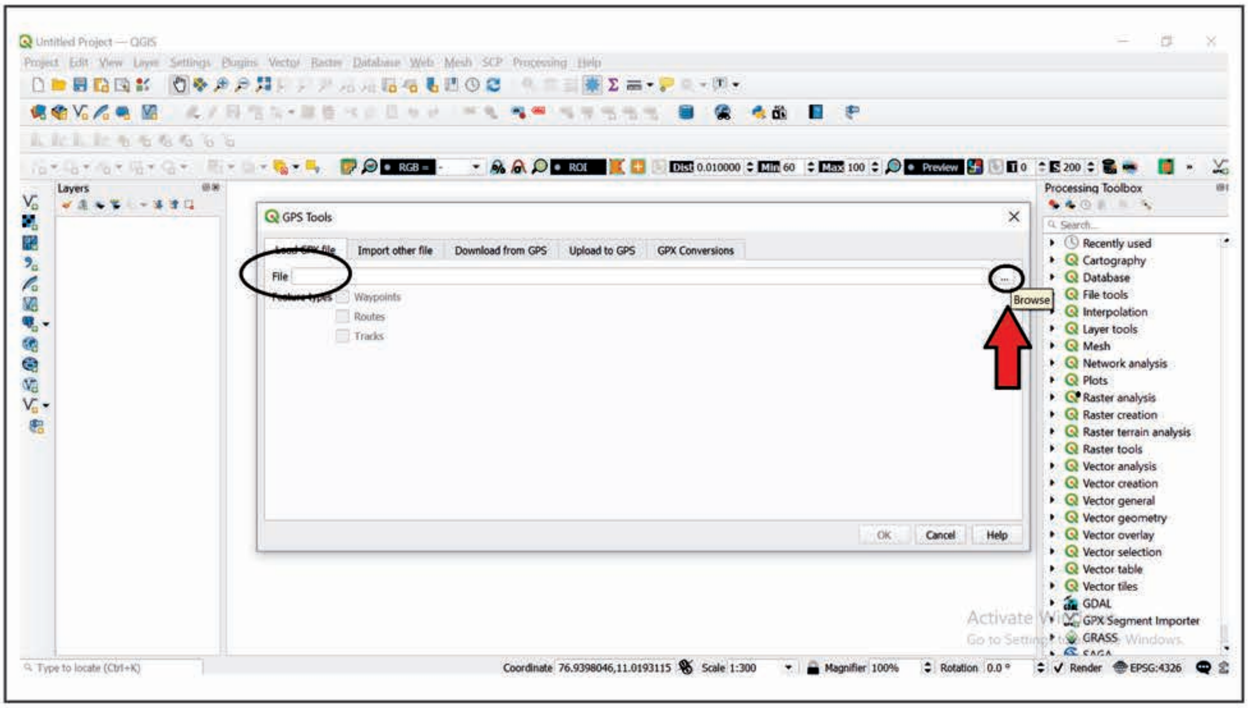


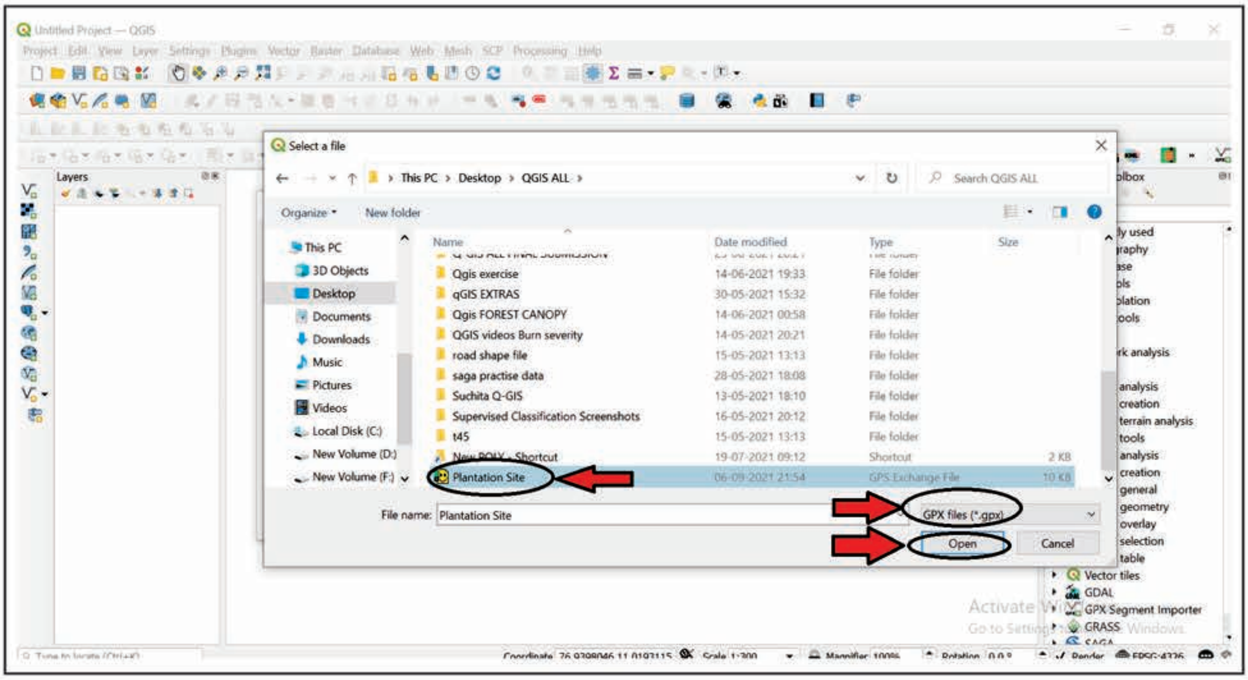

EasyGPS - [Untitled1]
File Edit Geocache Tools GPS Window Help
New Open Save Print Add Find Send Receive Move Map Zoom Select Route
Untitled1
List: Find: Clear
Waypoints
Label Type Symbol Descri... Na
There are no waypoints to display
Receive from GPS
Receive from GPS
Geocaches
Waypoints
Routes
Tracks
Saved Tracks
OK
Cancel
GPS Settings
Garmin GPS 72H
Connect via USB.
100 m

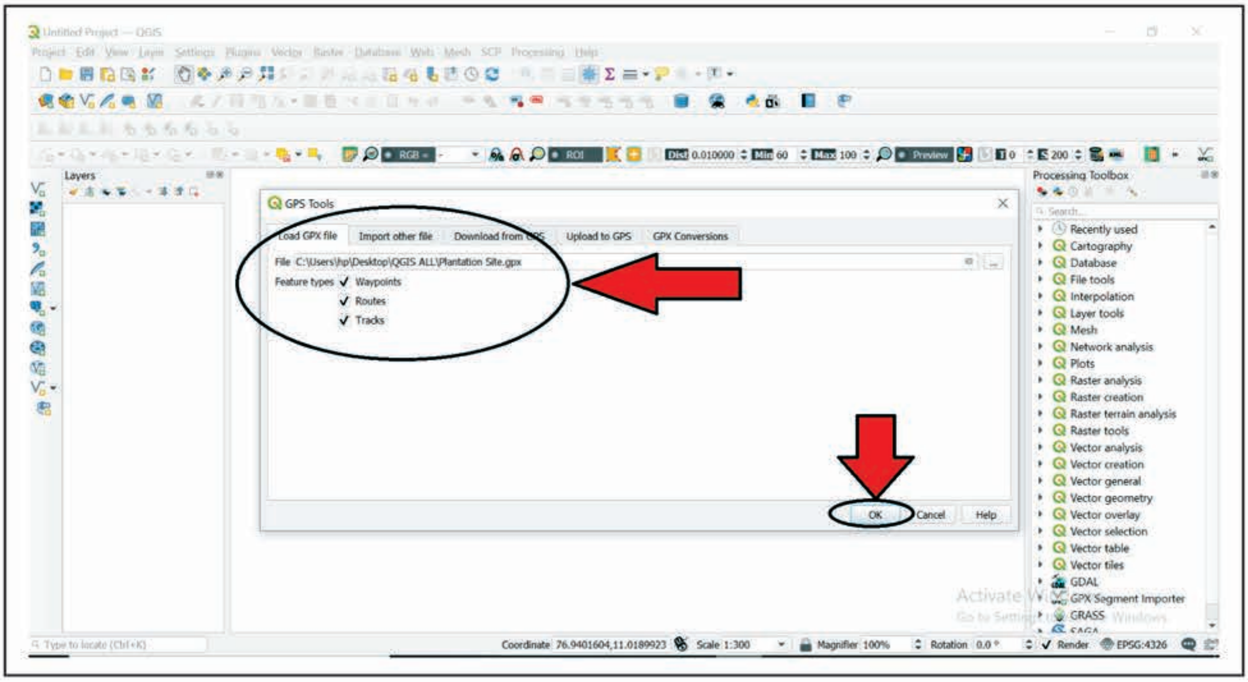

EasyGPS - [Untitled1*]
File Edit Geocache Tools GPS Window Help
Untitled1*
List: Find: Clear
Waypoints
Label Type Symbol Descri...
5 m
Map Scale Coordinates Coordinate Format Distance to Active Poin

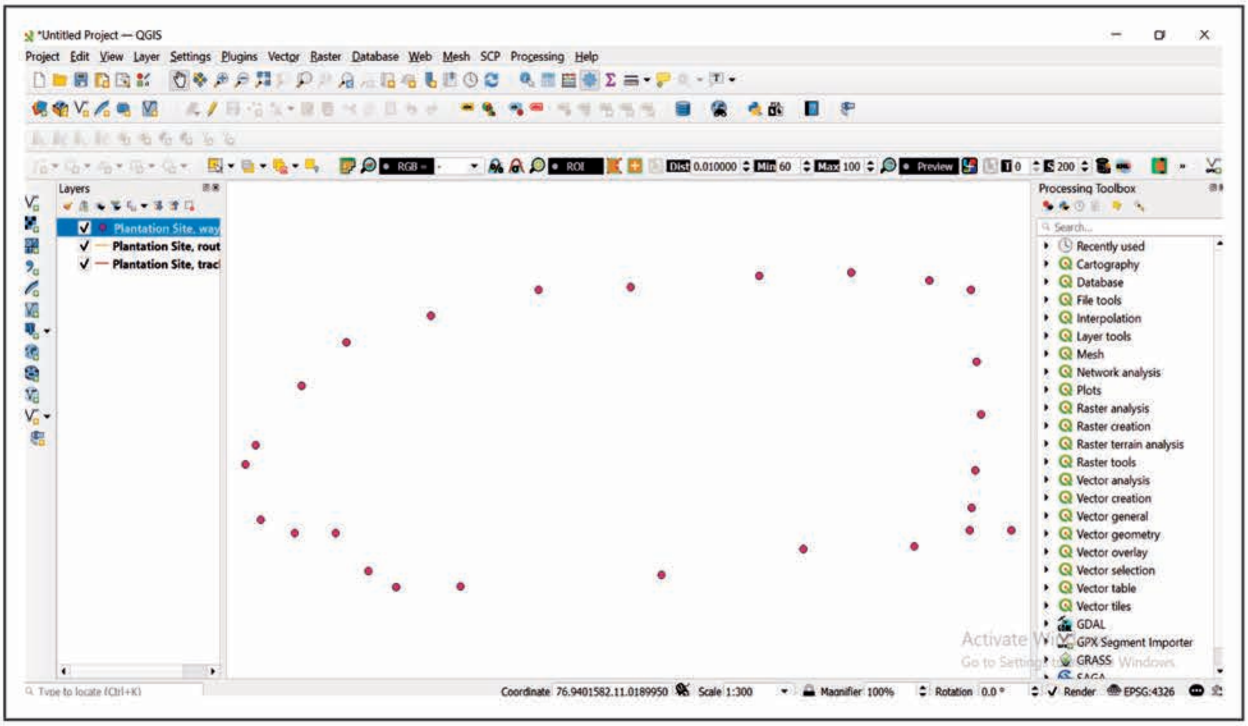


Step 02: Import the data (.gpx file) saved in Step 01, in QGIS.

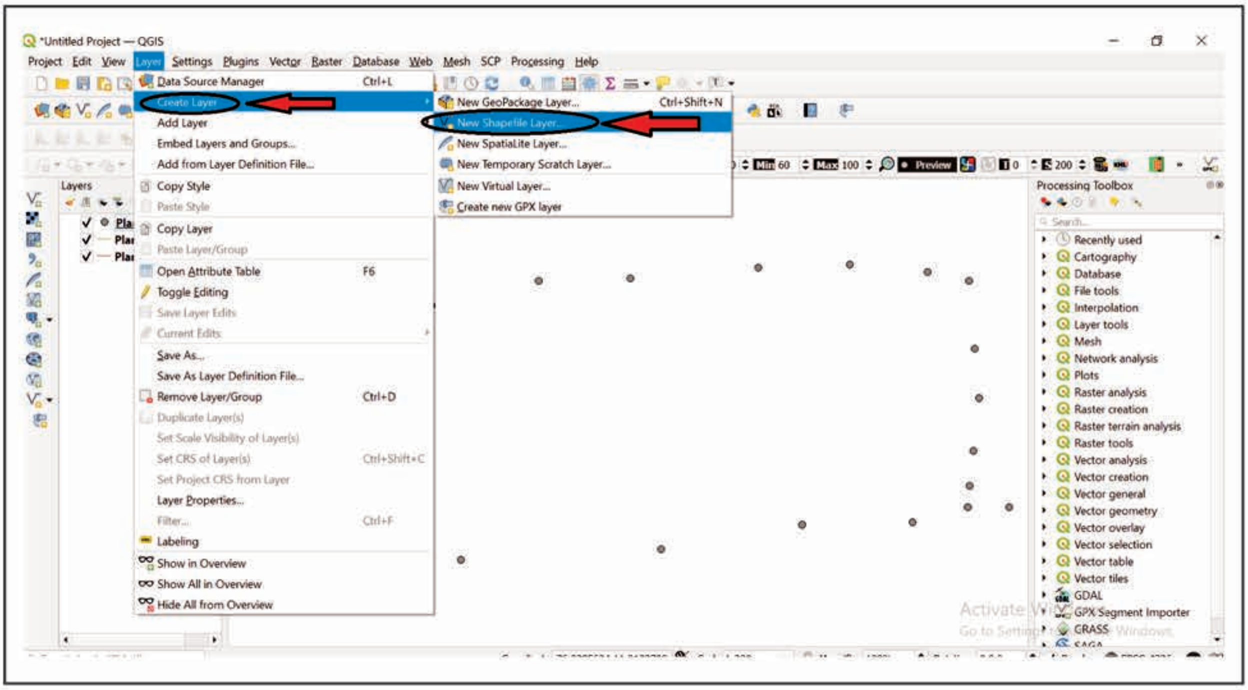


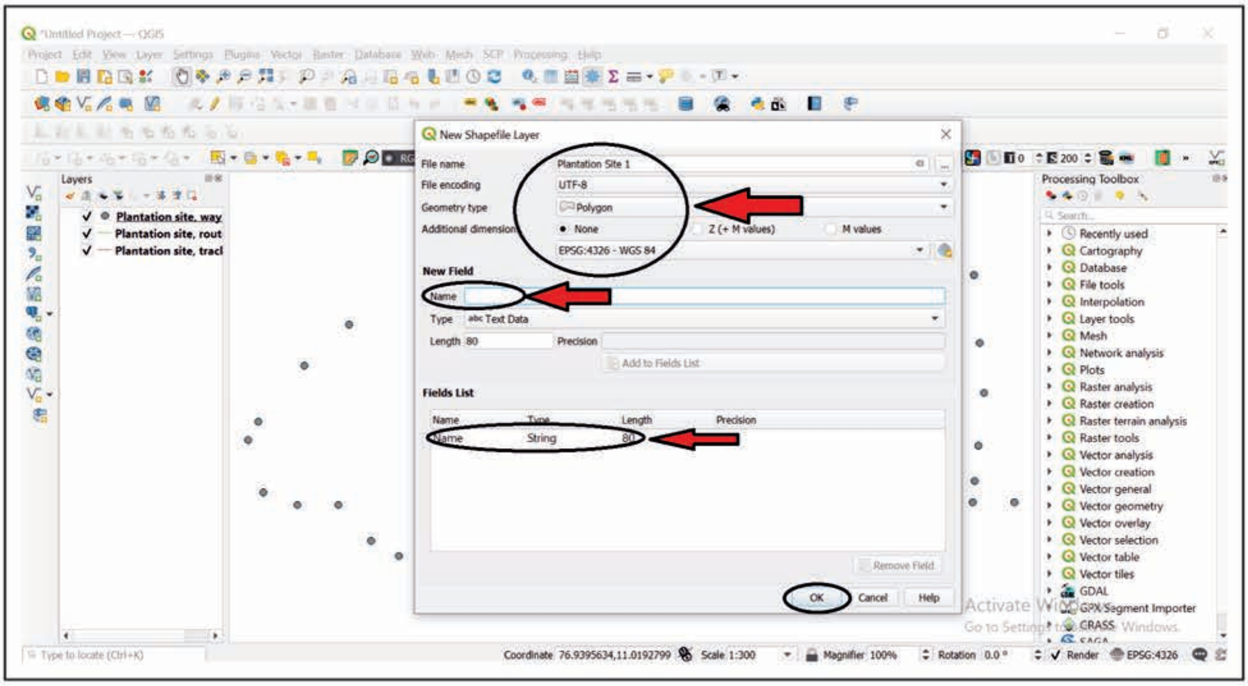

Untitled Project — QGIS
Select a file
This PC > Desktop > QGIS ALL >
Search QGIS ALL
Organize
New folder
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
New Volume (D:)
New Volume (F:)
Name
Date modified
Type
Size
Qgis exercise
qGIS EXTRAS
Qgis FOREST CANOPY
QGIS videos Burn severity
road shape file
saga practise data
Suchita Q-GIS
Supervised Classification Screenshots
t45
Plantation Site
File name:
GPX files (*.gpx)
Open
Cancel


Untitled Project — QGIS
GPS Tools
Load GPX file
Import other file
Download from GPS
Upload to GPS
GPX Conversions
File C:\Users\hp\Desktop\QGIS ALL\Plantation Site.gpx
Feature types
Waypoints
Routes
Tracks
OK
Cancel
Help
Processing Toolbox
Recently used
Cartography
Database
File tools
Interpolation
Layer tools
Mesh
Network analysis
Plots
Raster analysis
Raster creation
Raster terrain analysis
Raster tools
Vector analysis
Vector creation
Vector general
Vector geometry
Vector overlay
Vector selection
Vector table
Vector tiles
GDAL
GPX Segment Importer
GRASS

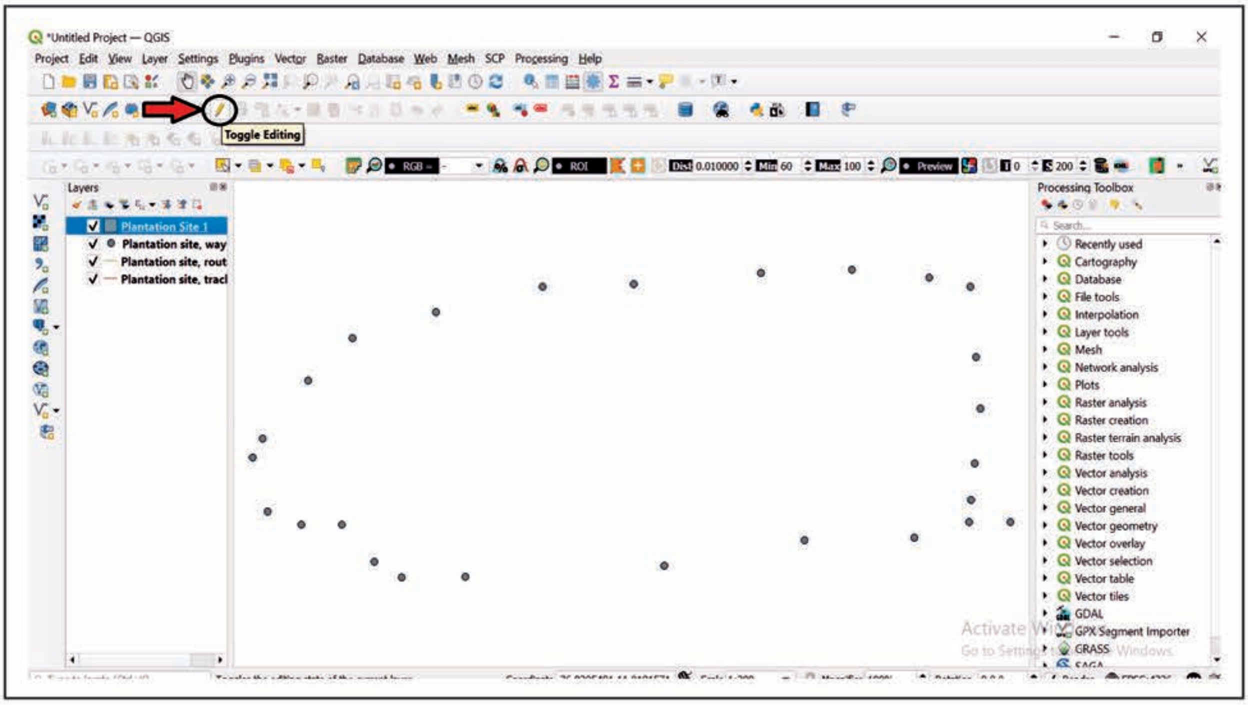


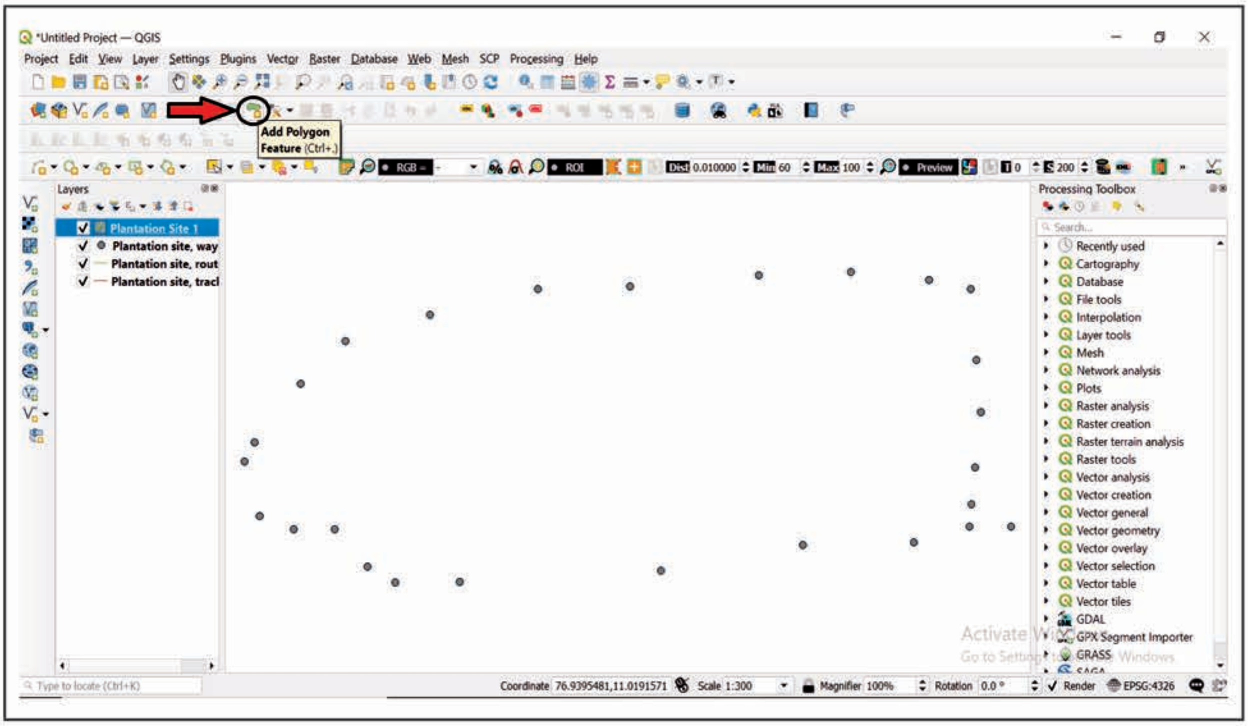
Step 03: Create a new Shapefile layer

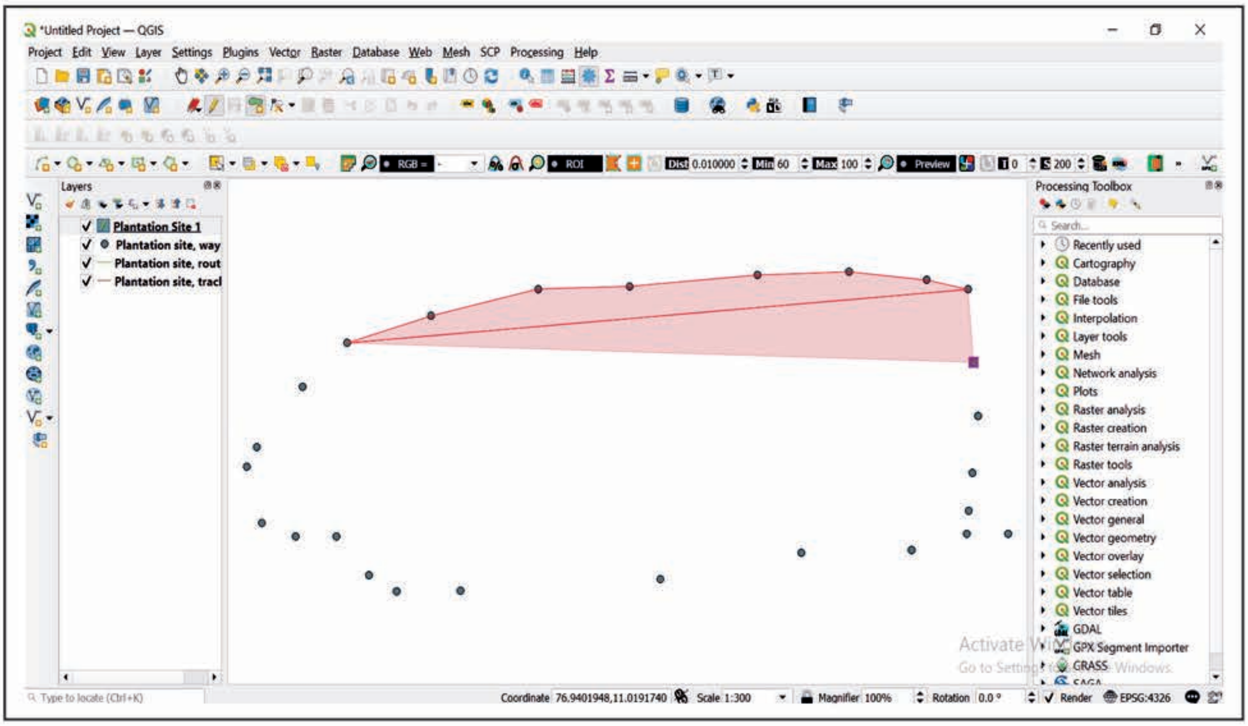


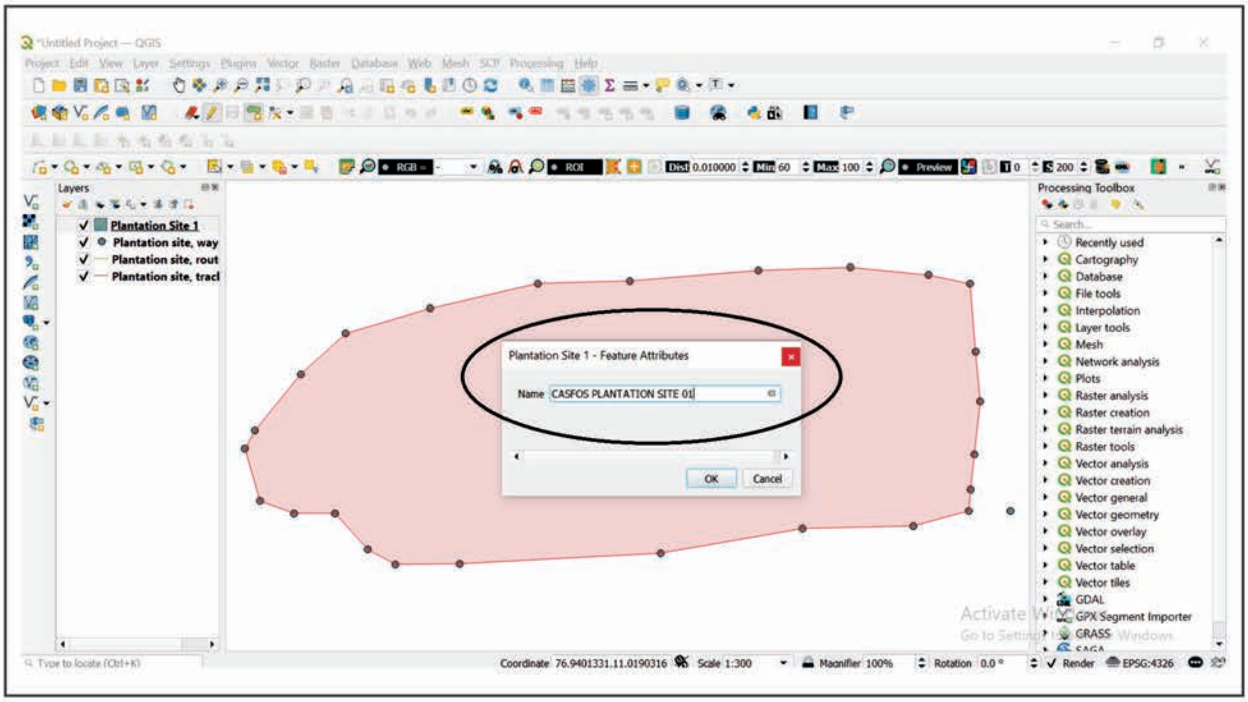


Step 04: Make a Polygon by connecting waypoints.

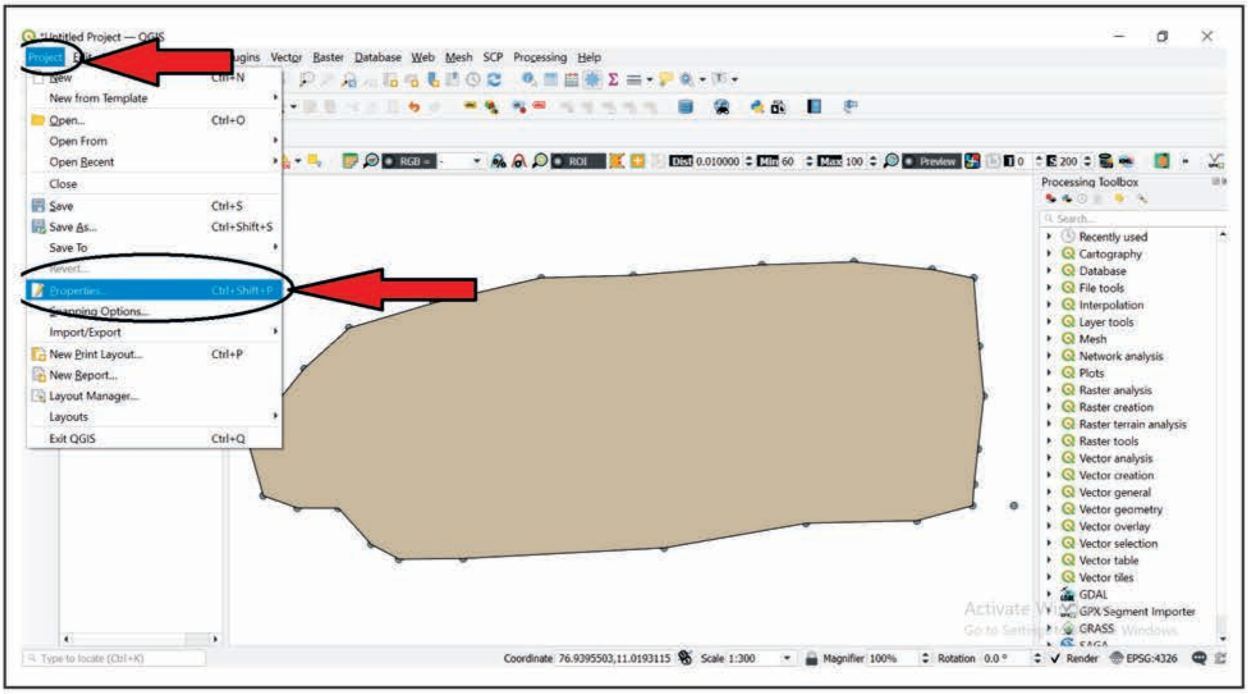


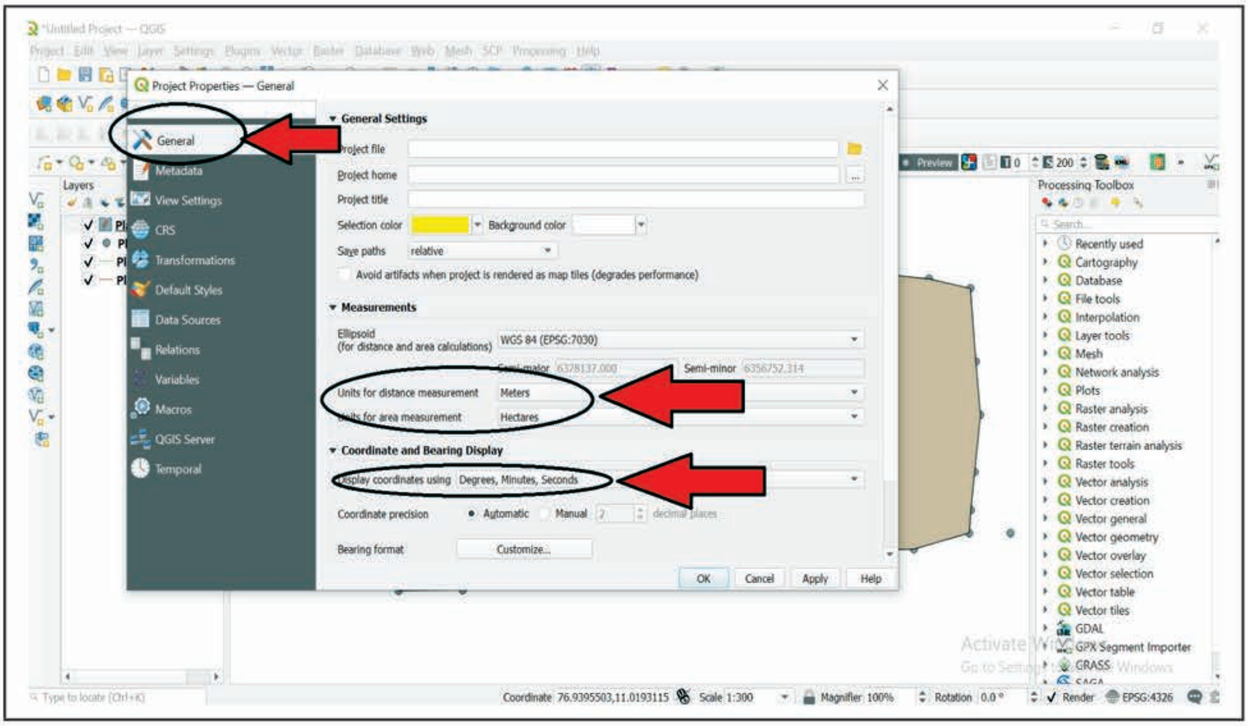

*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh SCP Processing Help
Add Polygon Feature (Ctrl+.)
Layers
Plantation Site 1
Plantation site, way
Plantation site, rout
Plantation site, tracl
Processing Toolbox
Recently used
Cartography
Database
File tools
Interpolation
Layer tools
Mesh
Network analysis
Plots
Raster analysis
Raster creation
Raster terrain analysis
Raster tools
Vector analysis
Vector creation
Vector general
Vector geometry
Vector overlay
Vector selection
Vector table
Vector tiles
GDAL
GPX Segment Importer
GRASS
Coordinate 76.9395481,11.0191571
Scale 1:300
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326


*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh SCP Processing Help
Layers
Plantation Site 1
Plantation site, way
Plantation site, rout
Plantation site, tracl
Processing Toolbox
Recently used
Cartography
Database
File tools
Interpolation
Layer tools
Mesh
Network analysis
Plots
Raster analysis
Raster creation
Raster terrain analysis
Raster tools
Vector analysis
Vector creation
Vector general
Vector geometry
Vector overlay
Vector selection
Vector table
Vector tiles
GDAL
GPX Segment Importer
GRASS
Coordinate 76.9401948,11.0191740
Scale 1:300
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326

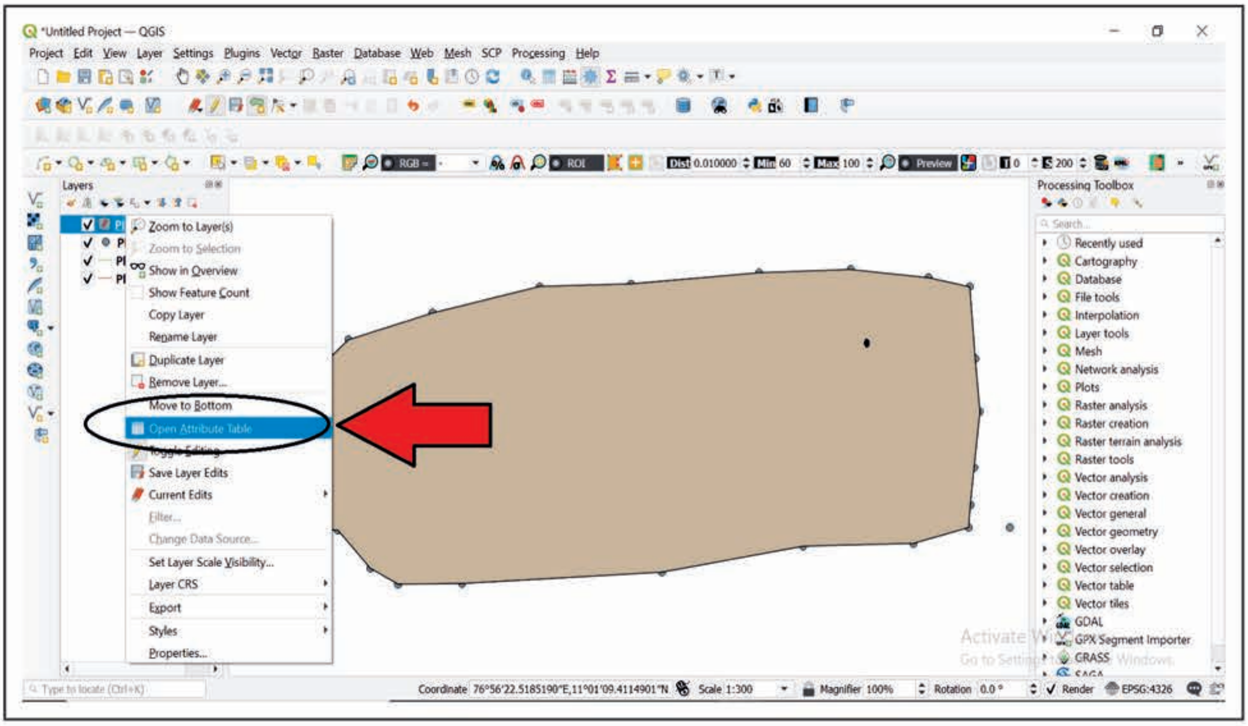


Step 05: Change the default measurement units to desired ones (eg., Area unit to Hectares).

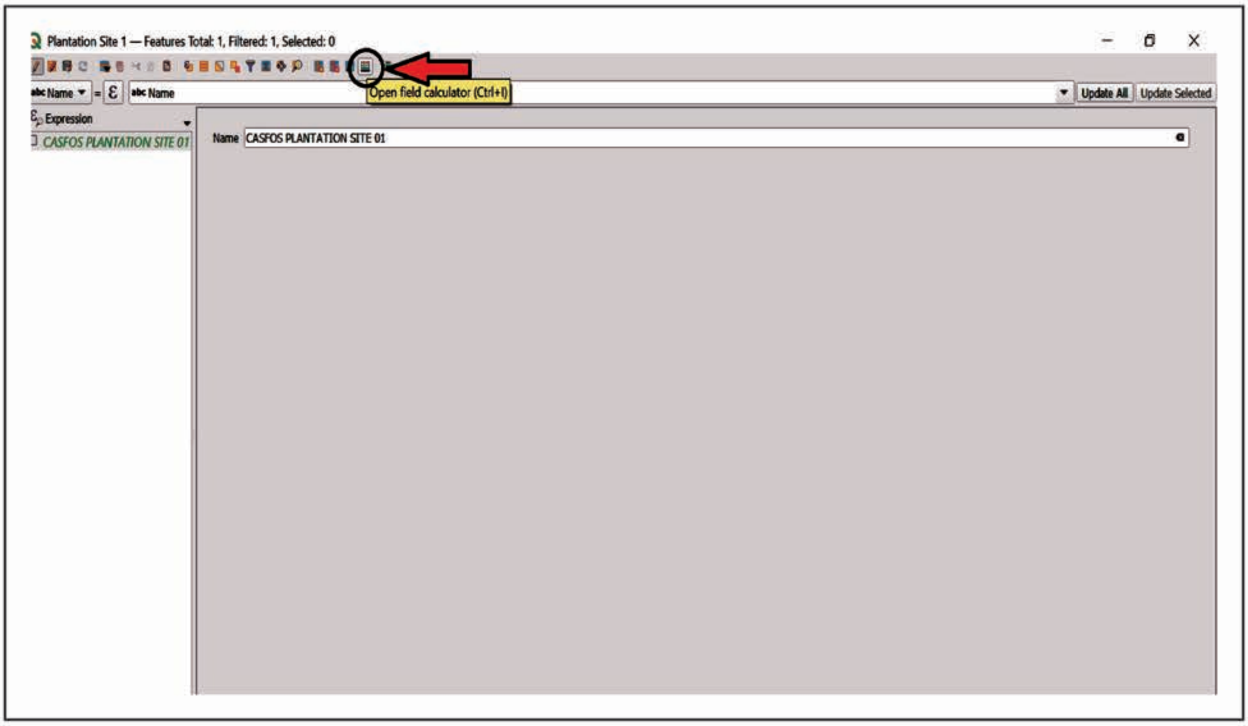


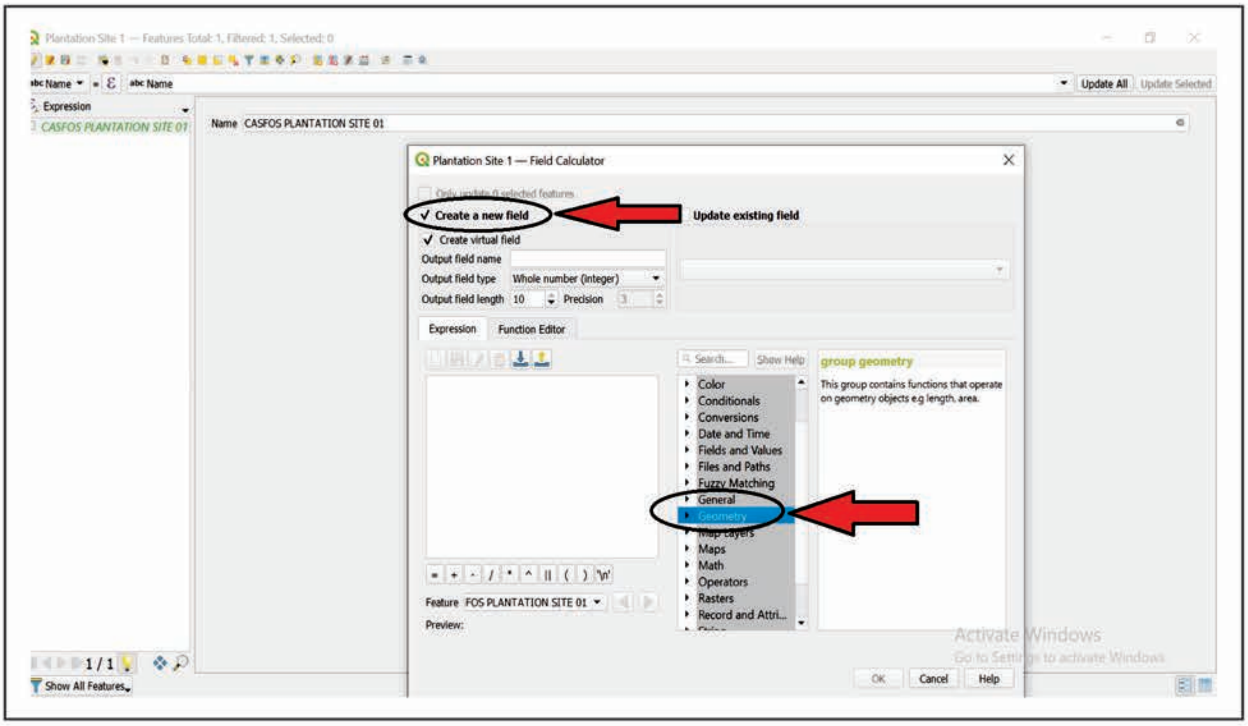


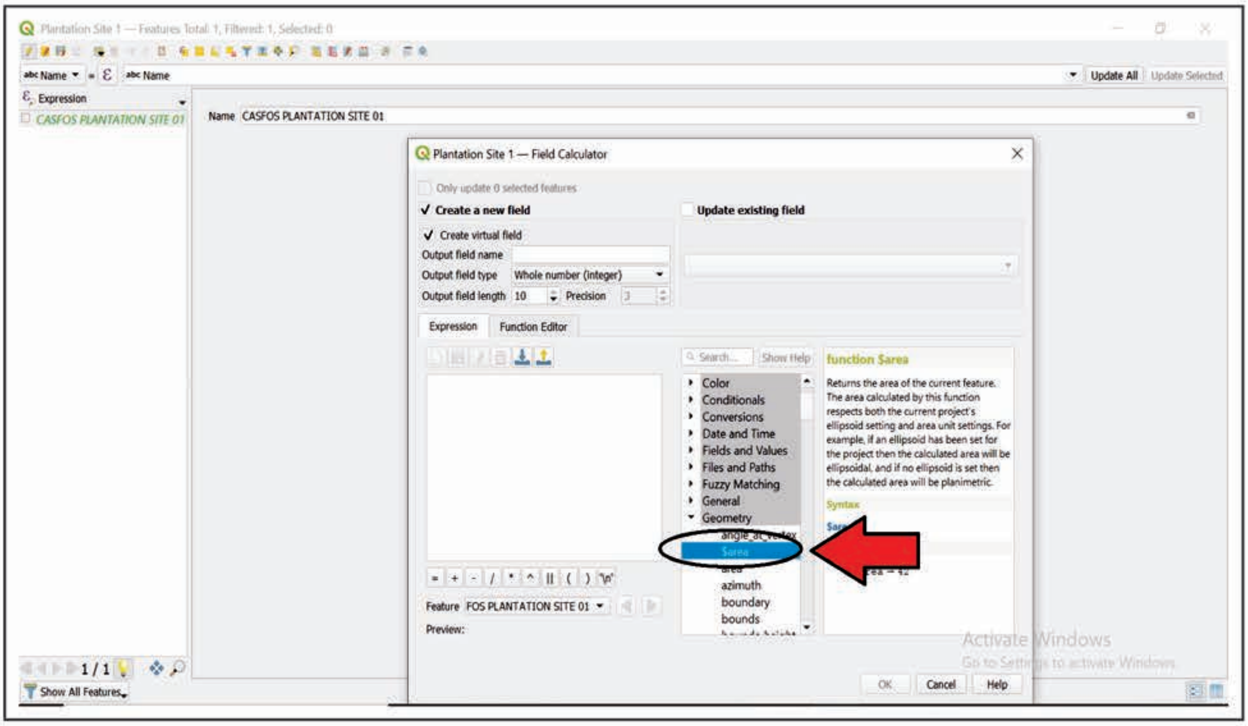
Step 06: Create attribute table for Area and Perimeter calculation.

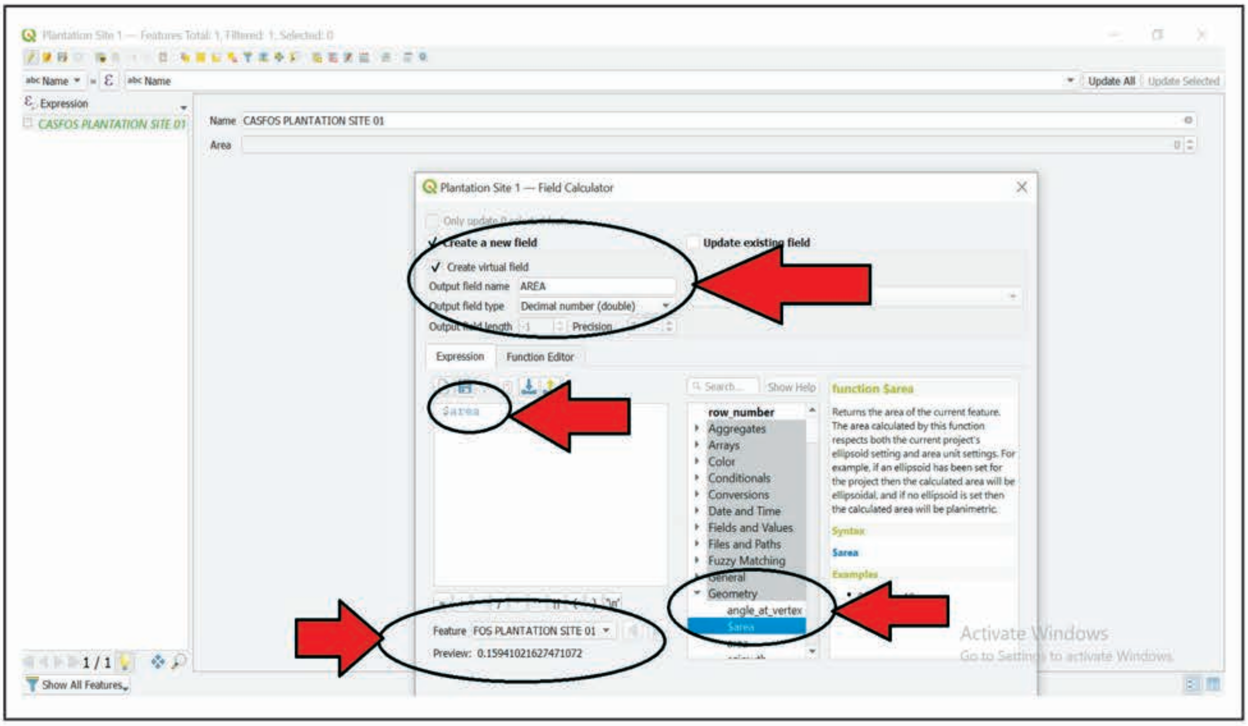


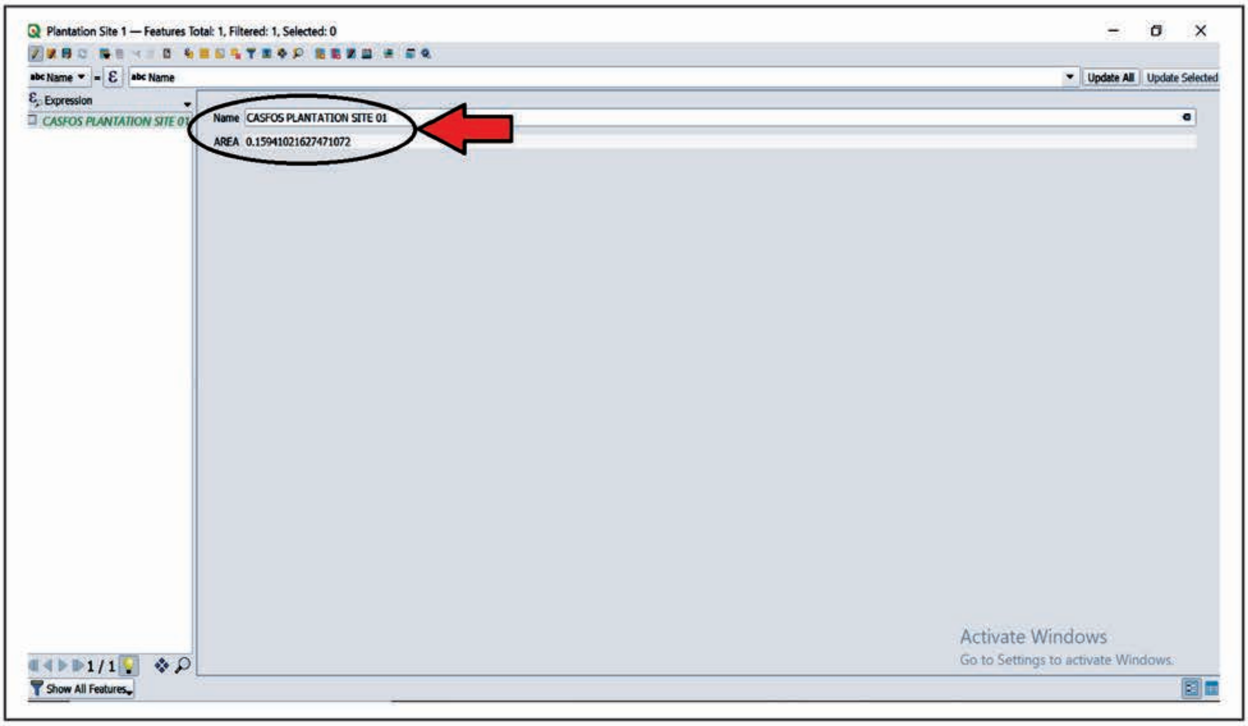
Open 'field calculator' to calculate the area:
'Create new field' > 'Geometry' > '$area'

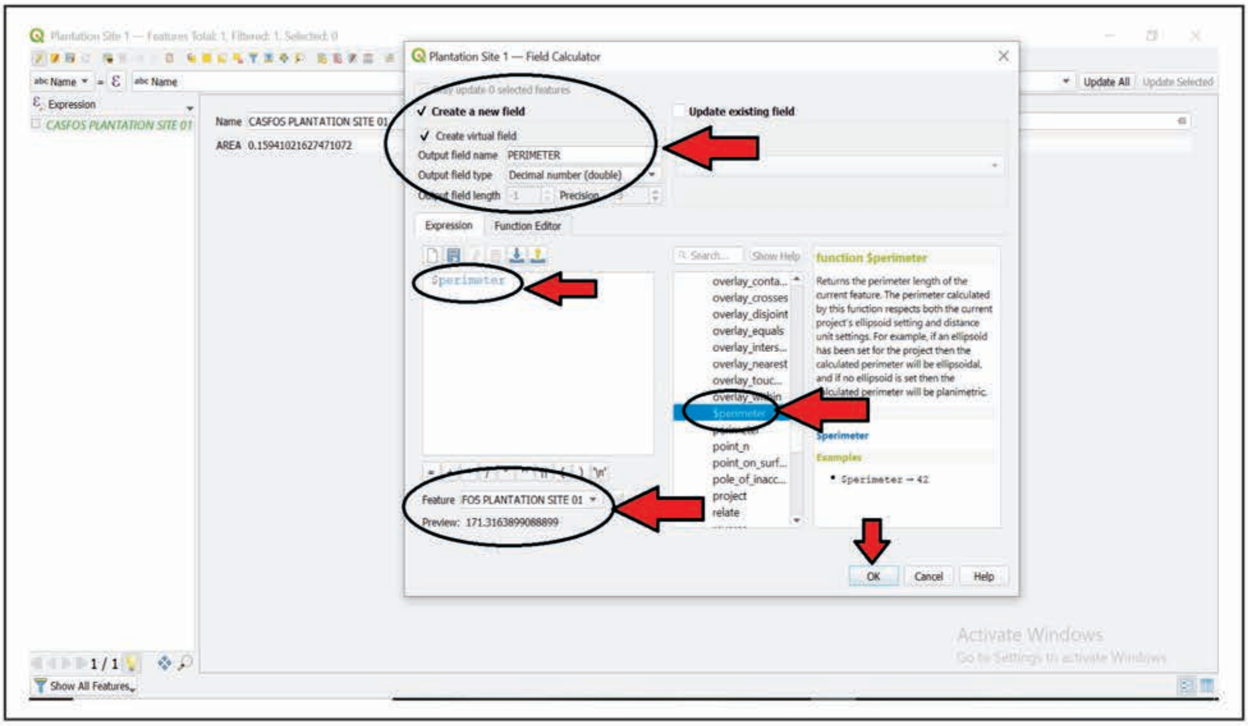


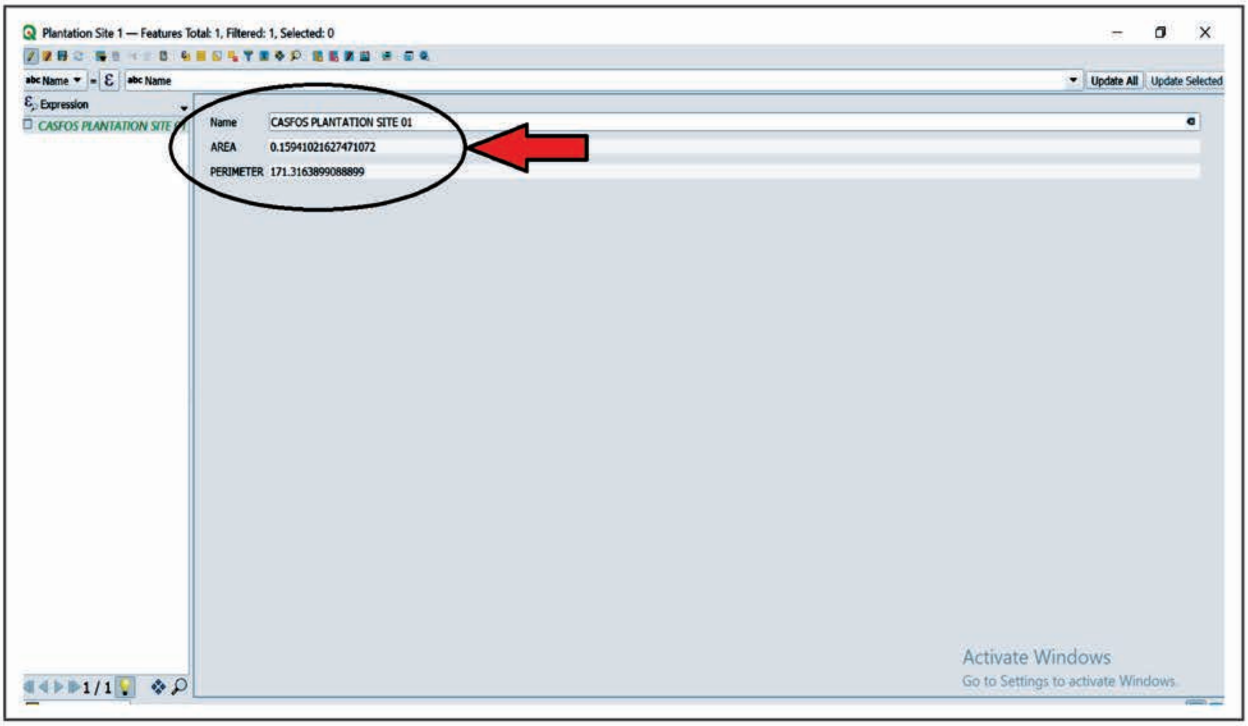



Plantation Site 1 — Features Total: 1, Filtered: 1, Selected: 0
Update All
Update Selected
Expression
CASFOS PLANTATION SITE 01
Name CASFOS PLANTATION SITE 01
Plantation Site 1 — Field Calculator
Only update 0 selected features
Create a new field
Update existing field
Create virtual field
Output field name
Output field type Whole number (integer)
Output field length 10 Precision 3
Expression
Function Editor
Show Help
function $area
Returns the area of the current feature. The area calculated by this function respects both the current project's ellipsoid setting and area unit settings. For example, if an ellipsoid has been set for the project then the calculated area will be ellipsoidal, and if no ellipsoid is set then the calculated area will be planimetric.
Syntax
Color
Conditionals
Conversions
Date and Time
Fields and Values
Files and Paths
Fuzzy Matching
General
Geometry
angle_at_vertex
$area
area
azimuth
boundary
bounds
Feature FOS PLANTATION SITE 01
Preview:
OK
Cancel
Help
Show All Features

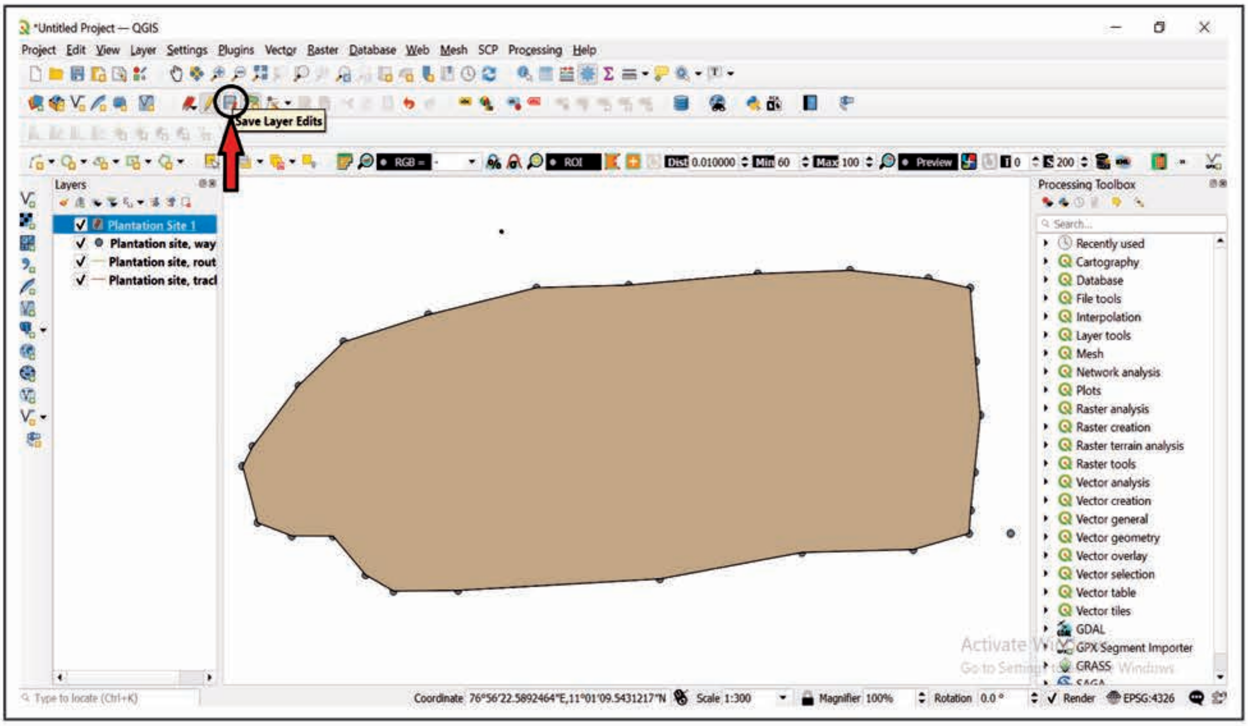

Plantation Site 1 — Features Total: 1, Filtered: 1, Selected: 0
Update All
Update Selected
Expression
CASFOS PLANTATION SITE 01
Name CASFOS PLANTATION SITE 01
Area
Plantation Site 1 — Field Calculator
Create a new field
Update existing field
Create virtual field
Output field name AREA
Output field type Decimal number (double)
Precision
Expression
Function Editor
$area
Show Help
function $area
Returns the area of the current feature. The area calculated by this function respects both the current project's ellipsoid setting and area unit settings. For example, if an ellipsoid has been set for the project then the calculated area will be ellipsoidal, and if no ellipsoid is set then the calculated area will be planimetric.
Syntax
$area
Examples
row_number
Aggregates
Arrays
Color
Conditionals
Conversions
Date and Time
Fields and Values
Files and Paths
Fuzzy Matching
General
Geometry
angle_at_vertex
$area
Feature FOS PLANTATION SITE 01
Preview: 0.15941021627471072
Show All Features

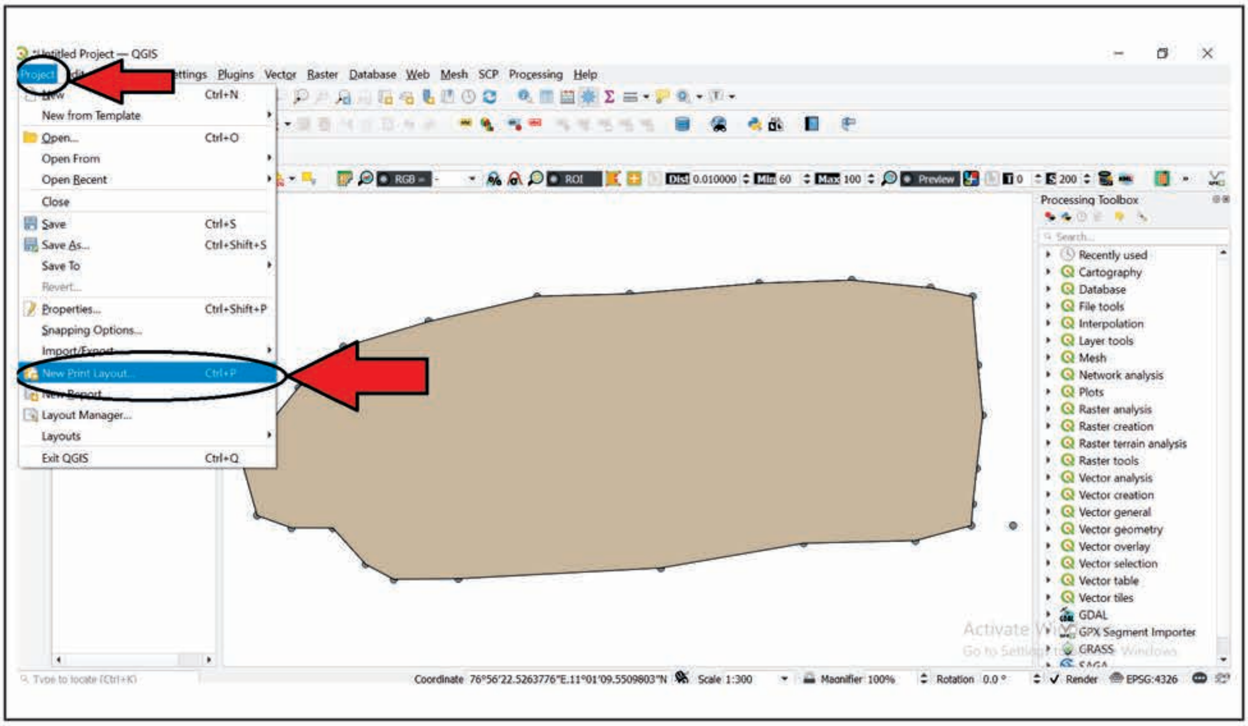

Plantation Site 1 — Features Total: 1, Filtered: 1, Selected: 0
Update All
Update Selected
Expression
CASFOS PLANTATION SITE 01
Name CASFOS PLANTATION SITE 01
AREA 0.15941021627471072
Show All Features
Activate Windows
Go to Settings to activate Windows.

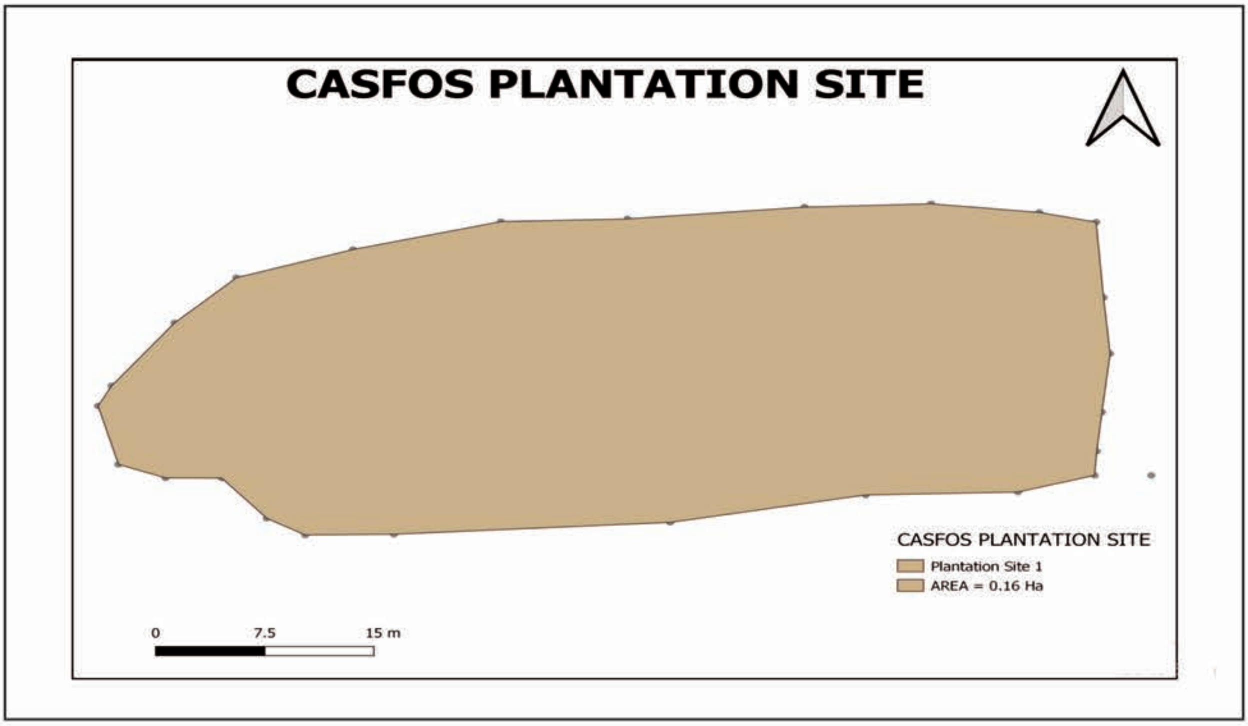

Plantation Site 1 — Field Calculator
Create a new field
Update existing field
Create virtual field
Output field name PERIMETER
Output field type Decimal number (double)
Expression
Function Editor
$perimeter
function $perimeter
Returns the perimeter length of the current feature. The perimeter calculated by this function respects both the current project's ellipsoid setting and distance unit settings. For example, if an ellipsoid has been set for the project then the calculated perimeter will be ellipsoidal, and if no ellipsoid is set then the calculated perimeter will be planimetric.
Examples
Feature FOS PLANTATION SITE 01
Preview: 171.3163899088899
OK
Cancel
Help



Step 07: Save the Edits



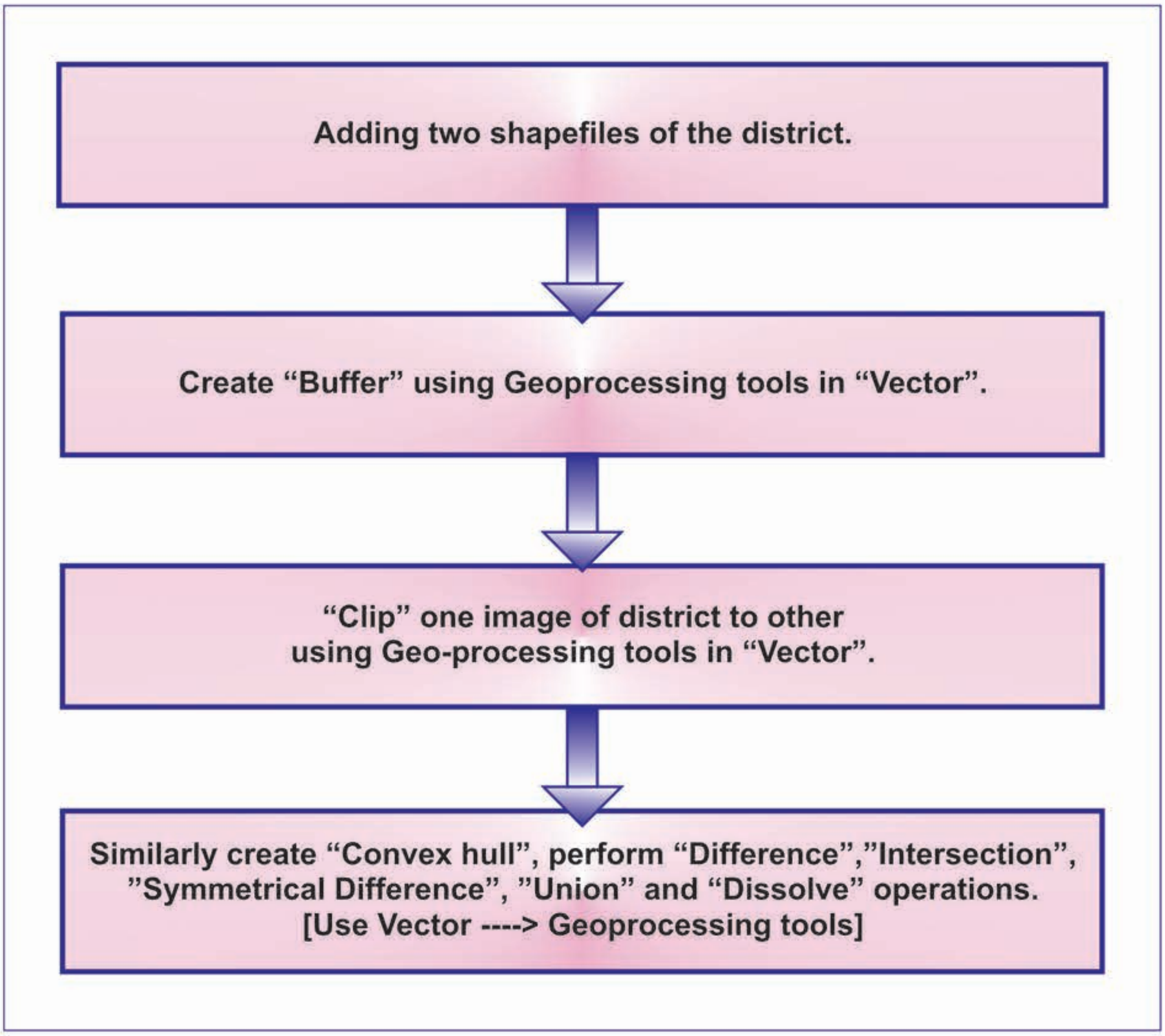

*Untitled Project — QGIS
Project
Settings Plugins Vector Raster Database Web Mesh SCP Processing Help
New Ctrl+N
New from Template
Open... Ctrl+O
Open From
Open Recent
Close
Save Ctrl+S
Save As... Ctrl+Shift+S
Save To
Revert...
Properties... Ctrl+Shift+P
Snapping Options...
Import/Export
New Print Layout... Ctrl+P
New Report...
Layout Manager...
Layouts
Exit QGIS Ctrl+Q
Processing Toolbox
Recently used
Cartography
Database
File tools
Interpolation
Layer tools
Mesh
Network analysis
Plots
Raster analysis
Raster creation
Raster terrain analysis
Raster tools
Vector analysis
Vector creation
Vector general
Vector geometry
Vector overlay
Vector selection
Vector table
Vector tiles
GDAL
GPX Segment Importer
GRASS
Coordinate 76°56'22.5263776"E,11°01'09.5509803"N
Scale 1:300
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326


CASFOS PLANTATION SITE
CASFOS PLANTATION SITE
Plantation Site 1
AREA = 0.16 Ha
0
7.5
15 m

6. Vector Geo-processing

The most significant feature of GIS is to query the given set of data for multiple criteria. In order to make a Query using multiple criteria, vector geoprocessing tools like clip, buffer, dissolve etc. are used. The methodology is described below.

Flowchart



Steps for Vector Geo-processing in QGIS

Step 1 :- Open two shapefiles of district Nayagarh,Odisha in QGIS by clicking on "Vector" layer and adding files from the folder.

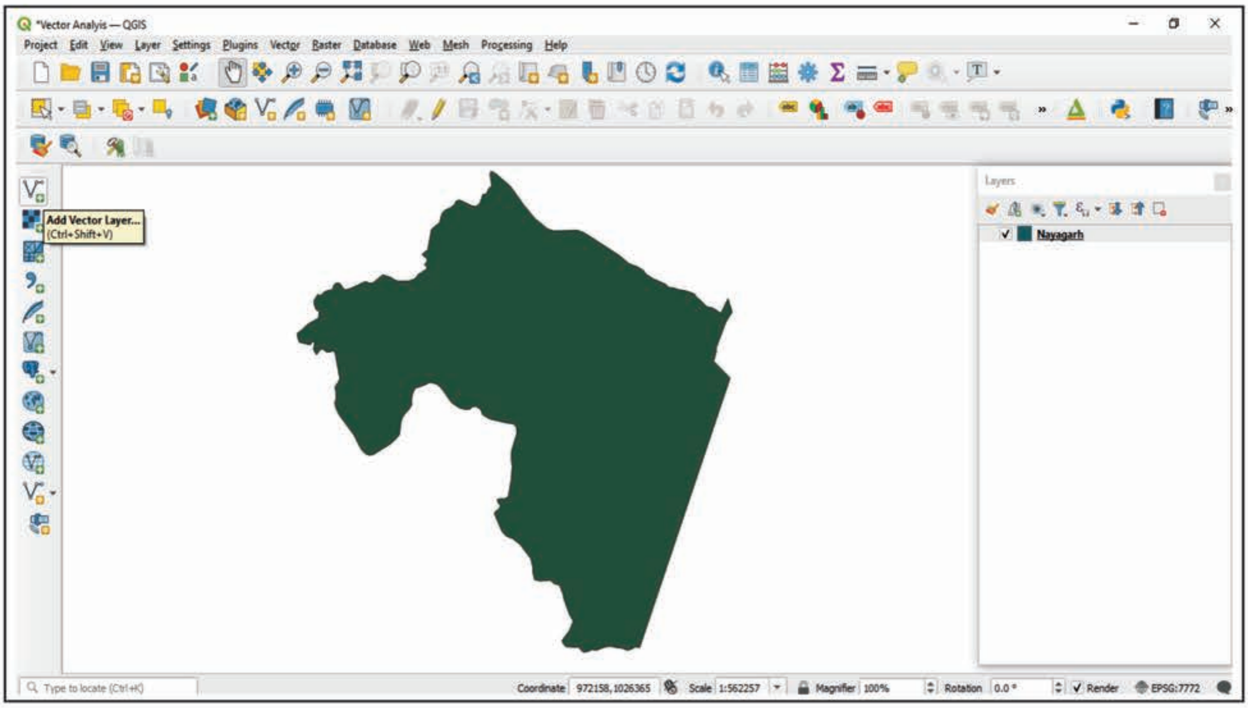


Fig.1(a) First shapefile of the district appears in the layers window

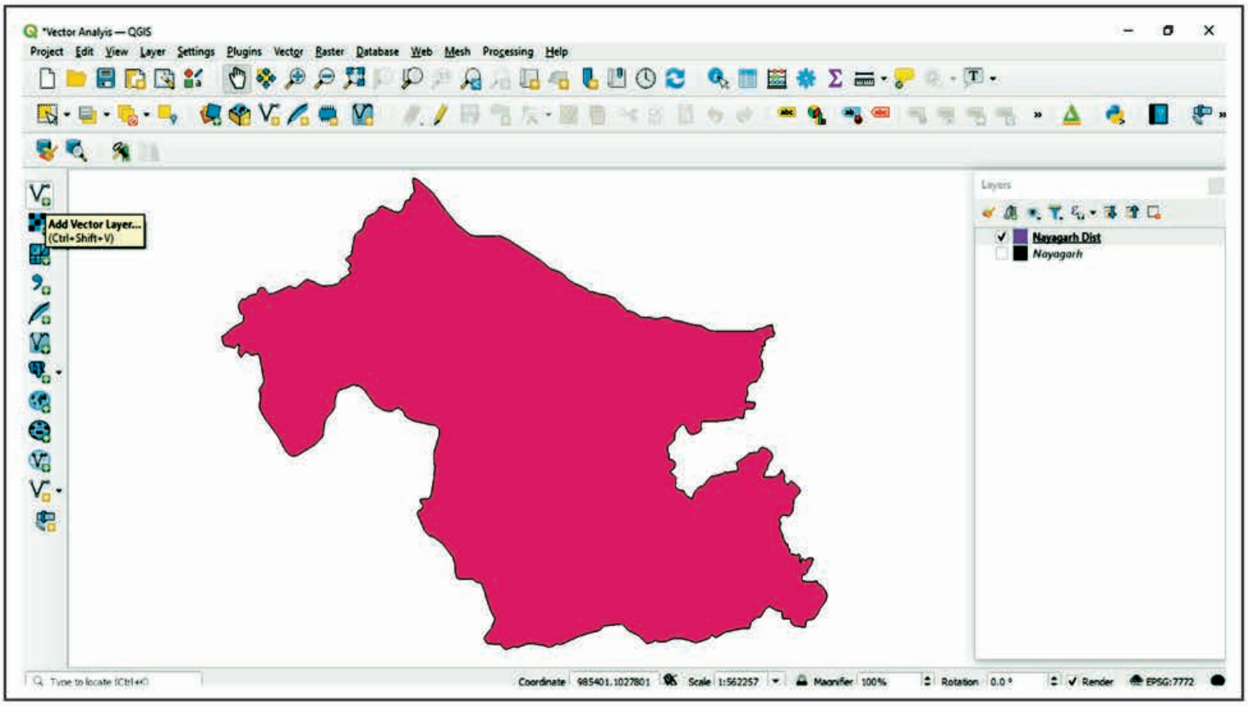


Fig.1(b) Second shapefile of the district appears in the layers window

Note:- With the above two shapefiles, we will be performing vector geo-processing of creation of (i) Buffer (ii) Clip (iii) Convex hull (iv) Difference (v) Dissolve (vi) Intersection (vii) Symmetrical Difference (viii) Union.

Step 2 : For creating "Buffer" of the district layers, click on "Vector""Geoprocessing tools""Buffer".

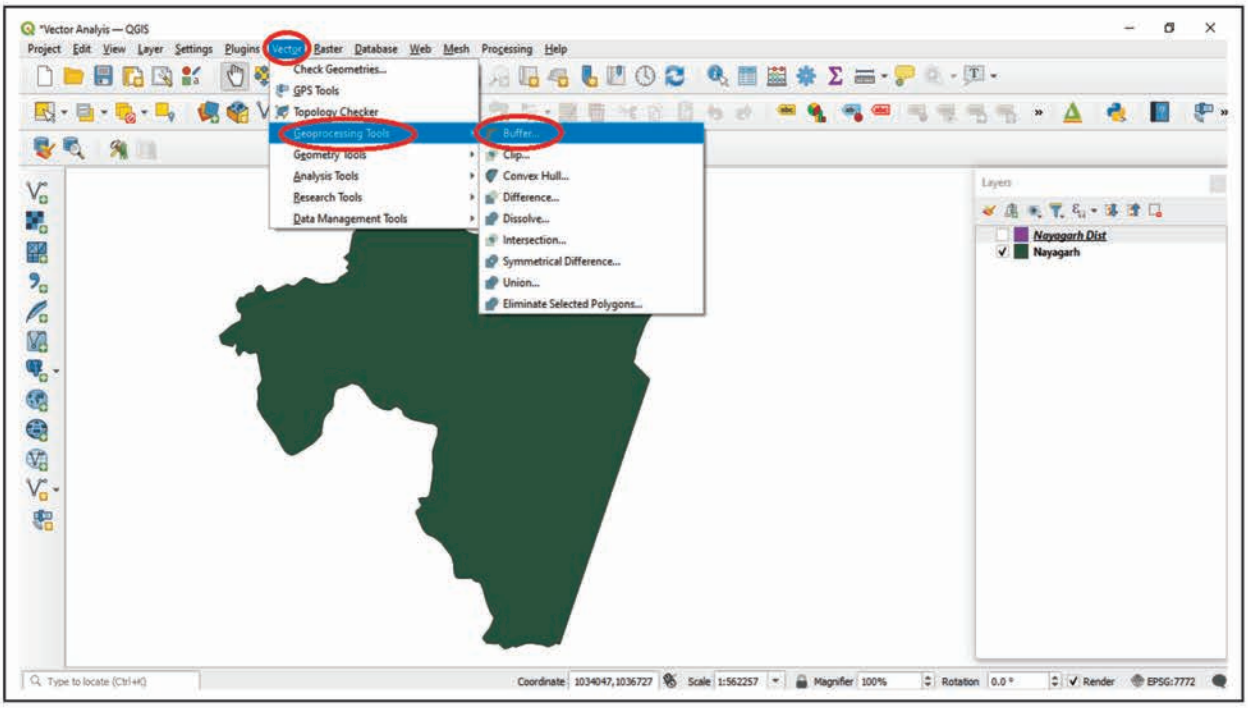


Fig.2(a) Clicking "Buffer" to perform vector analysis of creating buffer.

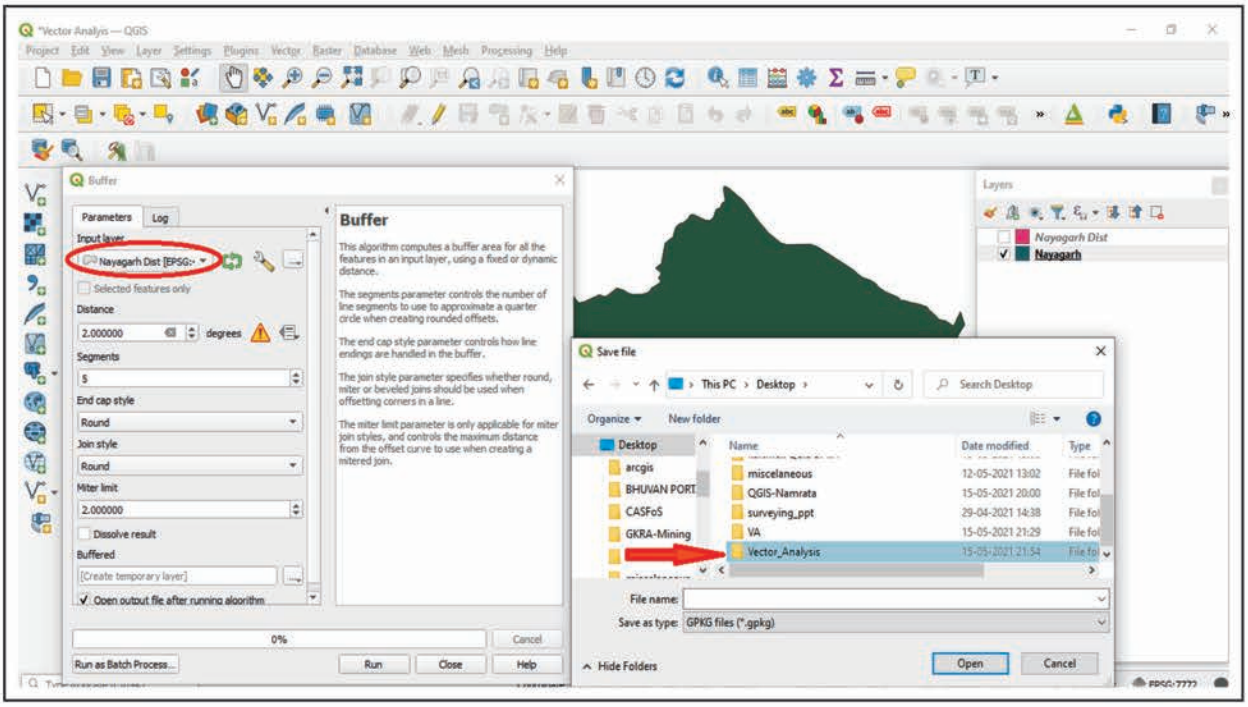


Fig. 2(b) Entering the Parameters in the Buffer window saving the work in New Folder (here named as "Vector_Analysis").

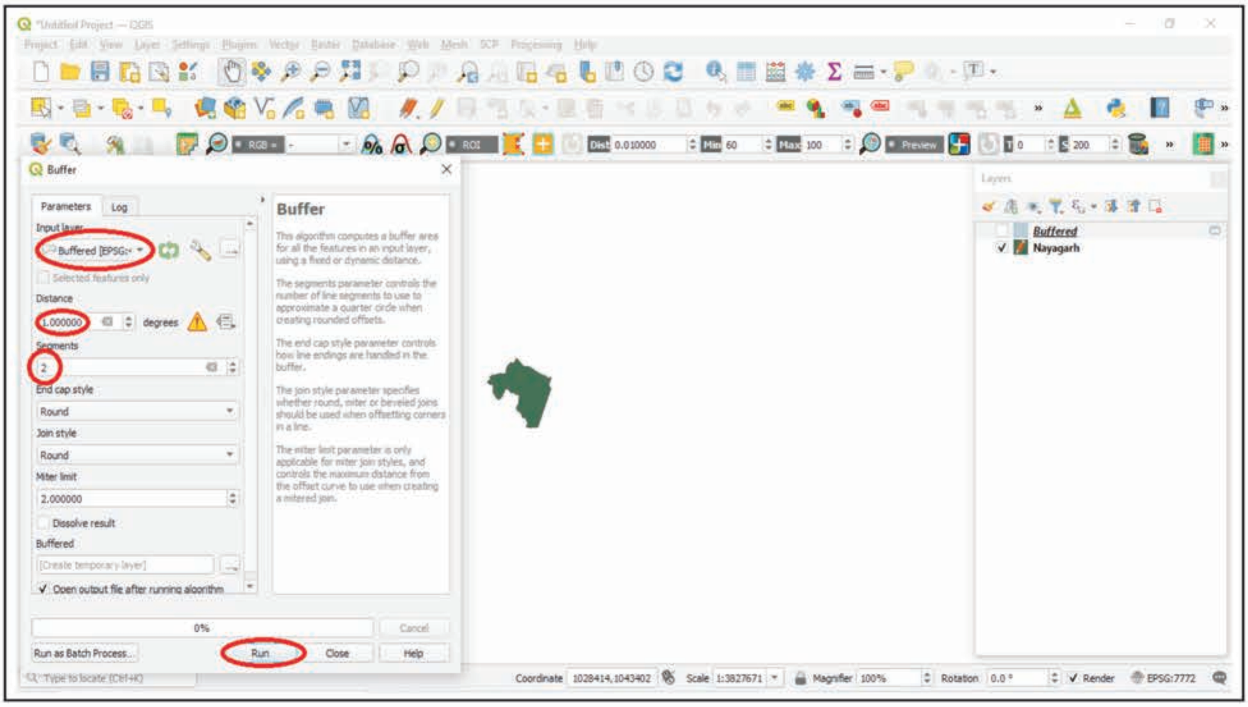


Fig. 2(c) Setting Parameters for Buffer creation around the boundary of Nayagrahdistrict (selected with tick symbol in layers).

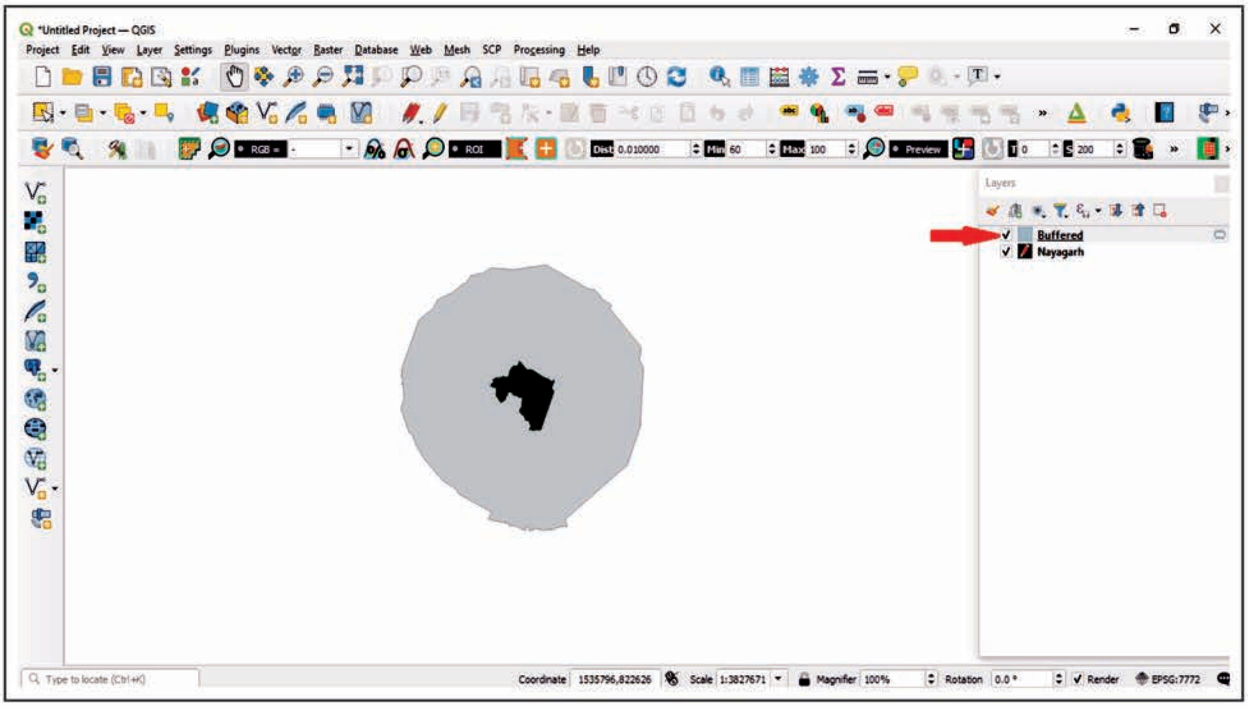


Fig. 2(d) Buffer created around the boundary of Nayagrah district (selected with tick symbol in layers).

Step 3:- For Clipping,Click on "Vector""Geo processing tools""Clip"

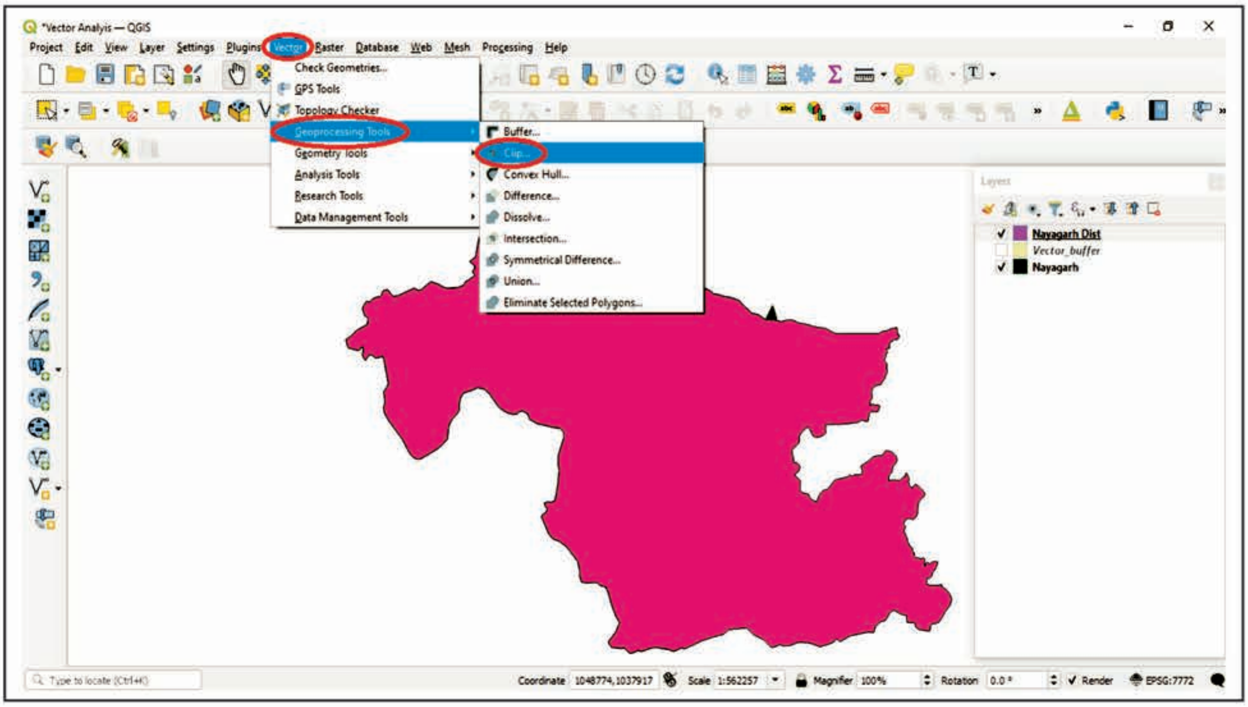


Fig.3(a) Selecting"Clip" to perform clipping operation

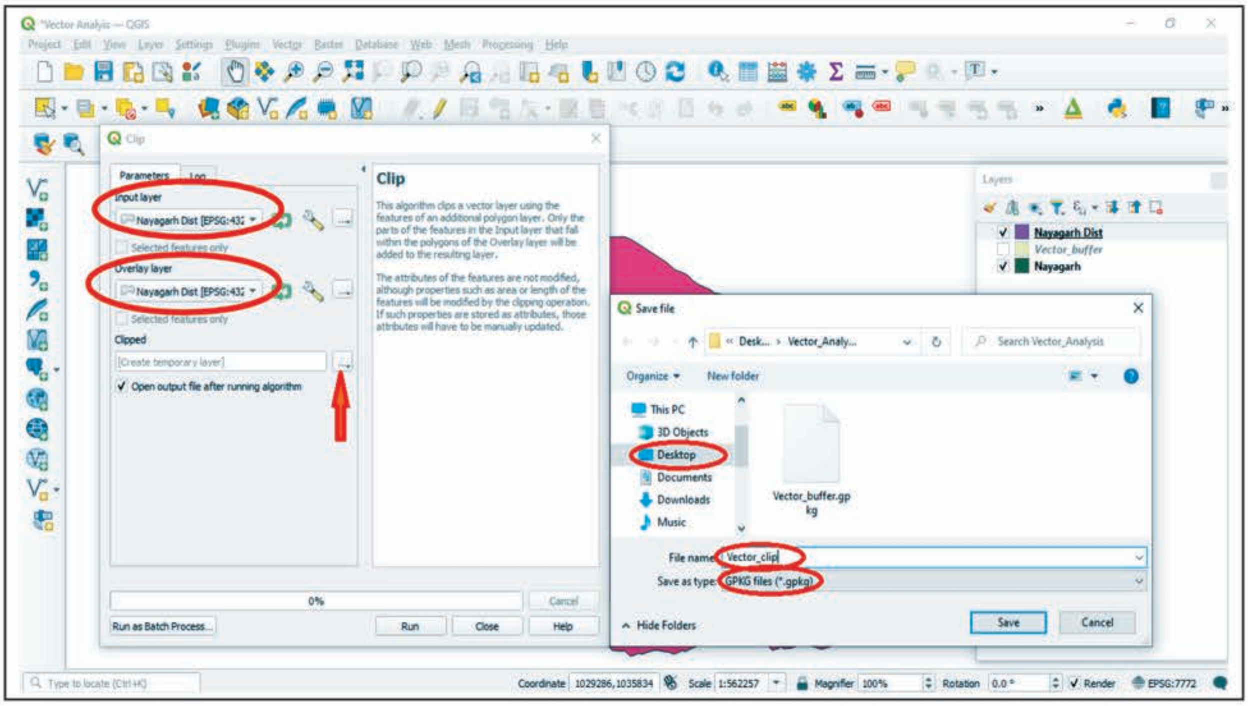


Fig.3(b) Selecting input layer and overlay layer in Parameters and saving clipped file (here named" Vector_clip") in folder(here"Vector_Analysis")

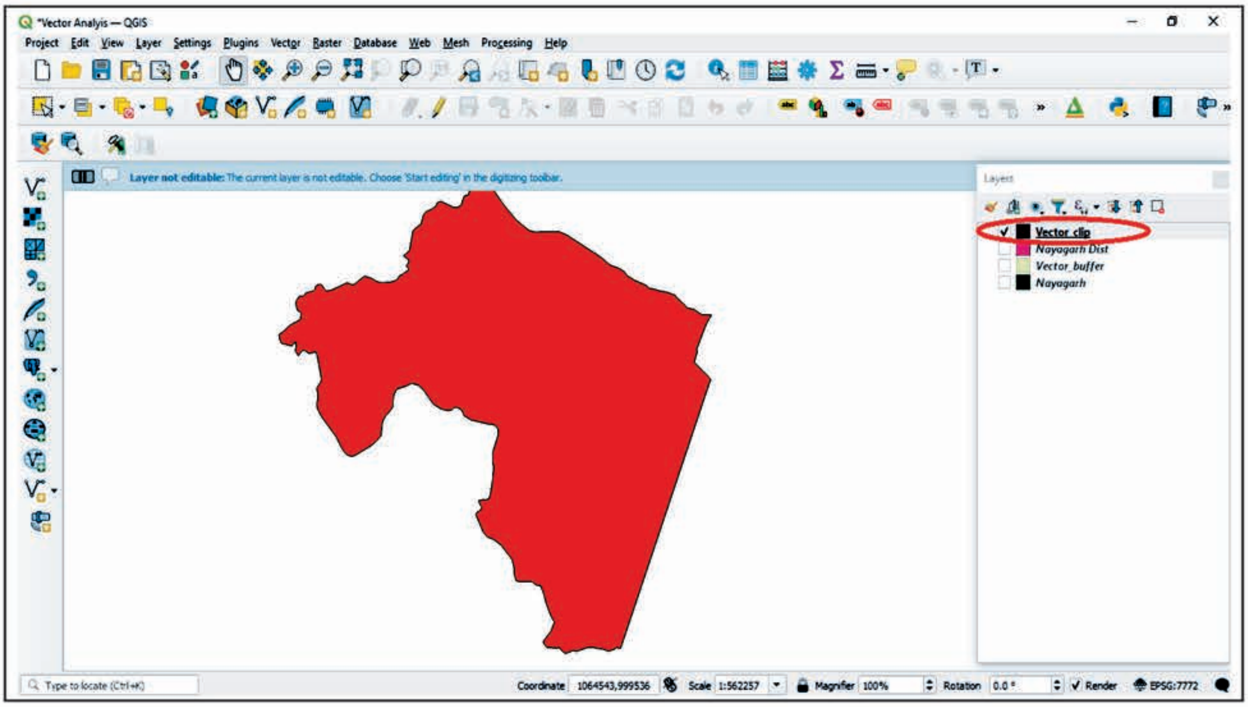


Fig. 3(c) The clipped image appears as above after putting other layers OFF by unchecking the box in layer.

Step 4 :- For creating Convex hull around district image, click on "Vector" "Geoprocessing Tools""ConvexHull"

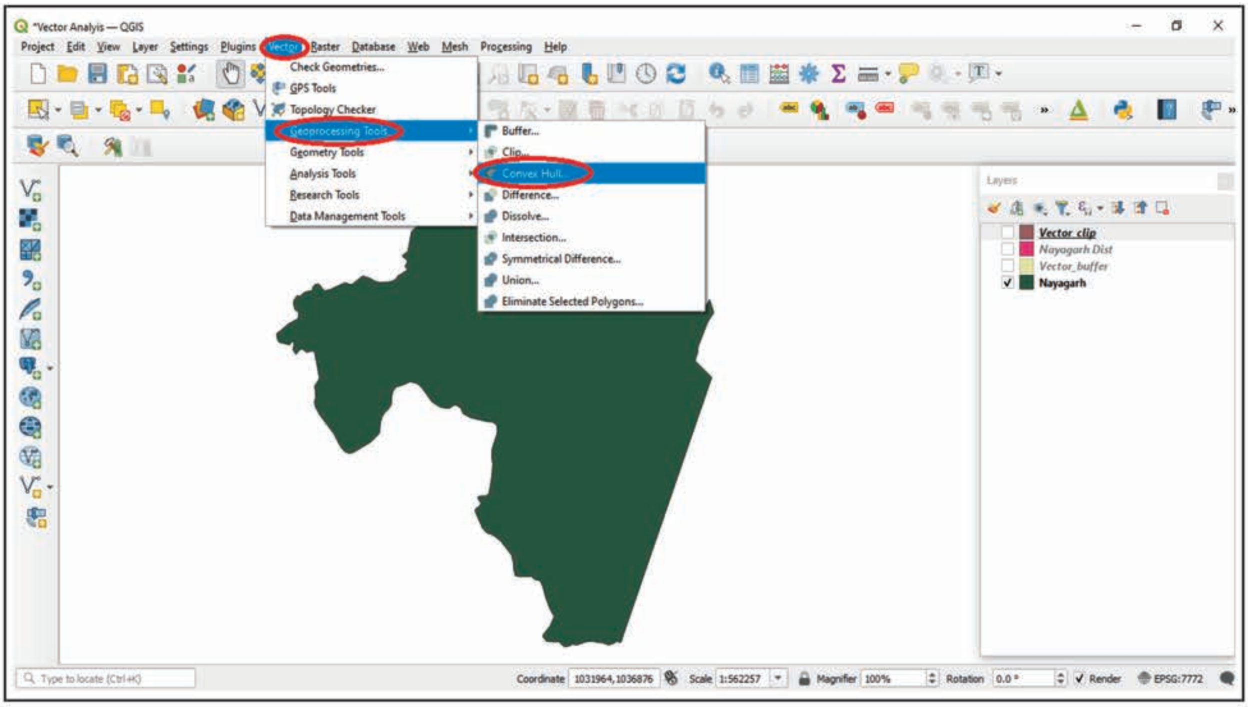


Fig.4(a) Selecting "Convex Hull" in Geo-processing tools.

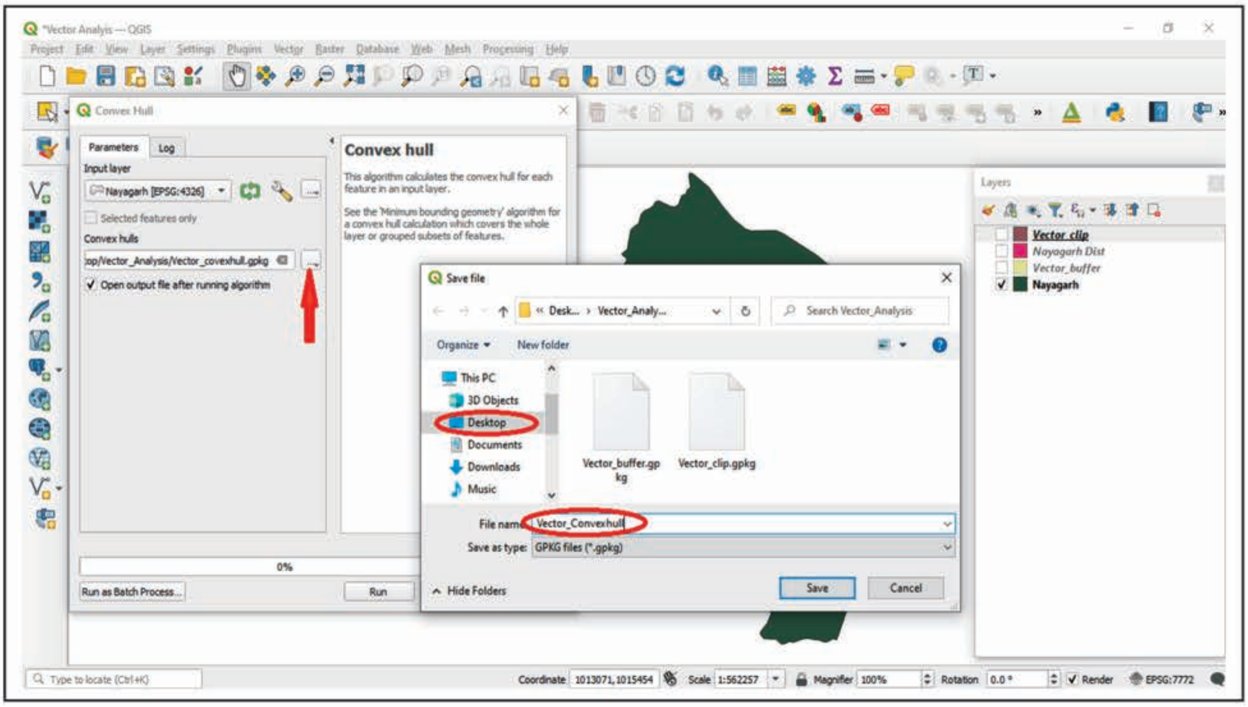


Fig. 4(b) Selecting Input layer and creating convex hull folder (as shown above) and clicking on "RUN"button.

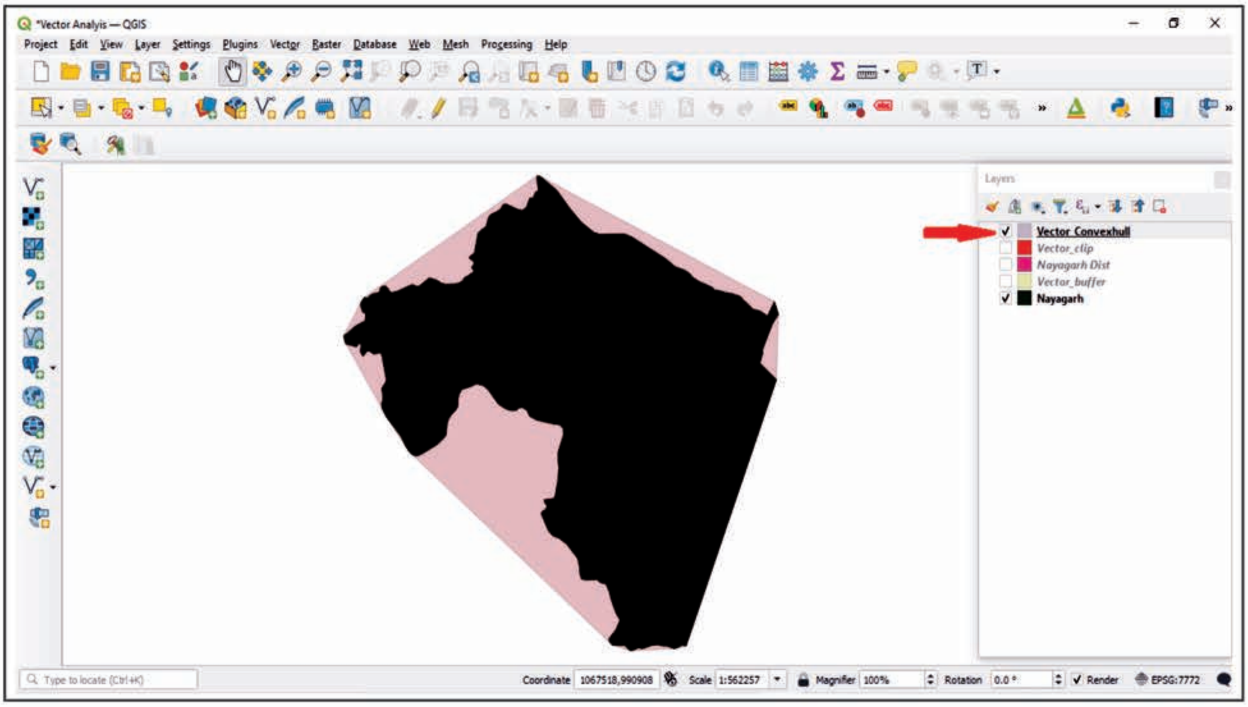


Fig. 4(b) Created Convexhull around district image.

Step 5:- For finding Difference,click on “Vector””Geoprocessing tools””Difference”.

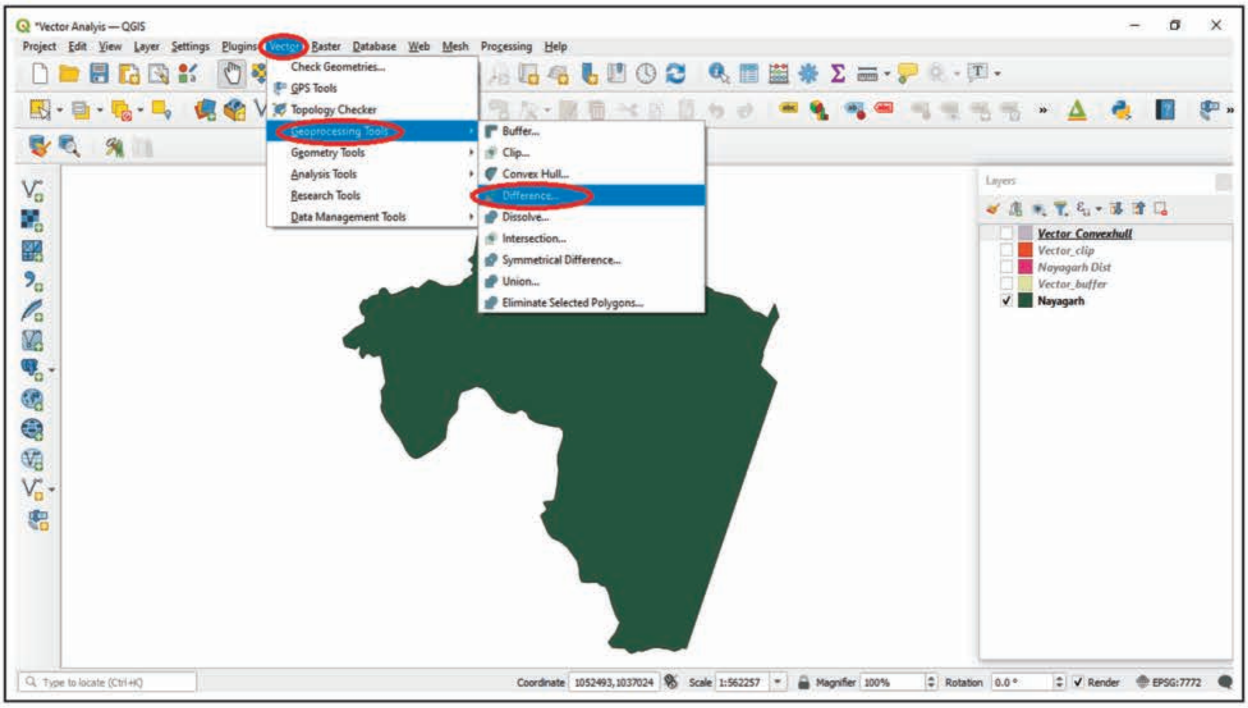


Fig. 5(a)Selecting “Difference” in Geo-processing tools.

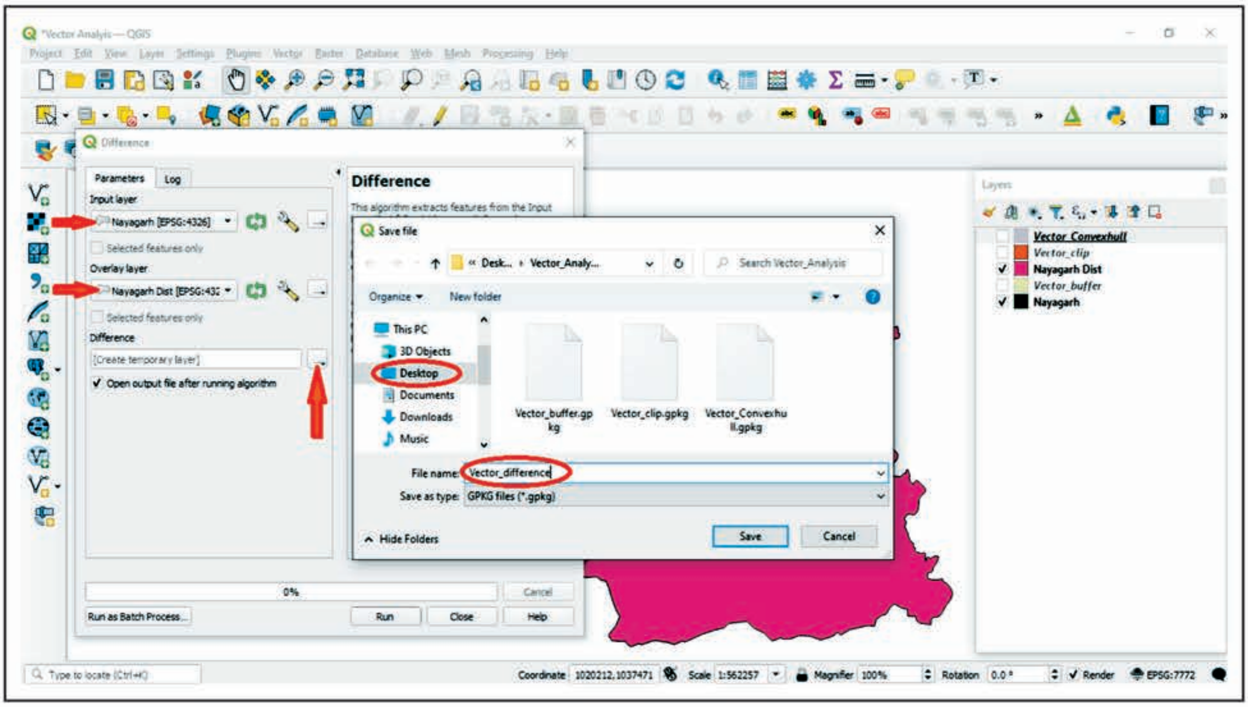


Fig. 5(b)Selecting input and overlay layer in Parameters and saving the difference file in a folder.

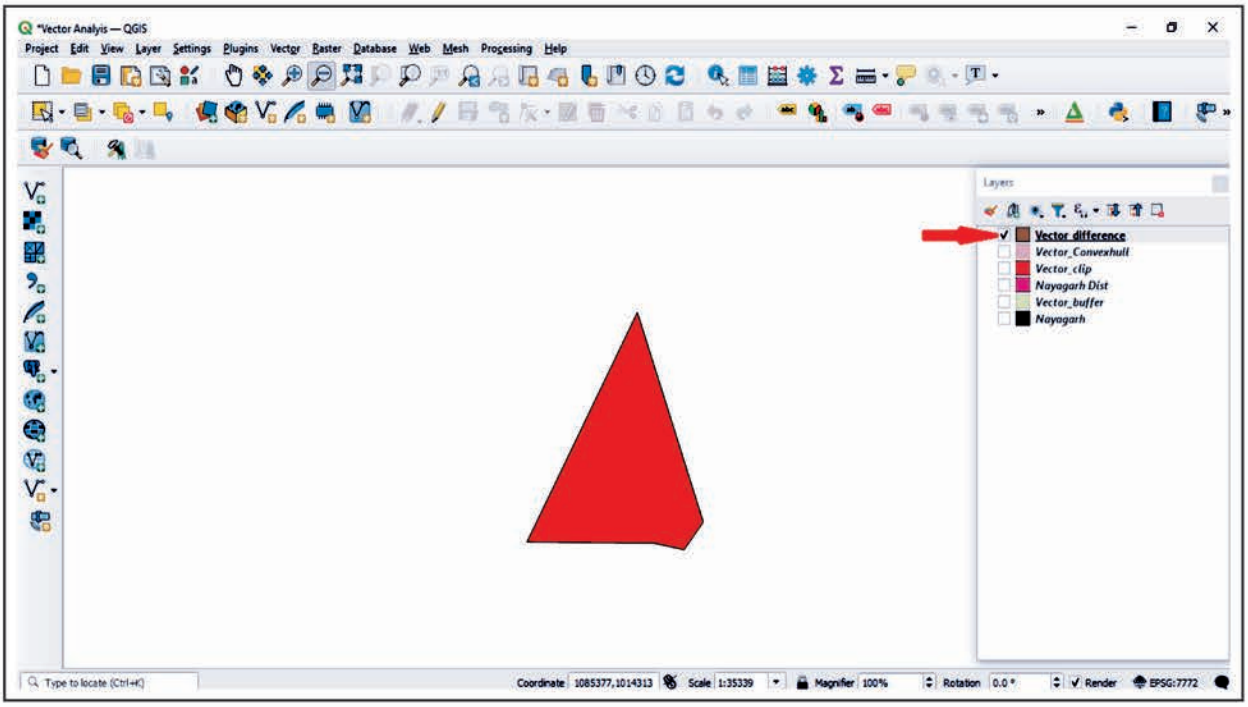


Fig. 5(c)The difference between two images of district (here district Nayagarh)

Step 6:- For performing Intersection,
click on “Vector” ”Geoprocessing tools” ”Intersection”.

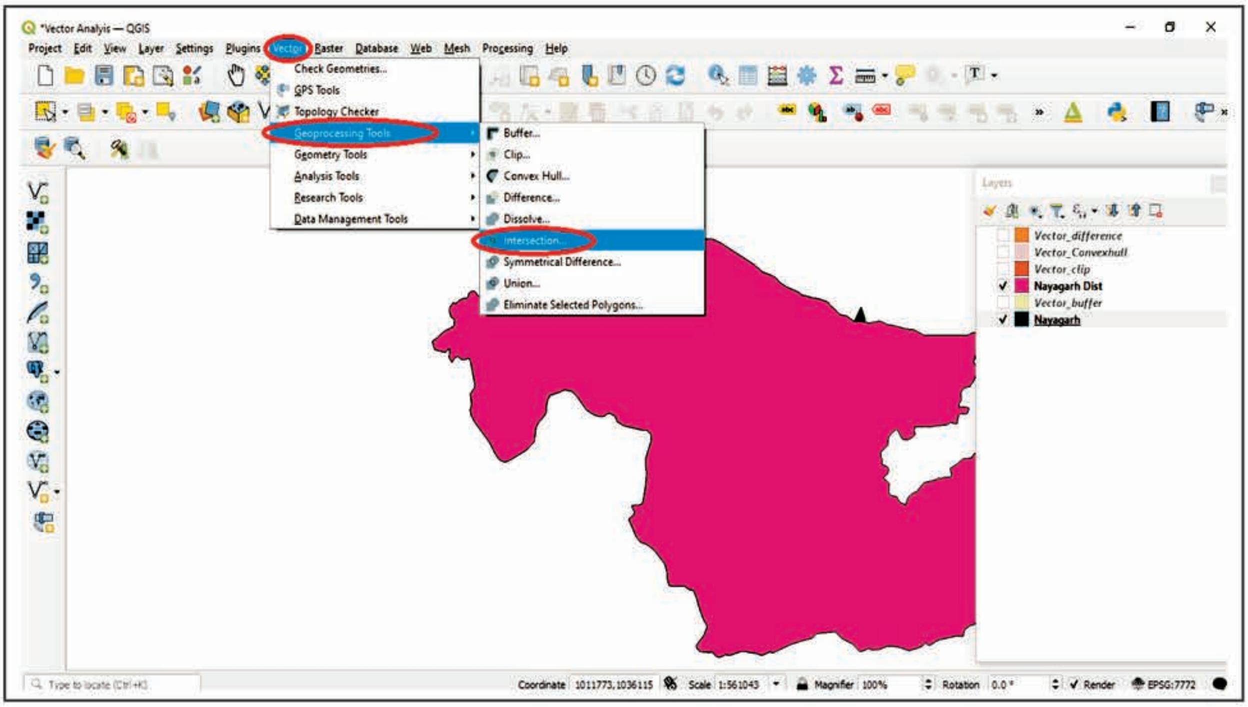


Fig.6(a) Selecting “Intersection” in Geo-processing tools.

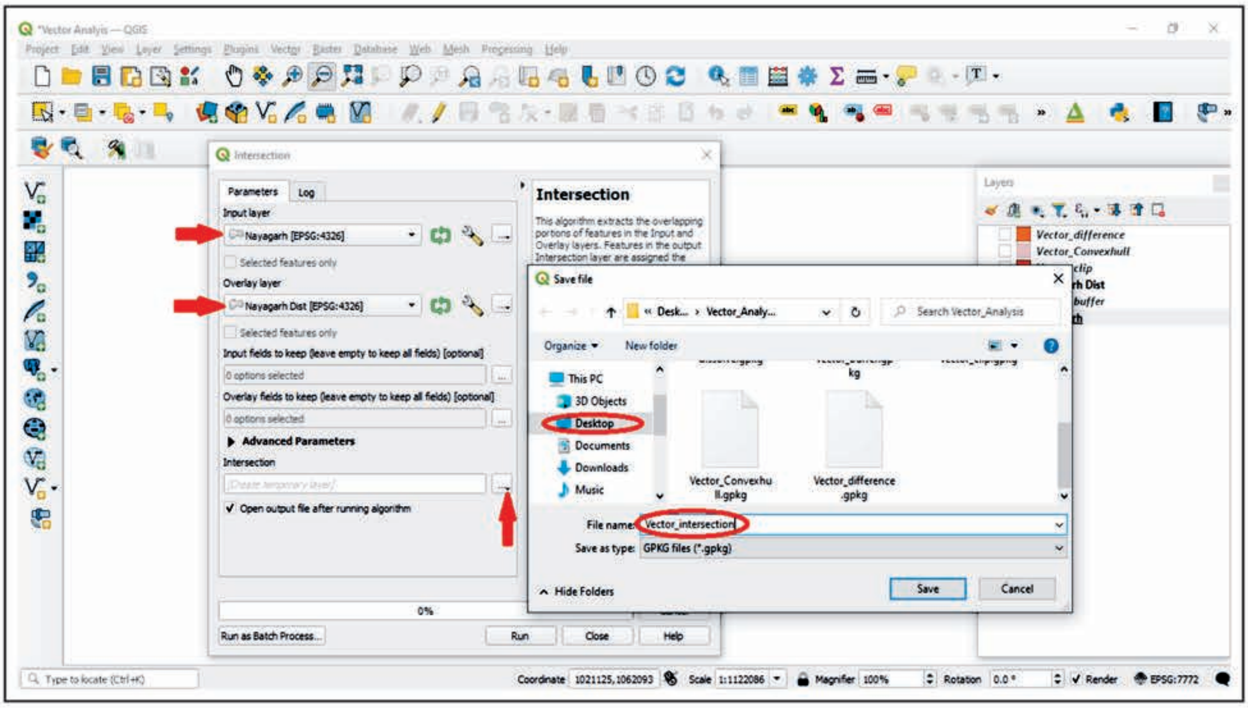


Fig. 6(b) Selecting input and overlay layer in Parameters and saving the intersection file in a folder.

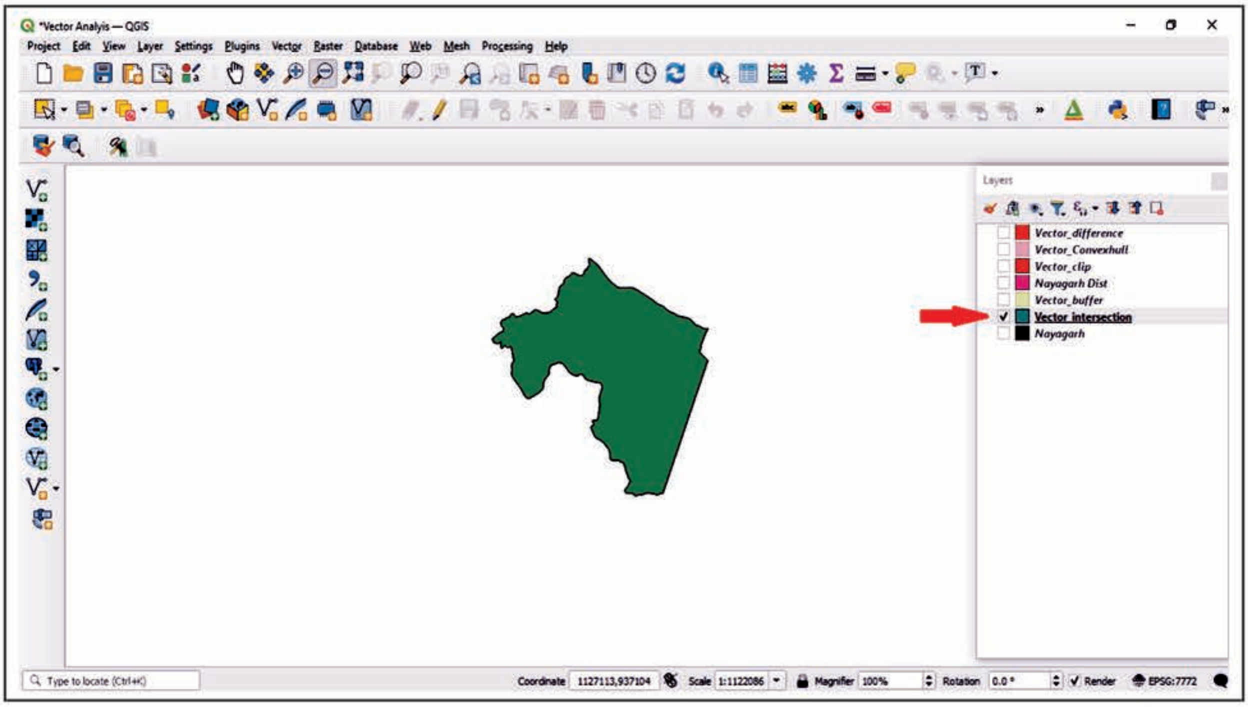


Fig.6(c)The intersection of two images of district(here district Nayagarh)

Step 7 :- For finding Symmetrical Difference,click on "Vector" "Geoprocessing tools""Symmetrical Difference"

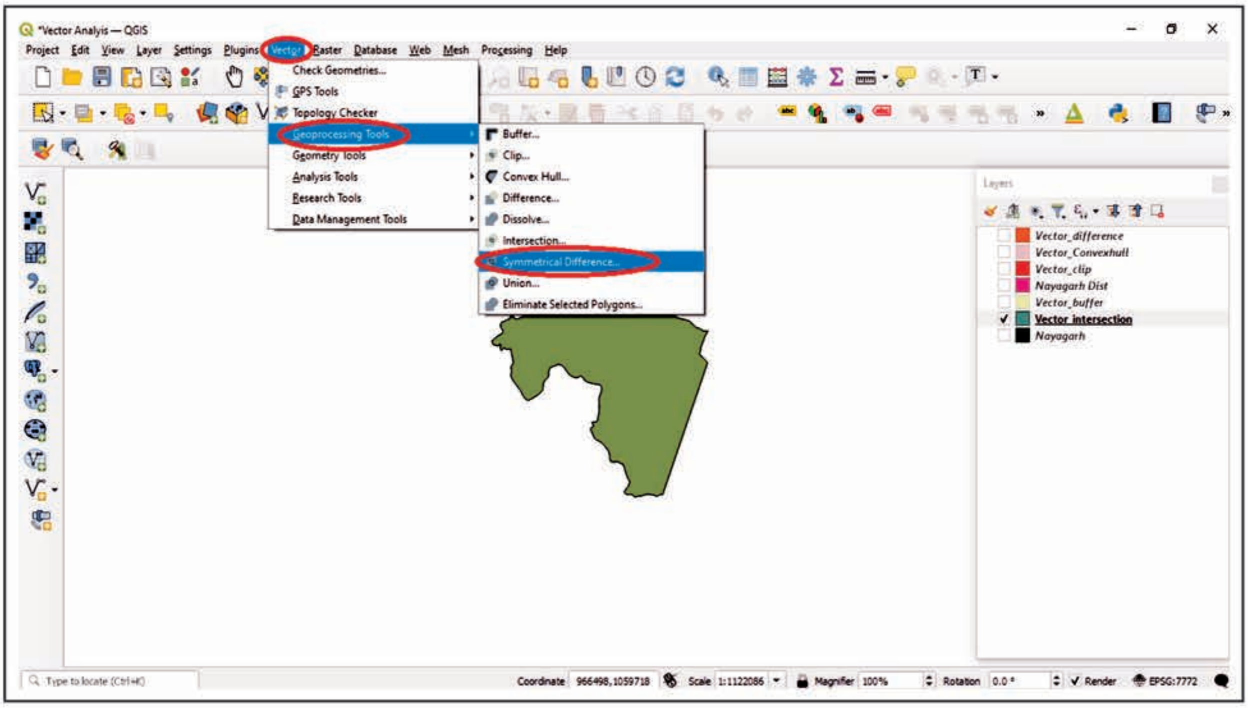


Fig.7(a)Selecting "Symmetrical Difference" in Geo-processing tools.

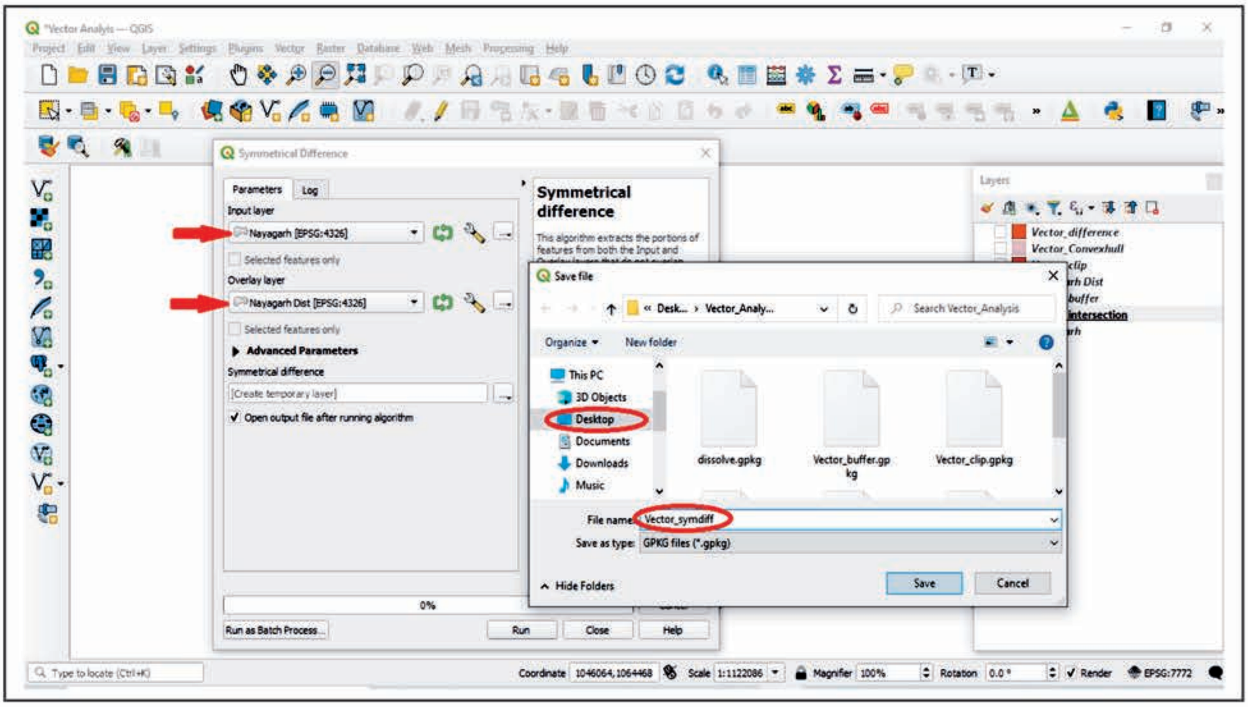


Fig. 7(b)Selecting input and overlay layer in Parameters and saving the symmetrical difference file in a folder.

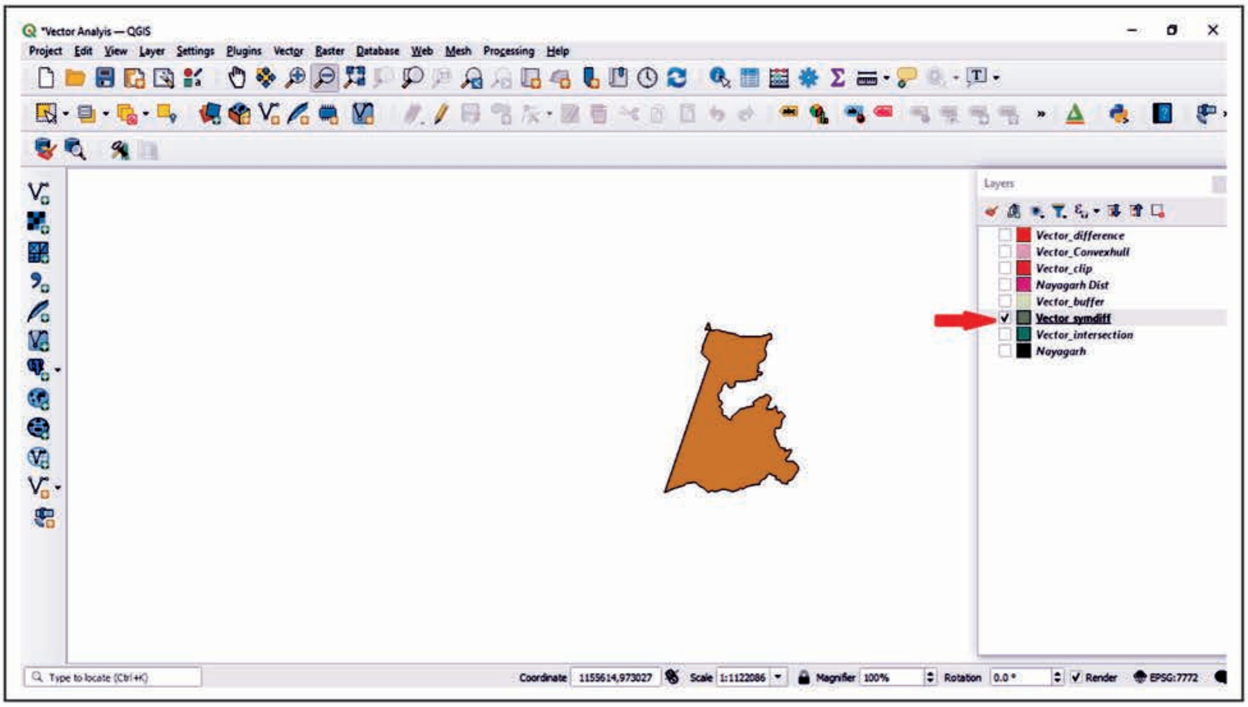


Fig. 7(c)The symmetrical difference of two images of district (here district Nayagarh)

Step 8 :- For finding Union,click on "Vector""Geoprocessing tools""Union".

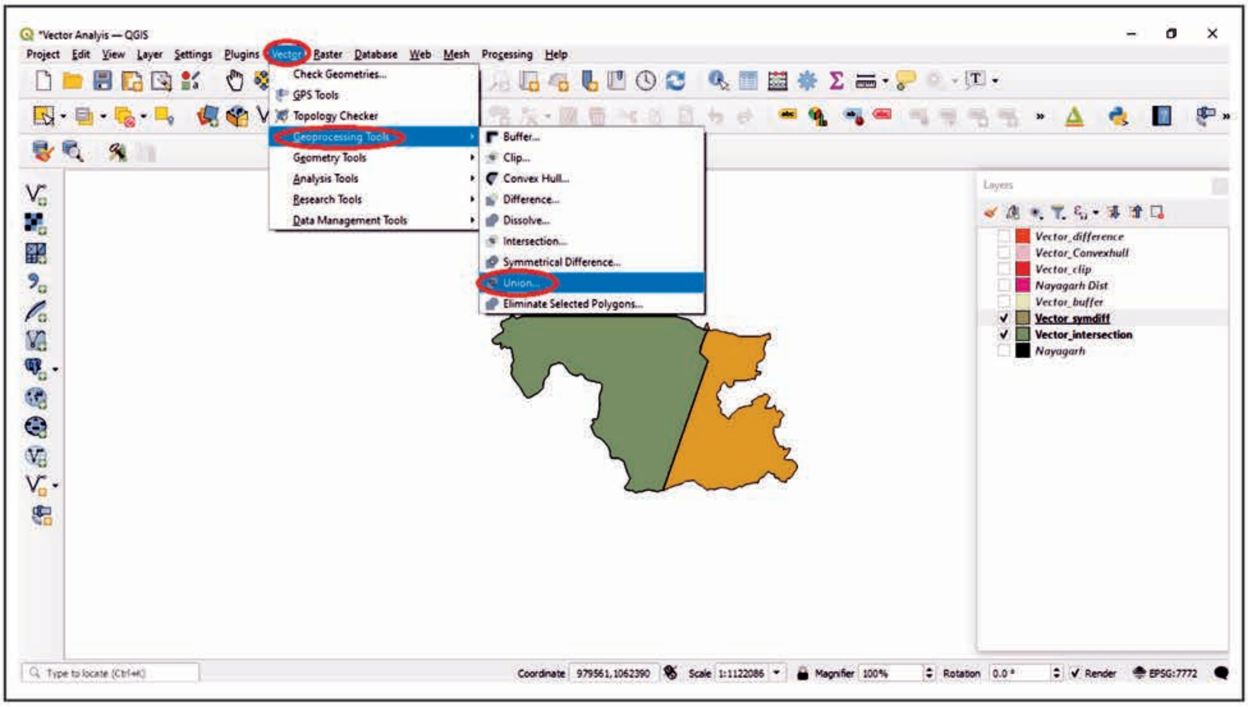


Fig.8(a) Selecting "Union" in Geo-processing tools.

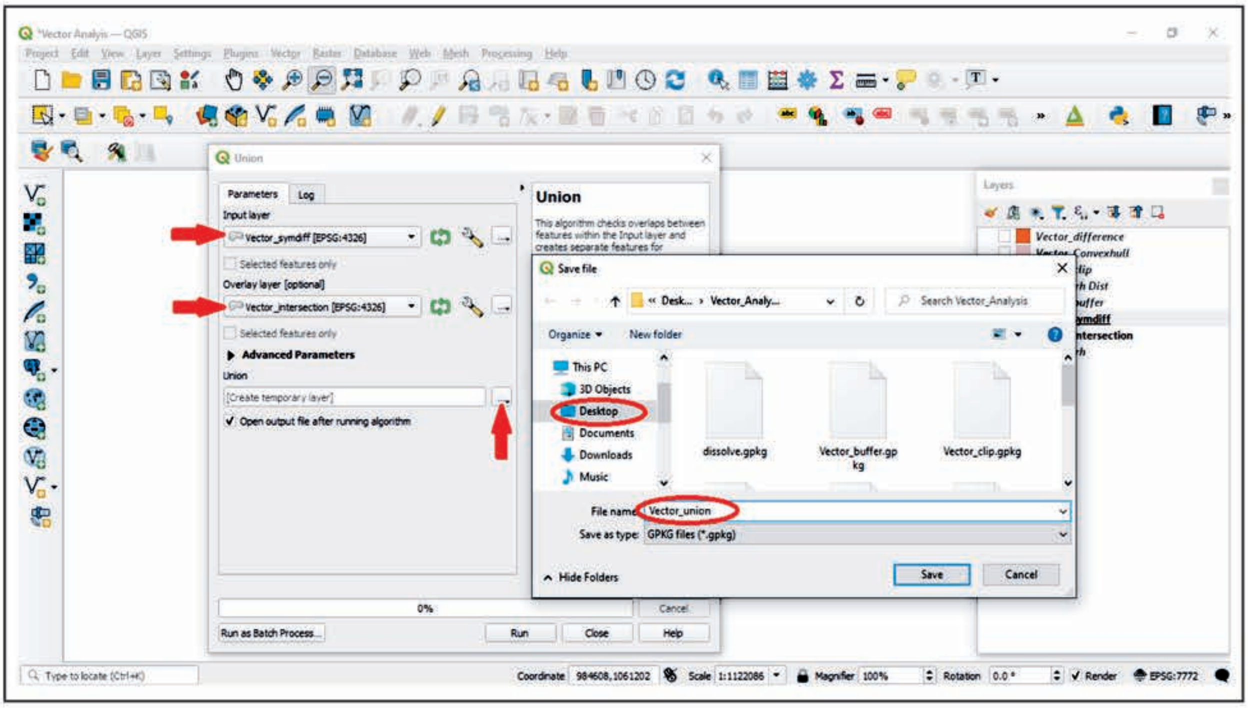


Fig. 8(b) Selecting input and overlay layer in Parameters and saving the union file in a folder.

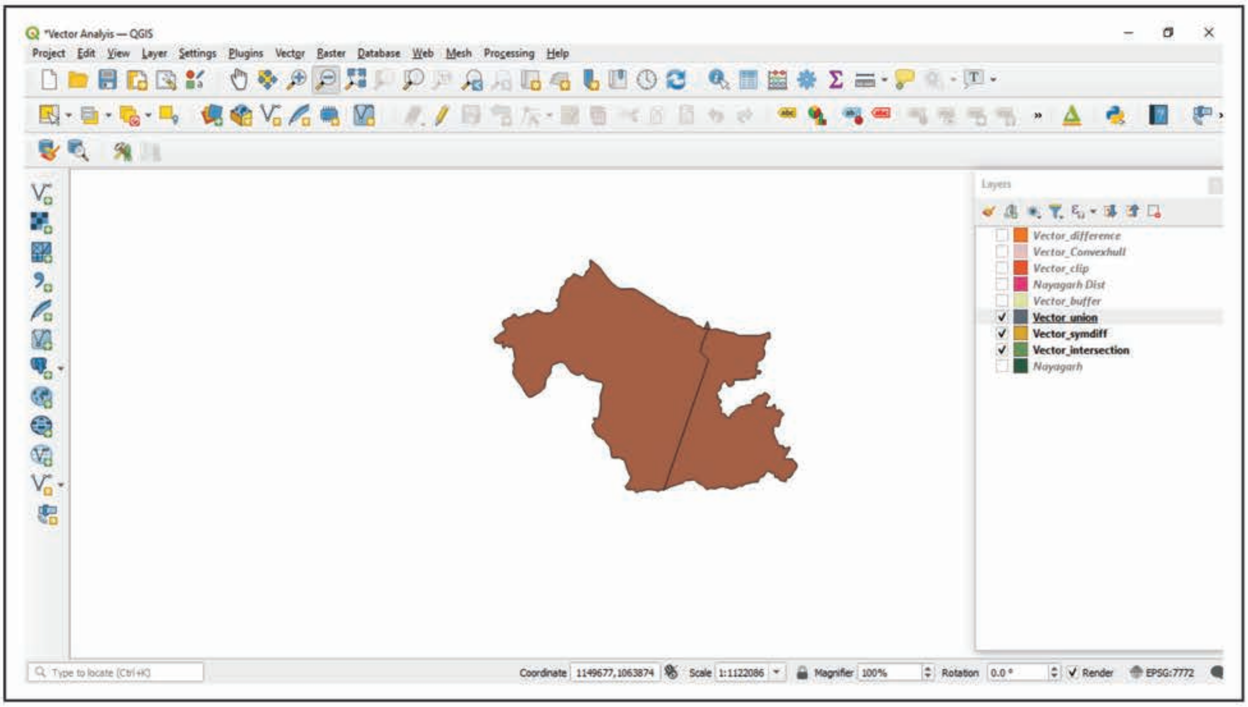


Fig. 8(c) The union of two images of district (here district Nayagarh)

Step 9:- For performing dissolve operation, click on "Vector" "Geoprocessing tools" "Dissolve".

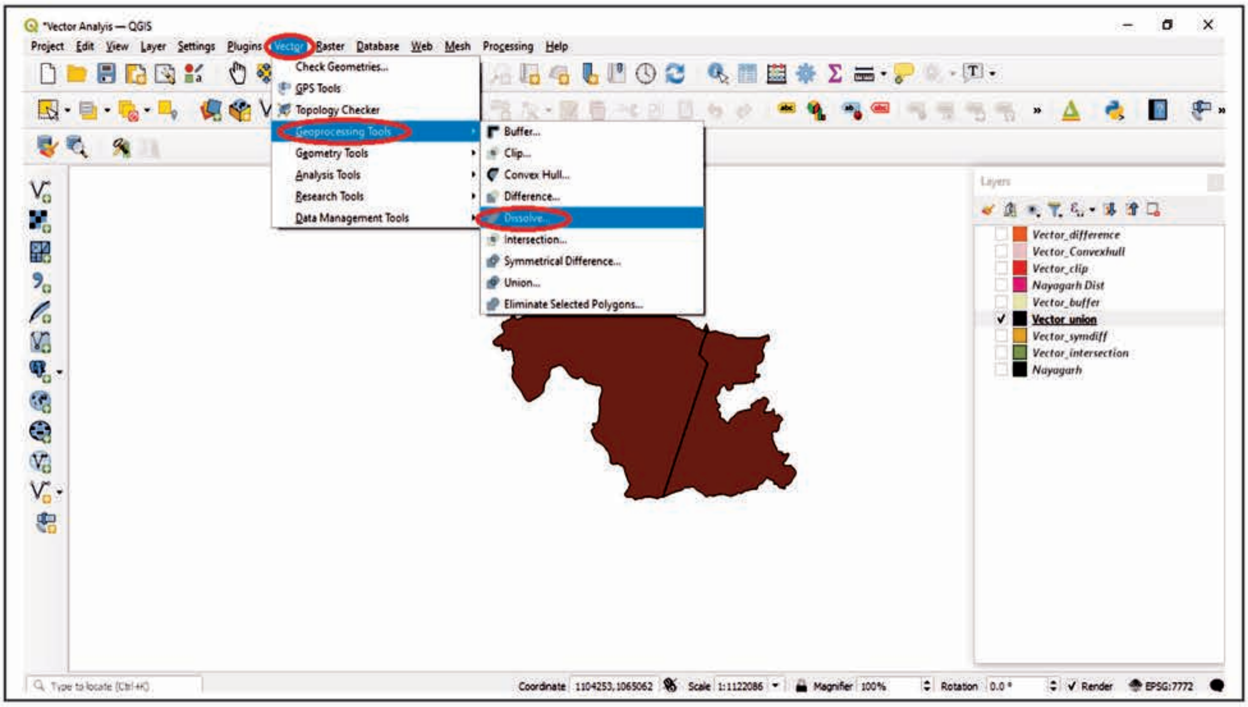


Fig.9(a) Selecting "Dissolve" in Geo-processing tools.

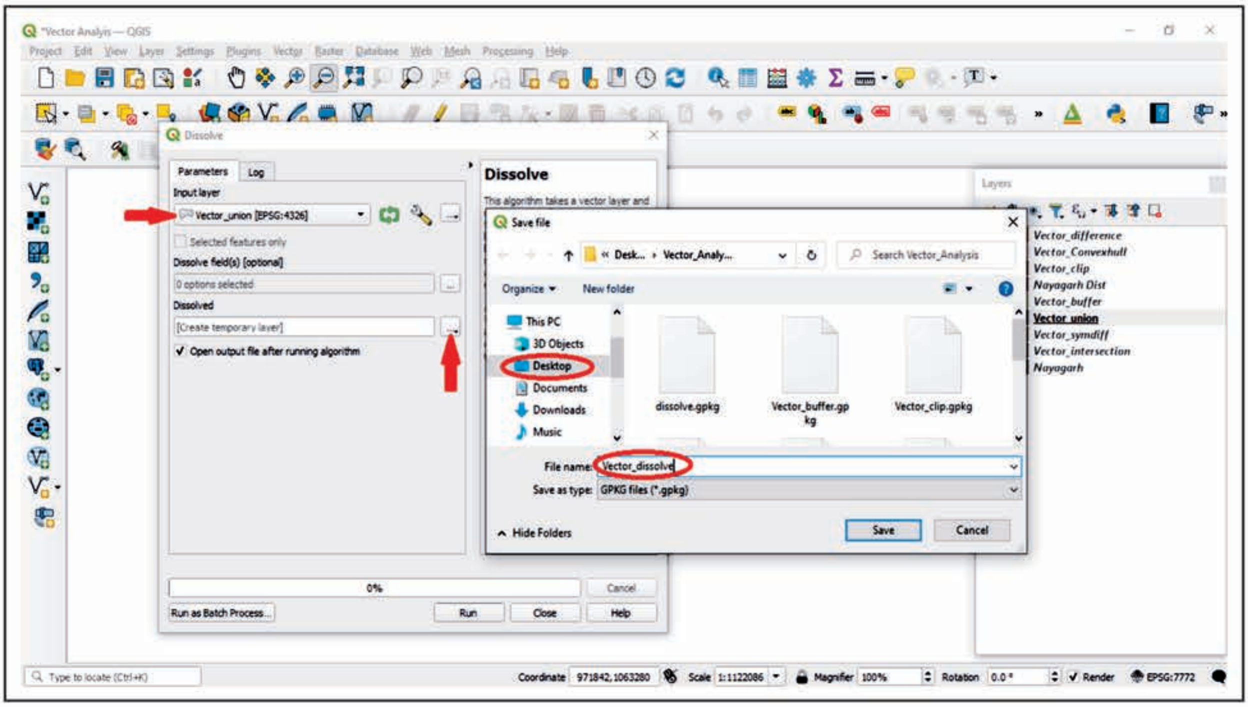


Fig. 9(b) Selecting input layer(here "vector_union" layer) and overlay layer in Parameters and saving the dissolve file in a folder.

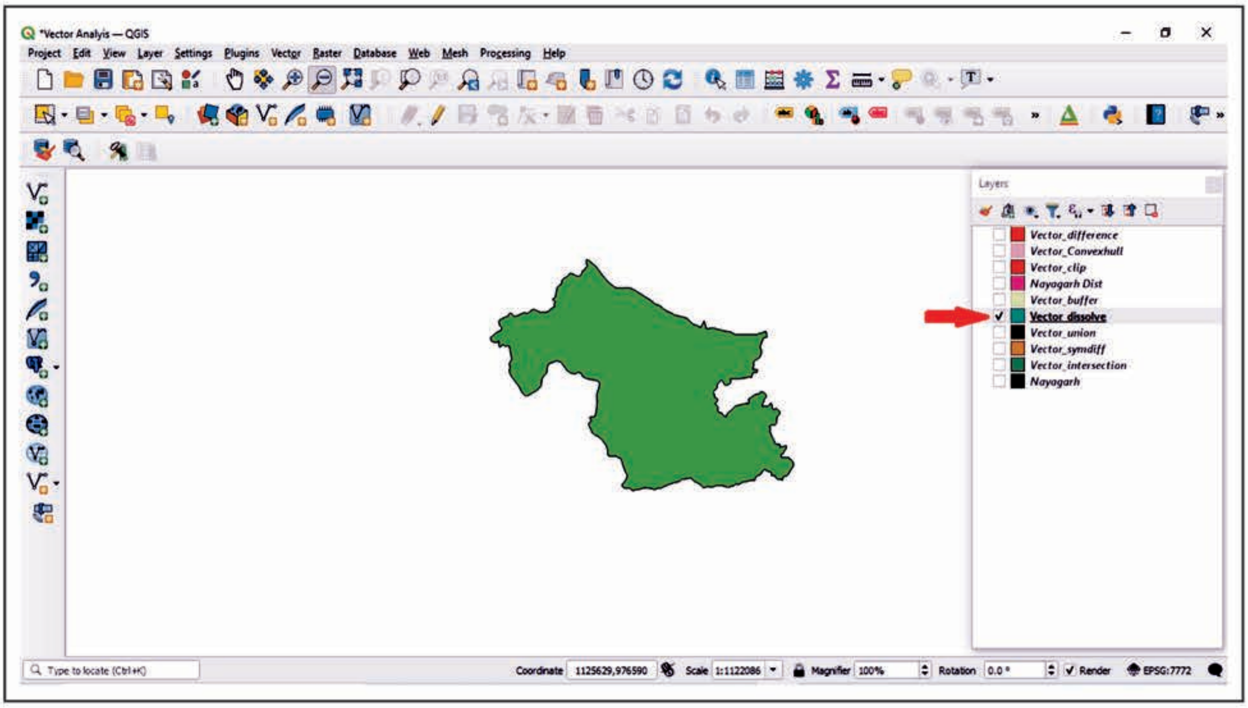


Fig. 9 (c)
Two images of district (here Nayagarh) dissolved.

7. Georeferencing a Toposheet

Add Raster Layer

↓

Change Display Coordinates to
'Degrees, Minutes, seconds' in 'Properties'

↓

Click 'Raster' on toolbar and select 'Georeferencer'

↓

Using 'Add Point' tool enter the correct ground coordinates
at the Corners of Toposheet.

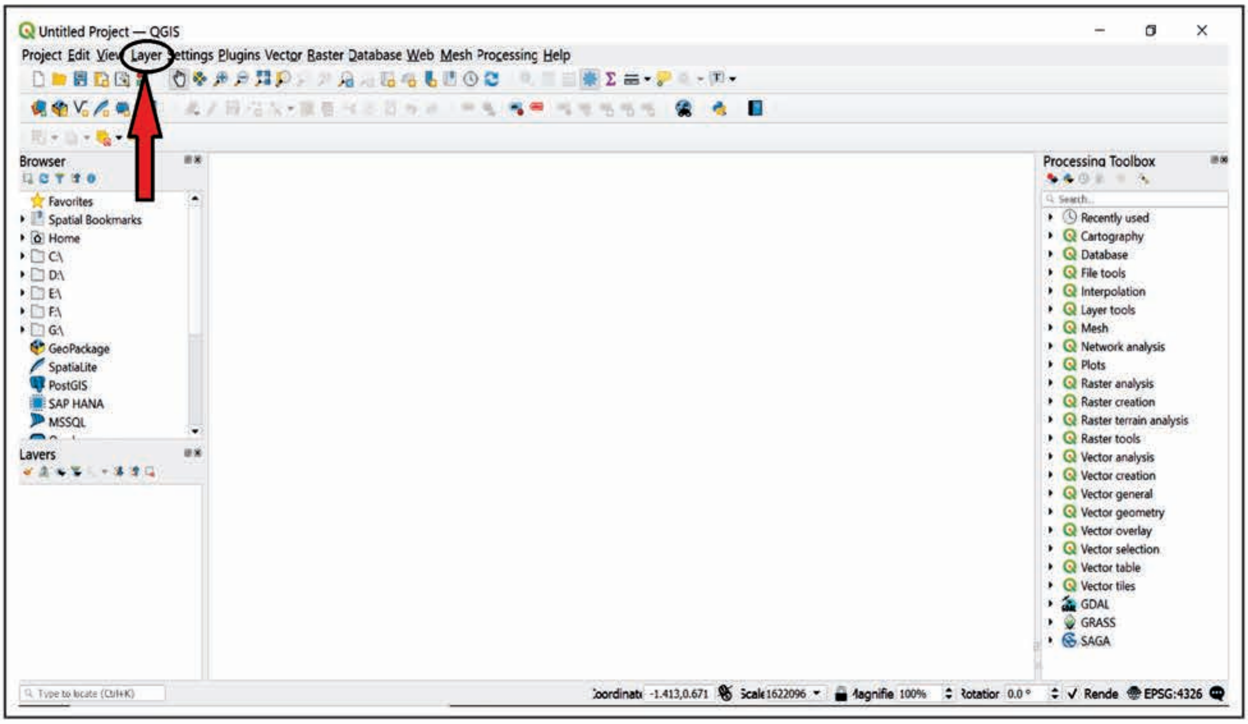
↓

In Transformation Settings enter the required fields.

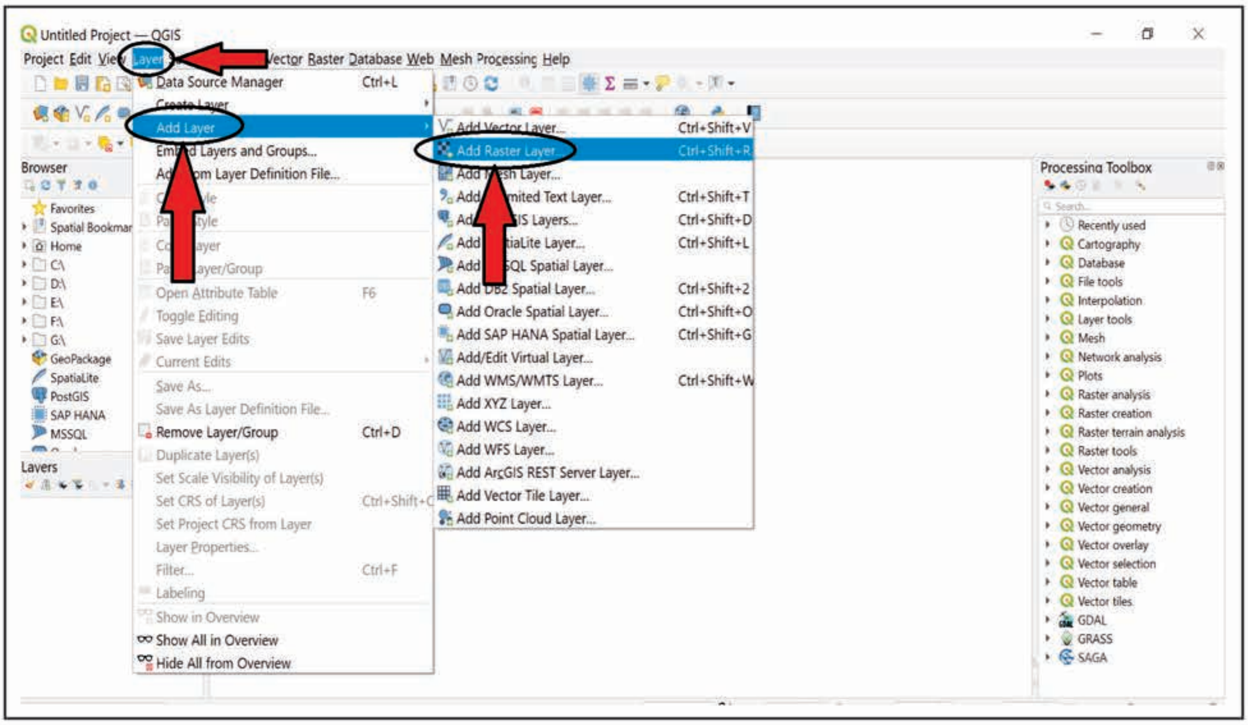
↓

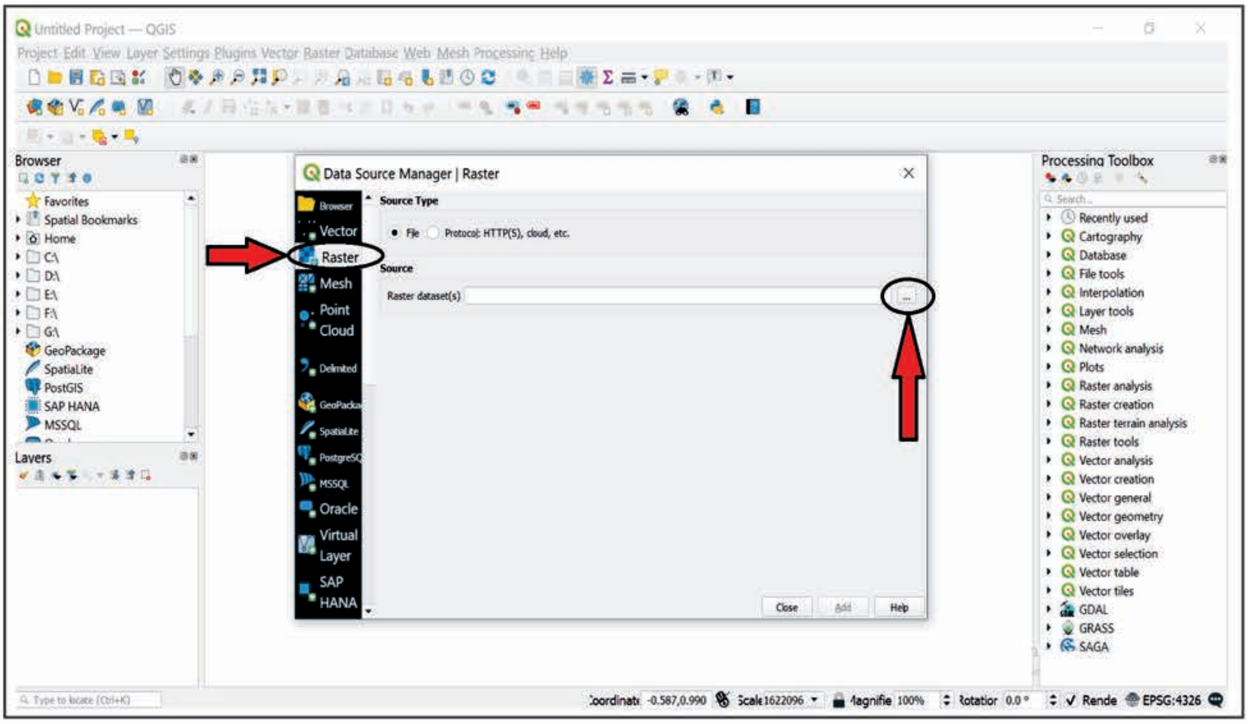
Click on the 'Start Geoferencing' Icon
to complete the Georeferencing

Step 01: Open QGIS Software and click on "Layer" in menu toolbar

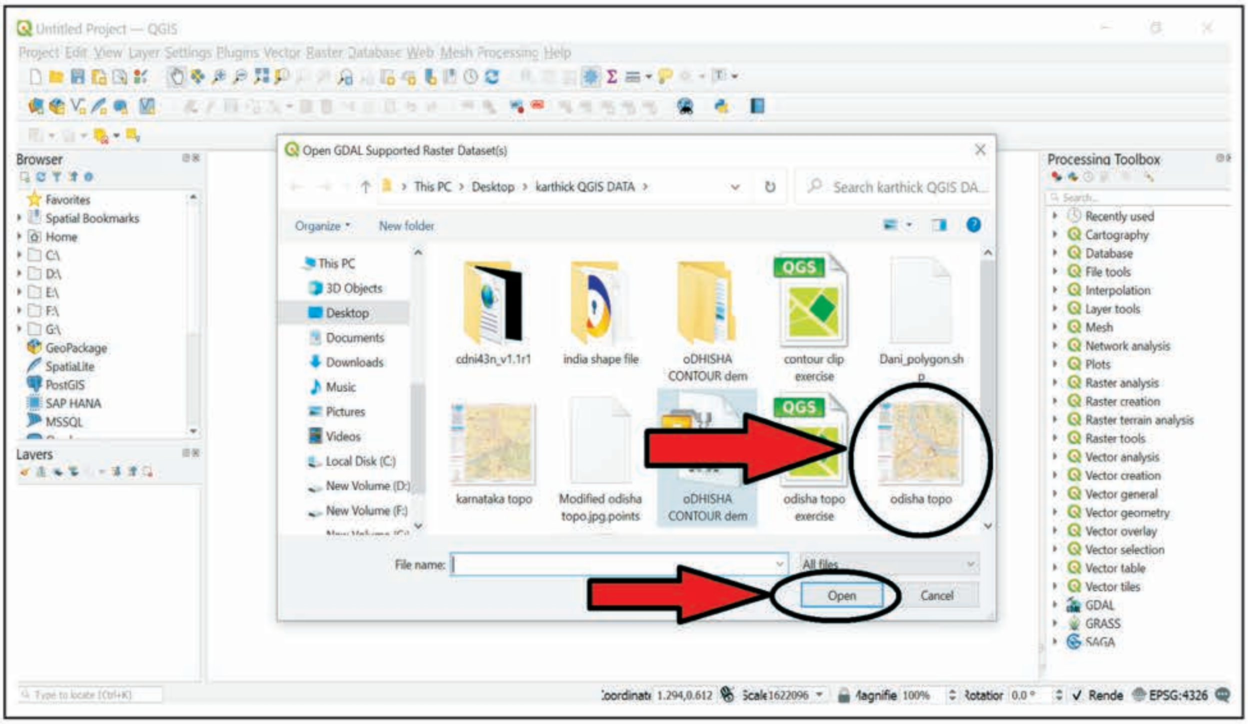


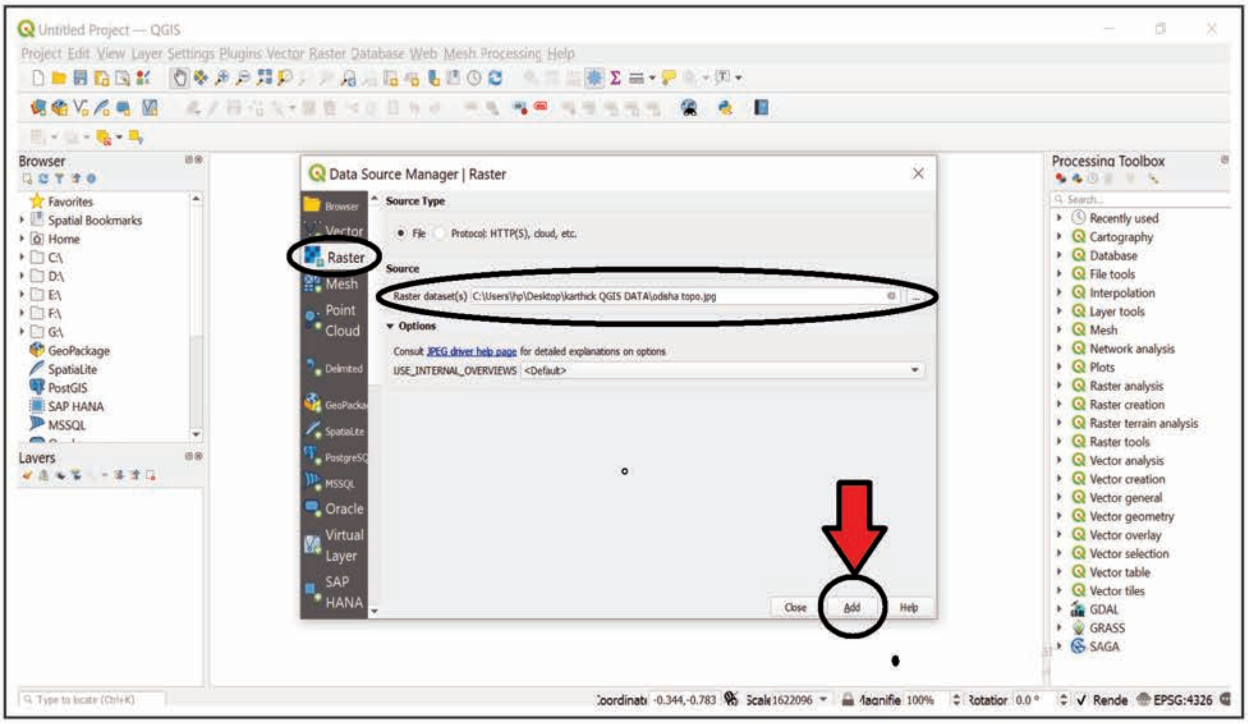
Step 02: Select 'Add Layer' and click 'Add Raster Layer' .



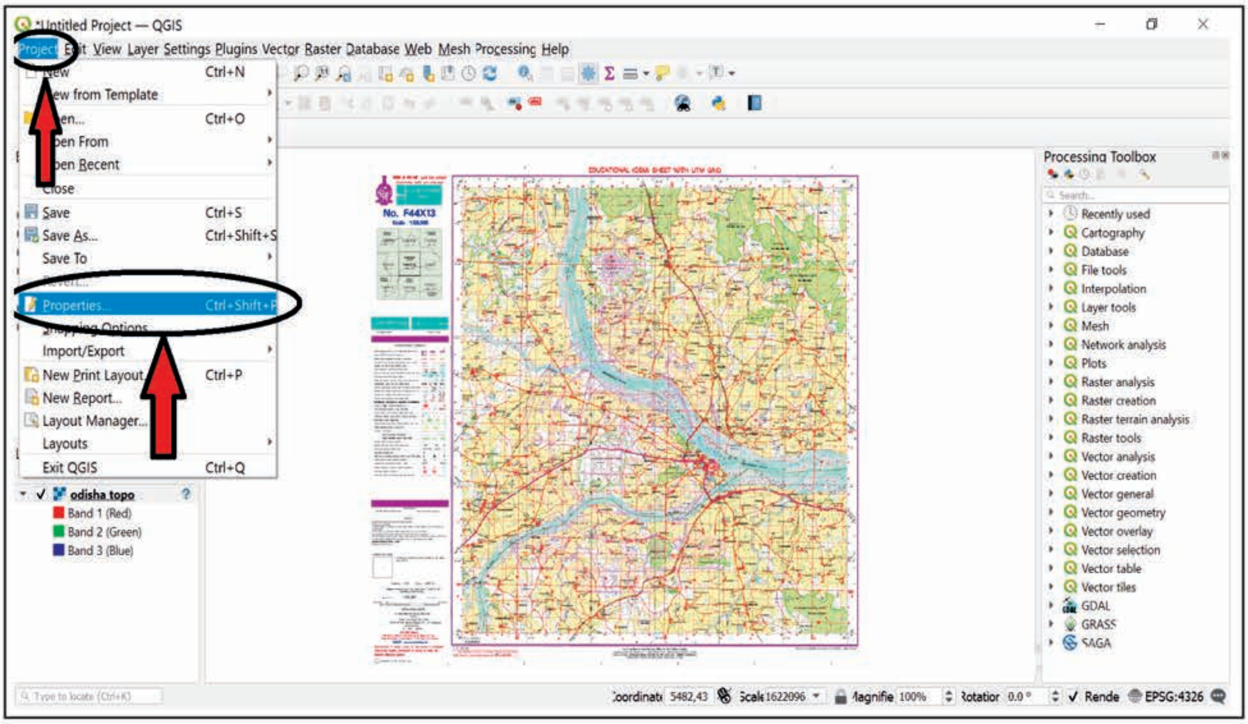


Step : 3 Add Raster file (e.g. Odisha Toposheet)

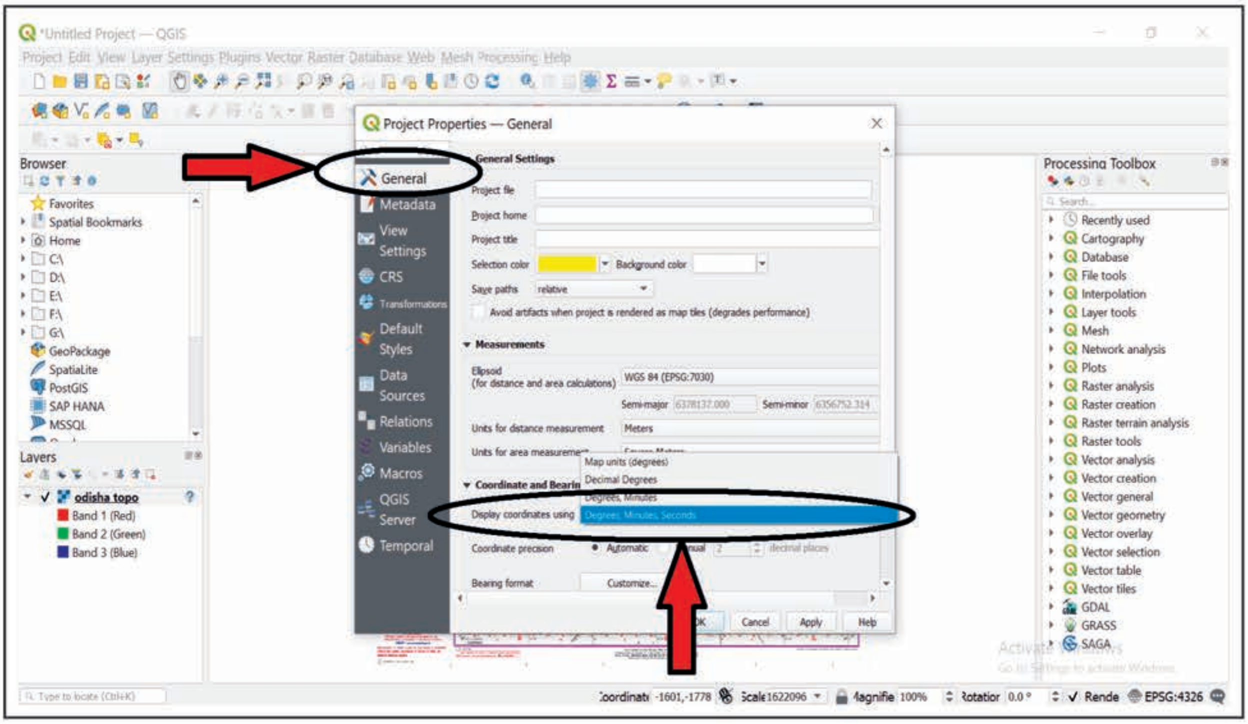




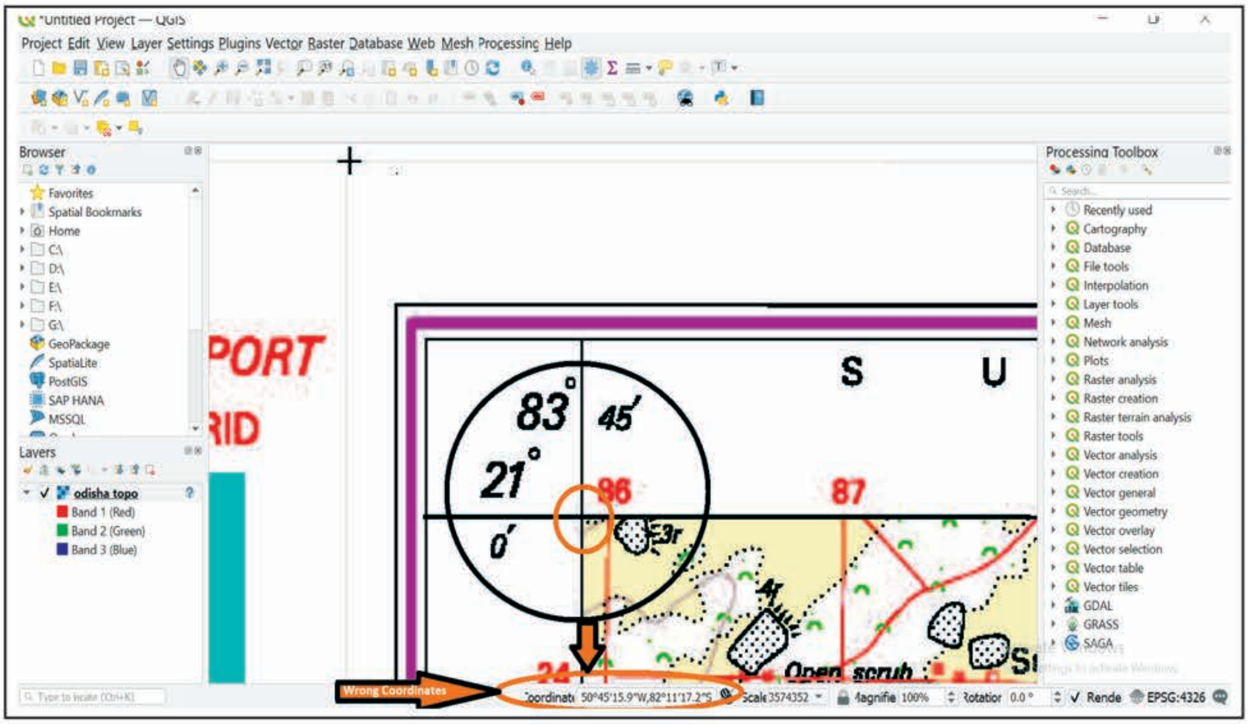
Step 04: Click on the'Project' and Select 'Properties'.



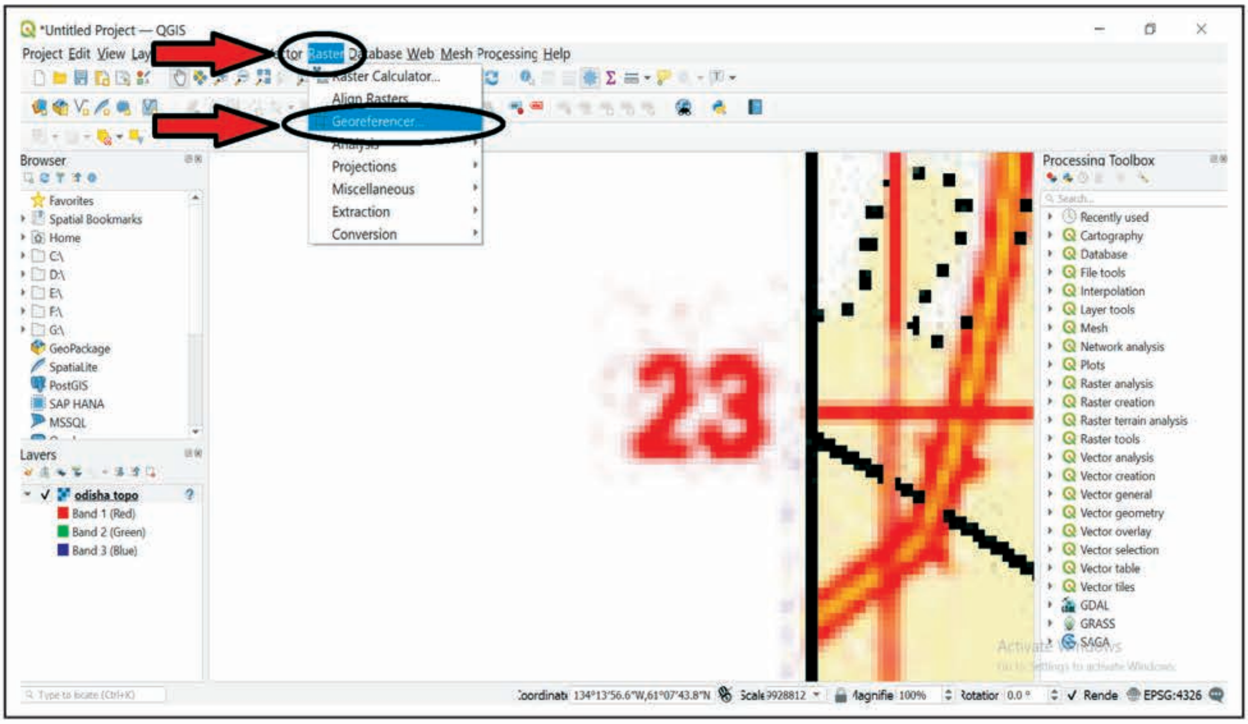
Step 05: set project properties :In 'General' tab under 'Project Properties' select 'Display Cordinates' using : 'Degrees, Minutes, seconds'



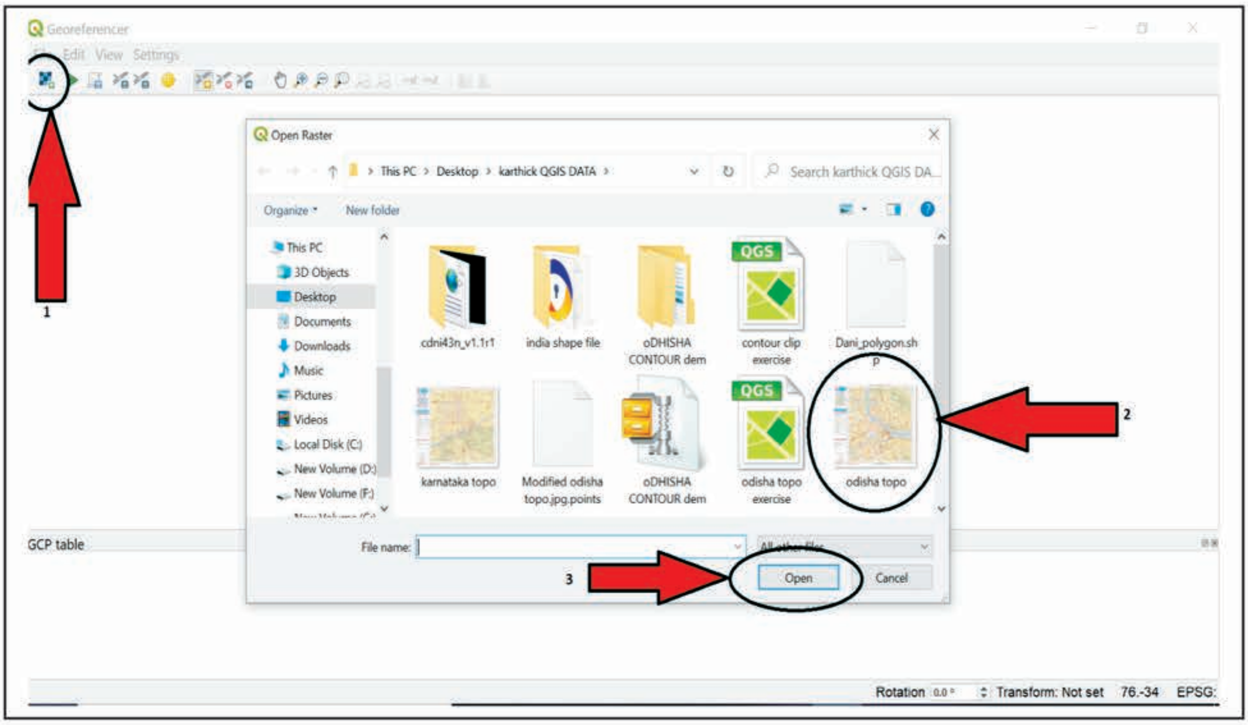
You can see wrong coordinates being shown as the Raster file (Toposheet) is not georeferenced



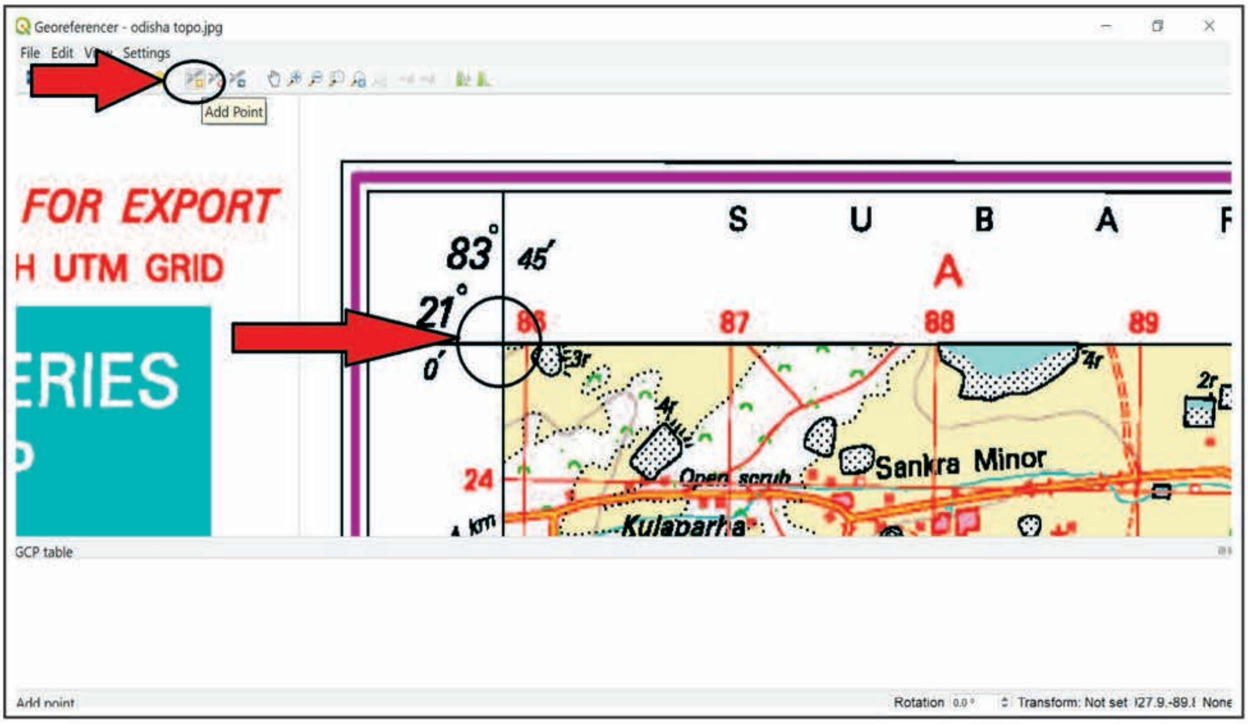
Step 06: Click 'Raster on Tool bar and select 'Georeferencer'



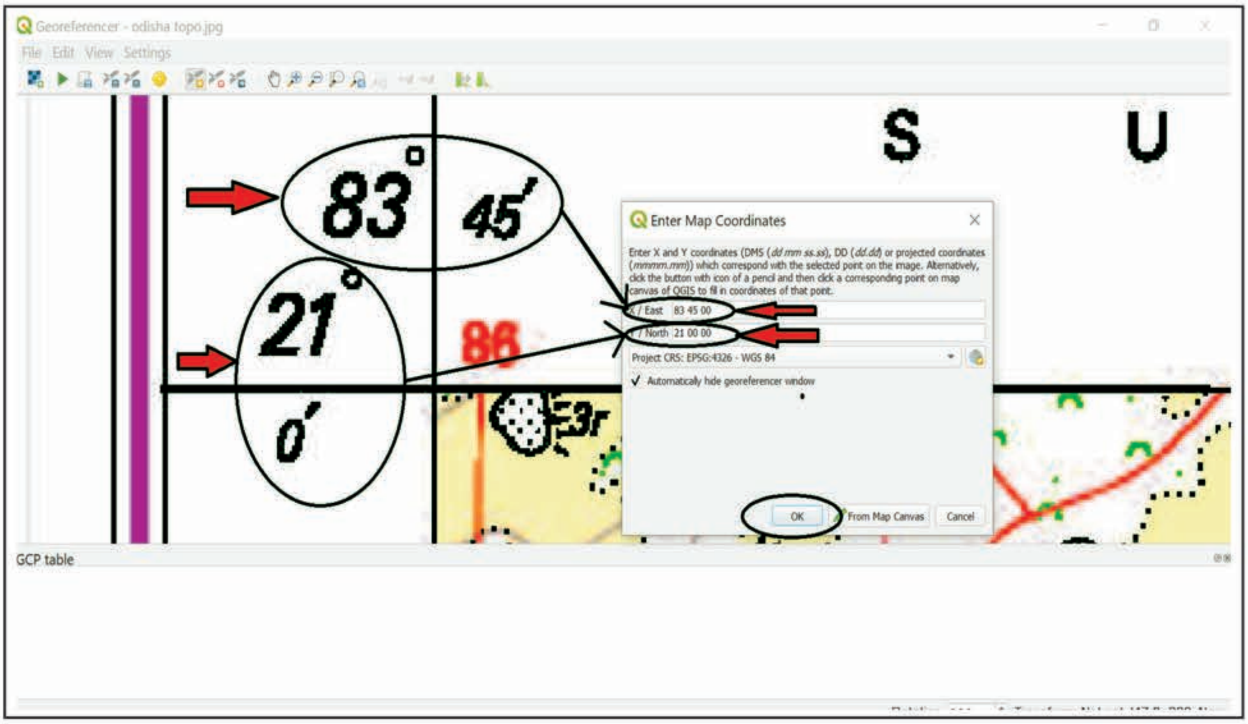
Step 07: Click 'Open Raster' tool icon and open Toposheet
for example Odisha Toposheet



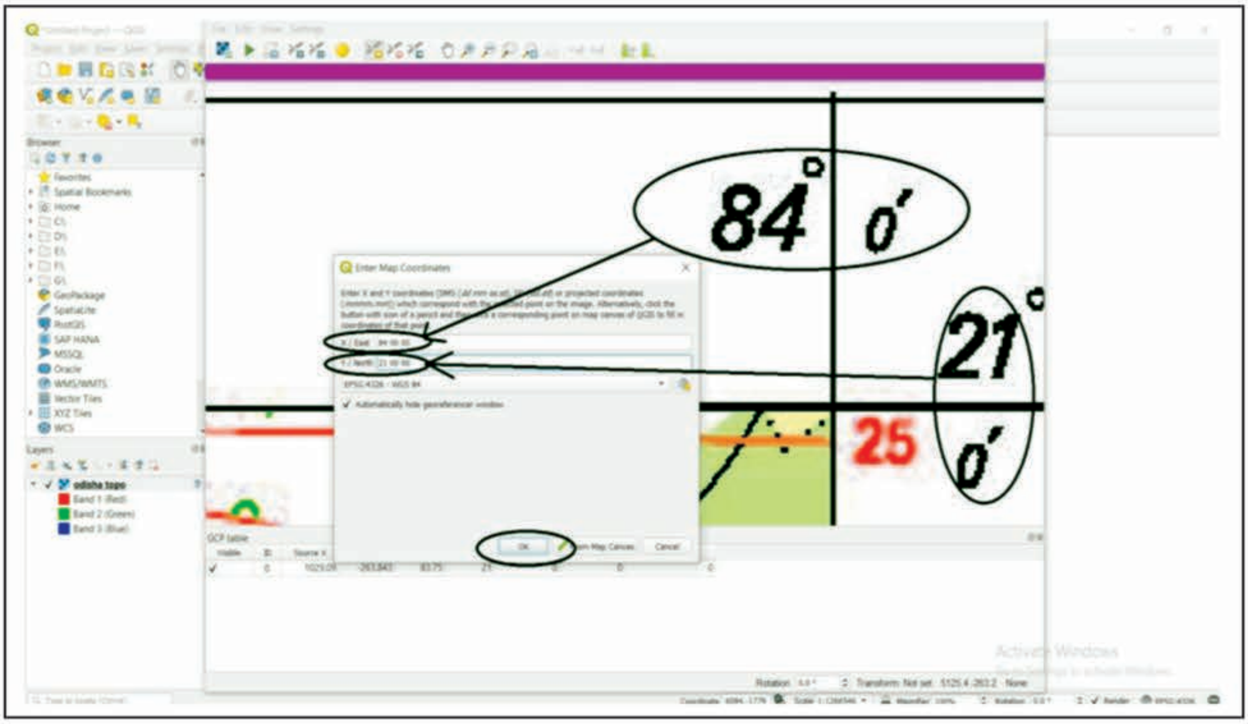
Step 08: Click on 'Add Point' tool and click at the corners of Toposheet (i.e., at the intersection of Latitude & Longitude)

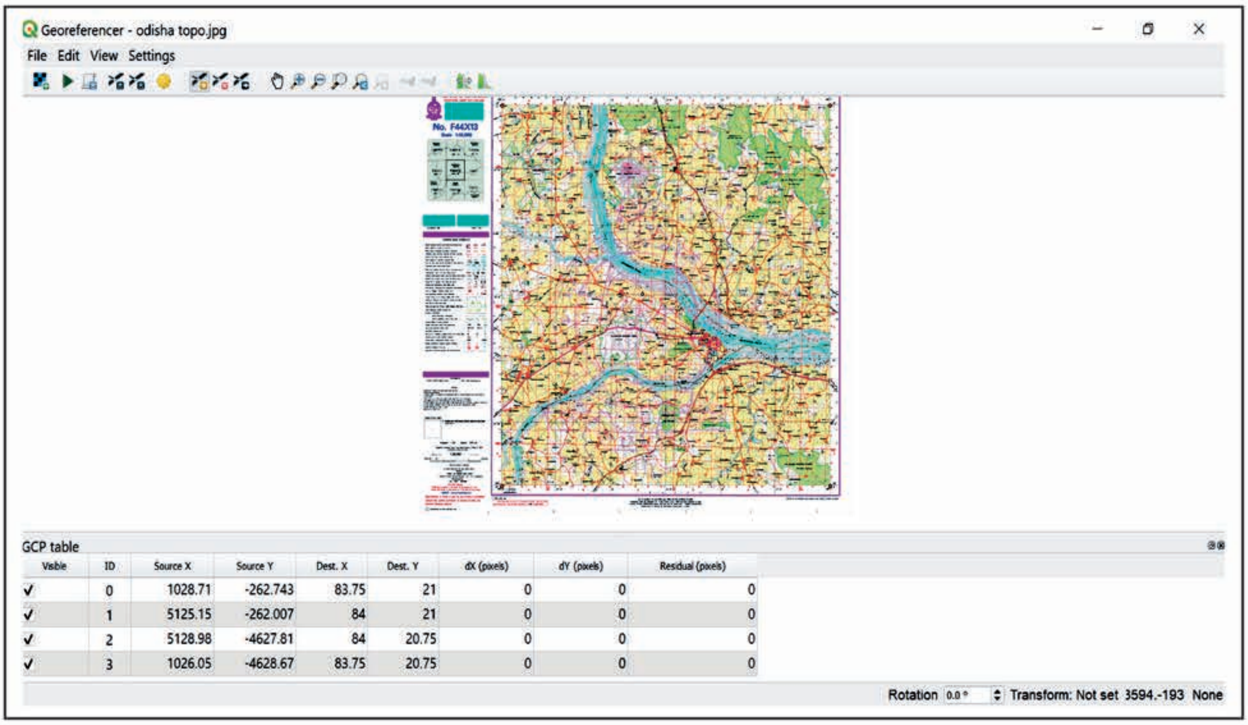


Step 09: Enter the given coordinates in the popup window and select coordinate system as WGS 84

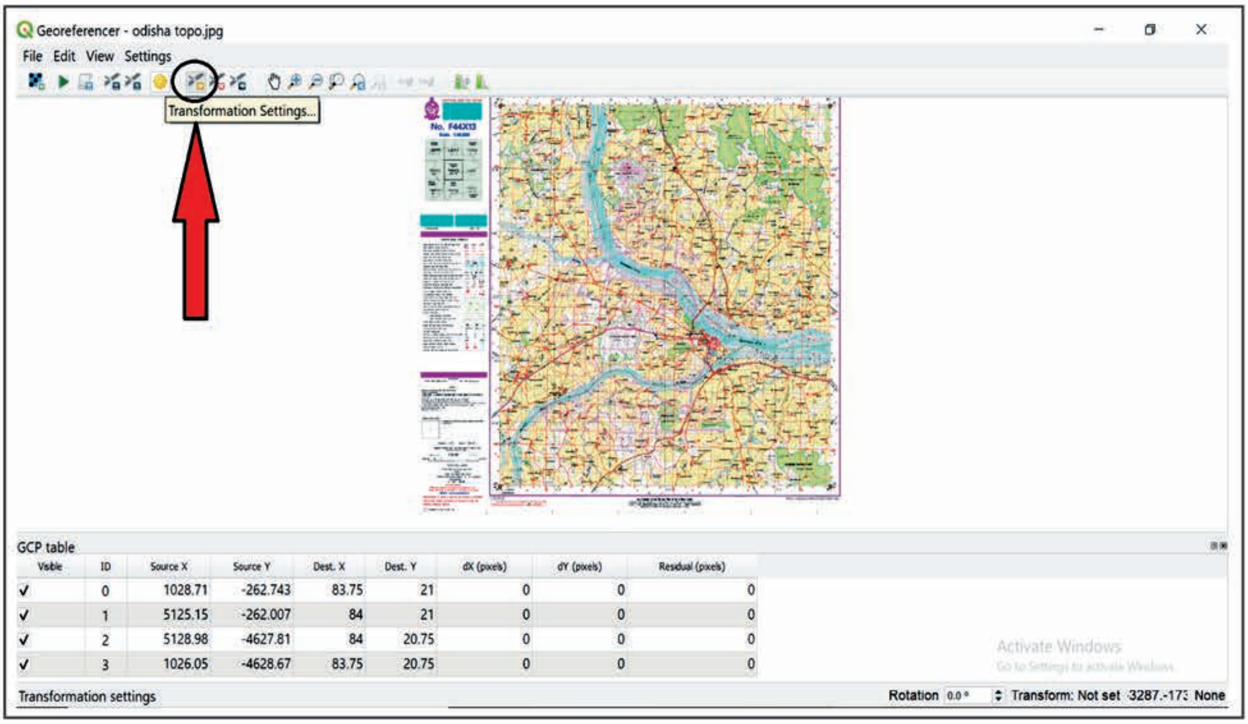


Repeat the step for other corners and intersection points on Toposheet.

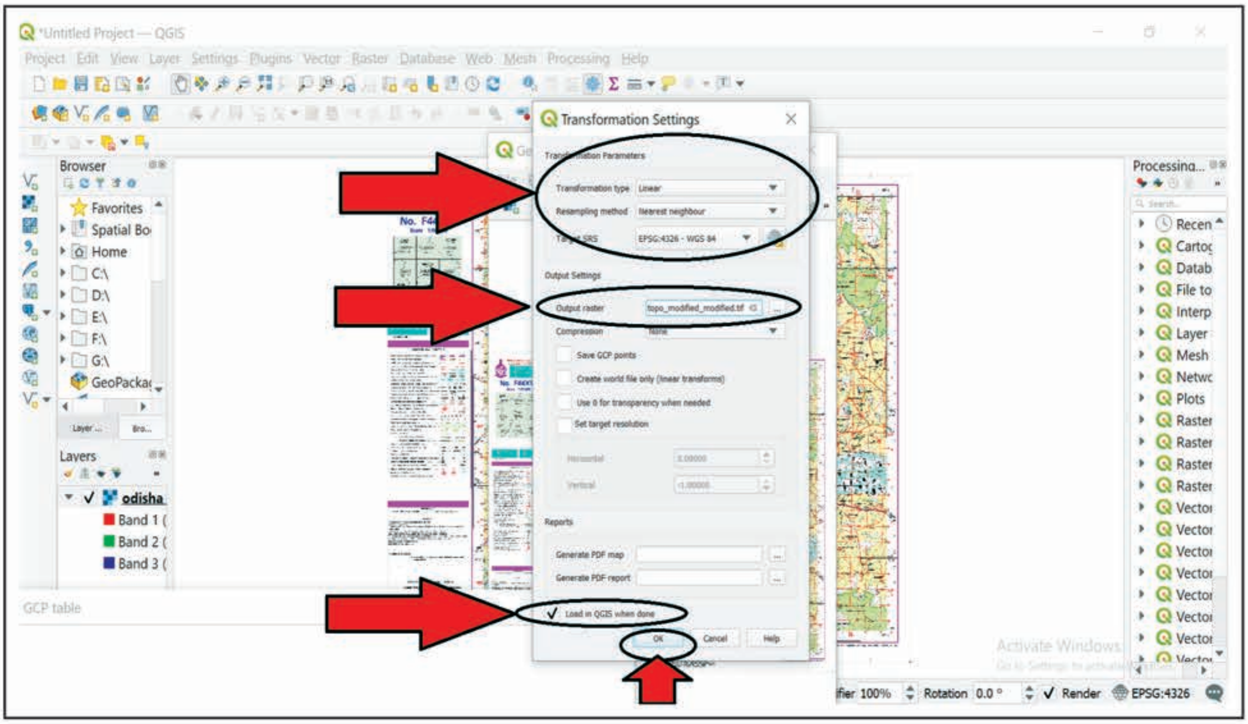




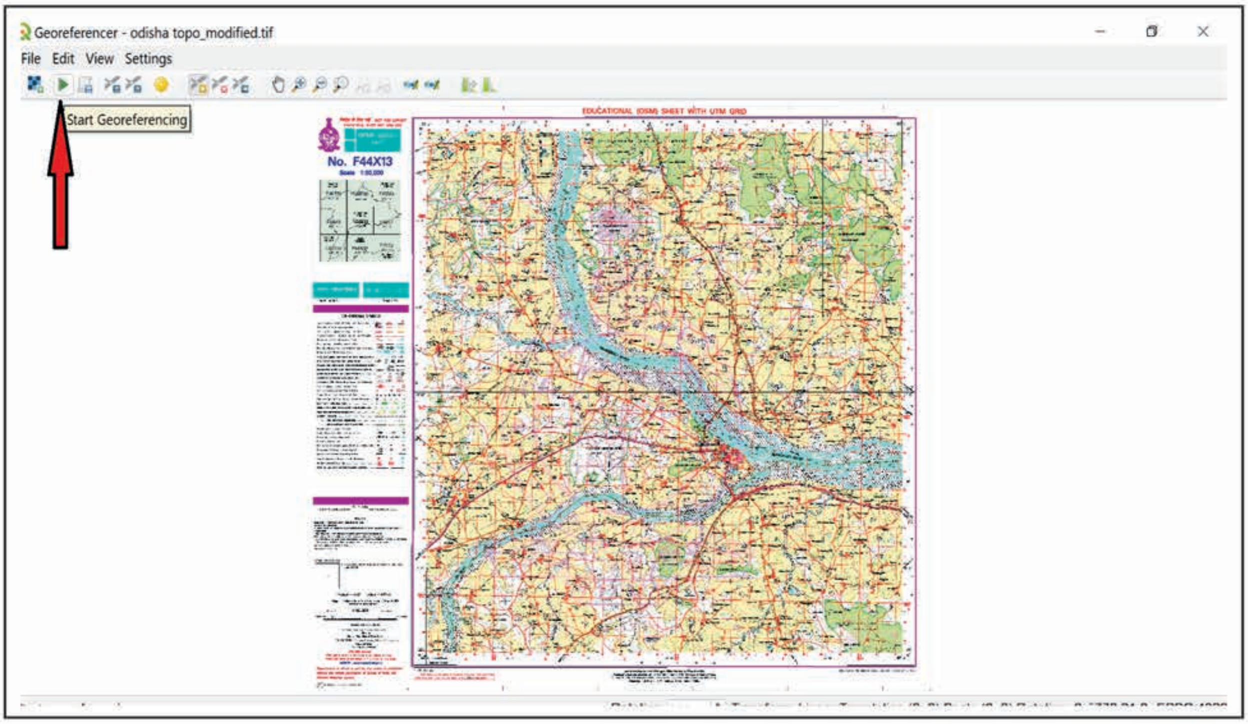
Step 10: Click on 'Transformation Settings'



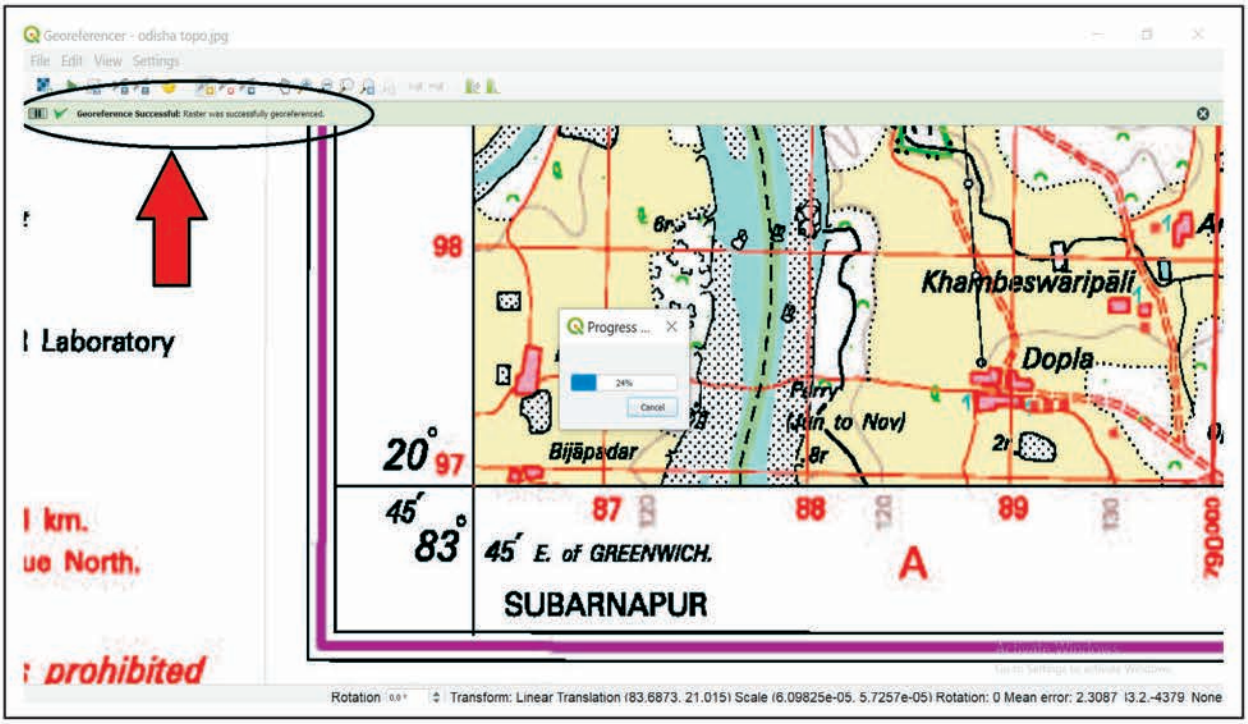
Select the fields in popup window as:
Transformation type: Linear
Resampling Method: Nearest neighbour
Target CRS: Project CRS: WGS 84
Select the output file location
Check the 'Load in QGIS when done' and Click OK



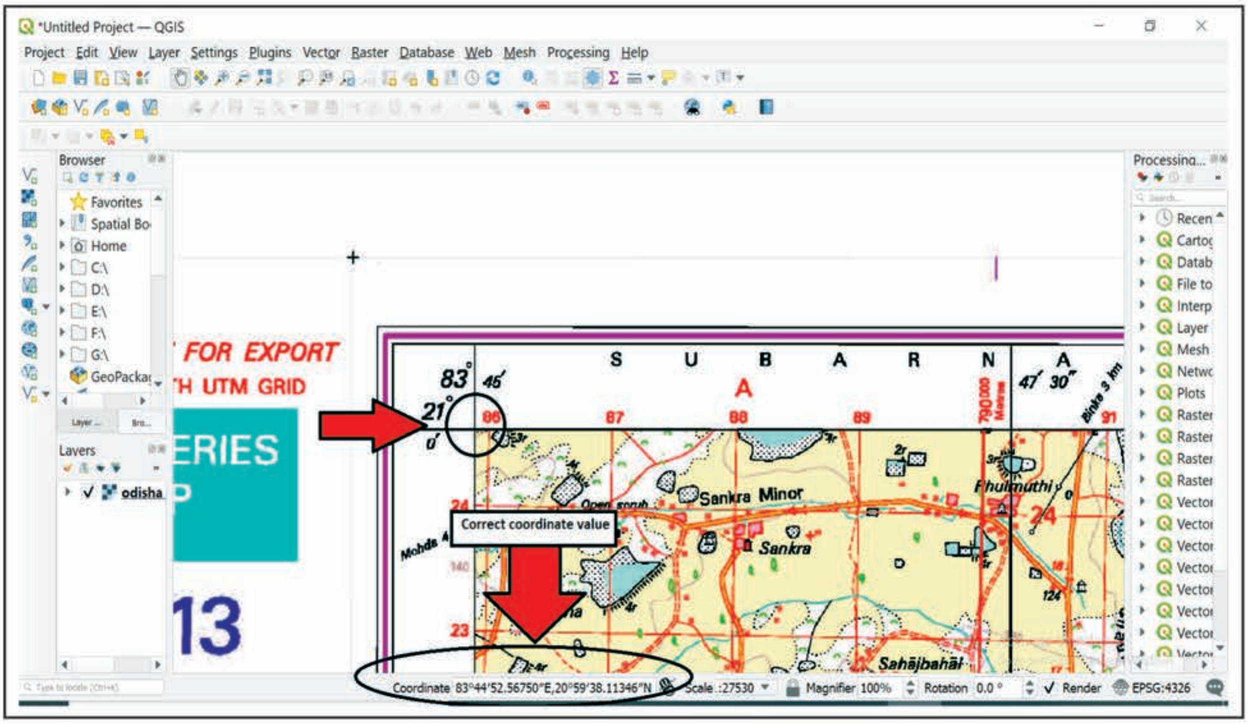
Step 11: After Transformation settings, click on the 'Start Geo-referencing' Icon to complete the Geo-referencing.



Once Geo-referencing is complete you will the get following message.



Now You can see the Correct Coordinates are being shown:



8. Georeferencing of Google Earth Image

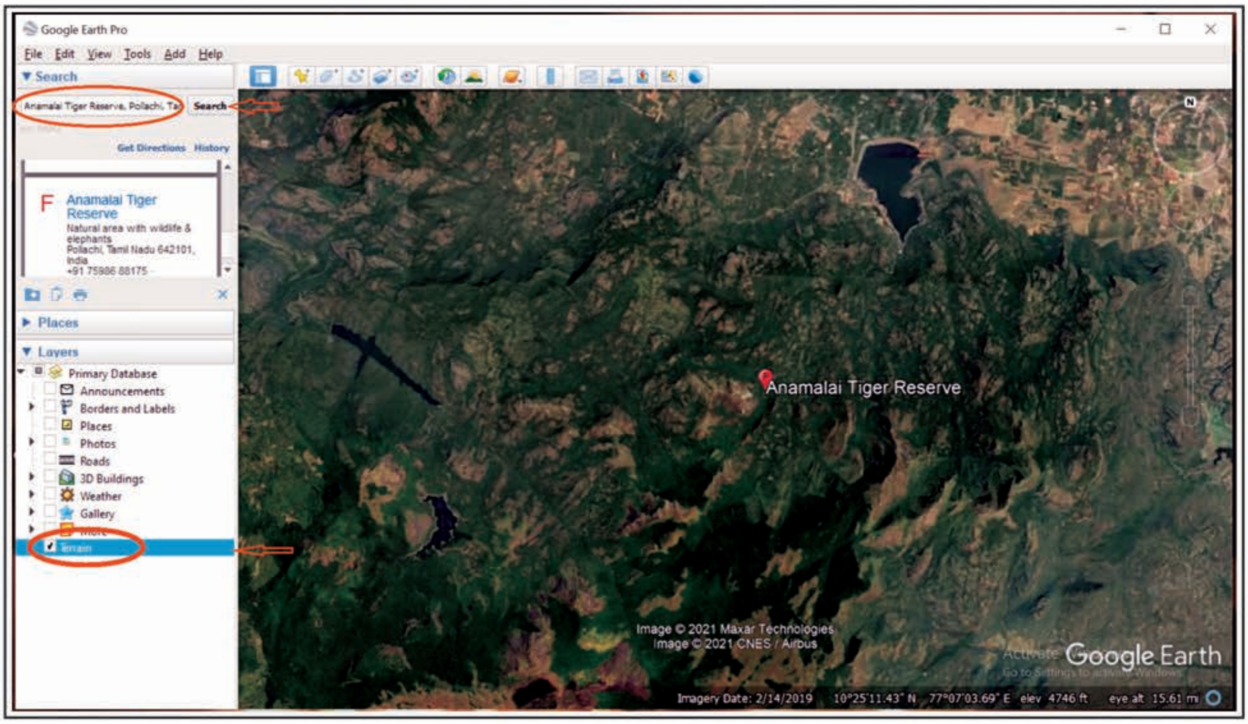
Google earth offers series of satellite imageries. These images can be georeferenced for GIS Analysis. In this exercise, we will deal about the detail procedure involved in georeferencing of google earth image in QGIS.

Part A : Extracting data from Google earth

1. Open Google Earth Pro desktop version.

2. Use Search option to locate the area for georeferencing>>Anamalai Tiger Reserve.

3. Layers>> Drop down >>Check only terrain and uncheck all other elements.



After processing, the area chosen will be located on the map.

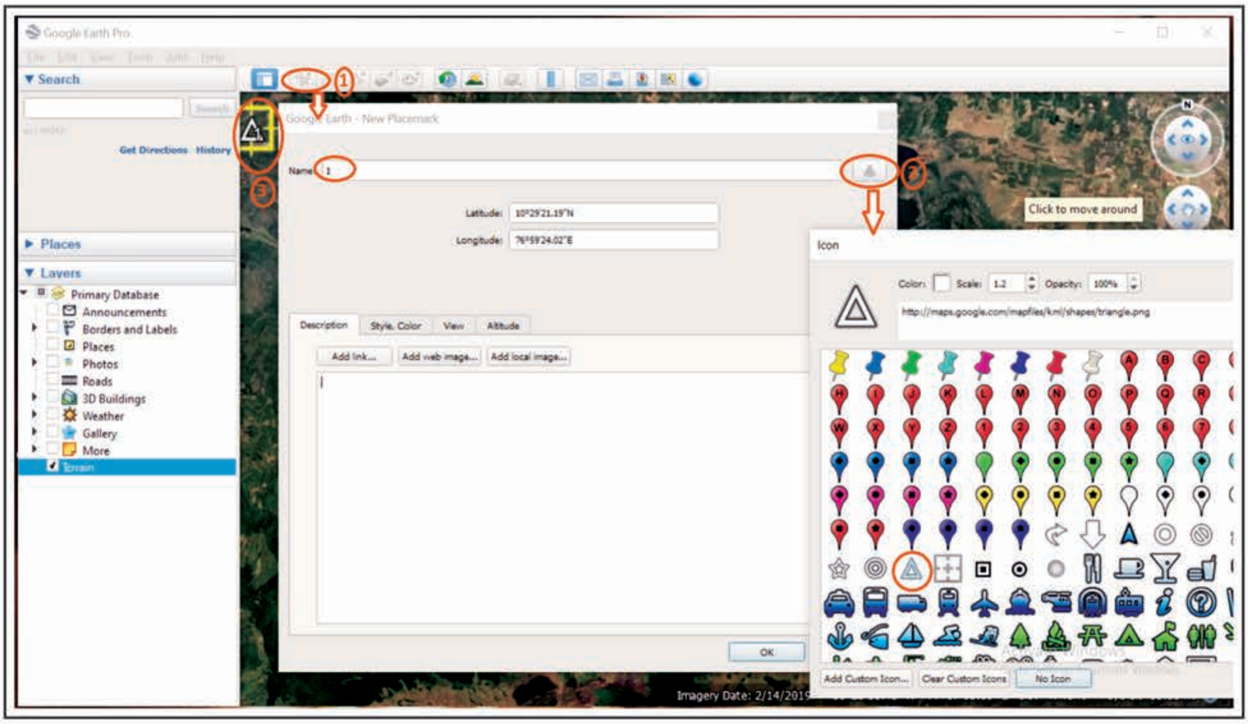
4. Selection of points for georeferencing:

Select Add Place mark tab in the tool bar.

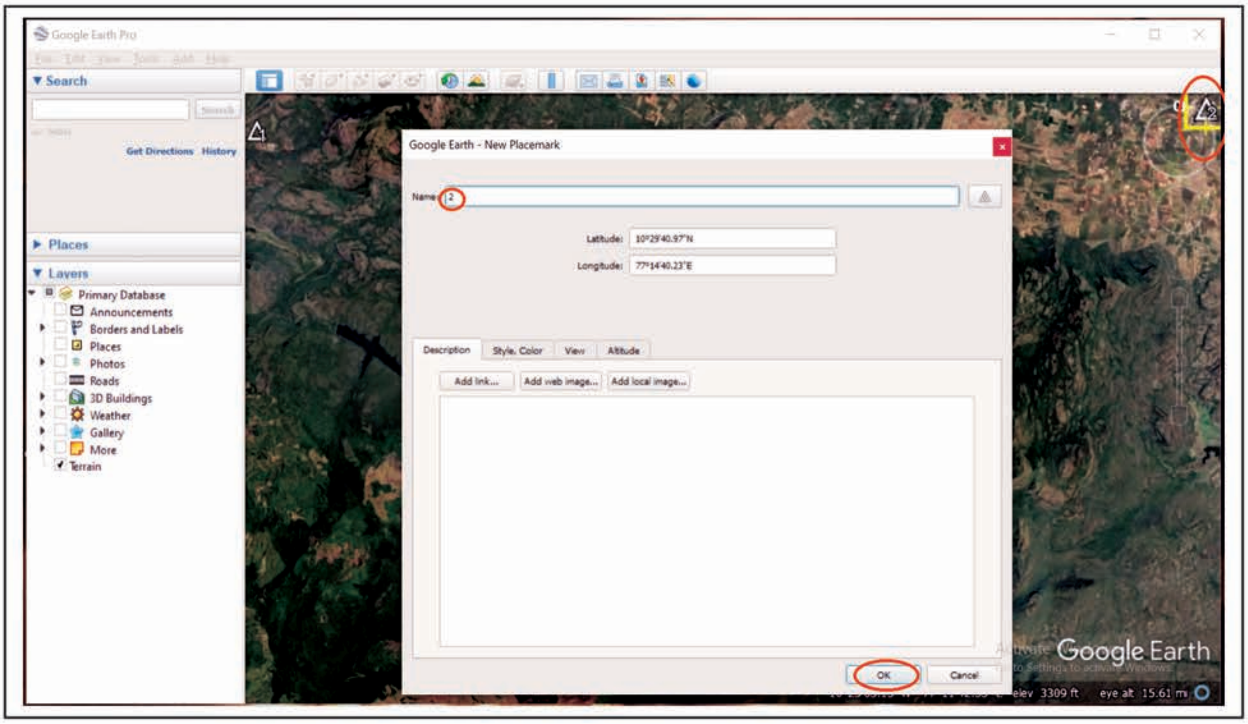
* Pop-up box will open
  >> give name to the point as 1
  >> select the symbol from drop down menu.

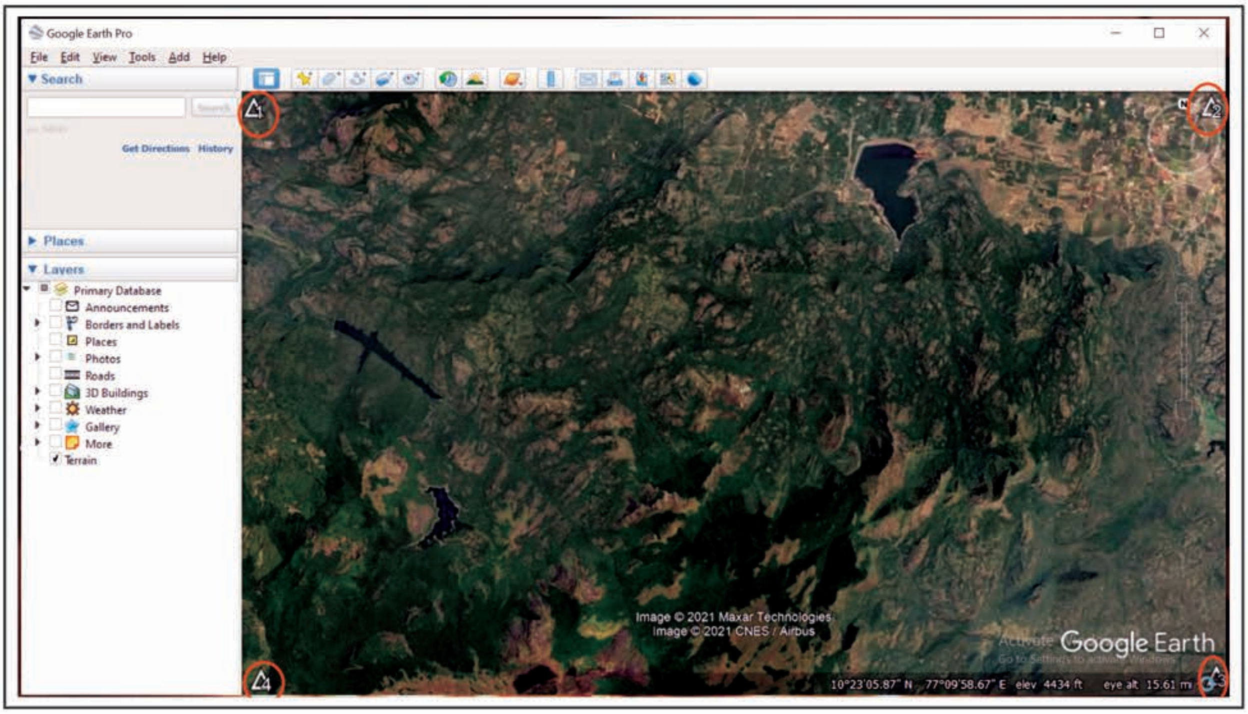
* Cursor will be changed into selected icon. Place it in the upper left corner as first point.

* Latitude and longitude will be simultaneously updated.



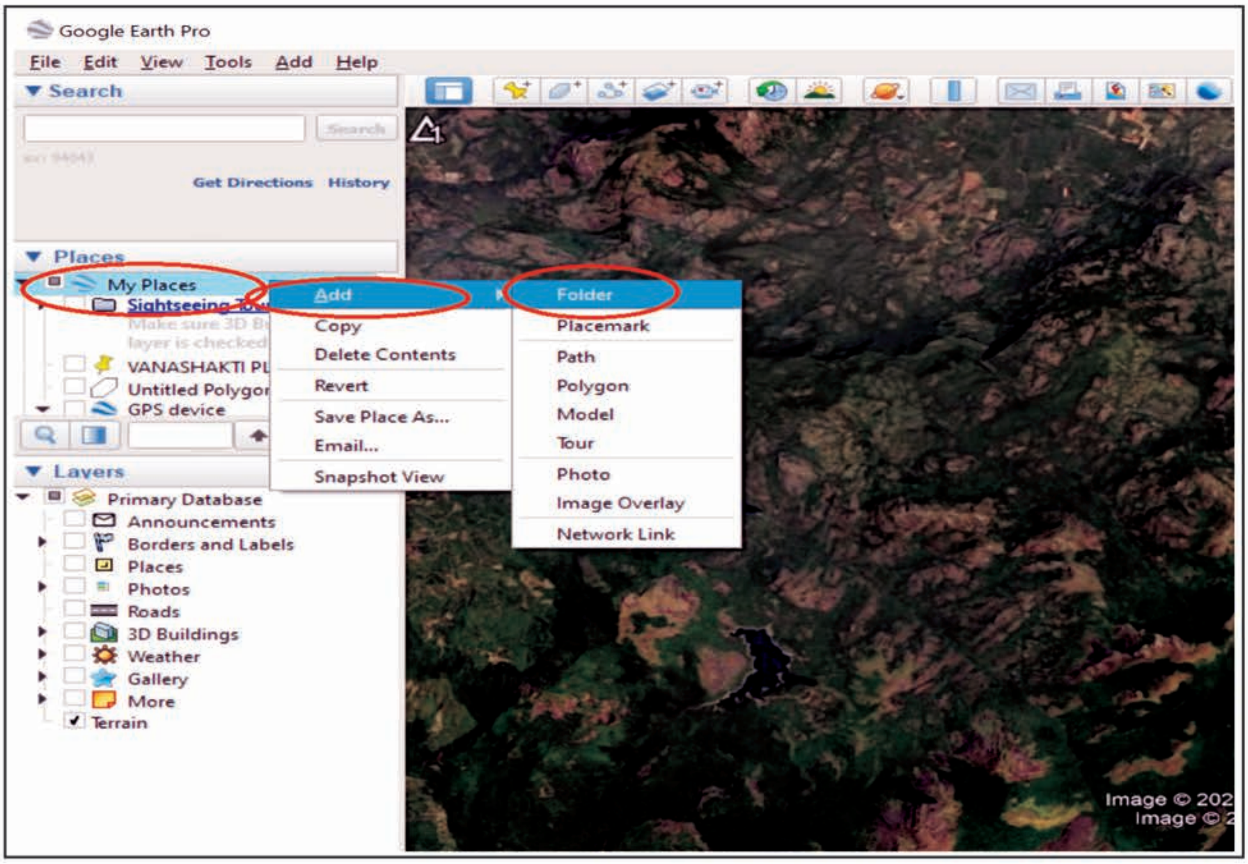
* Select the Second point in clockwise direction.
* Similarly, Third and Fourth Point to be placed in remaining corners, in clockwise direction.
* Minimum 4 points needs to be selected.

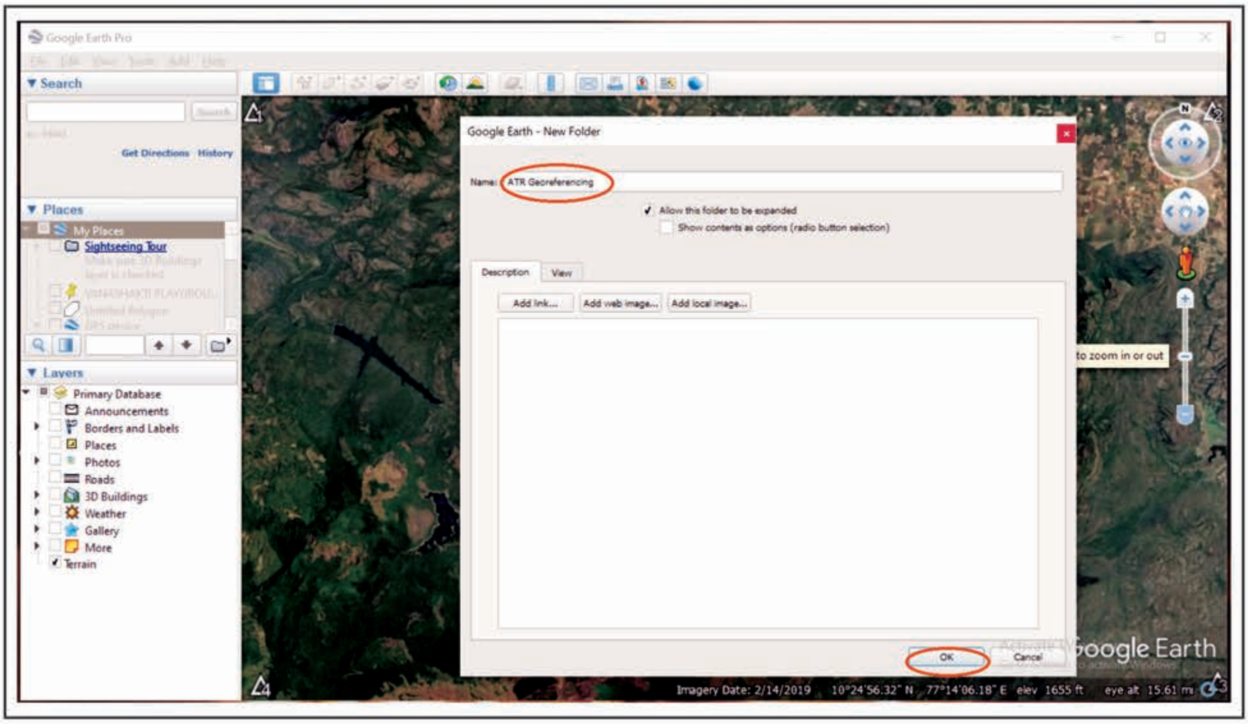




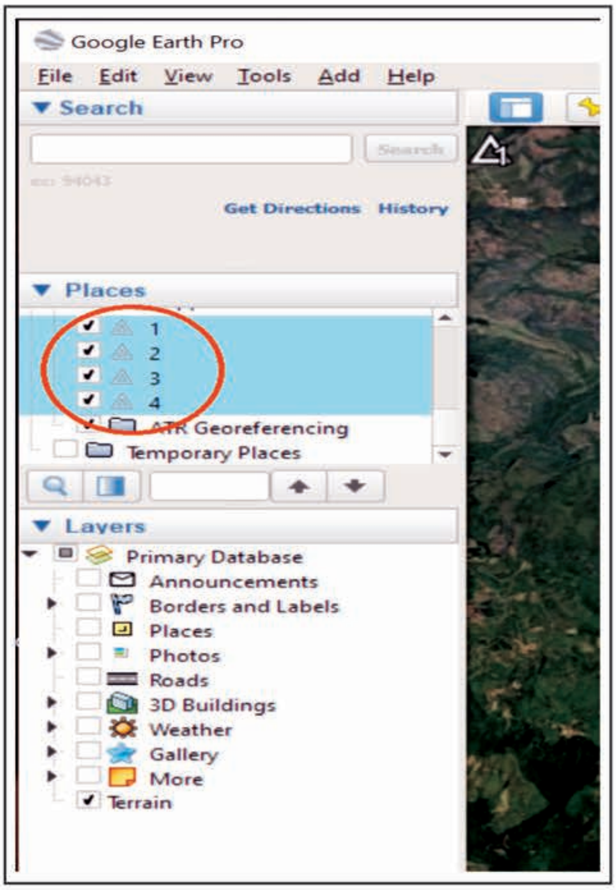
5. Places>> My places >> Add > Folder >> Box will open >> Give Name of the folder : Here ATR Georeferencing.

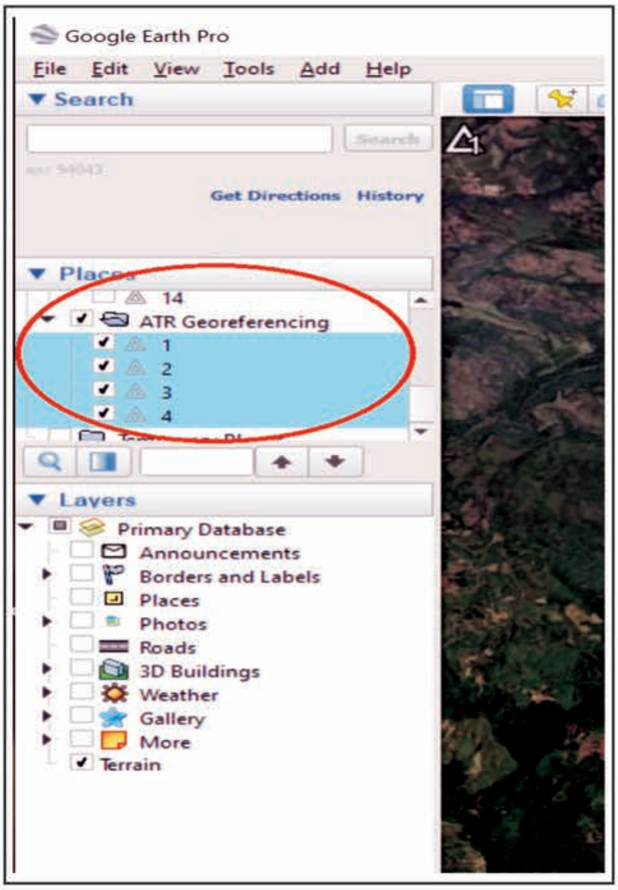
* New folder will be created under My places.



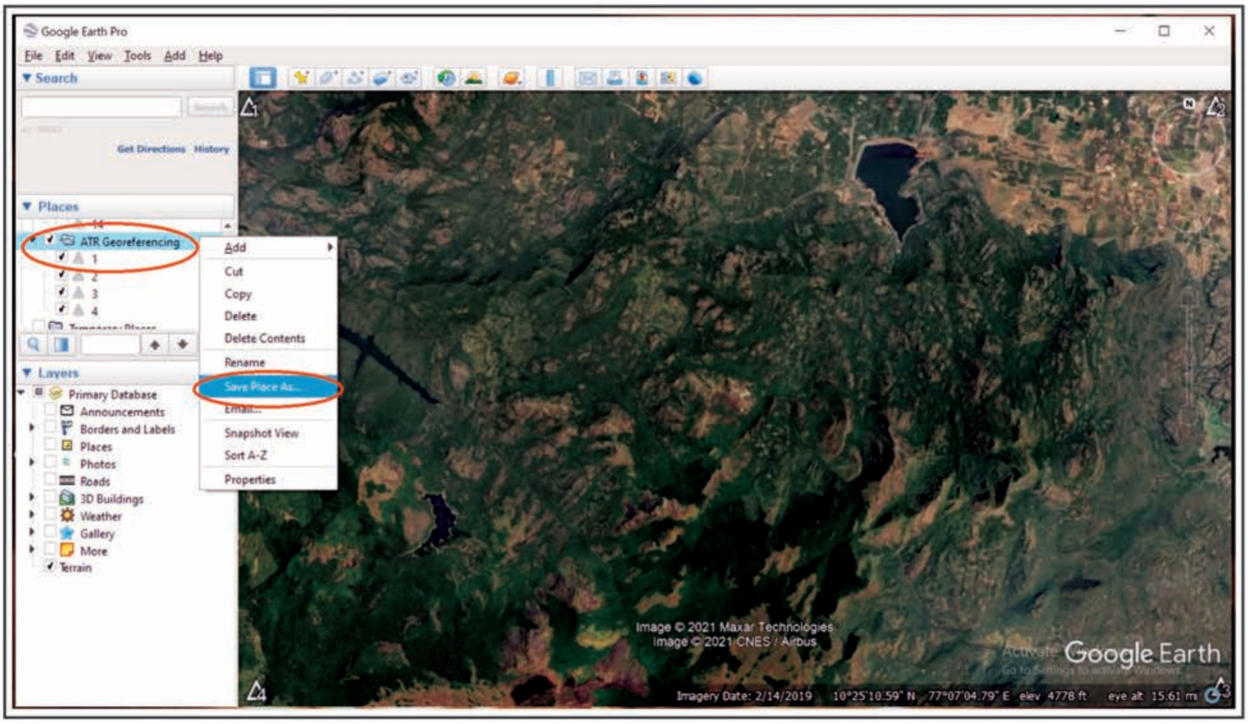


* Selected points 1,2,3,4 are seen under my places.
These can be copied to ATR Georeferencing folder.

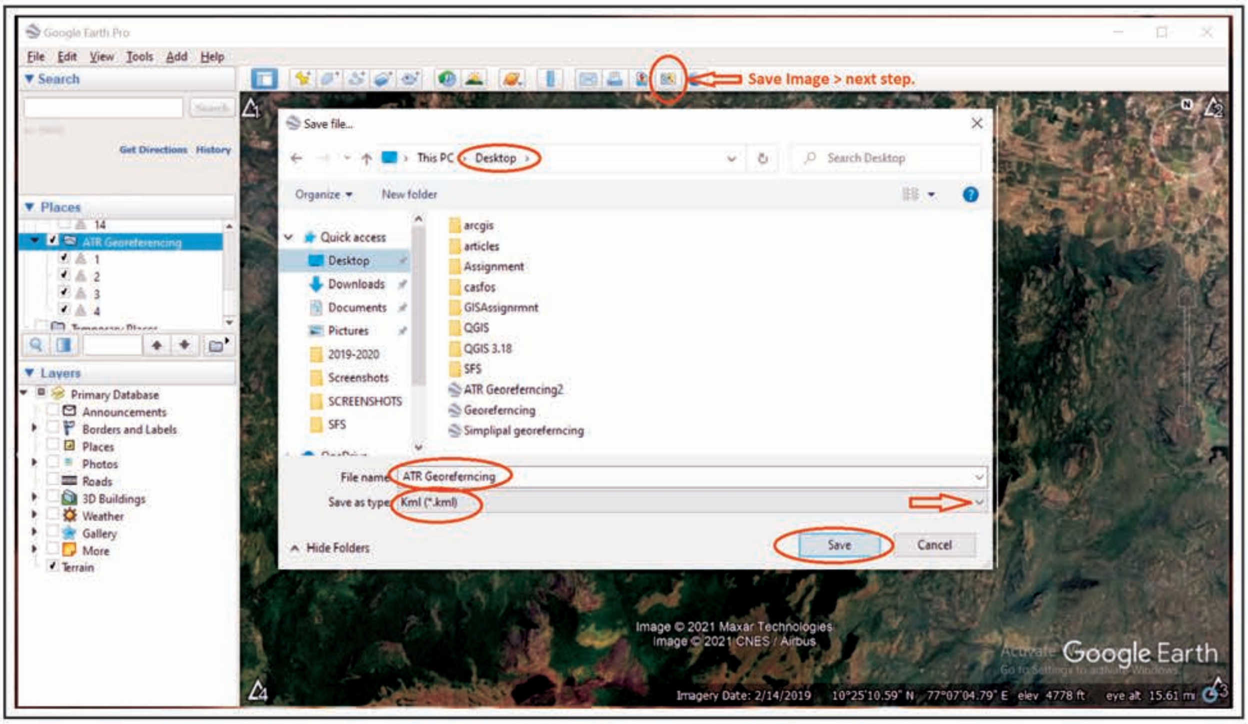




6. Saving ATR Georeferencing folder and data :
   * Right click on ATR Georeferencing >> Save places as



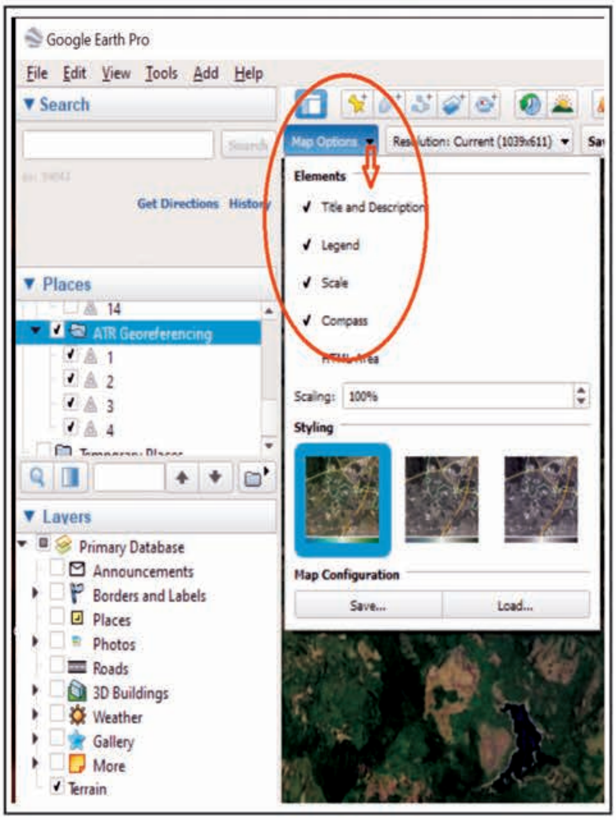
* Save file box will open >Save on desktop >File name: ATR Georeferencing.
* Save as type: Kml
* Save the file.

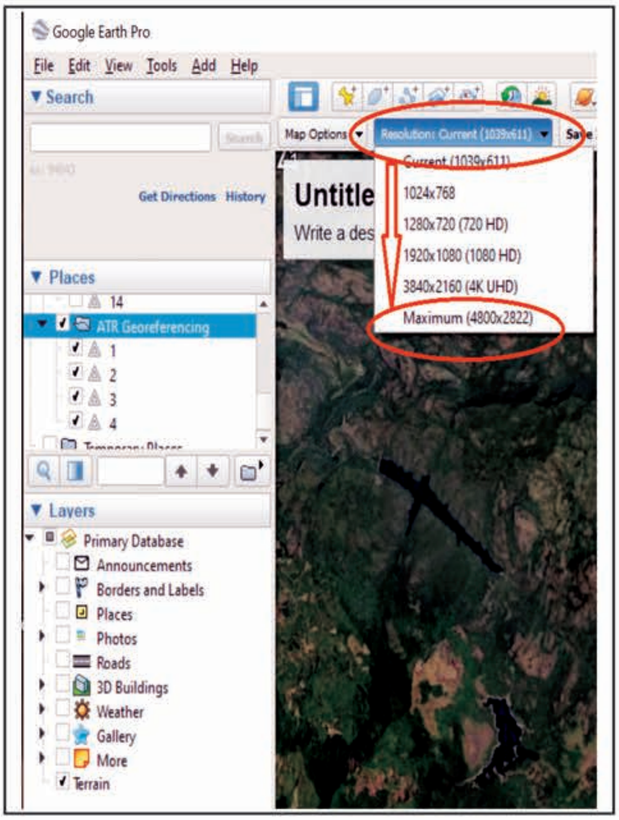


* Georeferencing data is thus extracted and saved on computer.

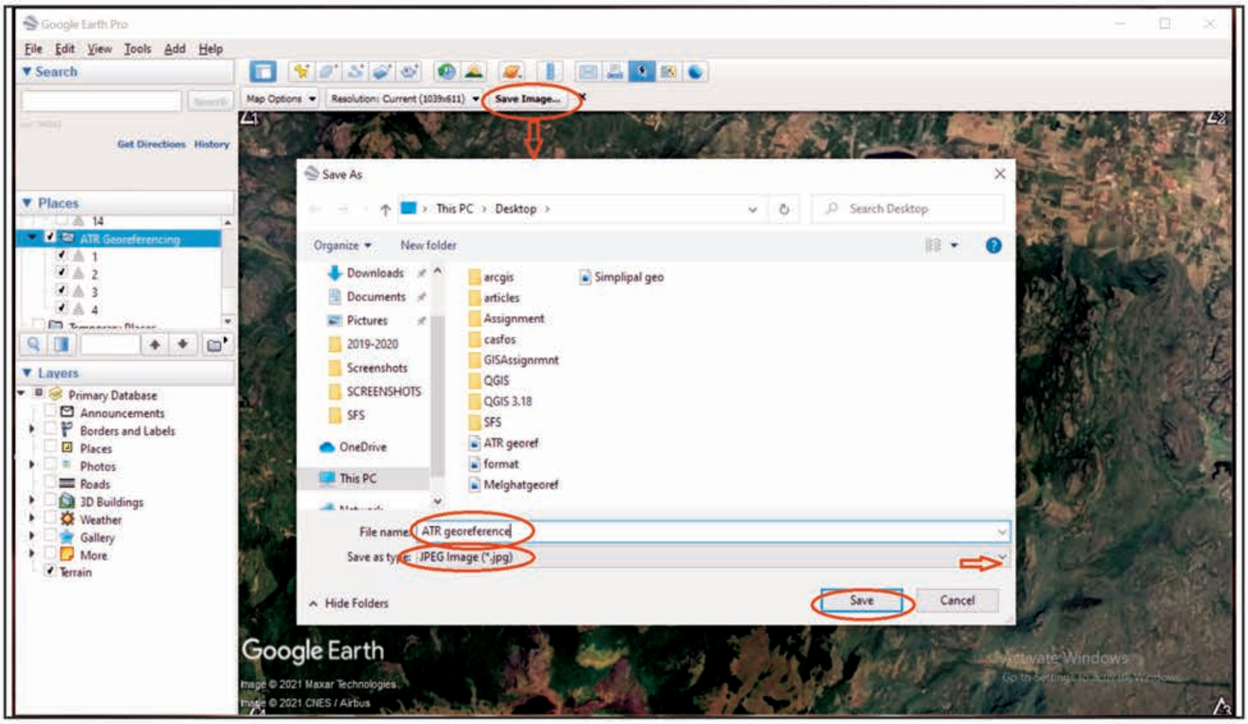
7. Getting Basic map/image for georeferencing :

* F11 or View >>Full screen
* Select Save image tab in the toolbar.
* Map options tab >> uncheck all elements.
* Resolution current >> Maximum.





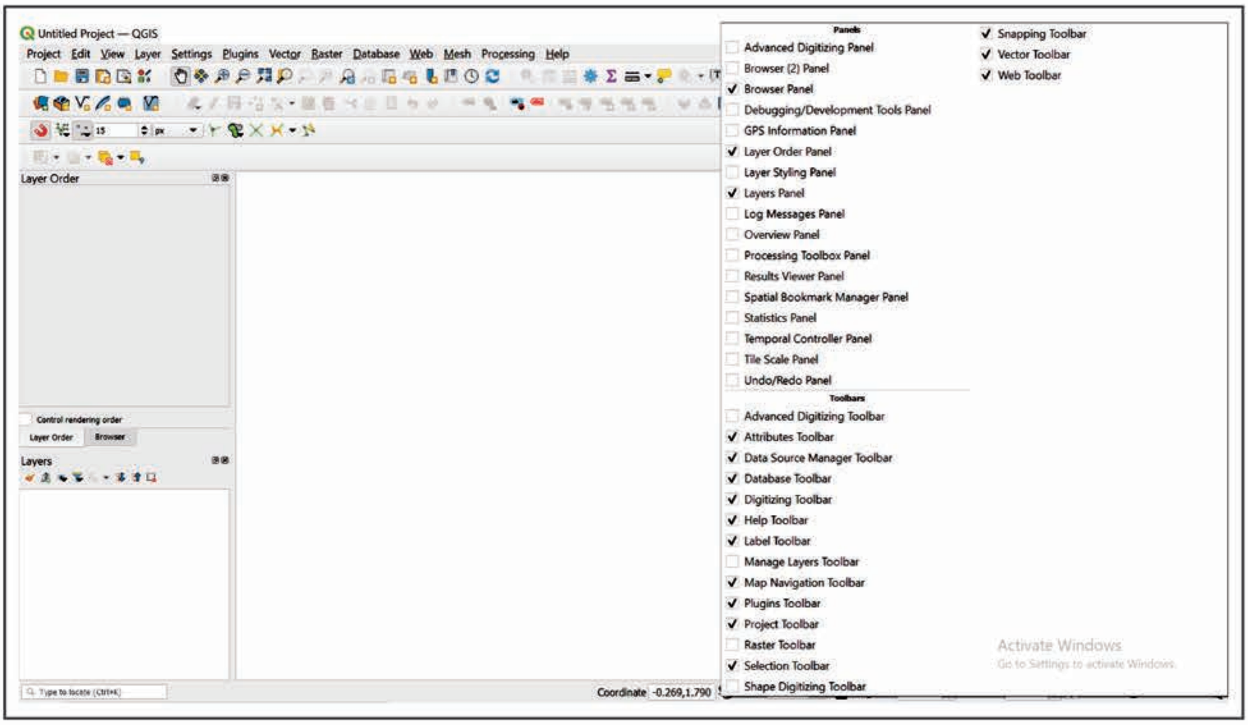
* Save image tab: File Name >>ATR Georeference and save as type JPEG Image.



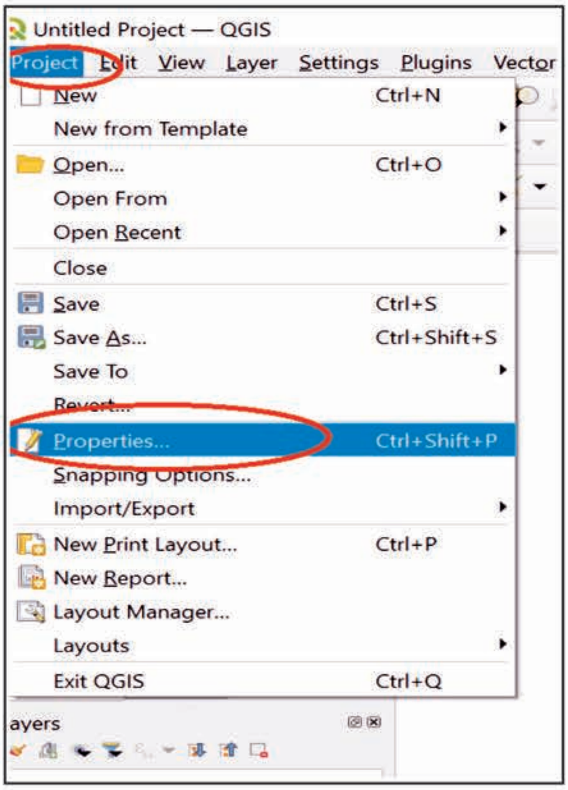
* Basic Image to be georeferenced is saved on the computer.

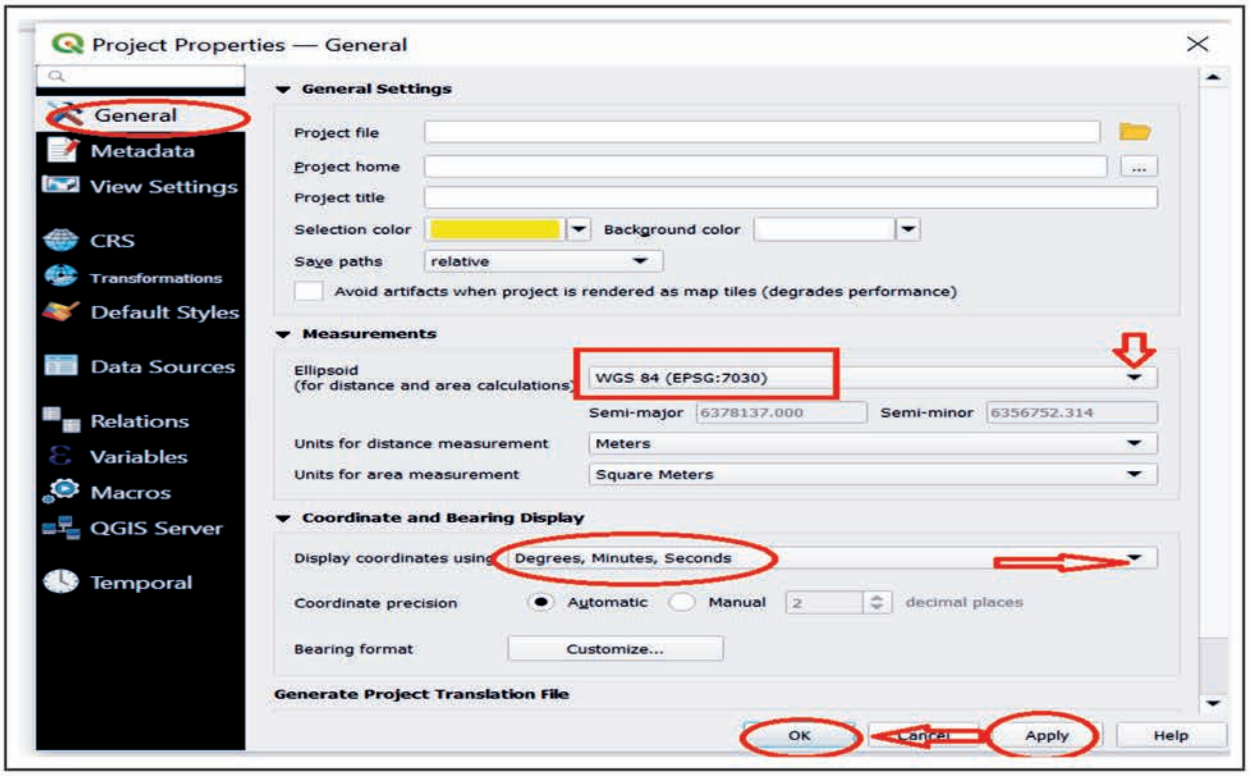
Part B: Georeferencing Of Google Earth image

1. Make Prior Settings for efficient working :
   * Right click on the tool bar and check all the required tools as shown in following picture.

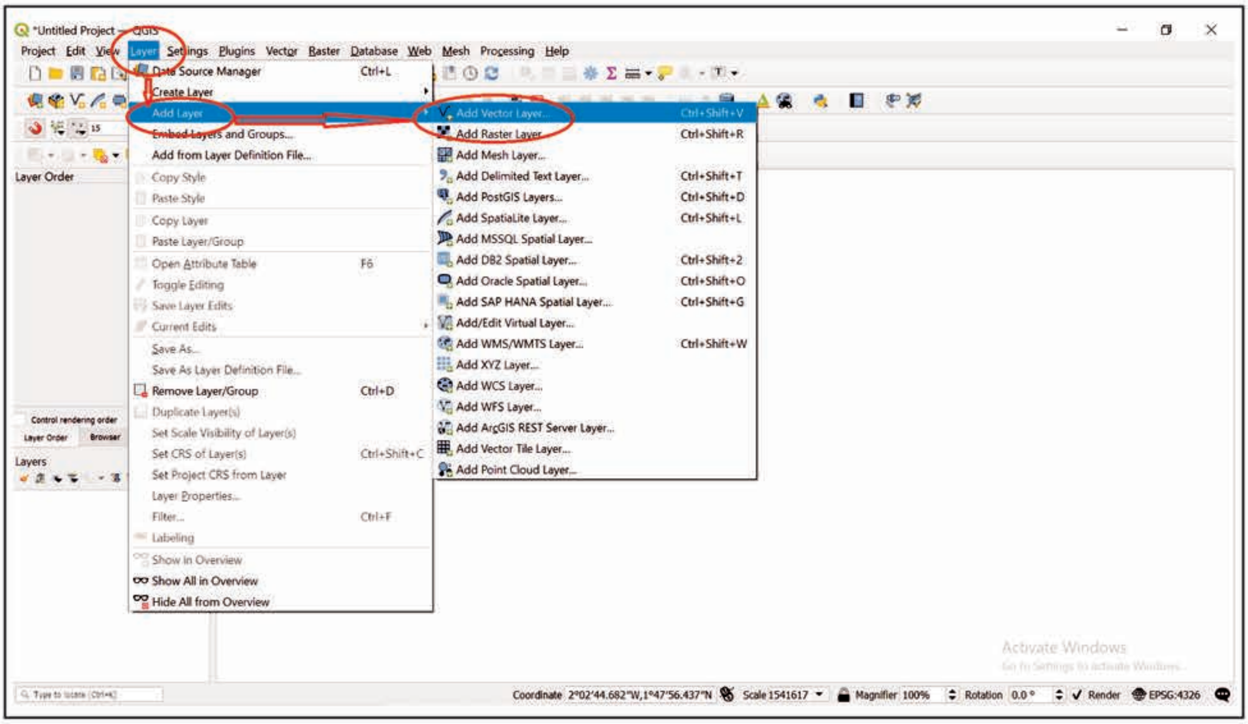


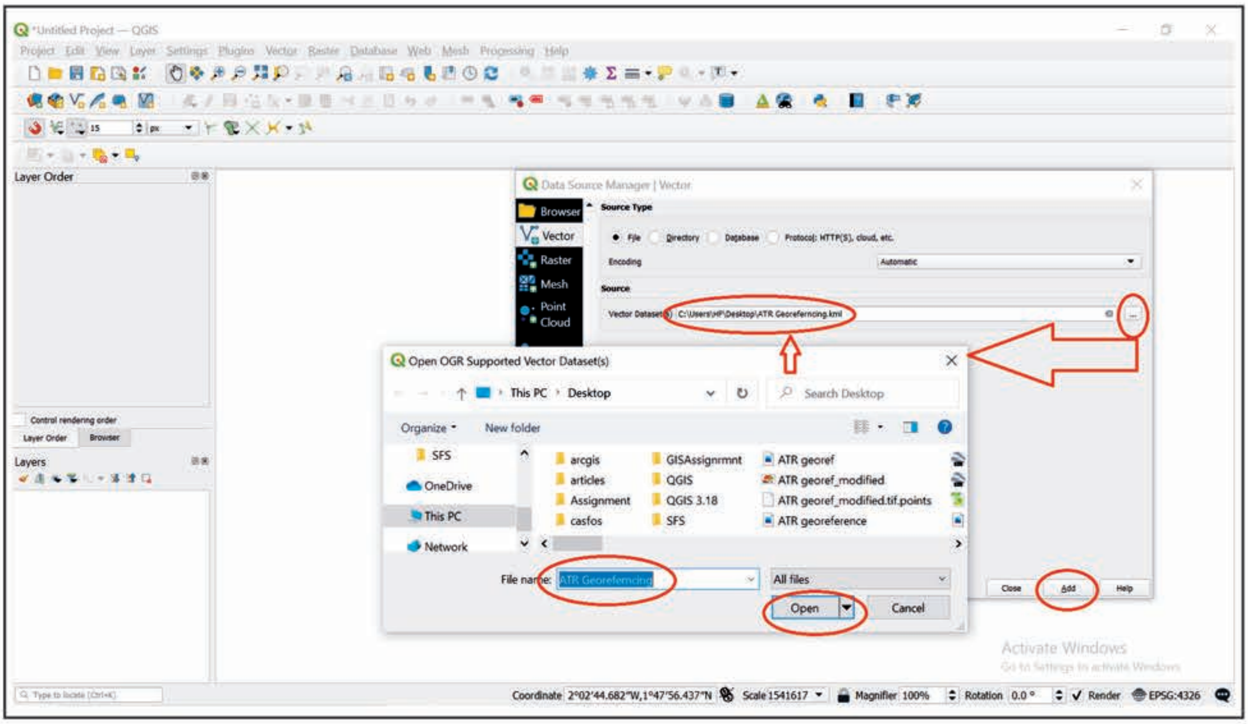
* File bar : Project >> Properties >> General >>
  - Ellipsoid : WGS 84: (EPSG : 7030)
  - Display coordinates using : Degree, Minutes, Seconds>> Apply >> Ok





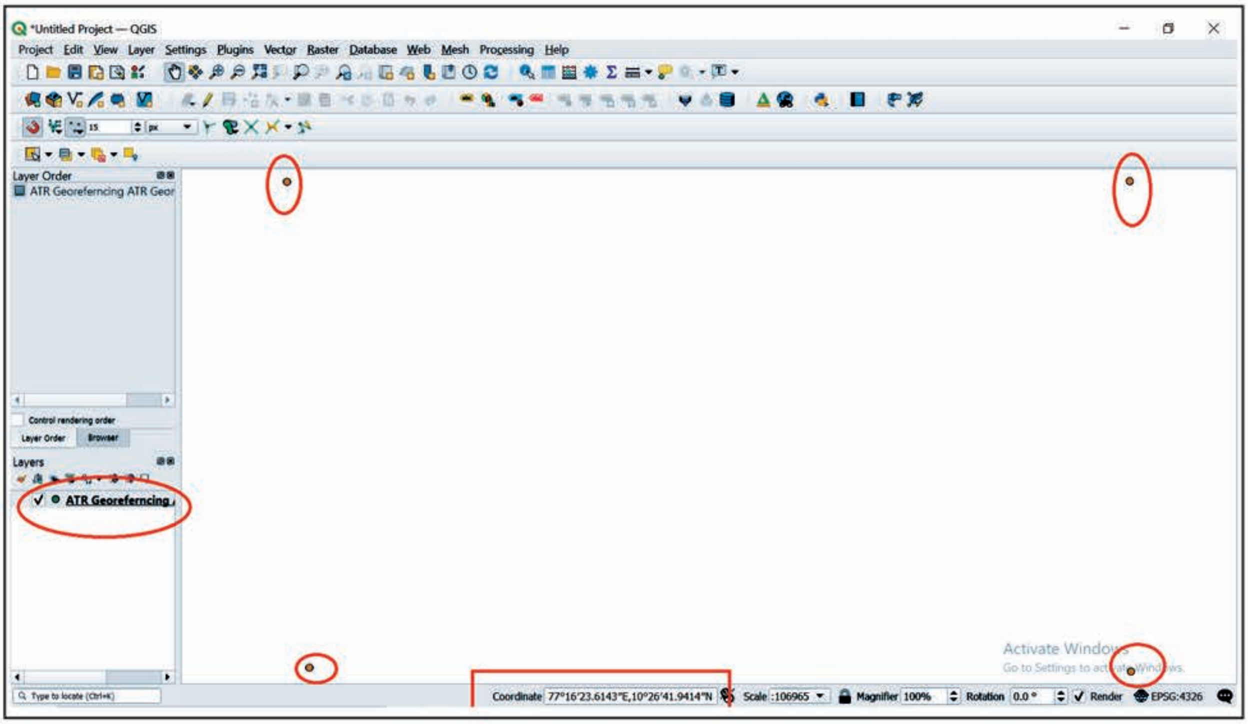
2. Adding data for georeferencing: Layer >> Add layer >> Add vector layer >> Data source manage box >> Vector dataset >> Browse >>ATR Georeferencing file >> Open>> Add.





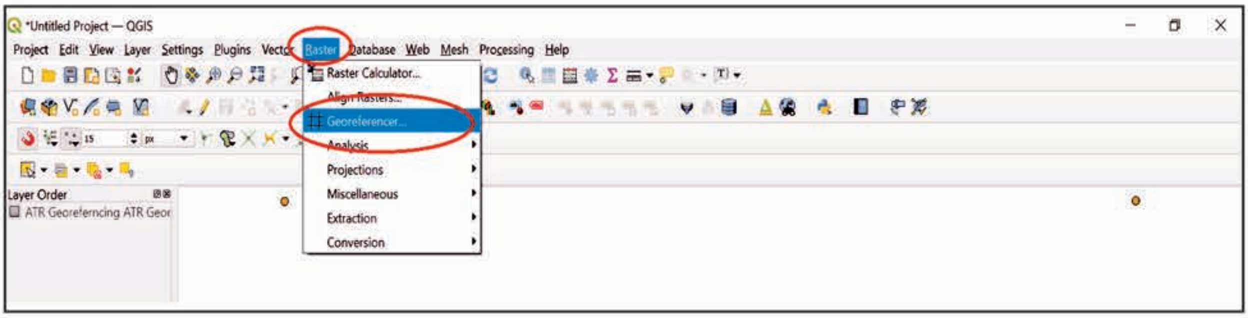
* Layers window on left side: Added file will be seen as a layer – ATR Georeferencing. On the window, data i.e. selected 4 place marks will be visible. Whenever the data is not visible, Right click on layer name i.e. ATR Georeferencing>>Zoom to layer.

* Also the coordinates of points can be seen in the bottom in coordinate box.



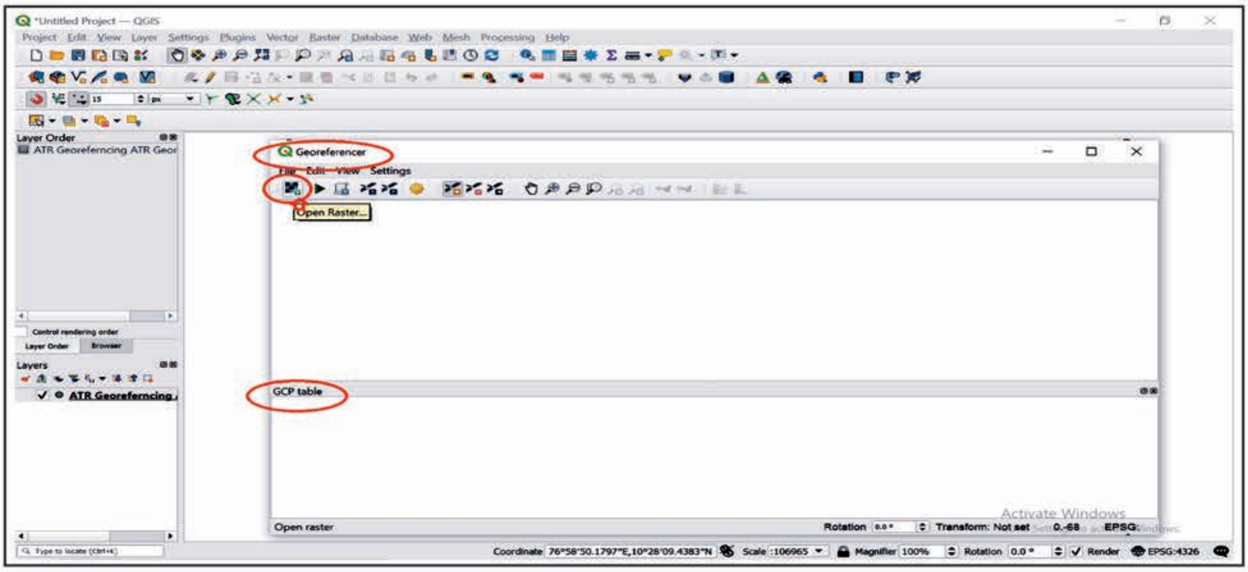
3. Adding image for Georeferencing:

* Menu bar >> Raster >> Georeferencer

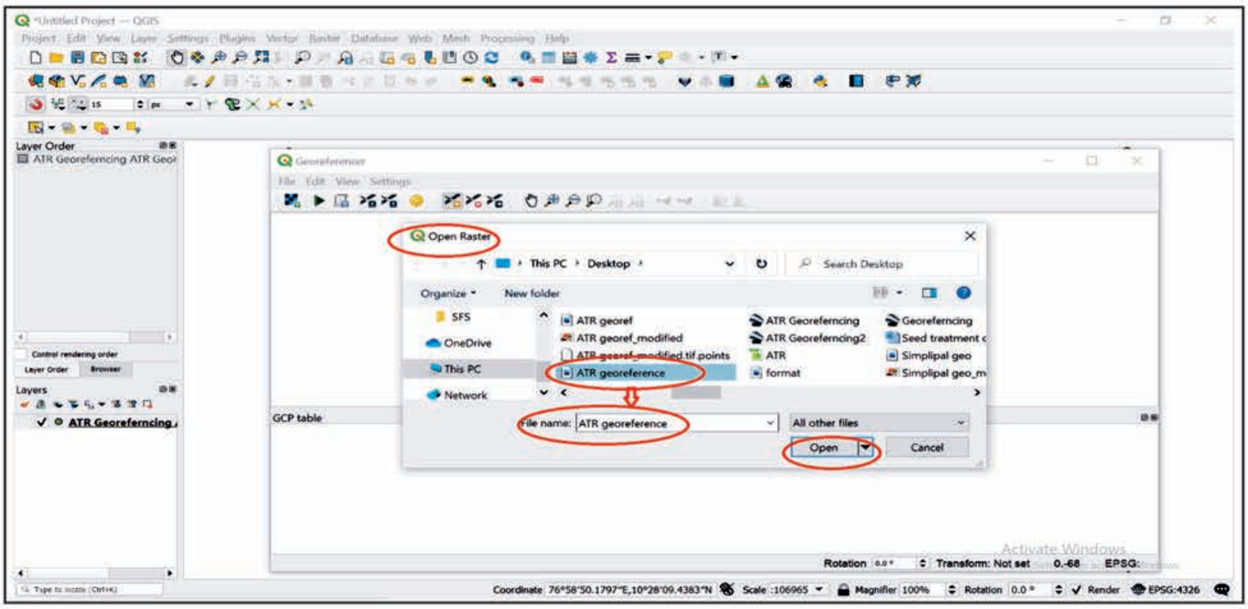


* Georeferencer box will open with two parts
  - Window for image
  - GCP table (Ground control points)

* Toolbar >> Open raster

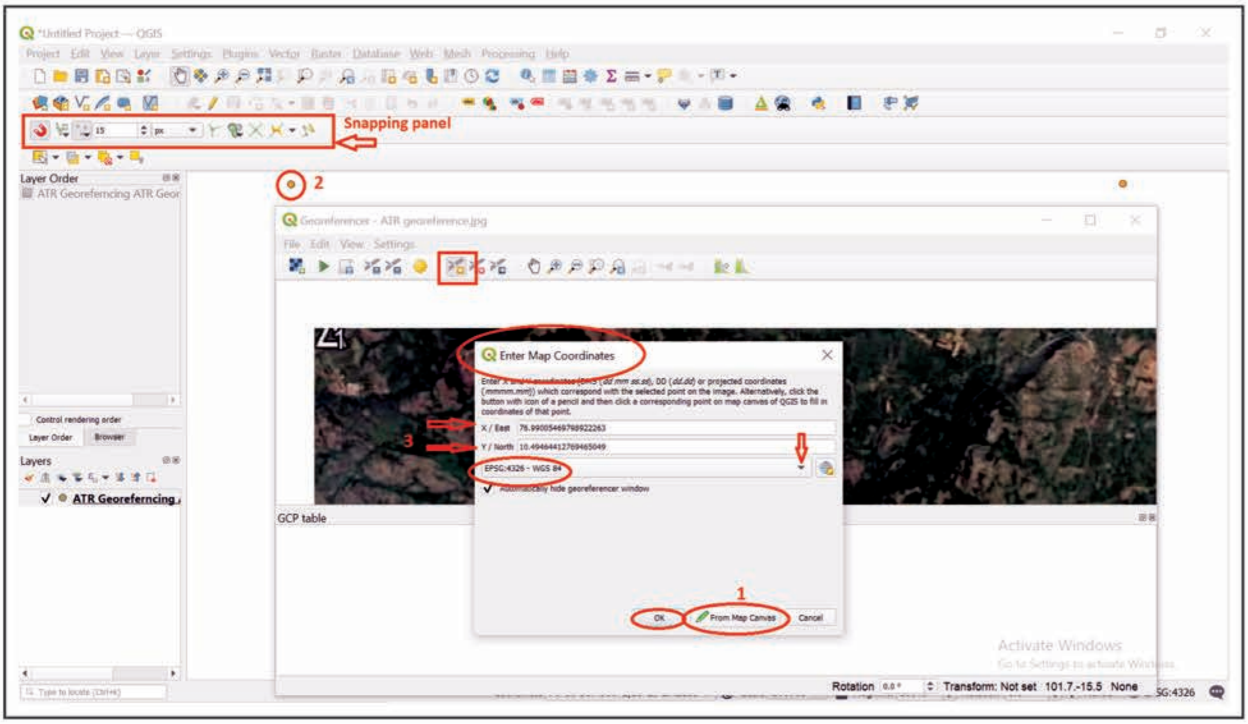


* Open raster box >> Search ATR Georeference (image file)

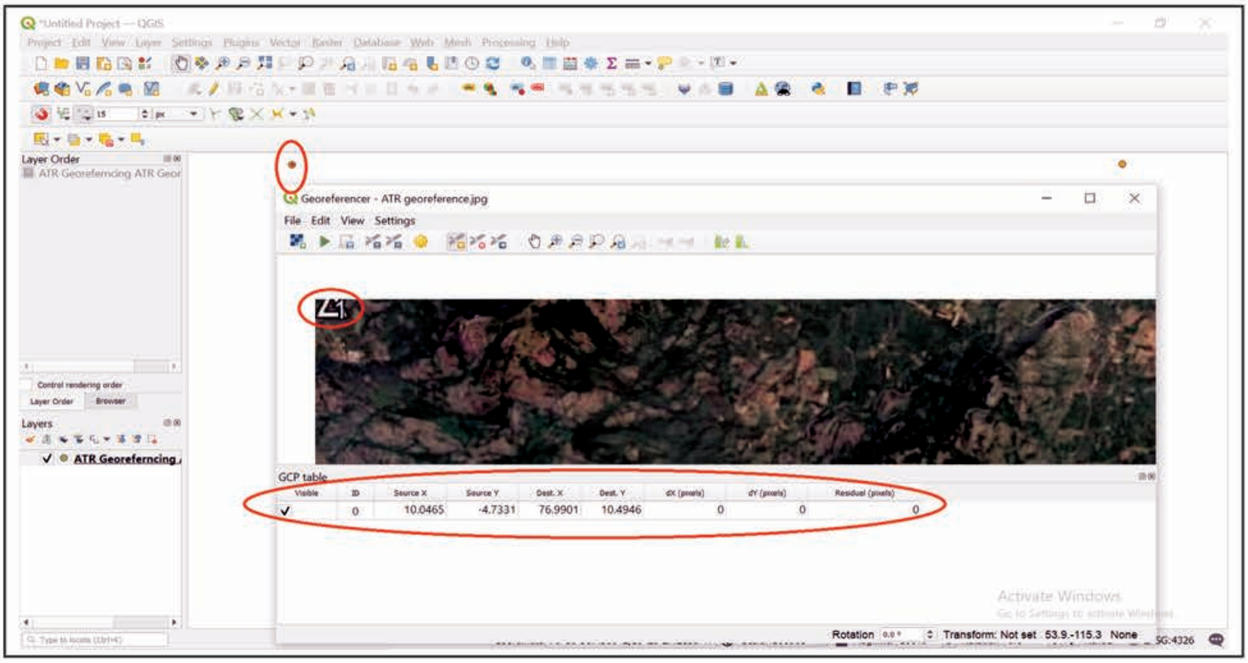


* The image will be loaded on the georeferencer panel.

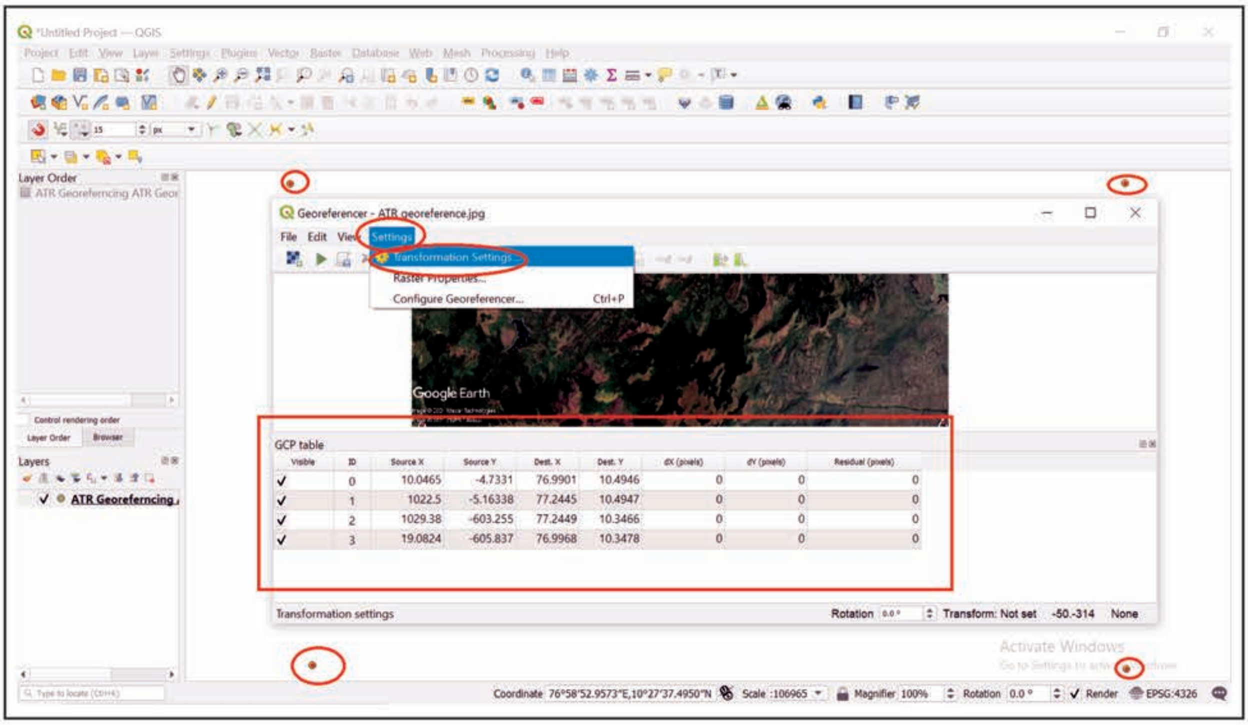
4. **Marking geo-coordinates on image** :
   * Select from tool bar Add point and move the cursor to 1st point>> select the point.
   * Enter Map coordinates box will open
     i. Select From Map Canvas>>it will open the ATR Georeferencing layer
     ii. Select the 1st point in upper left corner (As snapping bar/panel is active it will assist in accuracy of selection. Snapping: When the cursor is bought near the ground control point it gets identified automatically. 'Map is snapped with vertex to pixels'.)



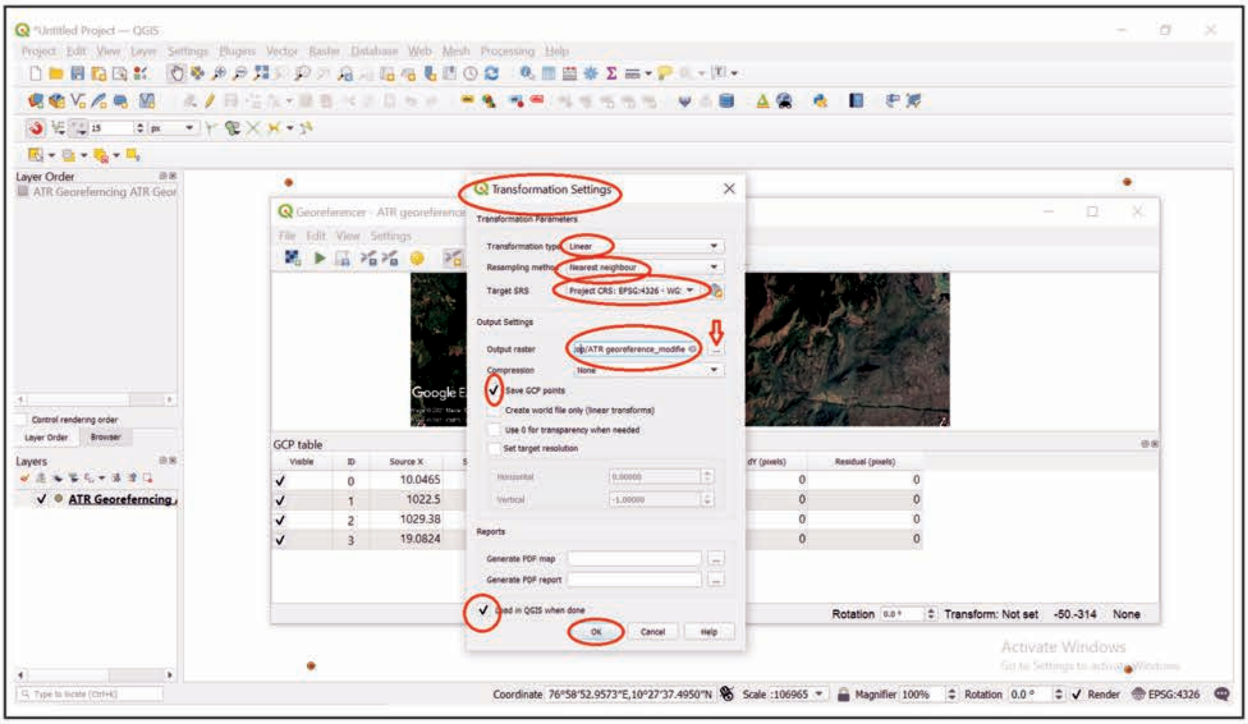
iii. Enter Map coordinates box will again open: coordinates for the 1st point have been loaded.
iv. In the next bar (CRS bar) >> select EPSG: 4326 – WGS 84. >> Ok
v. Geocordinates will be seen in GCP table and 1st point will be marked.
vi. Follow the same process for all points.
vii. GCP table will show all points and they will be marked on panel.



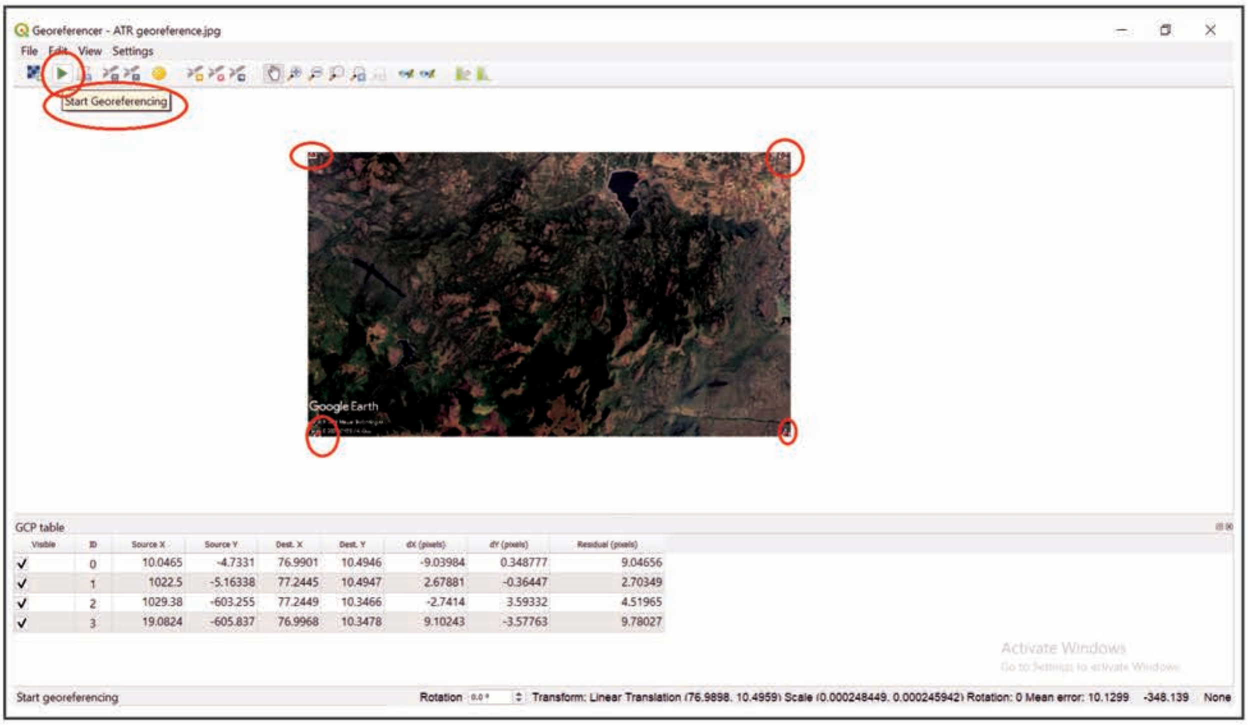
5. Go to Menu bar >>Settings >> Transformation settings



* Transformation settings Box >>select the fields from drop down menu as shown in the attached picture >> Give Output raster Name : ATR Georeference_modified>> Ok



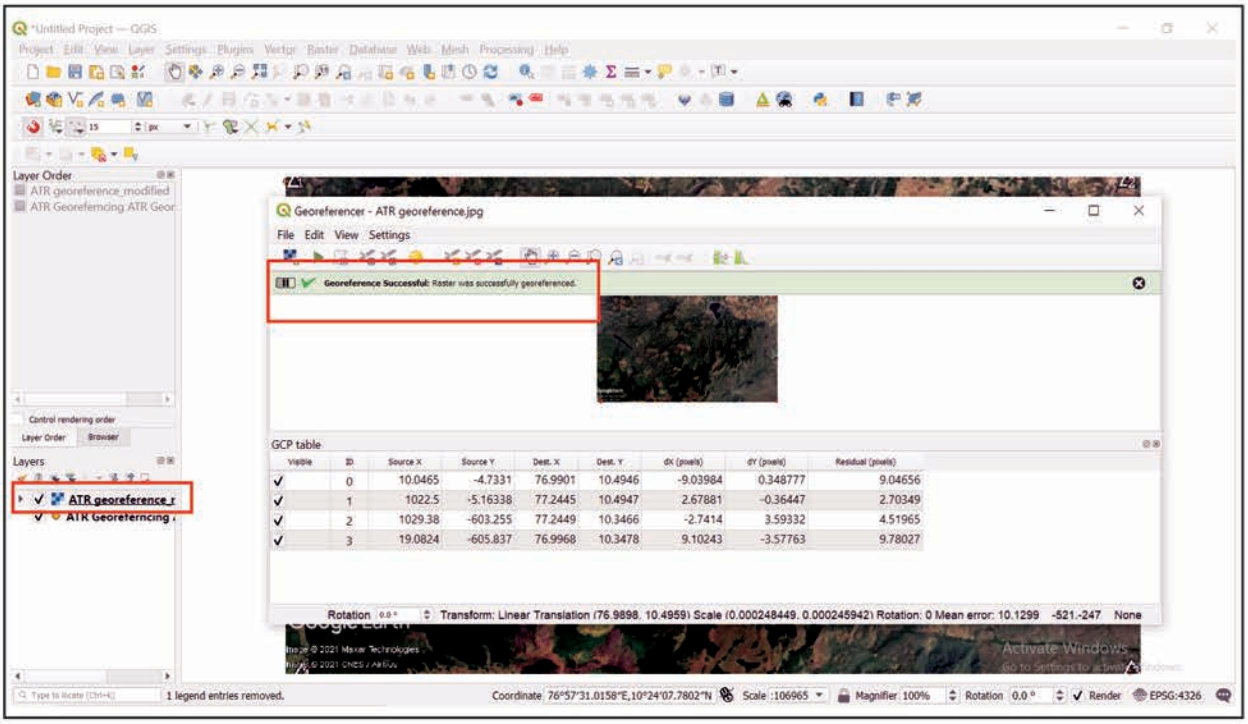
6. Tool bar >> select Start Georeferencing



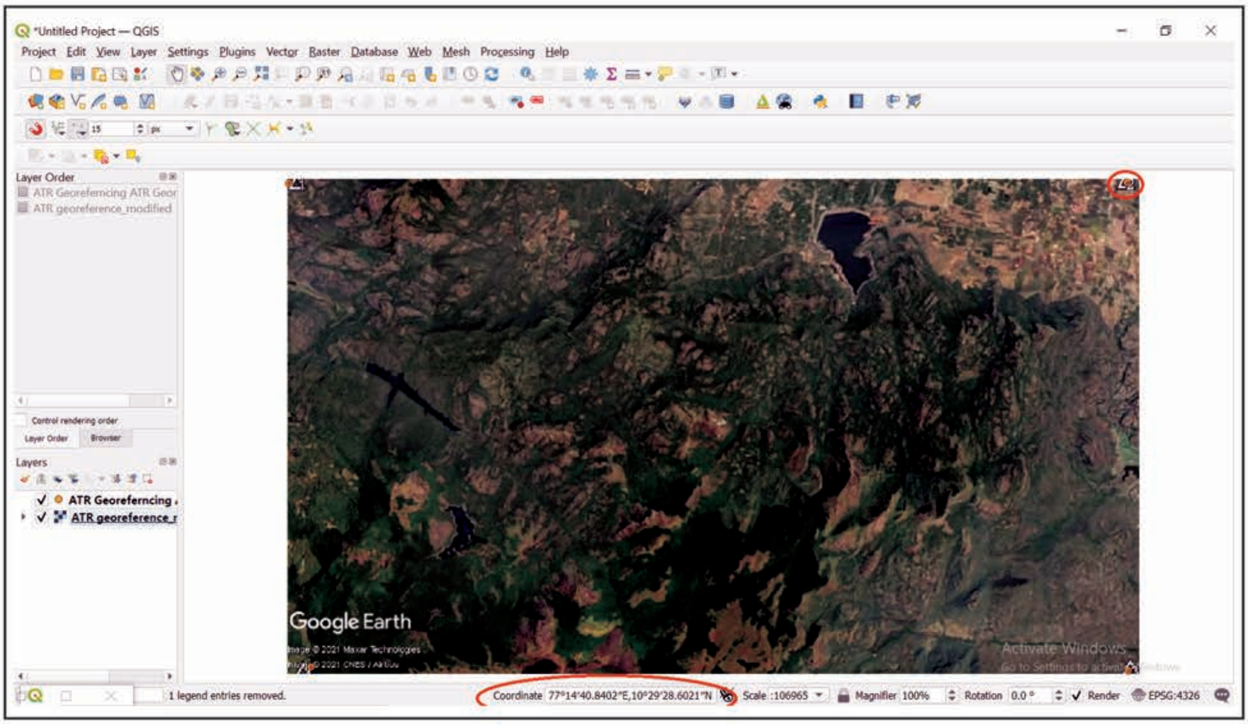
* It will show processing and once completed >> Georeference Successful message will be displayed.

* ATR georeference modified layer will be visible in the layers panel.

* Image is successfully georeferenced.

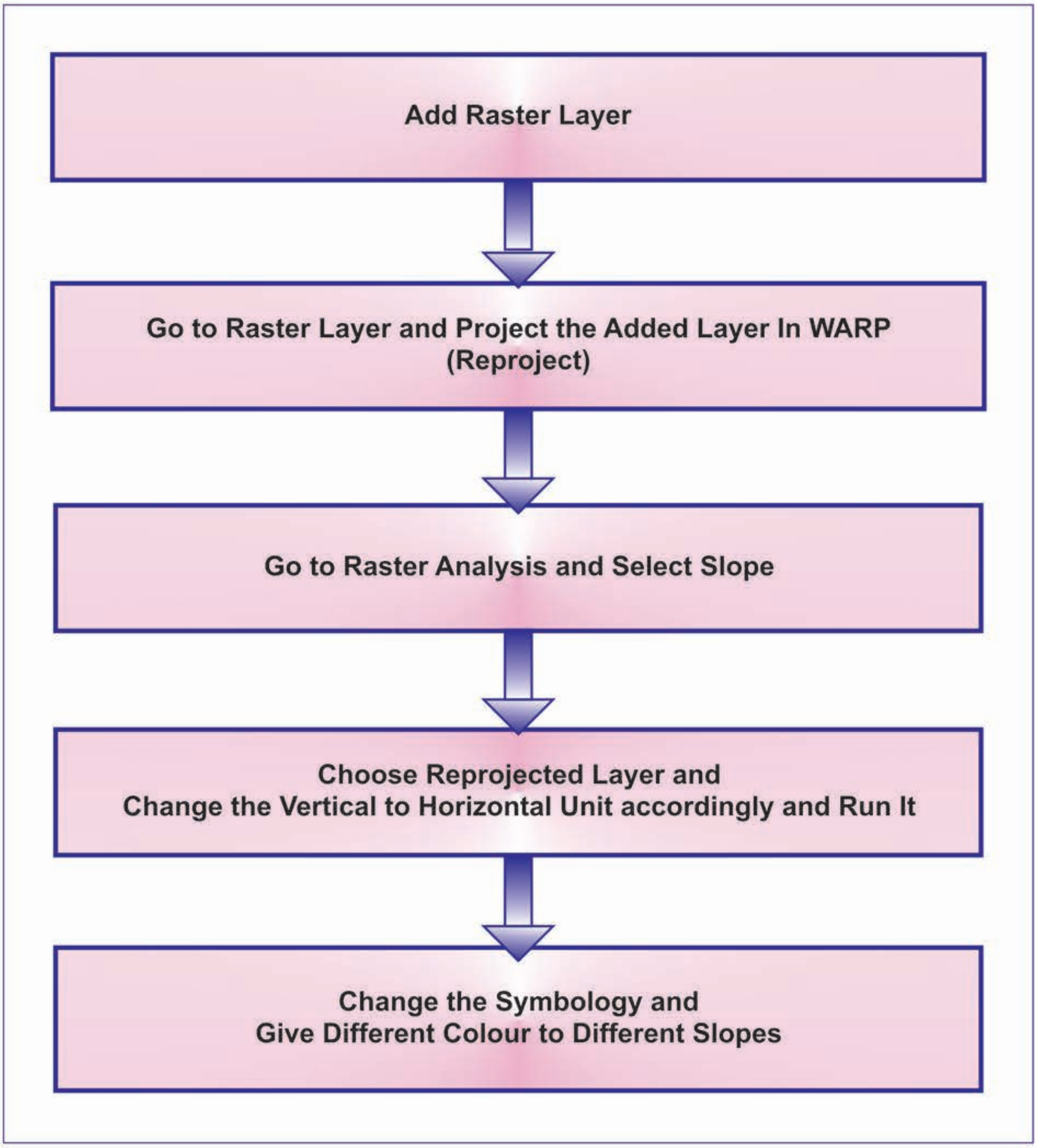


7. **To check**: Move the cursor to any point and verify the coordinates.

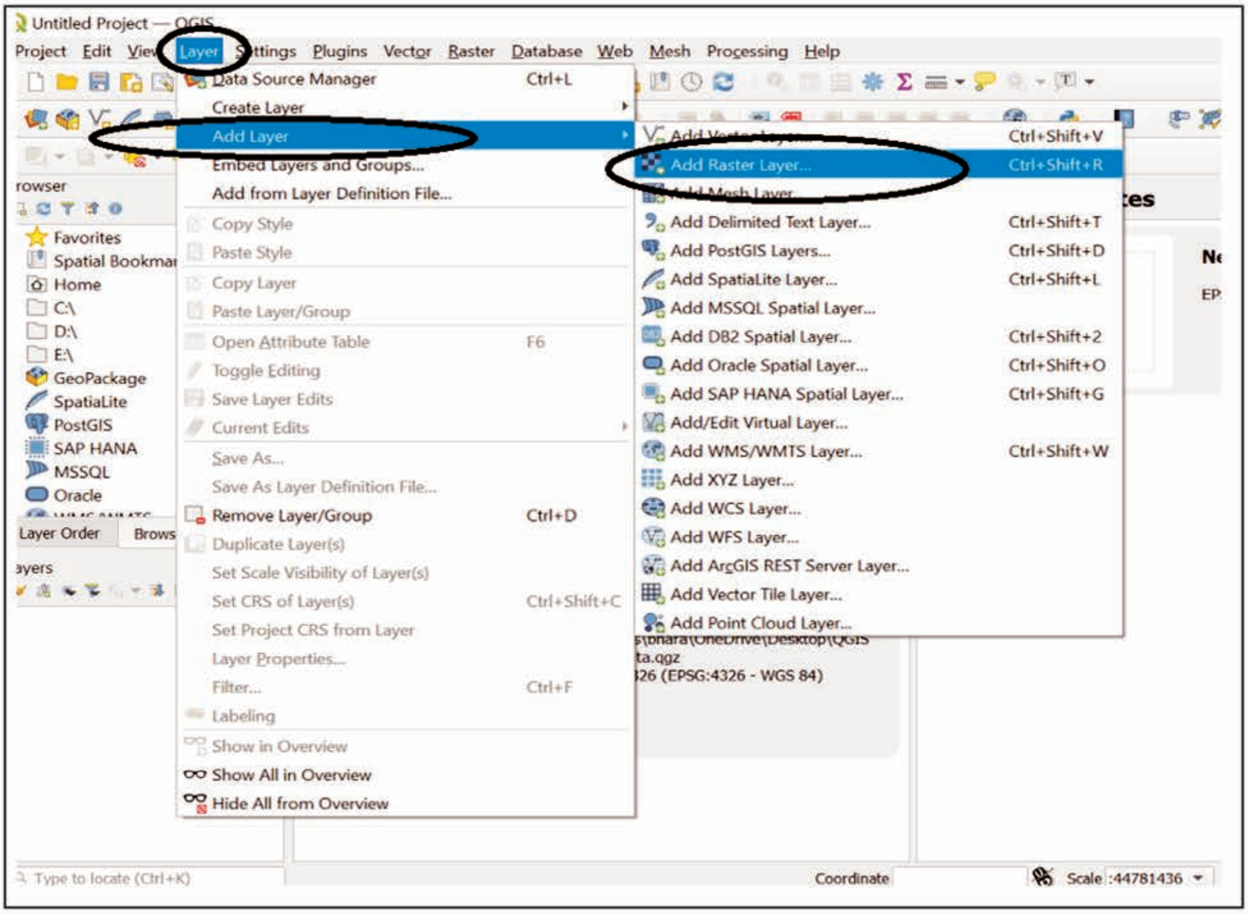


9. Slope Analysis Exercise Step in QGIS

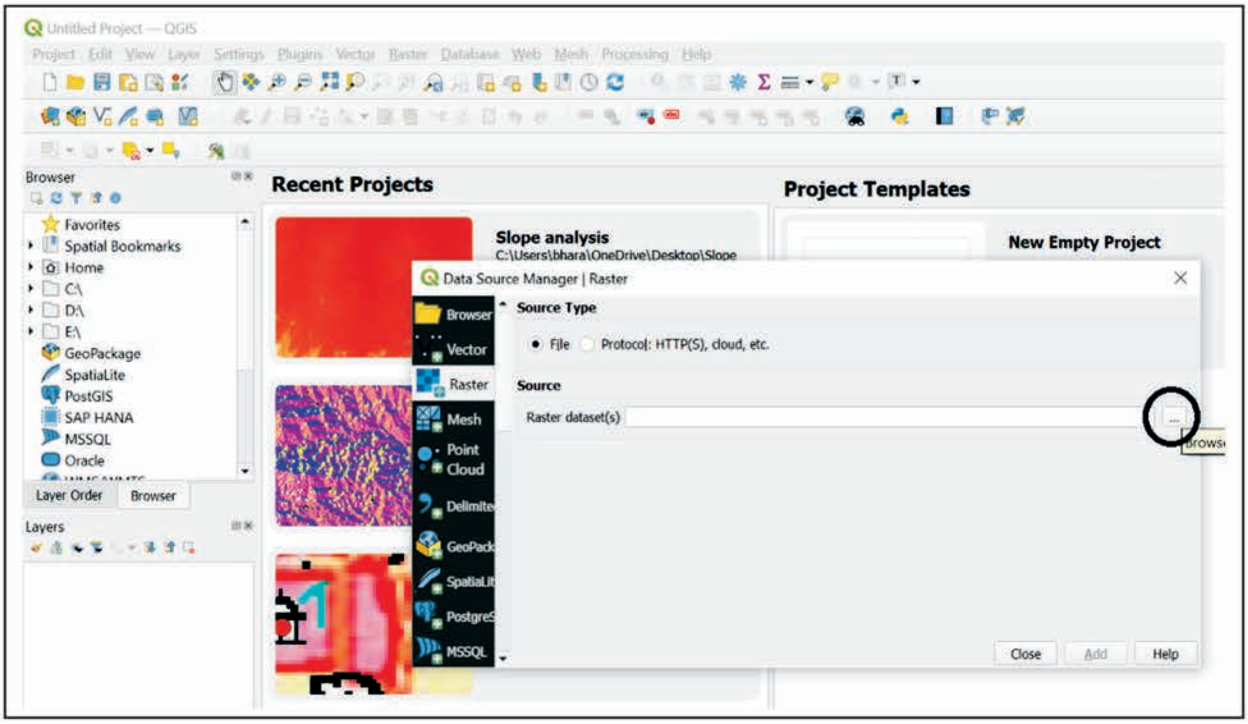
Slope is the angle of inclination to the horizontal. It can be derived from DEM (Digital Elevation Model). Slope has direction and length. Slope defines inclination, intensity of soil erosion and many application in forestry operation. slope is the important factor influencing the vegetation of particular area. Slope also helps in planning of soil moisture conservation works in forest area. This chapter deals with the procedure for deriving slope from DEM for a particular area of interest.

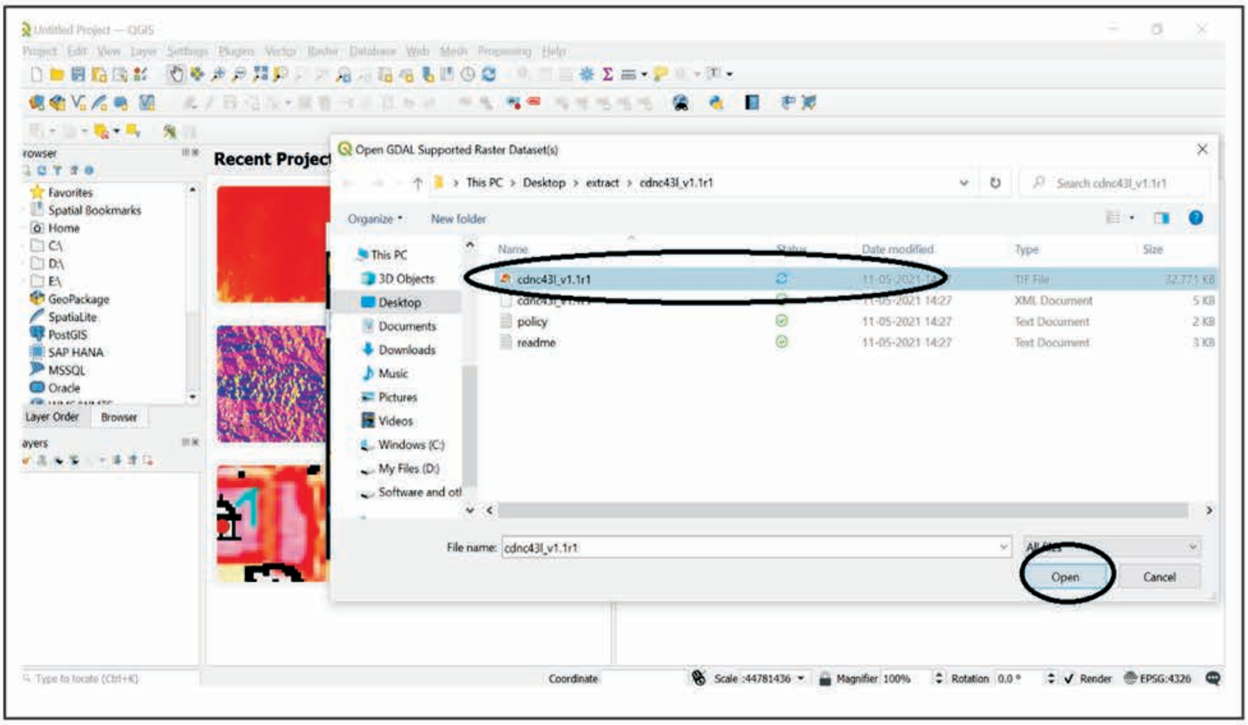


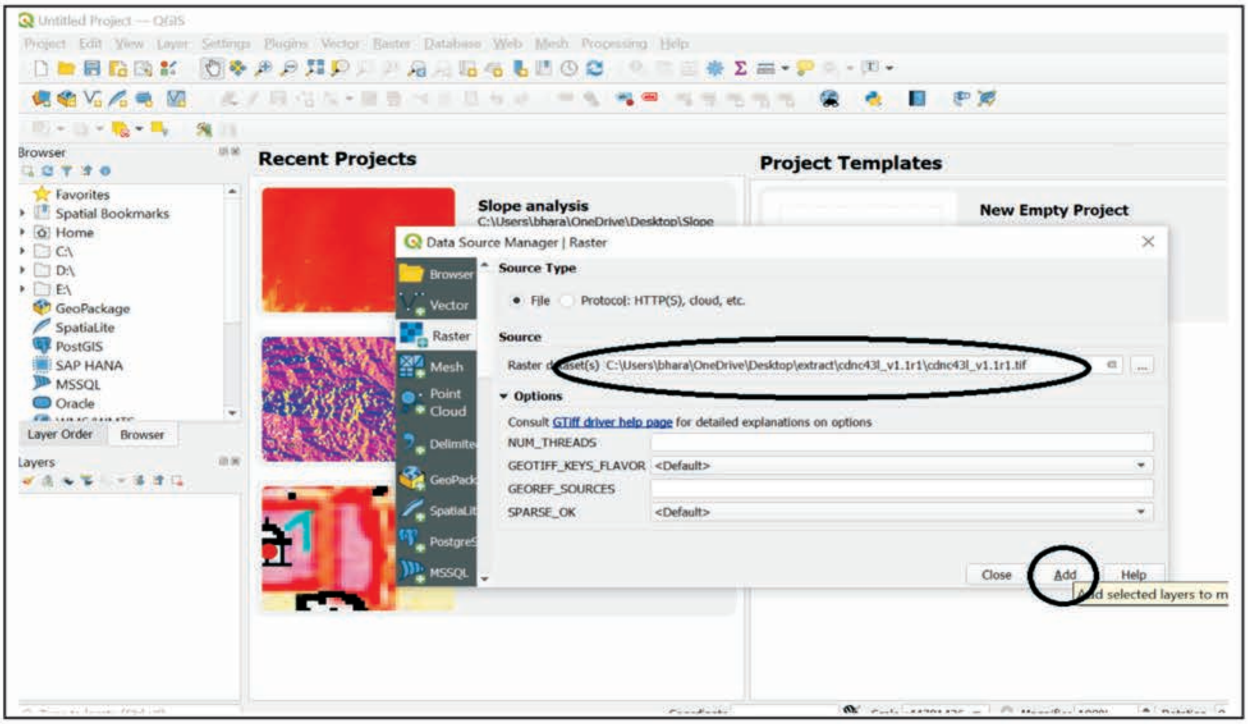
Step-1 Add Raster layer of Satellite imagery.
Click Layer>> Add layer>> Add Raster Layer



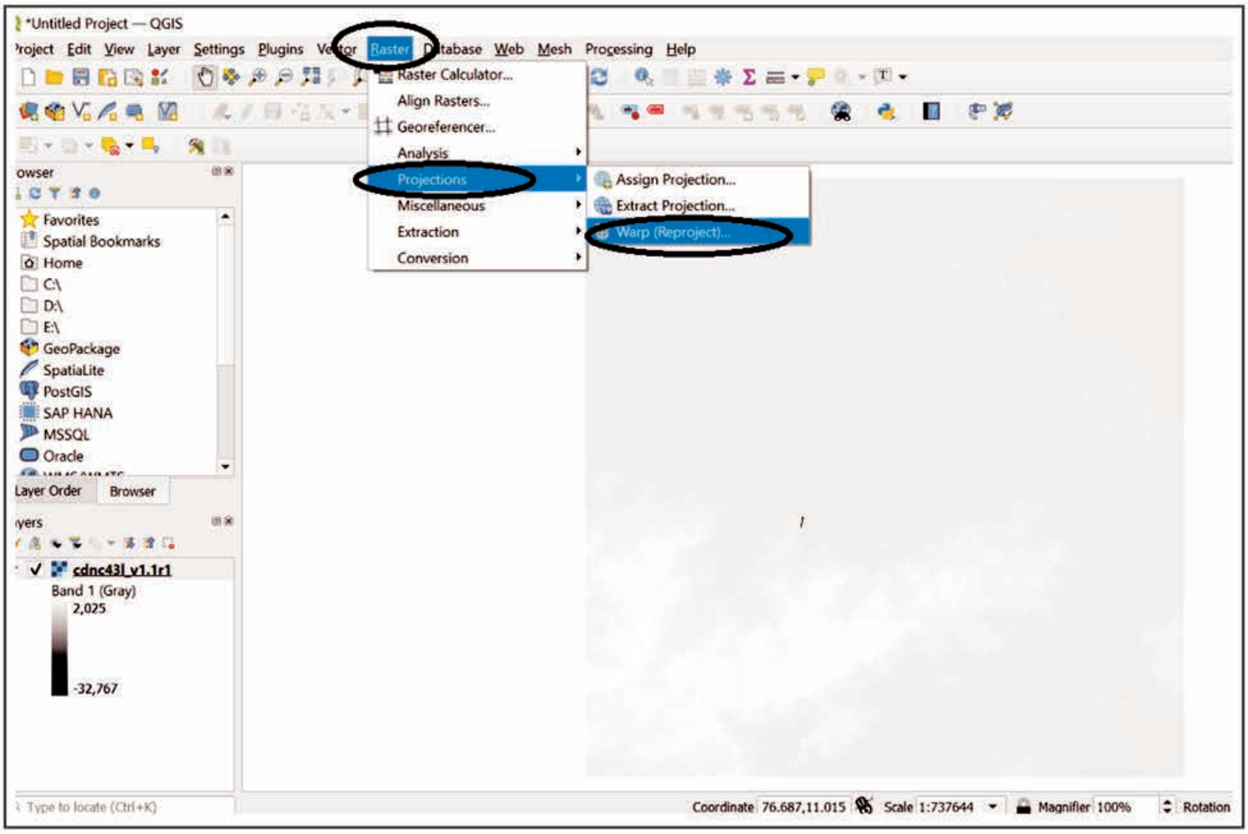
Step-2 Browse the Raster dataset (Satellite Imagery) from extracted folder Create file path by selecting the required file.



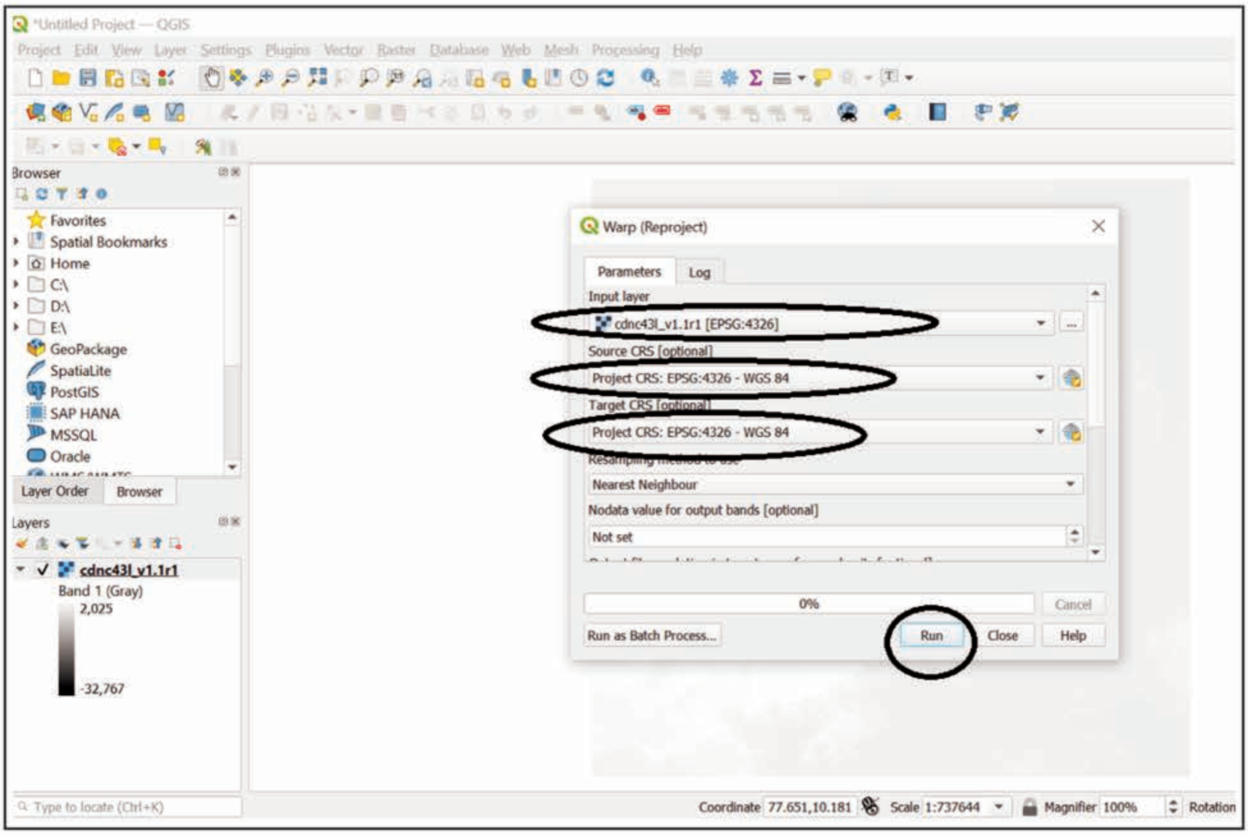

Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Recent Project
Open GDAL Supported Raster Dataset(s)
This PC > Desktop > extract > cdnc43l_v1.1r1
Search cdnc43l_v1.1r1
Organize
New folder
Favorites
Spatial Bookmarks
Home
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
Layer Order
Browser
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Windows (C:)
My Files (D:)
Name
Date modified
Type
Size
cdnc43l_v1.1r1
TIF File
32,771 KB
11-05-2021 14:27
XML Document
5 KB
policy
11-05-2021 14:27
Text Document
2 KB
readme
11-05-2021 14:27
Text Document
3 KB
File name: cdnc43l_v1.1r1
Open
Cancel
Coordinate
Scale 1:44781436
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326

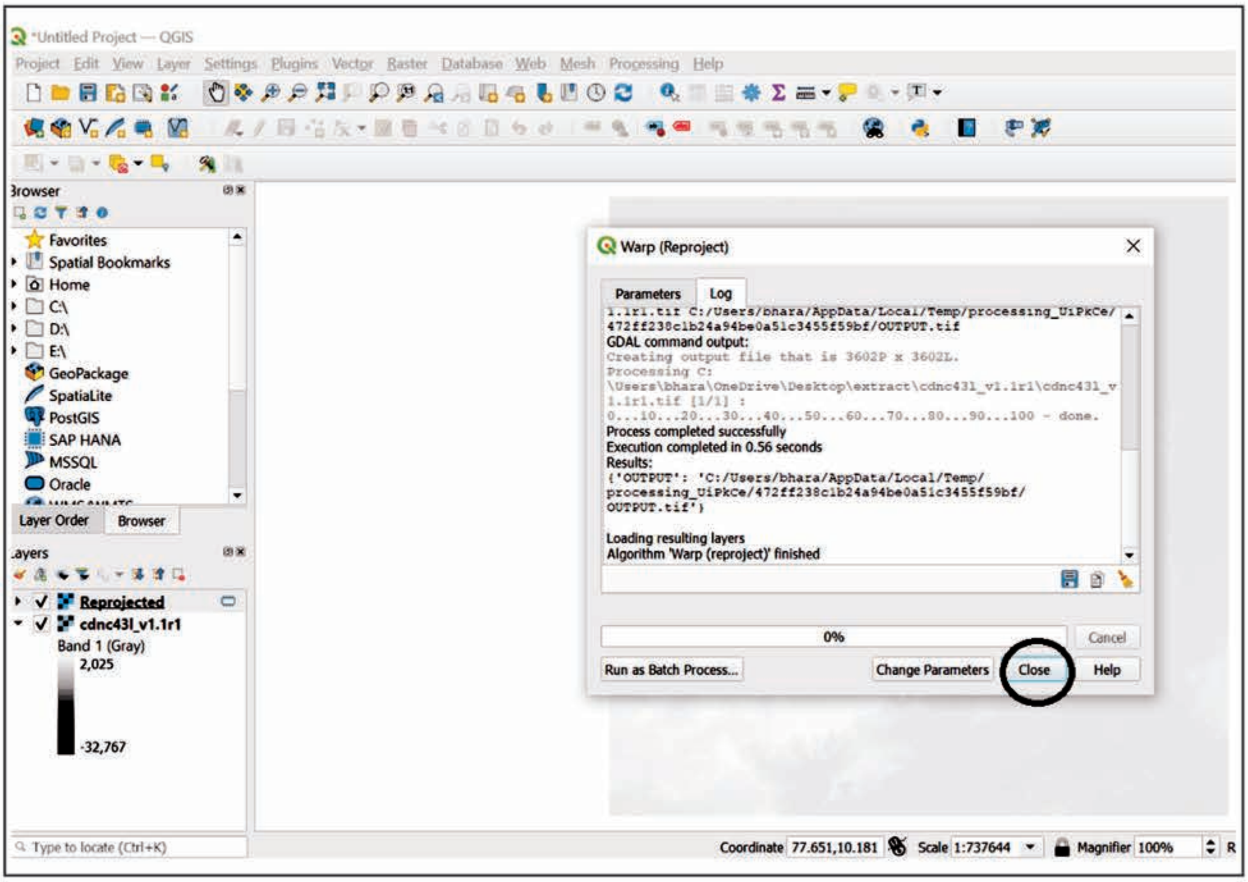

Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Browser
Favorites
Spatial Bookmarks
Home
C:\
D:\
E:\
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
Layer Order
Browser
Layers
Recent Projects
Slope analysis
C:\Users\bhara\OneDrive\Desktop\Slope
Project Templates
New Empty Project
Data Source Manager | Raster
Browser
Vector
Raster
Mesh
Point Cloud
GeoPack
SpatiaLit
Postgre
MSSQL
Source Type
File
Protocol: HTTP(S), cloud, etc.
Source
Raster dataset(s) C:\Users\bhara\OneDrive\Desktop\extract\cdnc43l_v1.1r1\cdnc43l_v1.1r1.tif
Options
Consult GTiff driver help page for detailed explanations on options
NUM_THREADS
GEOTIFF_KEYS_FLAVOR <Default>
GEOREF_SOURCES
SPARSE_OK <Default>
Close
Add
Help

Step-3 : Project the added layer in WARP (Reprojection) format.
Click Raster>> Projection>> Wrap (Reproject)

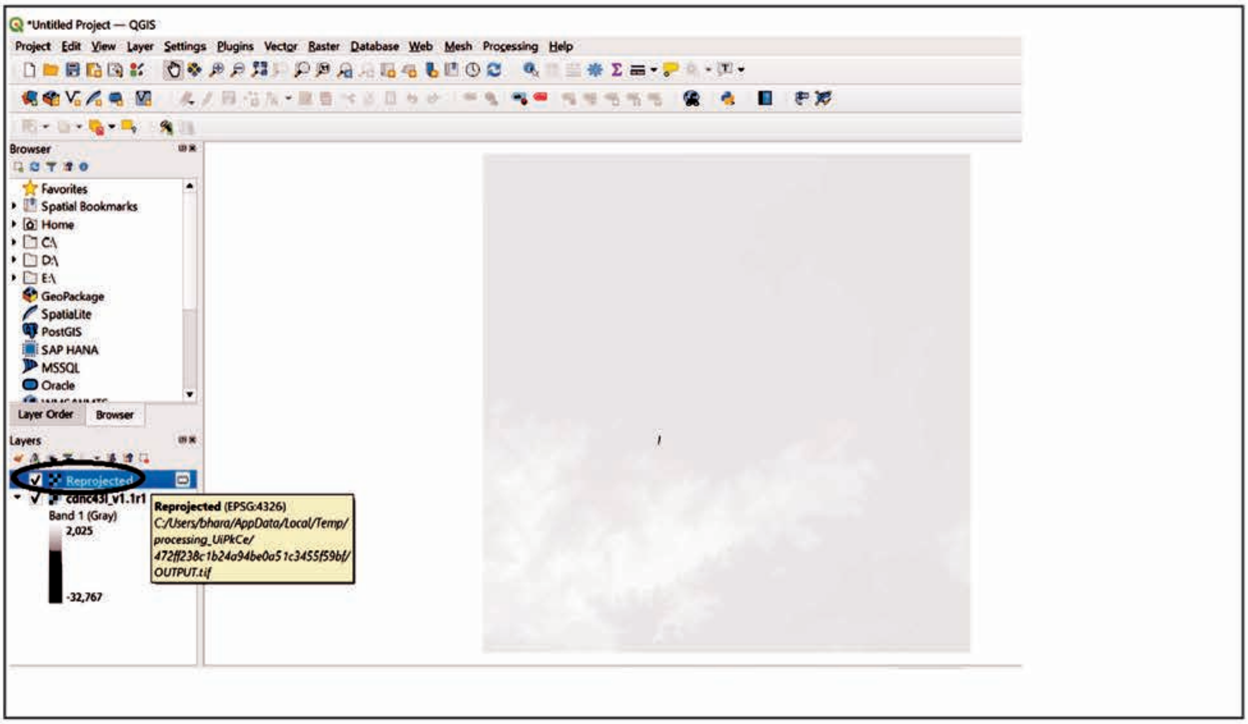


Step 4 : Select the layer, set source and targert CRS ; run the Reproject



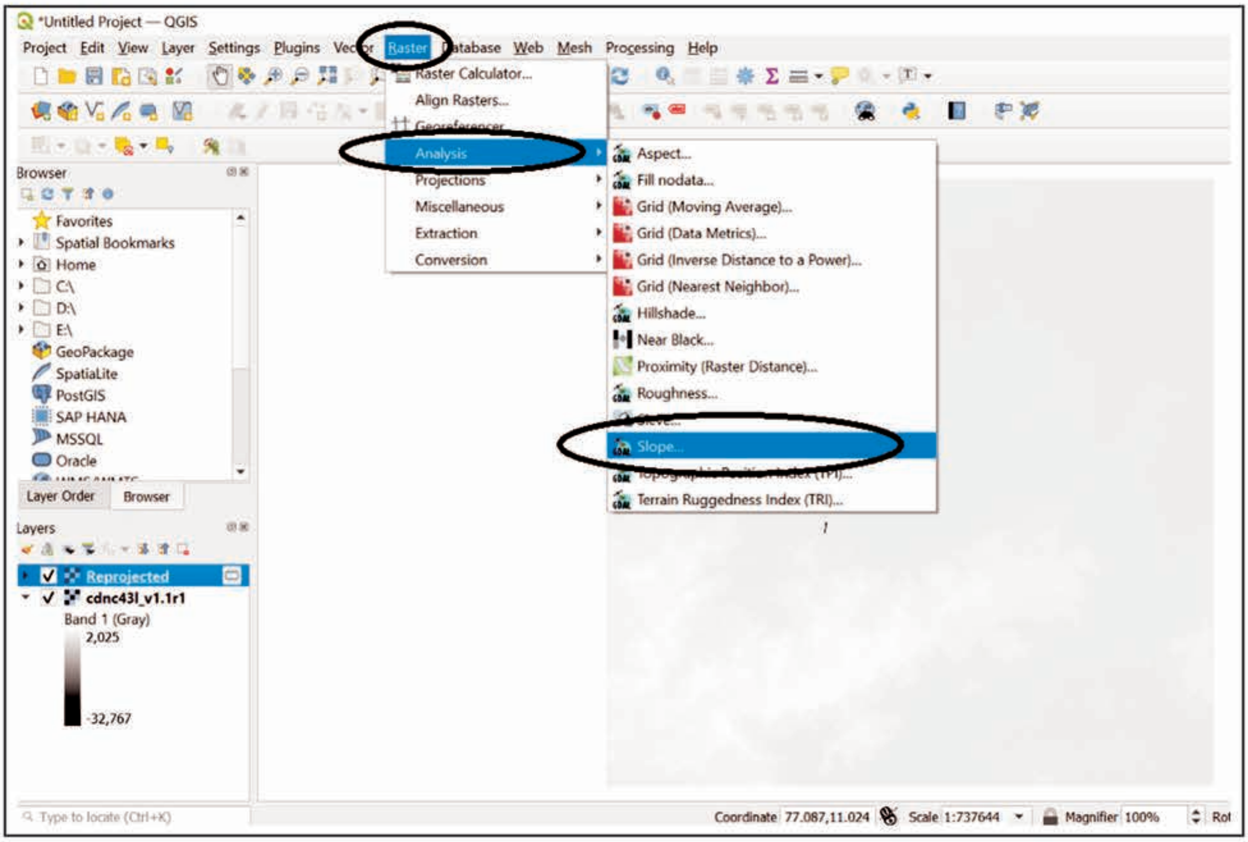


*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Browser
Favorites
Spatial Bookmarks
Home
C:\
D:\
E:\
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
Layer Order
Browser
Layers
Reprojected
cdnc43l_v1.1r1
Band 1 (Gray)
2,025
-32,767
Warp (Reproject)
Parameters
Log
1.1r1.tif C:/Users/bhara/AppData/Local/Temp/processing_UiPkCe/472ff238c1b24a94be0a51c3455f59bf/OUTPUT.tif
GDAL command output:
Creating output file that is 3602P x 3602L.
Processing C:\Users\bhara\OneDrive\Desktop\extract\cdnc43l_v1.1r1\cdnc43l_v1.1r1.tif [1/1] :
0...10...20...30...40...50...60...70...80...90...100 - done.
Process completed successfully
Execution completed in 0.56 seconds
Results:
{'OUTPUT': 'C:/Users/bhara/AppData/Local/Temp/processing_UiPkCe/472ff238c1b24a94be0a51c3455f59bf/OUTPUT.tif'}
Loading resulting layers
Algorithm 'Warp (reproject)' finished
0%
Cancel
Run as Batch Process...
Change Parameters
Close
Help
Type to locate (Ctrl+K)
Coordinate 77.651,10.181
Scale 1:737644
Magnifier 100%

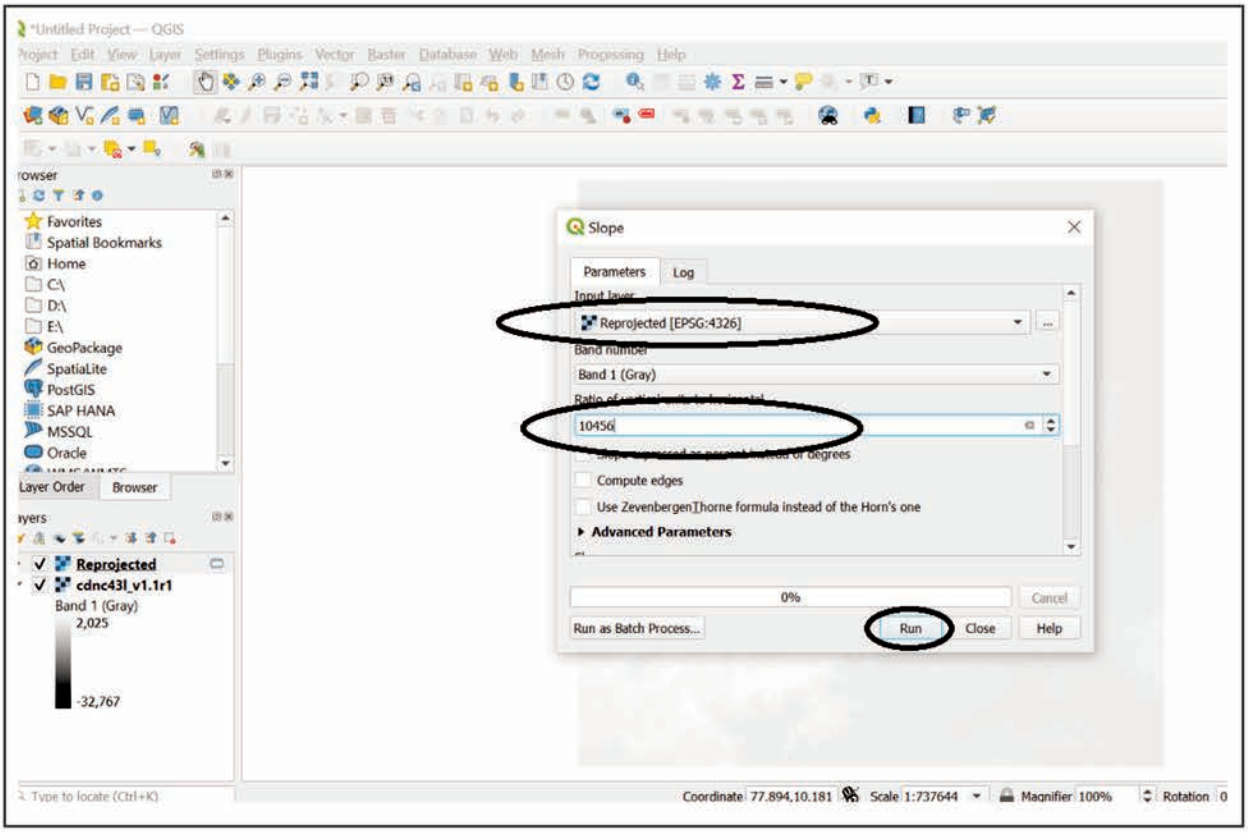


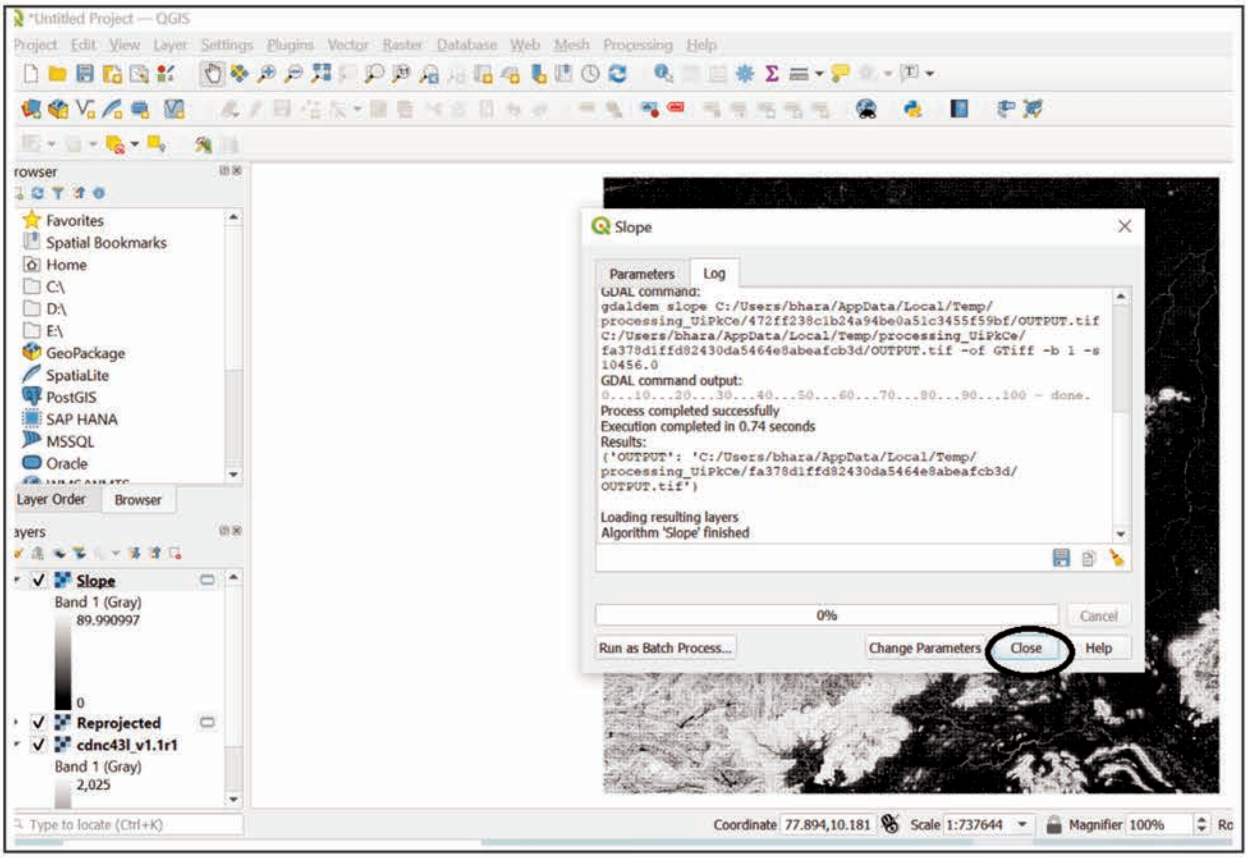
*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Browser
Favorites
Spatial Bookmarks
Home
C:\
D:\
E:\
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
Layer Order
Browser
Layers
Reprojected
cdnc43l_v1.1r1
Band 1 (Gray)
2,025
-32,767
Reprojected (EPSG:4326)
C:/Users/bhara/AppData/Local/Temp/processing_UiPkCe/472ff238c1b24a94be0a51c3455f59bf/OUTPUT.tif

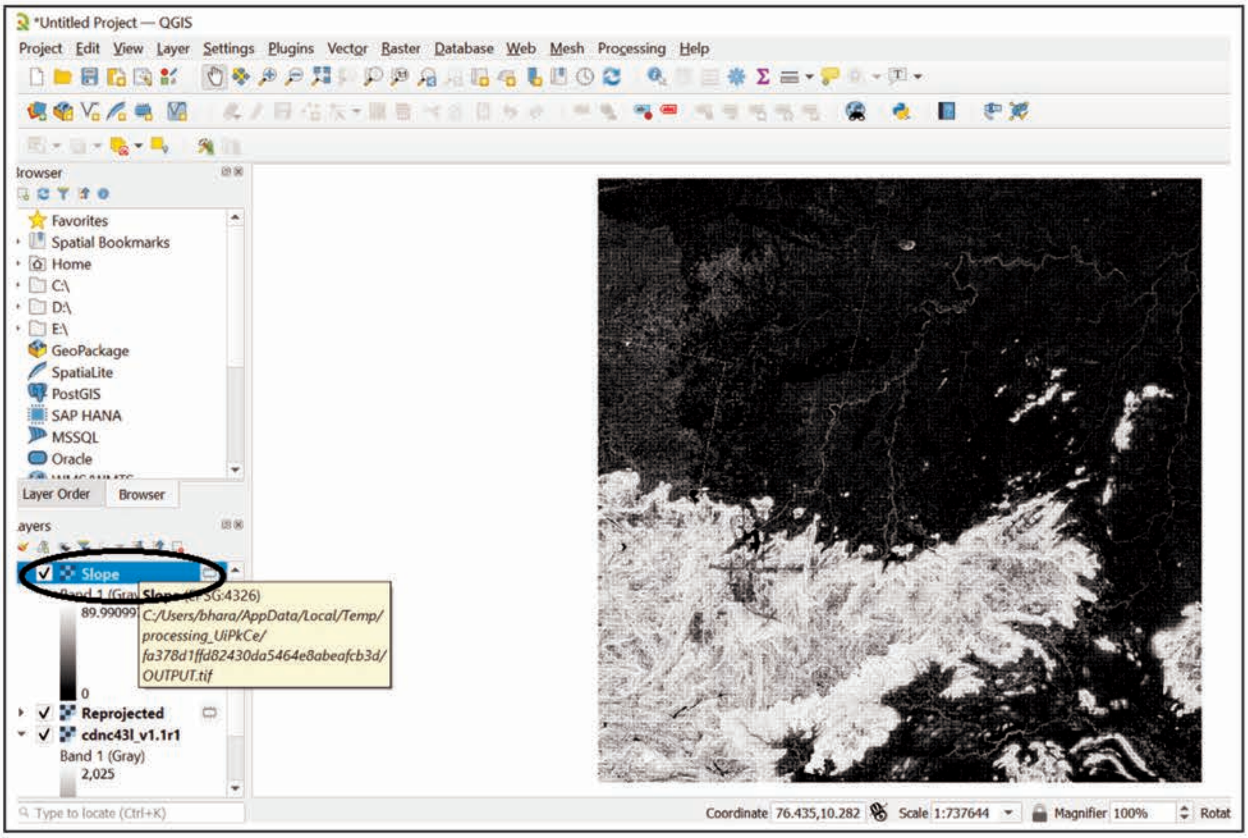
Step-5 Go to Raster, Analysis and select slope for analysis.
Click Raster >> Analysis>>Slope



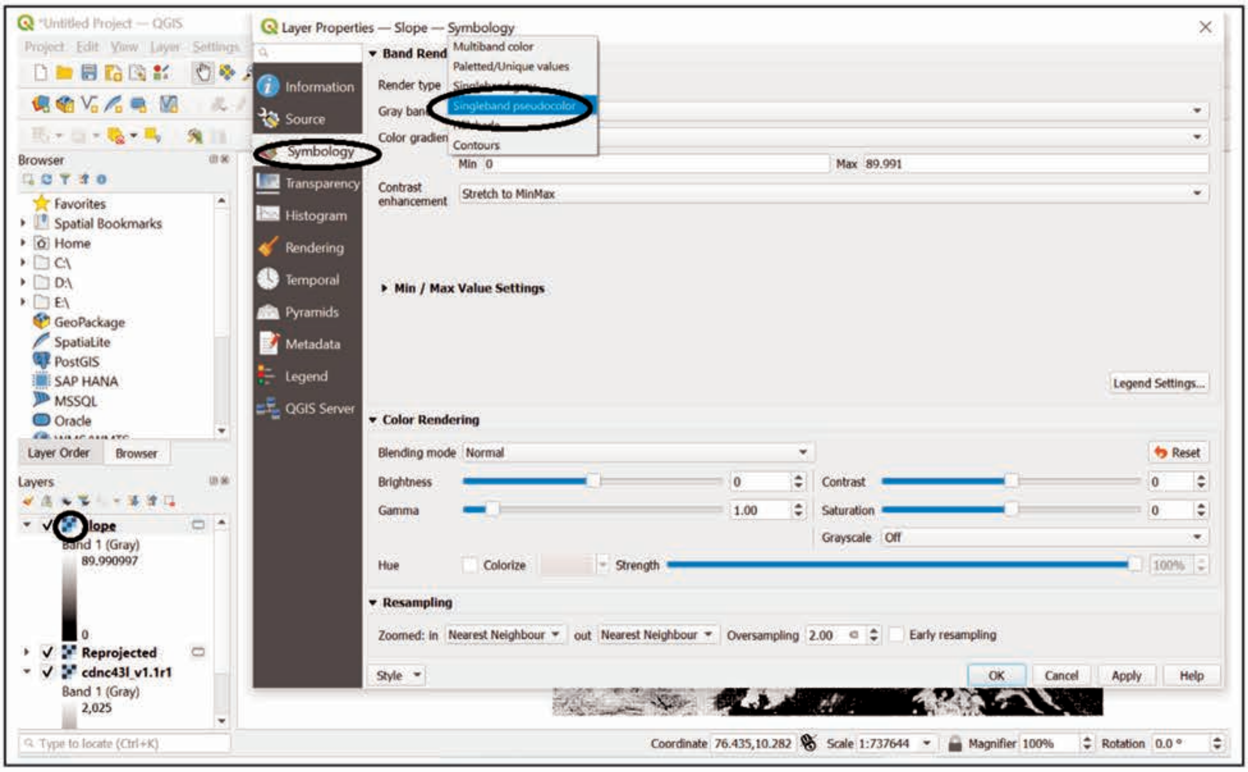
Step-6 Choose reprojected layer and change the vertical to horizontal units and run it.



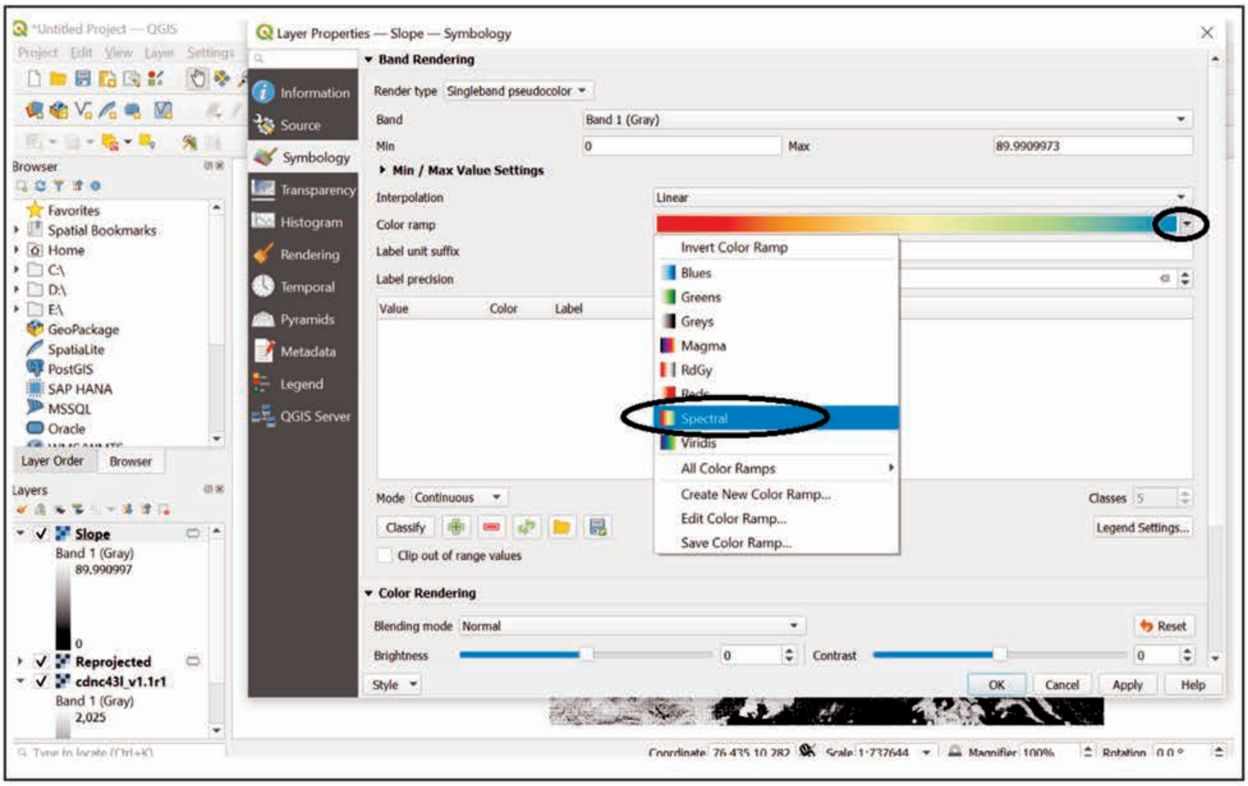

*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Slope
Parameters Log
GDAL command:
gdaldem slope C:/Users/bhara/AppData/Local/Temp/processing_UiPkCe/472ff238c1b24a94be0a51c3455f59bf/OUTPUT.tif C:/Users/bhara/AppData/Local/Temp/processing_UiPkCe/fa378d1ffd82430da5464e8abeafcb3d/OUTPUT.tif -of GTiff -b 1 -s 10456.0
GDAL command output:
0...10...20...30...40...50...60...70...80...90...100 - done.
Process completed successfully
Execution completed in 0.74 seconds
Results:
{'OUTPUT': 'C:/Users/bhara/AppData/Local/Temp/processing_UiPkCe/fa378d1ffd82430da5464e8abeafcb3d/OUTPUT.tif'}
Loading resulting layers
Algorithm 'Slope' finished
0%
Cancel
Run as Batch Process...
Change Parameters
Close
Help
Favorites
Spatial Bookmarks
Home
C:\
D:\
E:\
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
Layer Order
Browser
Slope
Band 1 (Gray)
89.990997
0
Reprojected
cdnc43l_v1.1r1
Band 1 (Gray)
2,025
Type to locate (Ctrl+K)
Coordinate 77.894,10.181
Scale 1:737644
Magnifier 100%

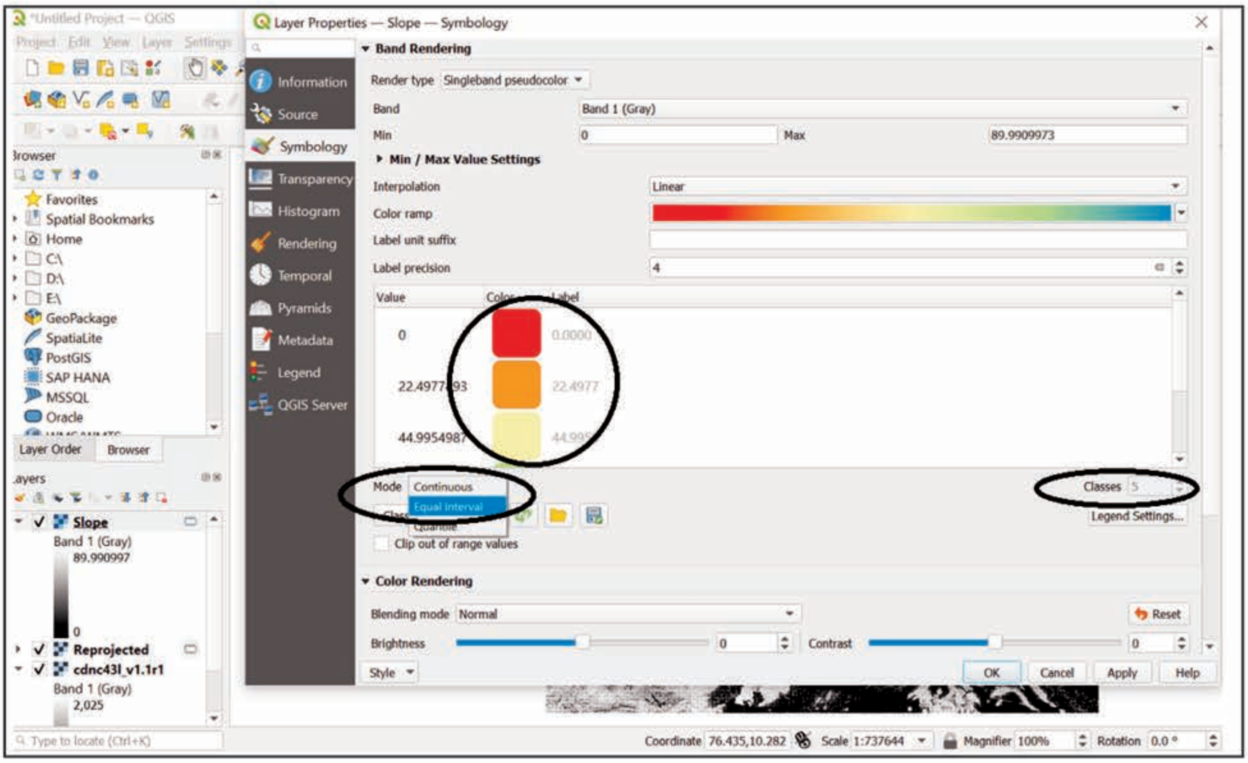

*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Favorites
Spatial Bookmarks
Home
C:\
D:\
E:\
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
Layer Order
Browser
Slope
Slope (EPSG:4326)
C:/Users/bhara/AppData/Local/Temp/processing_UiPkCe/fa378d1ffd82430da5464e8abeafcb3d/OUTPUT.tif
0
Reprojected
cdnc43l_v1.1r1
Band 1 (Gray)
2,025
Type to locate (Ctrl+K)
Coordinate 76.435,10.282
Scale 1:737644
Magnifier 100%
Rotat

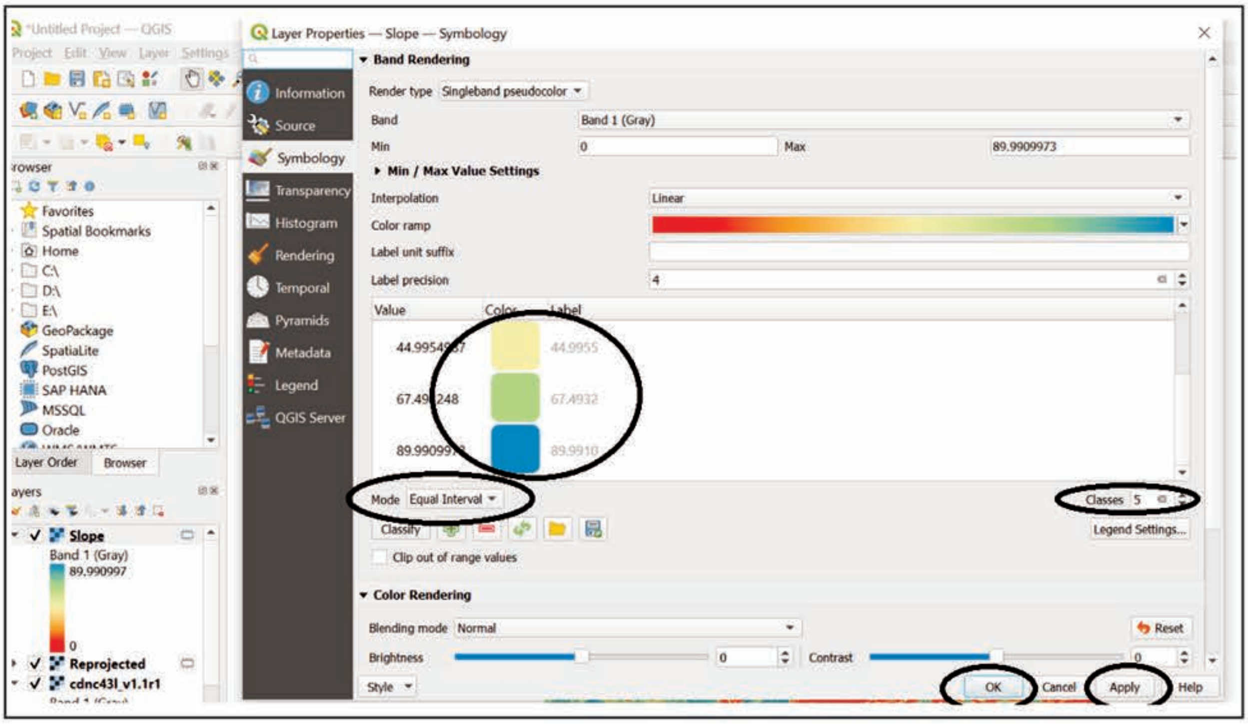
Step-7 click on slope>> select symbology,>> select single bandpseudocolor in render type.



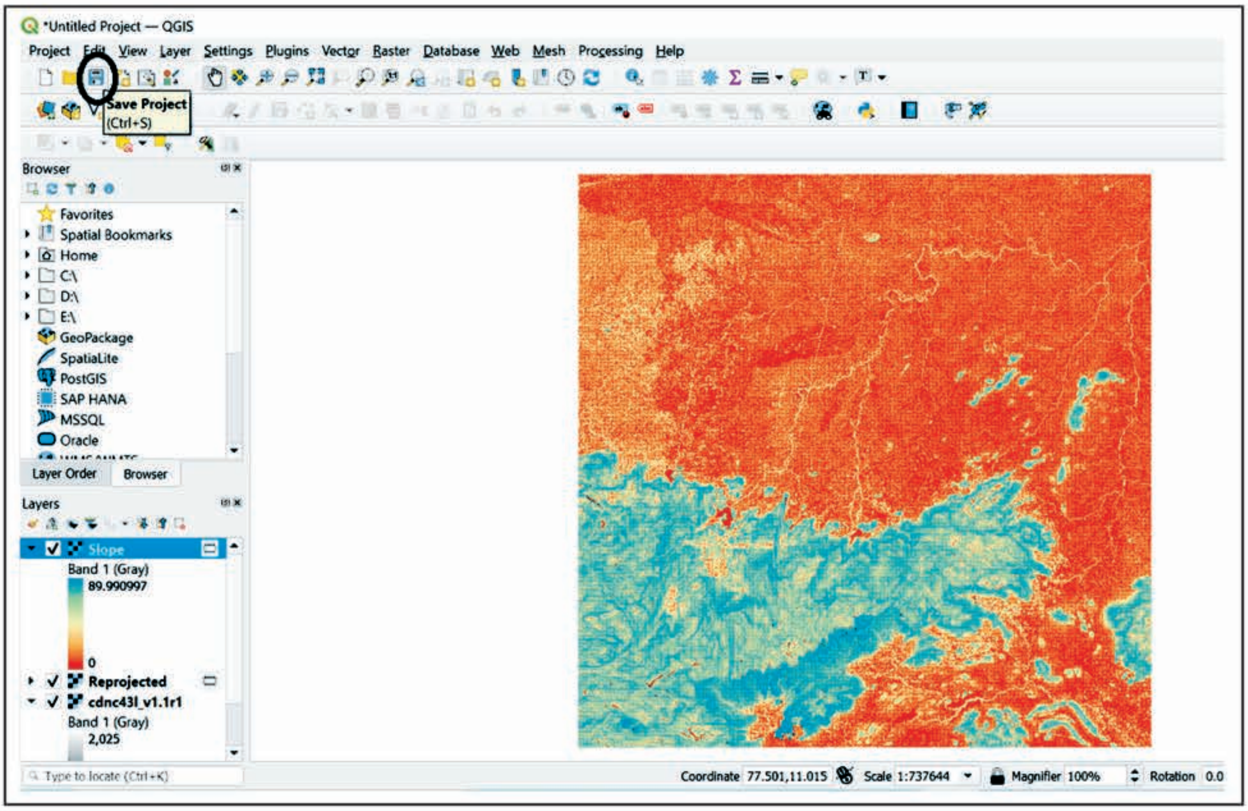
Step-8 Select colour ramp >>mode in equal interval>> and classes as per need. Different colours appear for different slopes.>> Click apply and ok.




Layer Properties — Slope — Symbology
Band Rendering
Render type Singleband pseudocolor
Band 1 (Gray)
Min 0
Max 89.9909973
Min / Max Value Settings
Interpolation Linear
Color ramp
Label unit suffix
Label precision 4
Value
Color
Label
0
0.0000
22.4977
44.9954987
Mode Continuous
Equal Interval
Quantile
Classes 5
Legend Settings...
Clip out of range values
Color Rendering
Blending mode Normal
Brightness
Contrast
Reset
Style
OK
Cancel
Apply
Help


Layer Properties — Slope — Symbology
Band Rendering
Render type Singleband pseudocolor
Band 1 (Gray)
Min 0
Max 89.9909973
Min / Max Value Settings
Interpolation Linear
Color ramp
Label unit suffix
Label precision 4
Value
Color
Label
44.9955
67.4932
89.9910
Mode Equal Interval
Classes 5
Classify
Legend Settings...
Clip out of range values
Color Rendering
Blending mode Normal
Brightness
Contrast
Reset
Style
OK
Cancel
Apply
Help

Step-9 Save the slope project.



Keywords

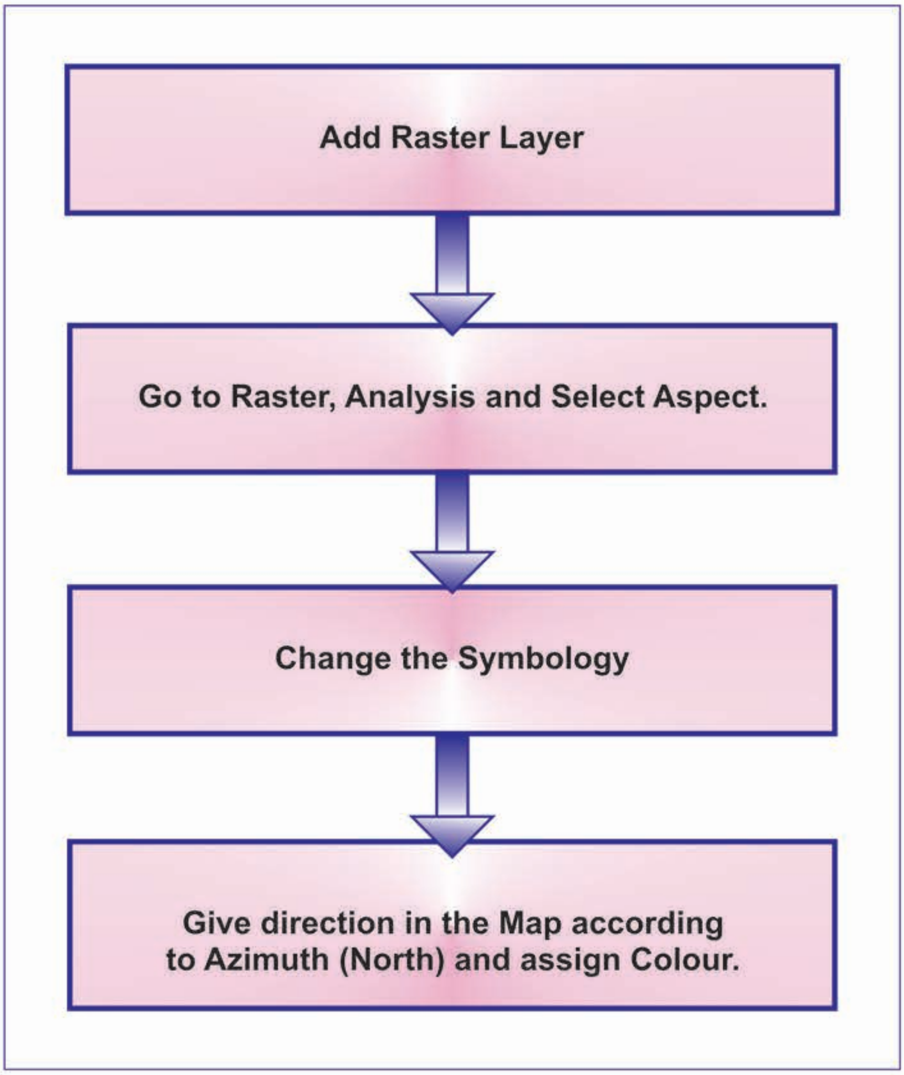
DEM (Digital Elevation Model) - It is a raster image. Each pixel in the Dem refers the surface elevation.Itis again into Digital Terrain Model (DTM) and Digital Surface Model(DSM).DSM represents elevation of all surface whereas DTM exclude elevation of man made structure.

Raster : It is an image compiled using pixels or tiny dots containing unique color and tonal information. It is pixel based hence is resolution dependent. Ex. Satellite Imagery, Digitised toposheet.

Reprojection : Transfer of raster layer into another coordinate reference system. The output file resolution and the resampling method can be chosen.

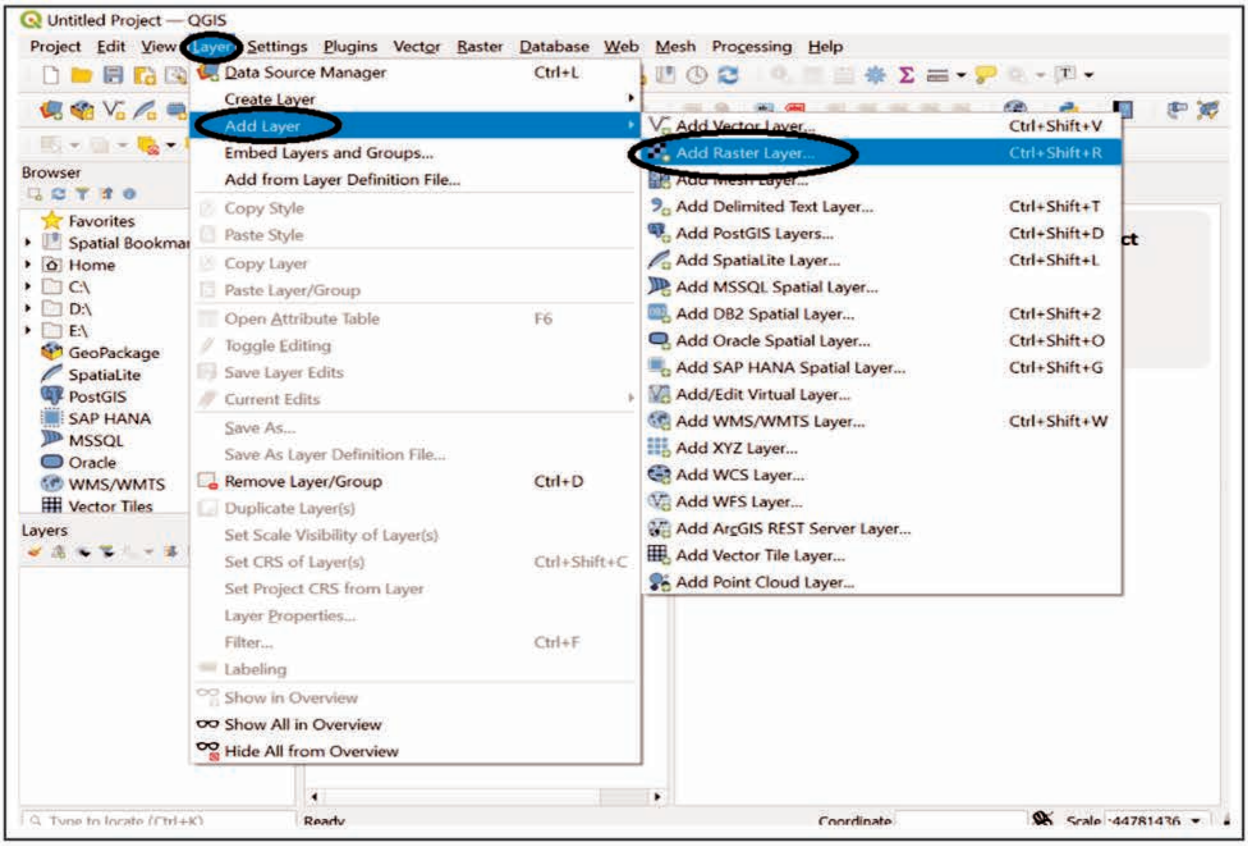
10. EXERCISE FOR ASPECT ANALYSIS

Aspect is the compass direction that a slope faces. The pixel will have a value from 0 - 360 degree measured in degree from North indicating the Azimuth. Since aspect is the significant factor in influencing the vegetation of the area, it is mendatory to understand and include aspect in forest management and planning.

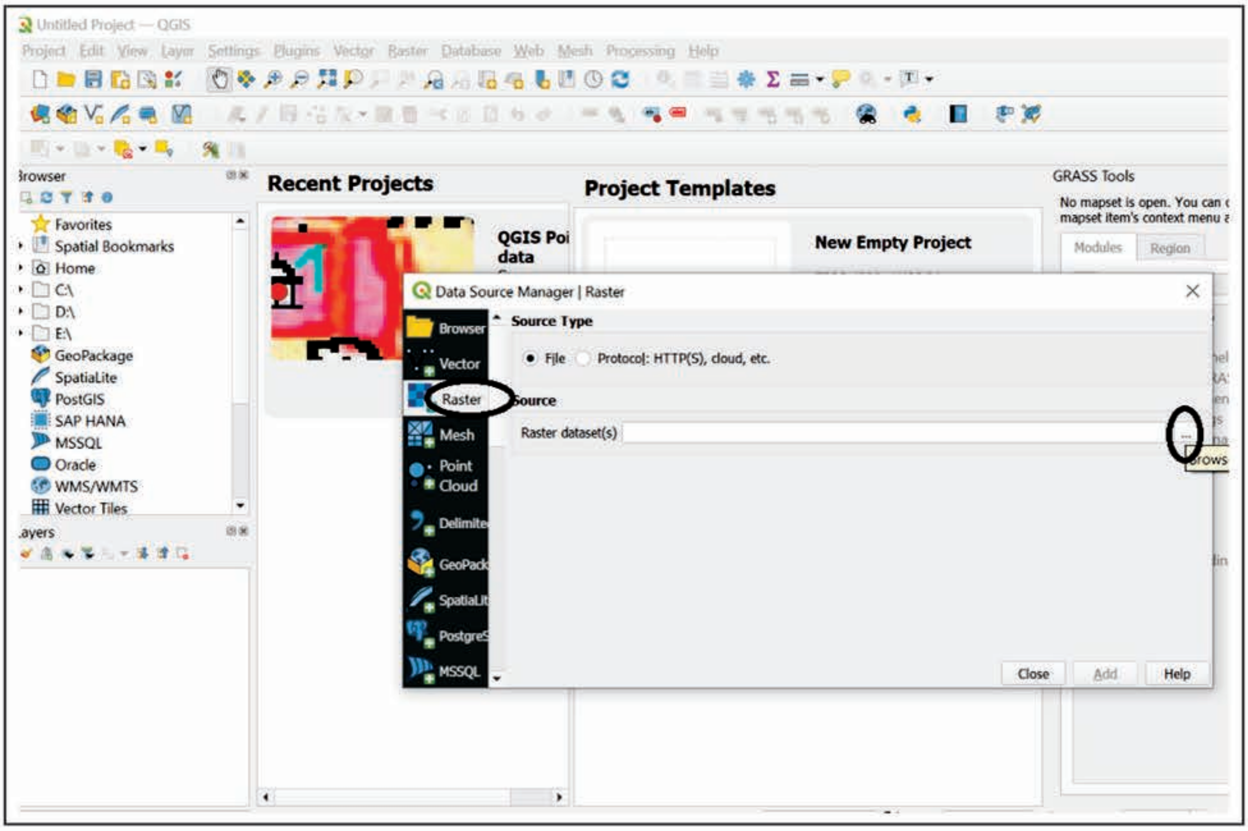


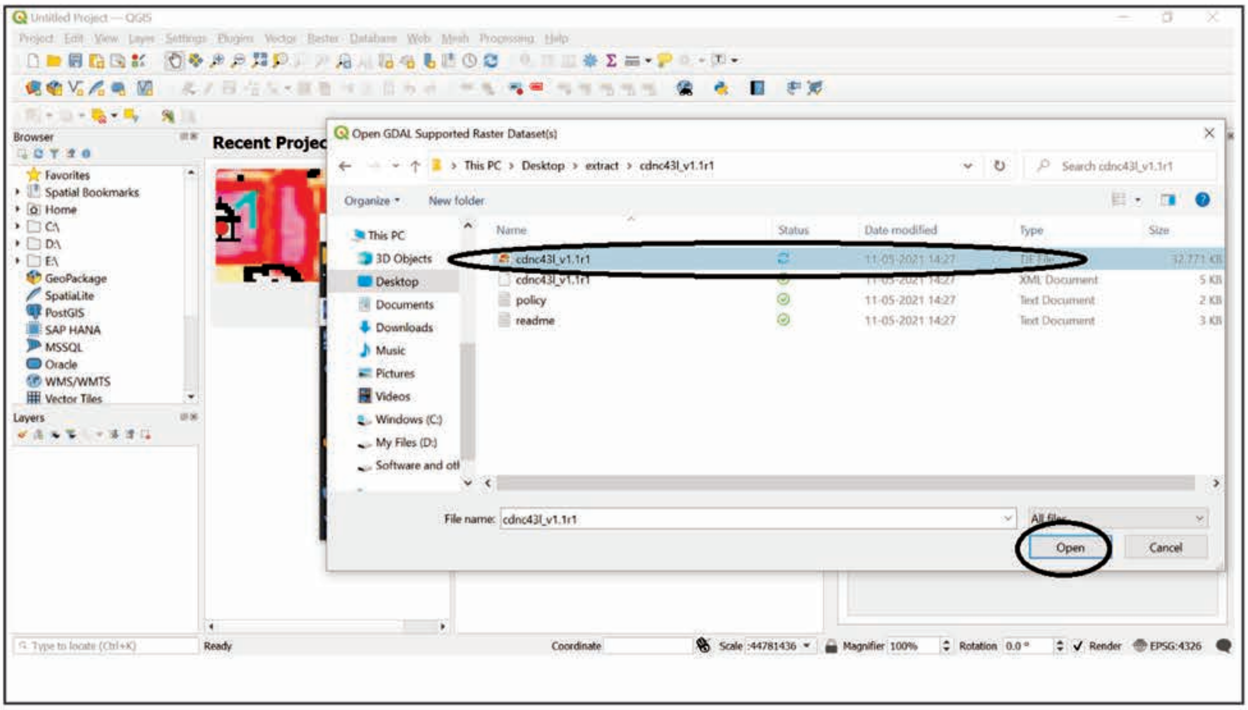
STEP 1 : Add satellite imagery as a Raster Layer

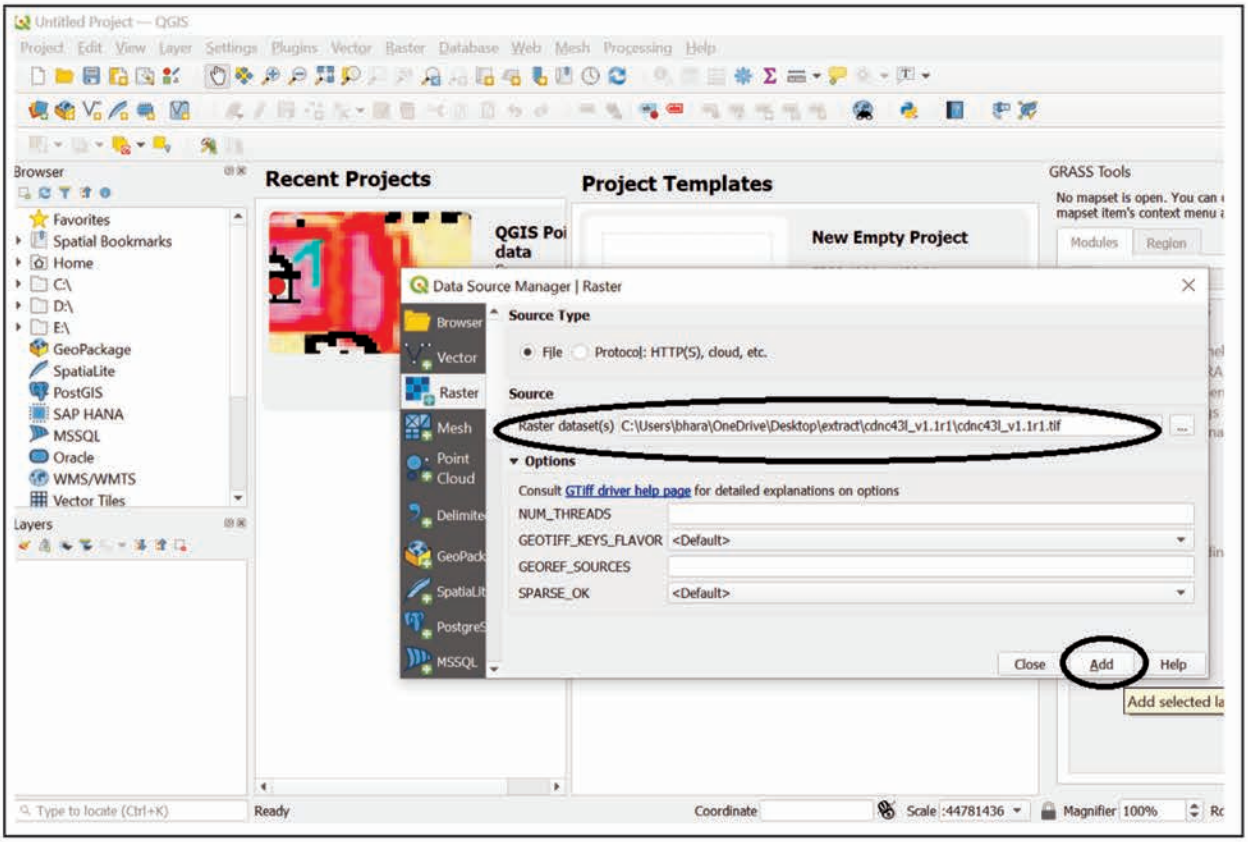
Click layer >> Add Layer>> Add Raster Layer

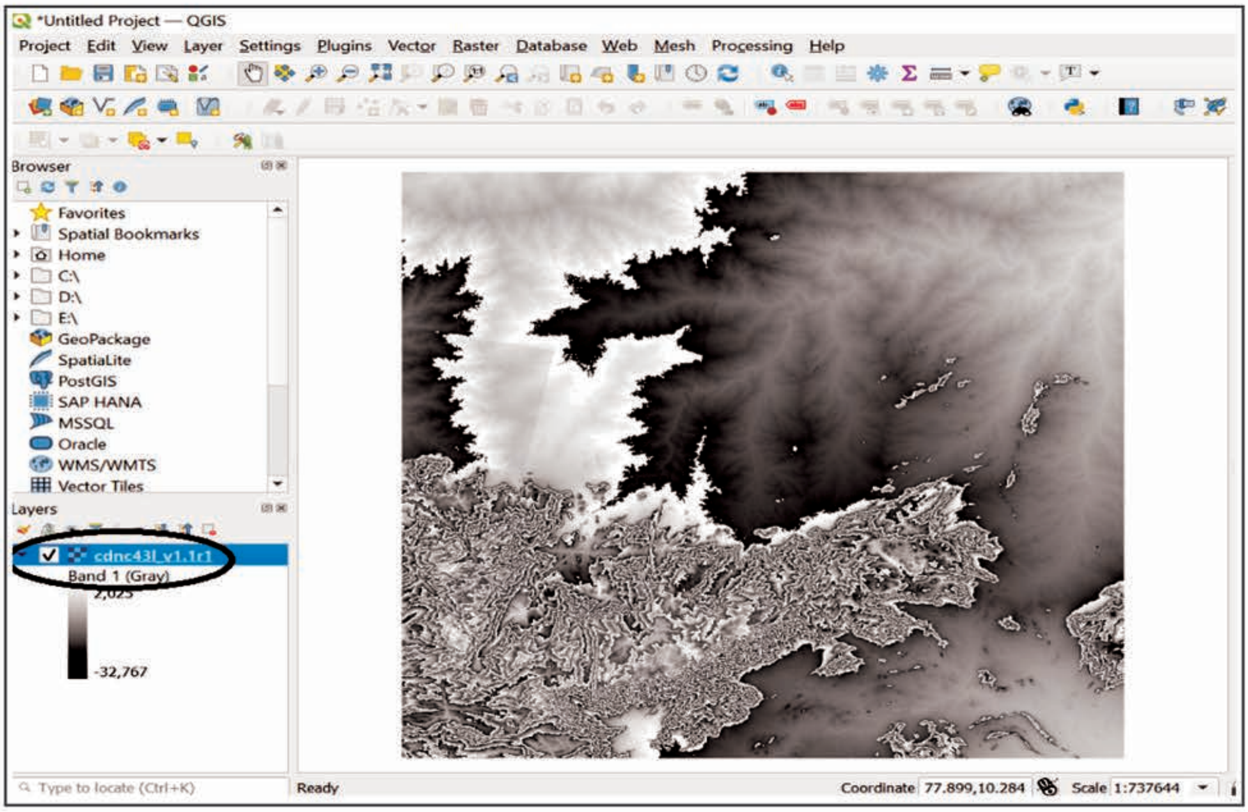


STEP 2: Select imagery from extracted folder and add.

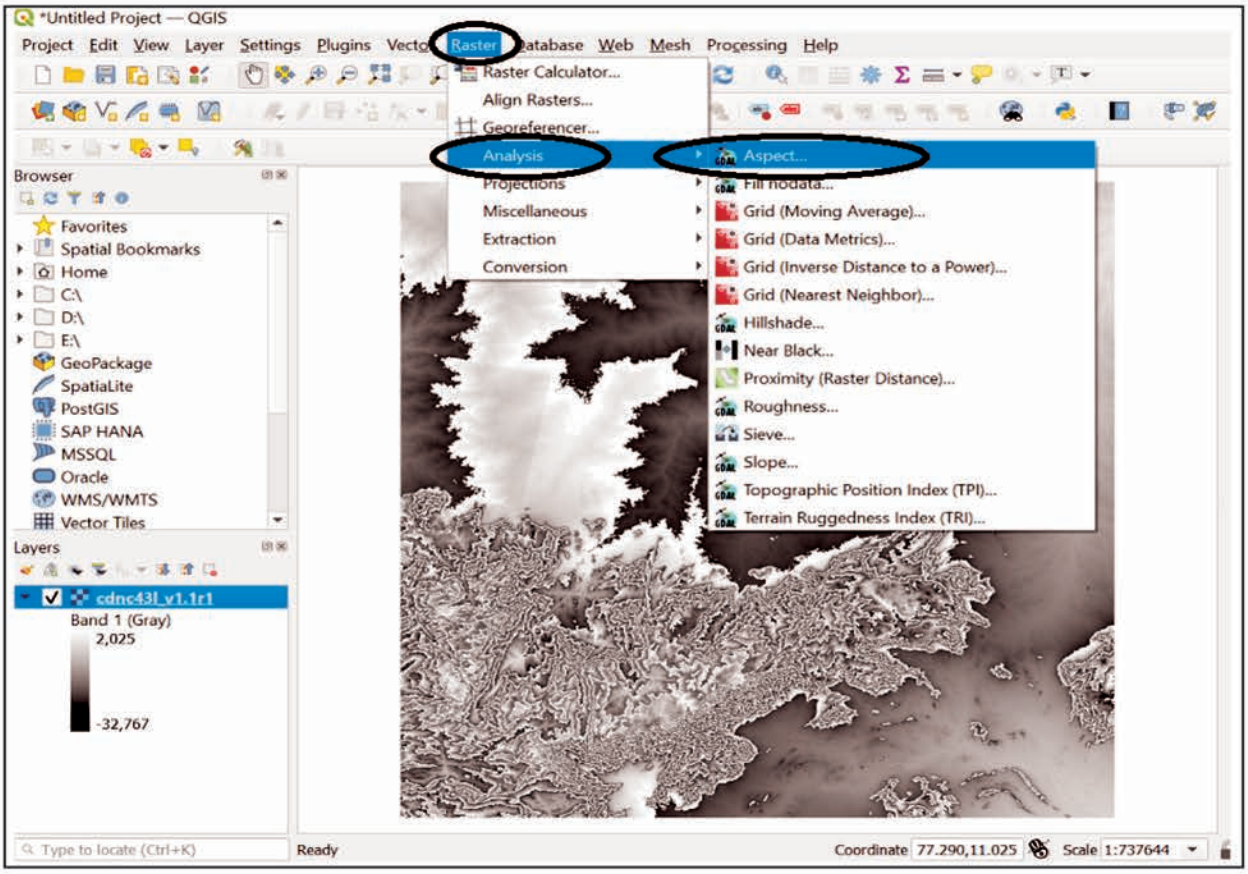



Untitled Project — QGIS
Open GDAL Supported Raster Dataset(s)
This PC > Desktop > extract > cdnc43l_v1.1r1
Search cdnc43l_v1.1r1
Organize
New folder
Name
Status
Date modified
Type
Size
cdnc43l_v1.1r1
policy
readme
11-05-2021 14:27
XML Document
Text Document
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Windows (C:)
My Files (D:)
File name: cdnc43l_v1.1r1
Open
Cancel
Browser
Favorites
Spatial Bookmarks
Home
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
WMS/WMTS
Vector Tiles
Layers
Recent Projec
Ready
Coordinate
Scale
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326

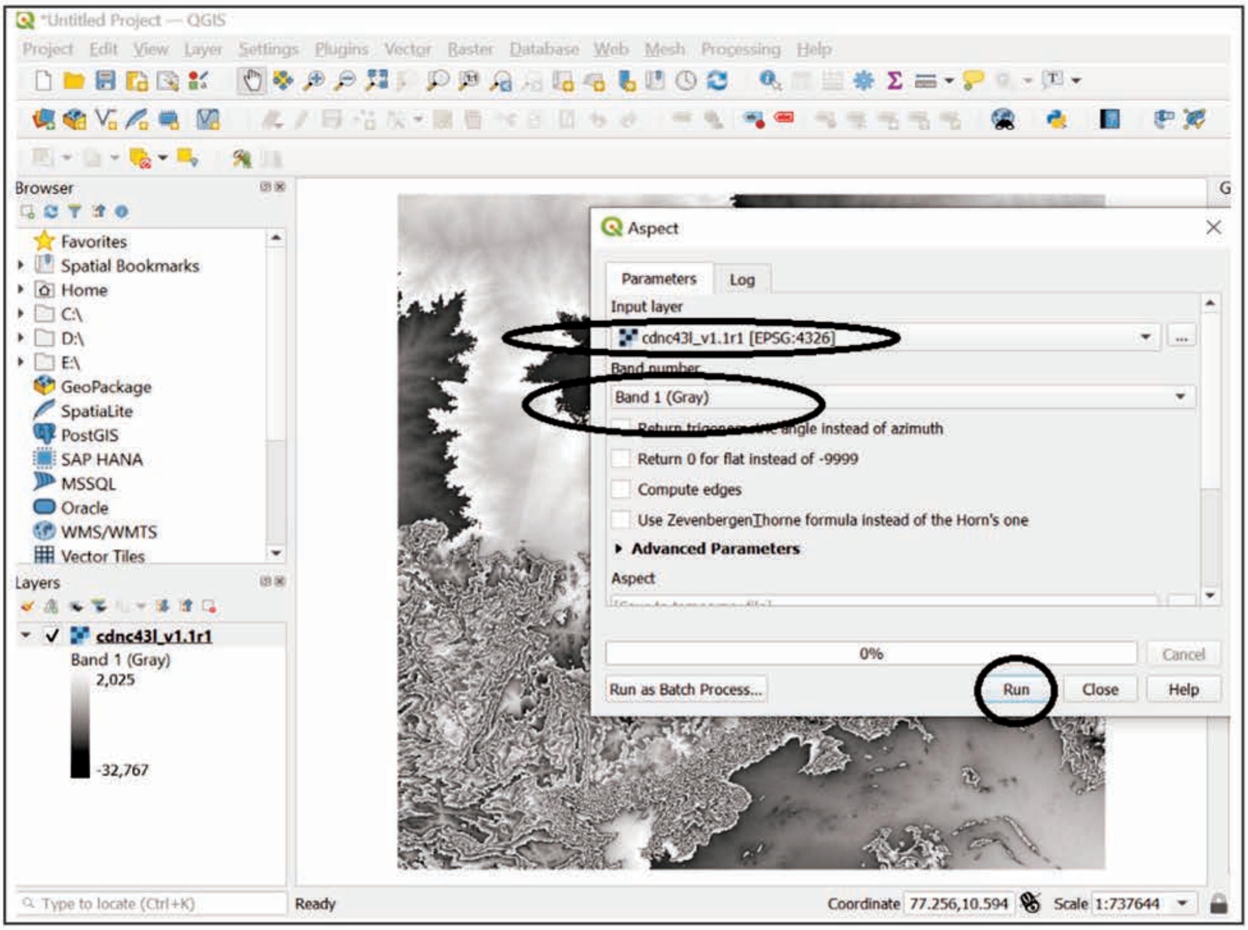

Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh Processing Help
Browser
Favorites
Spatial Bookmarks
Home
GeoPackage
SpatiaLite
PostGIS
SAP HANA
MSSQL
Oracle
WMS/WMTS
Vector Tiles
Layers
Recent Projects
Project Templates
New Empty Project
GRASS Tools
Data Source Manager | Raster
Browser
Vector
Raster
Mesh
Point Cloud
Source Type
File
Protocol: HTTP(S), cloud, etc.
Source
Raster dataset(s) C:\Users\bhara\OneDrive\Desktop\extract\cdnc43l_v1.1r1\cdnc43l_v1.1r1.tif
Options
Consult GTiff driver help page for detailed explanations on options
NUM_THREADS
GEOTIFF_KEYS_FLAVOR <Default>
GEOREF_SOURCES
SPARSE_OK <Default>
Close
Add
Help
Ready
Coordinate
Scale :44781436
Magnifier 100%

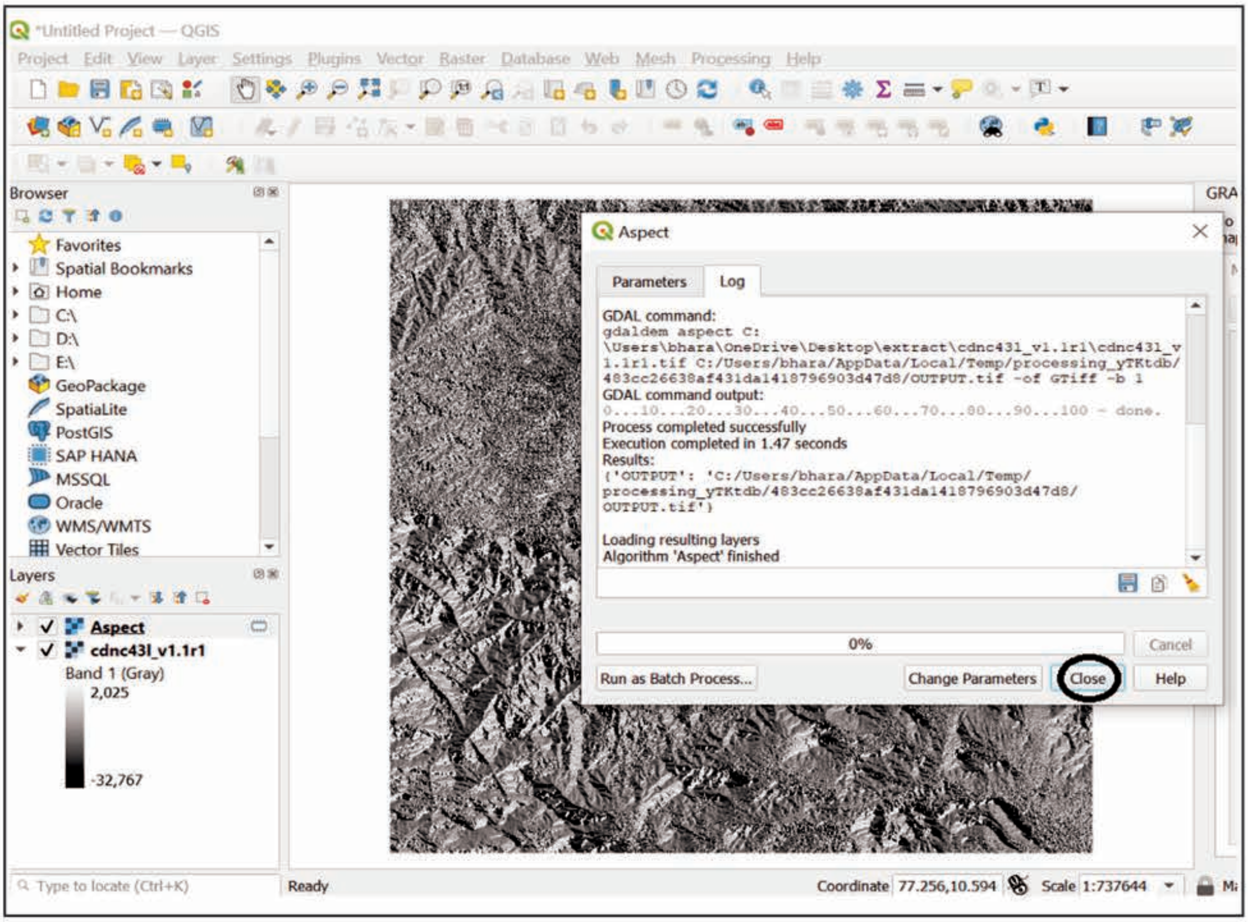


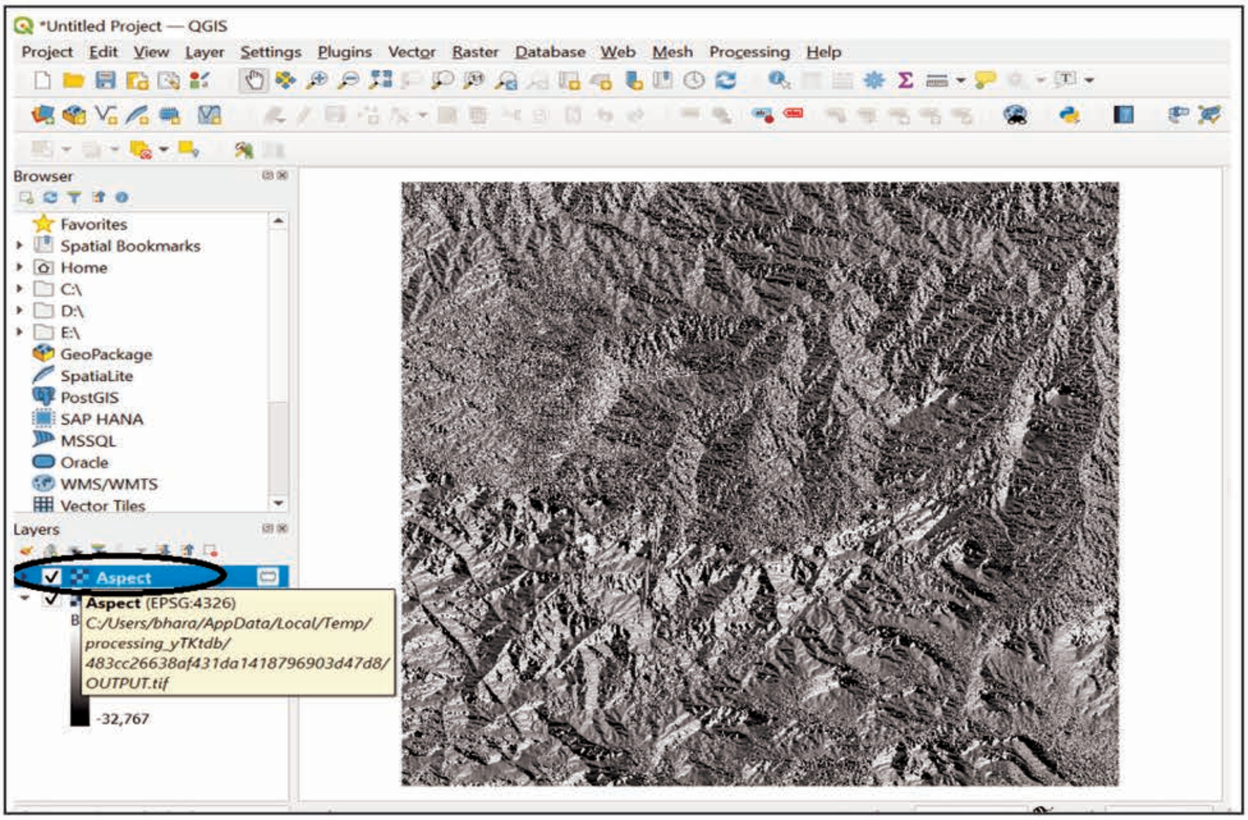
STEP 3 : Go to Raster >> Analysis >> Click Aspect



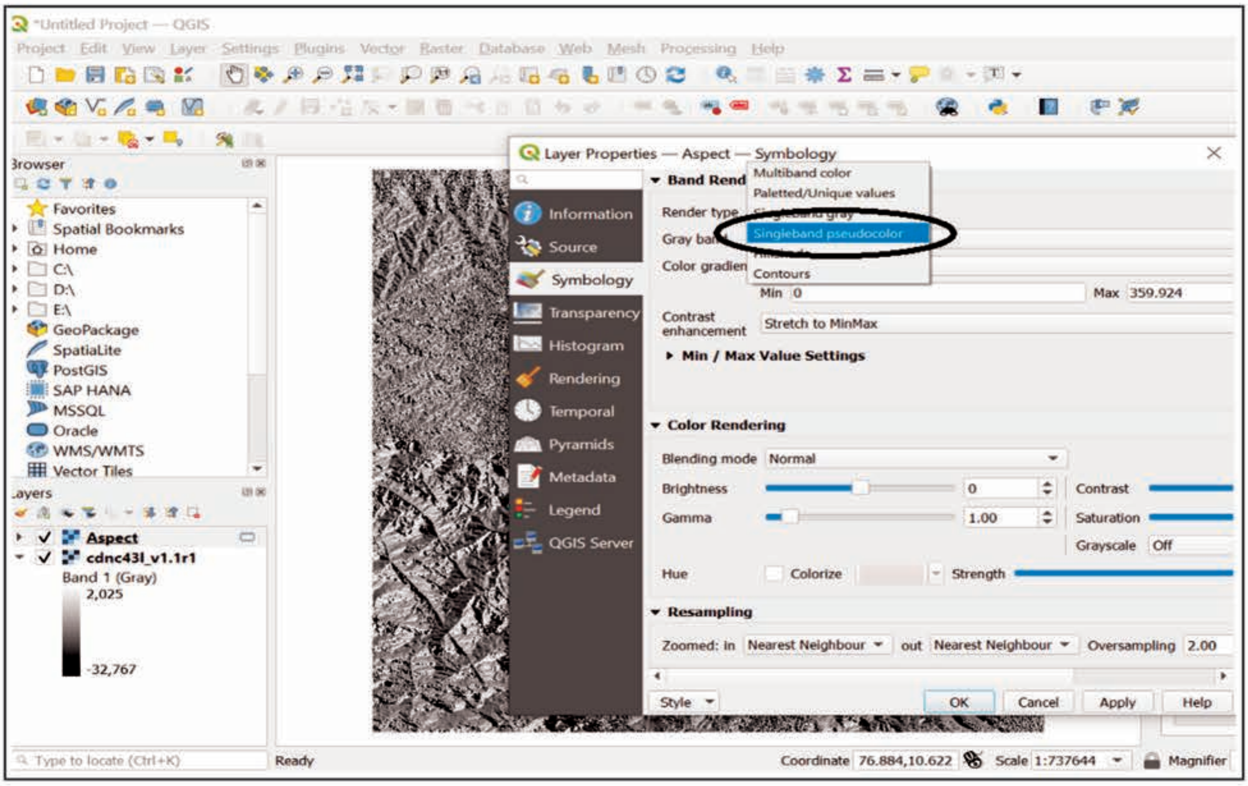
STEP 4: Run the Aspect



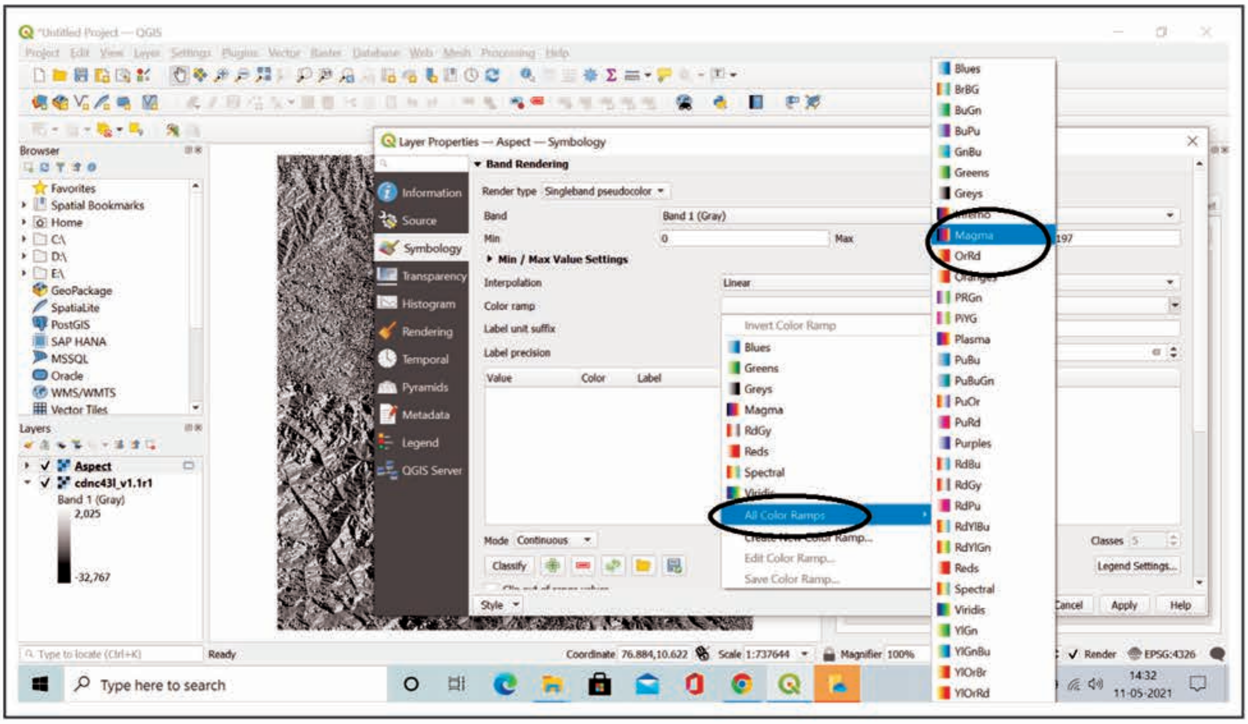


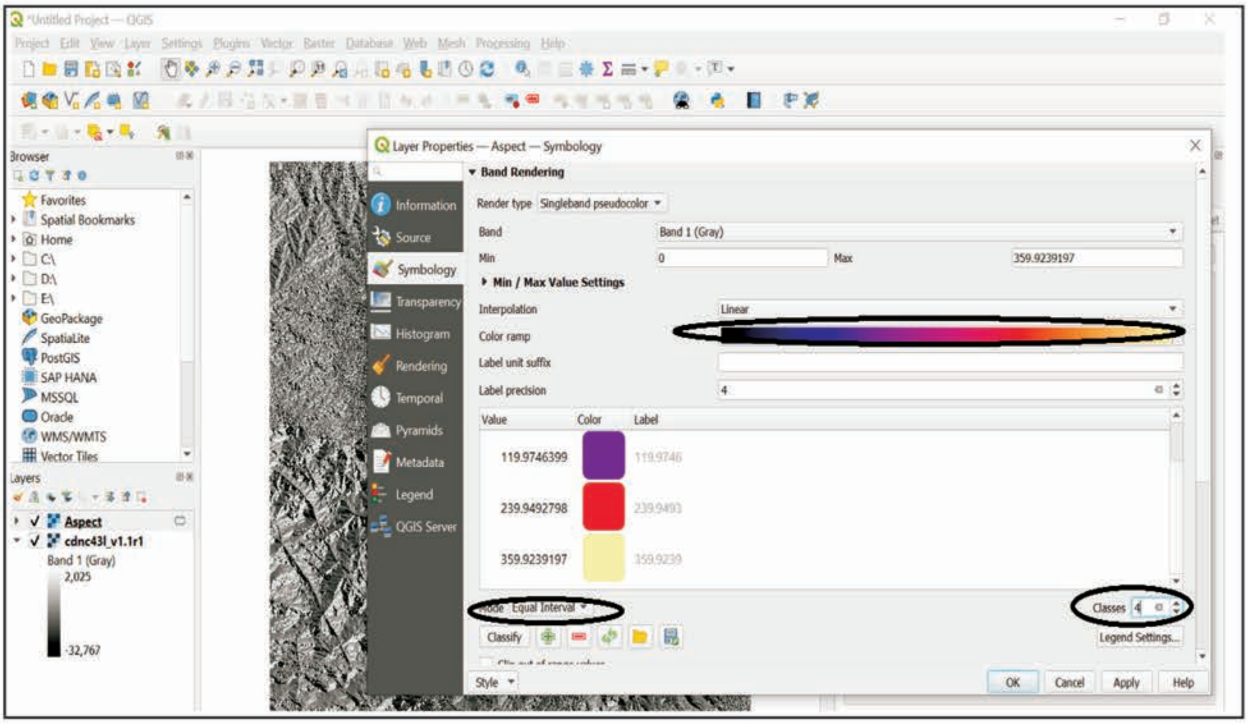


STEP 5 : Now click Aspect and go to Symbology
Select Singleband Pseudocolour in Render Type



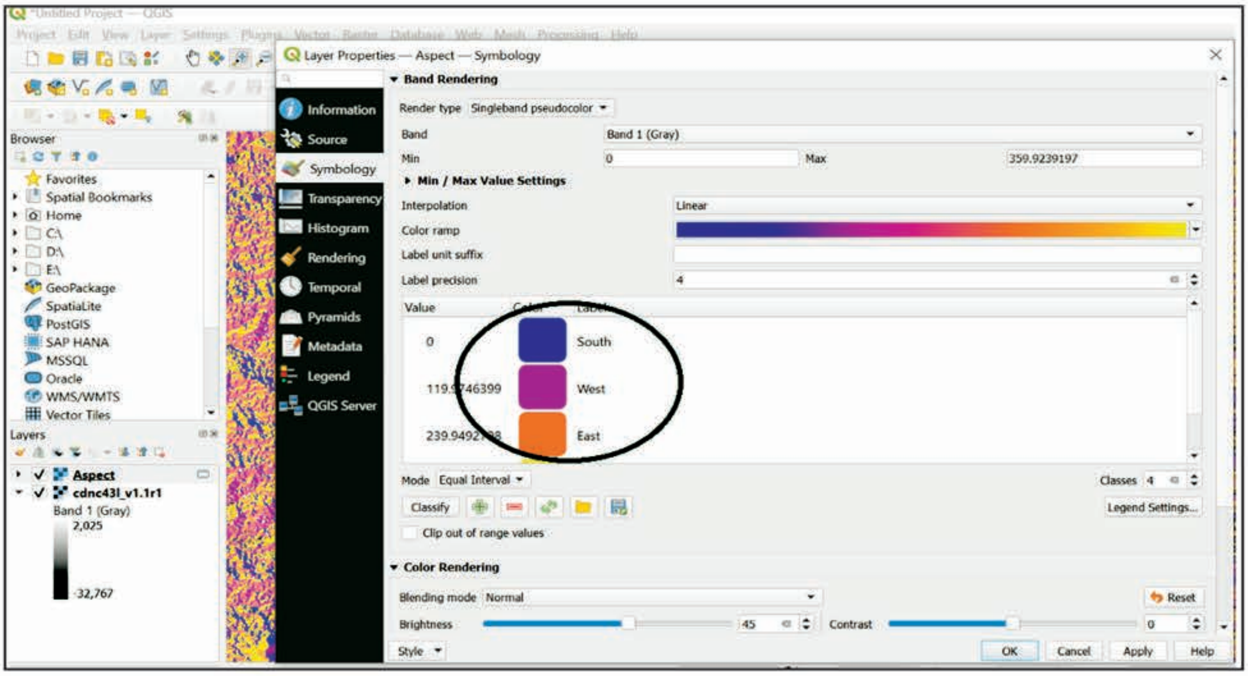
STEP 6: Choose Colour Ramp >> Mode equal interval and number of classes as per need

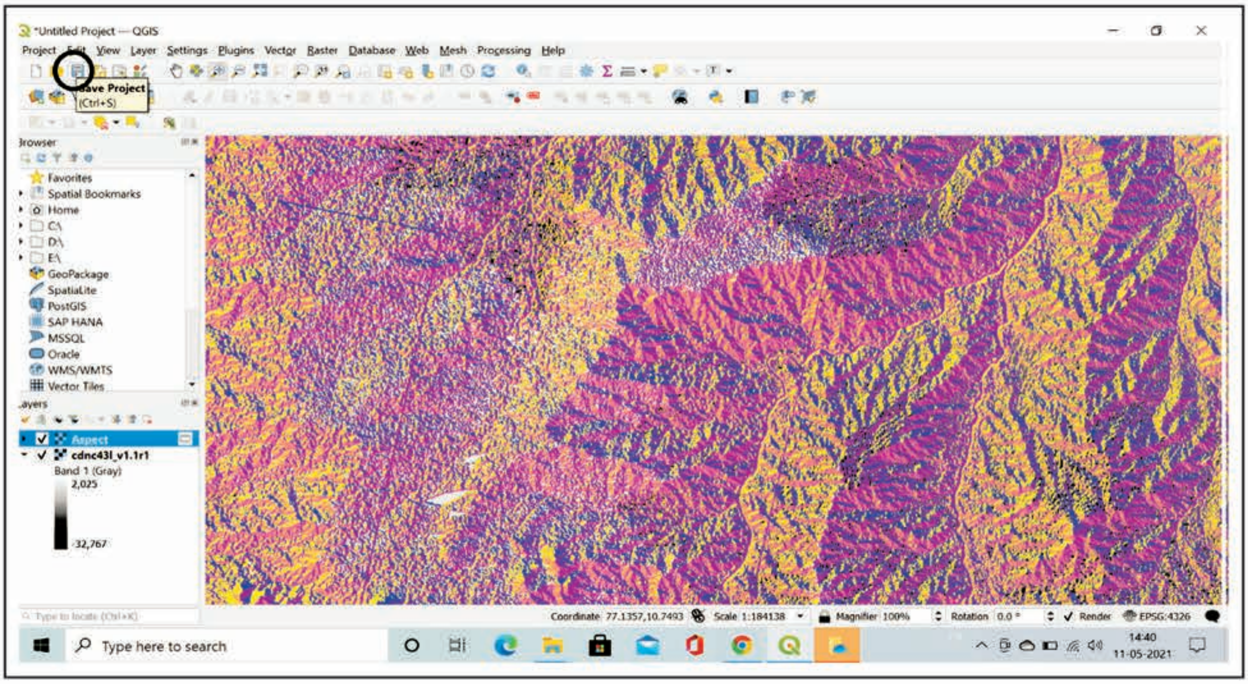




STEP 7 : Give direction according to the colour of aspect in respect of map (azimuth of the map.)

Click Ok and save the project.





Keywords

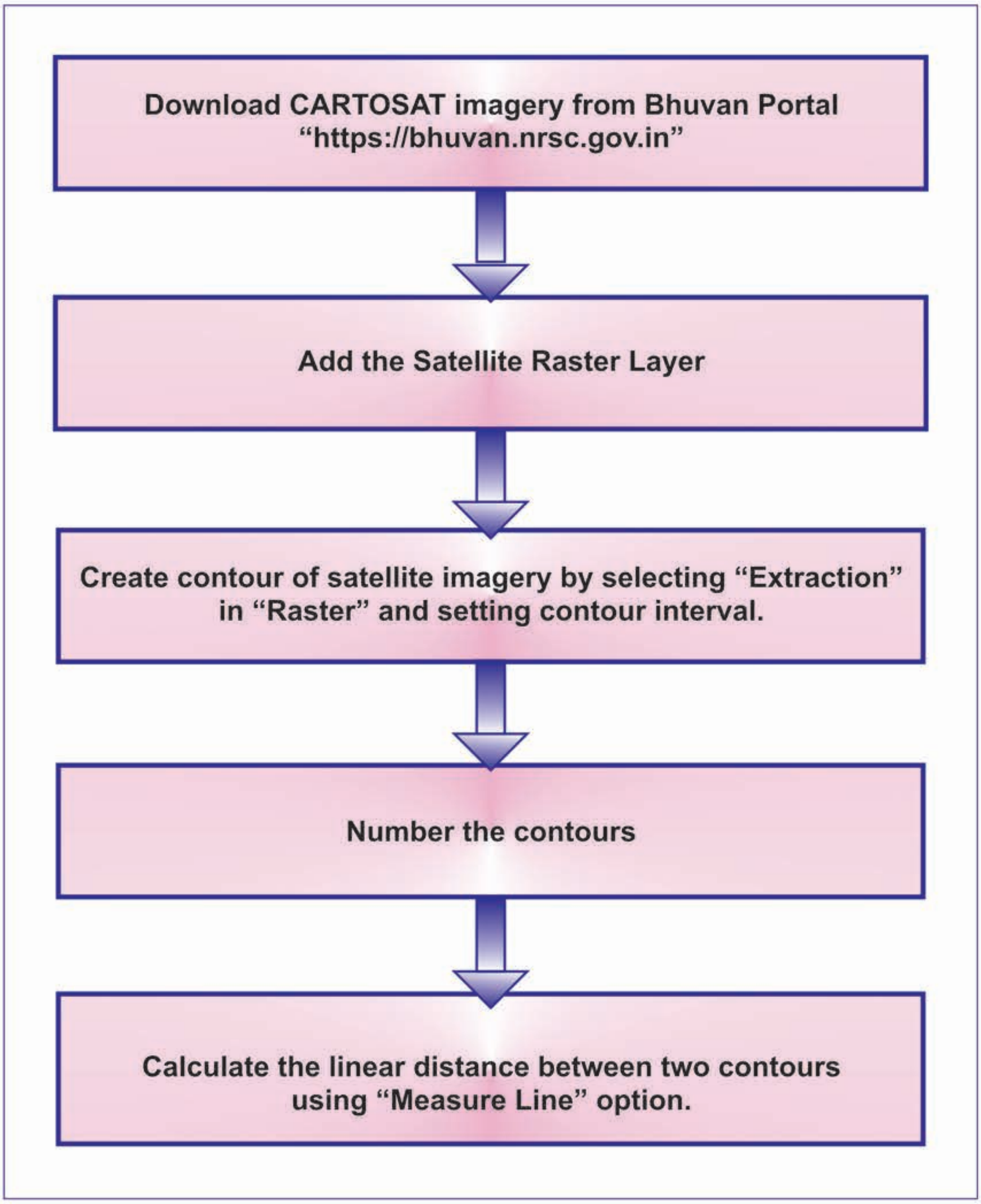
Azimuth : It is the angle between North, measured clockwise around the observer's horizon. North has an azimuth of 0-degree, one due east 90-degree, one due south 180 degree and one due west 270 degree.

Raster : It is an image compiled using pixels or tiny dots containing unique colour and tonal information. It is pixel based hence is resolution dependent. Ex. Satellite Imagery, Digitised Toposheet

11. Extracting contour from CARTOSAT imagery downloaded from Bhuvan Portal

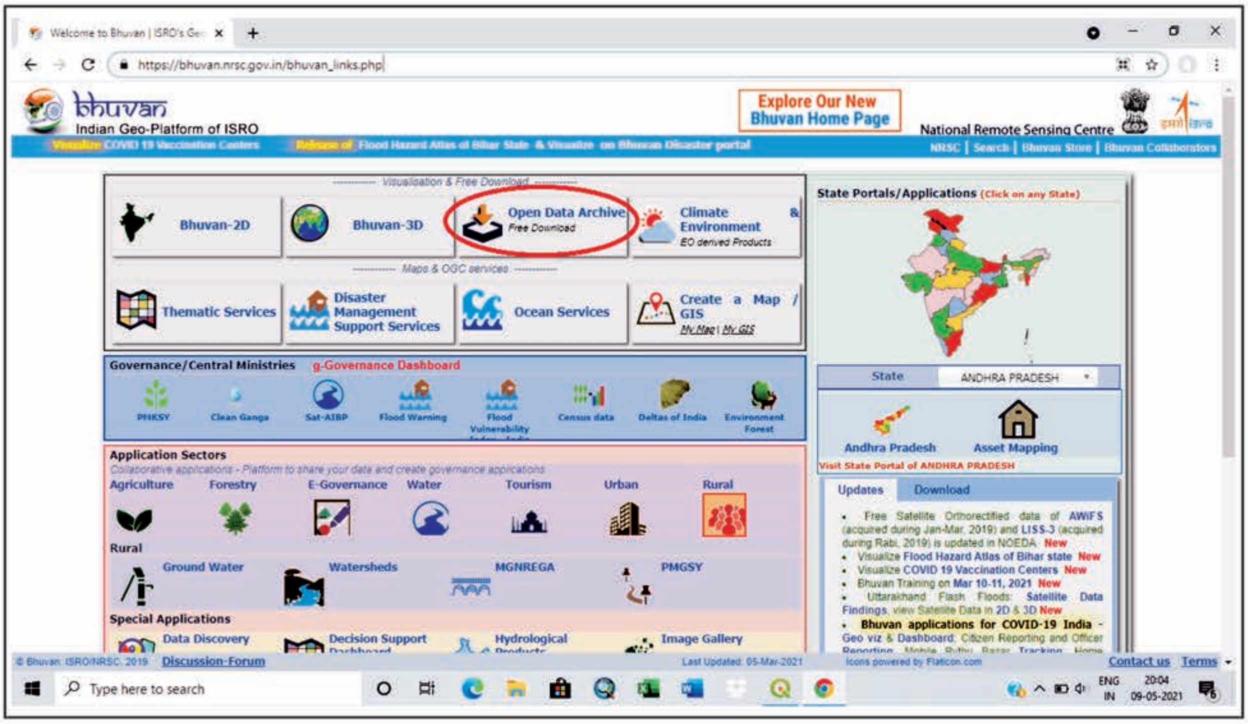
Contour is very important aspect for forest management and soil moisture conservation planning in forest areas. Deriving contour from DEM in QGIS is explained in this chapter.

The process involves downloading satellite imagery (raster data) from Bhuvan portal and extracting contours from it through raster analysis. The methodology is explained as below.

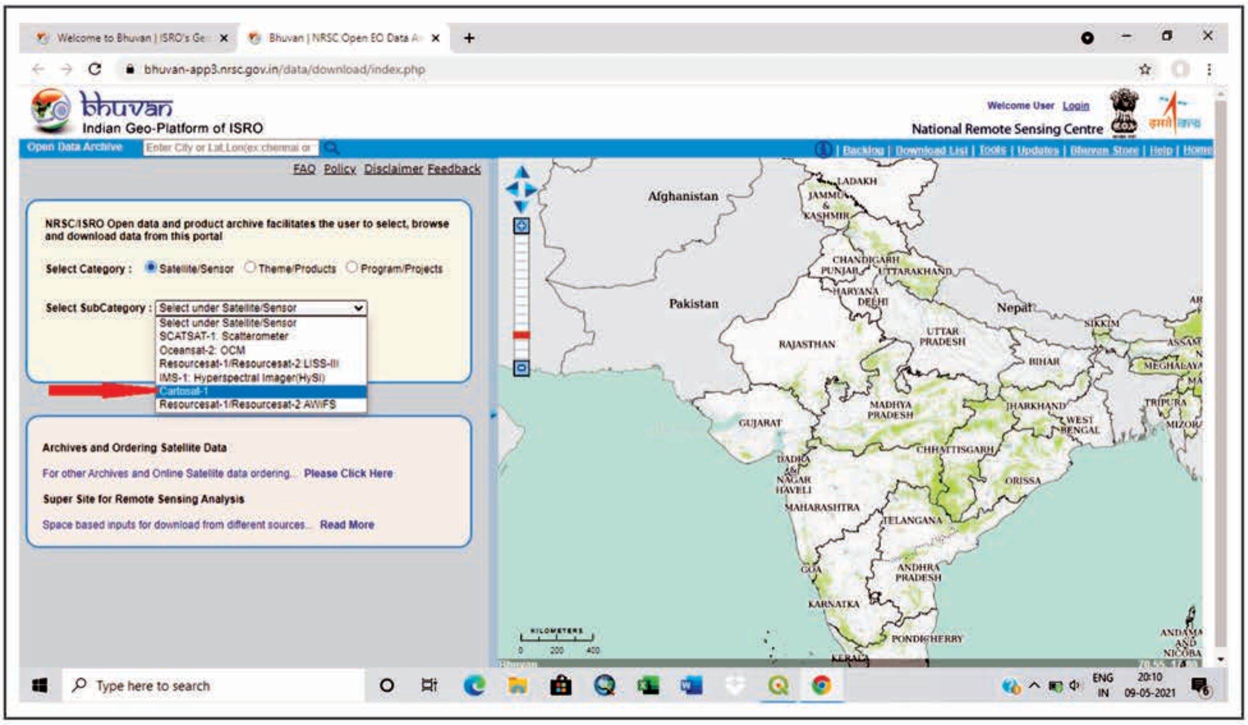


Steps for extracting Contour from CARTOSAT imagery downloaded from BHUVAN portal

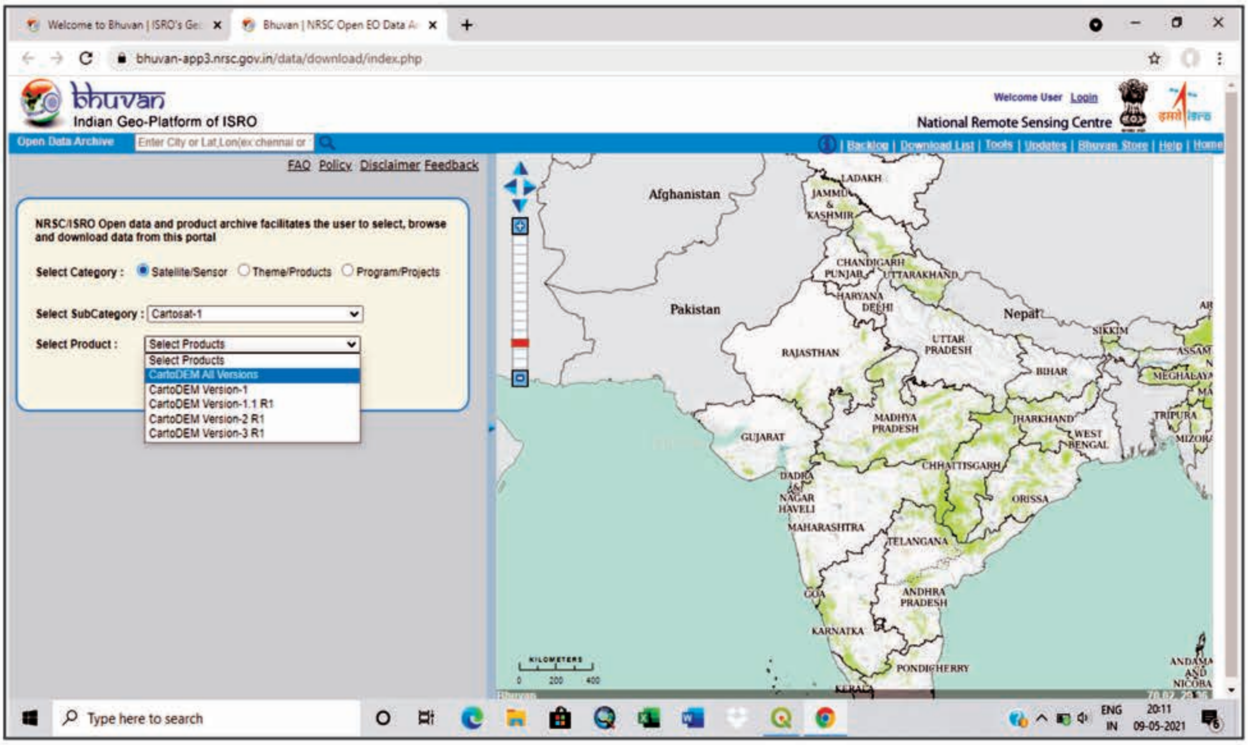
Step 1 : Open Bhuvan portal using the link "https://bhuvan.nrsc.gov.in" and click on "Open Data Archive".



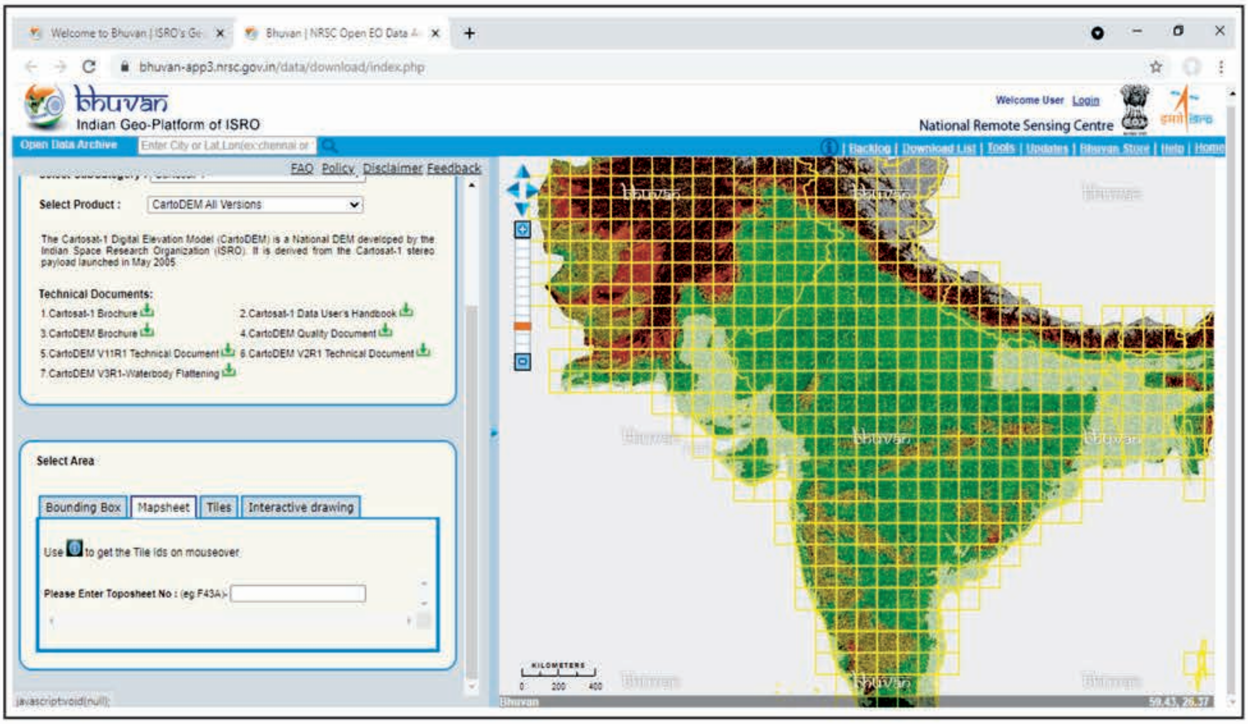
Step 2: Select Sub Category as "CARTOSAT 1"



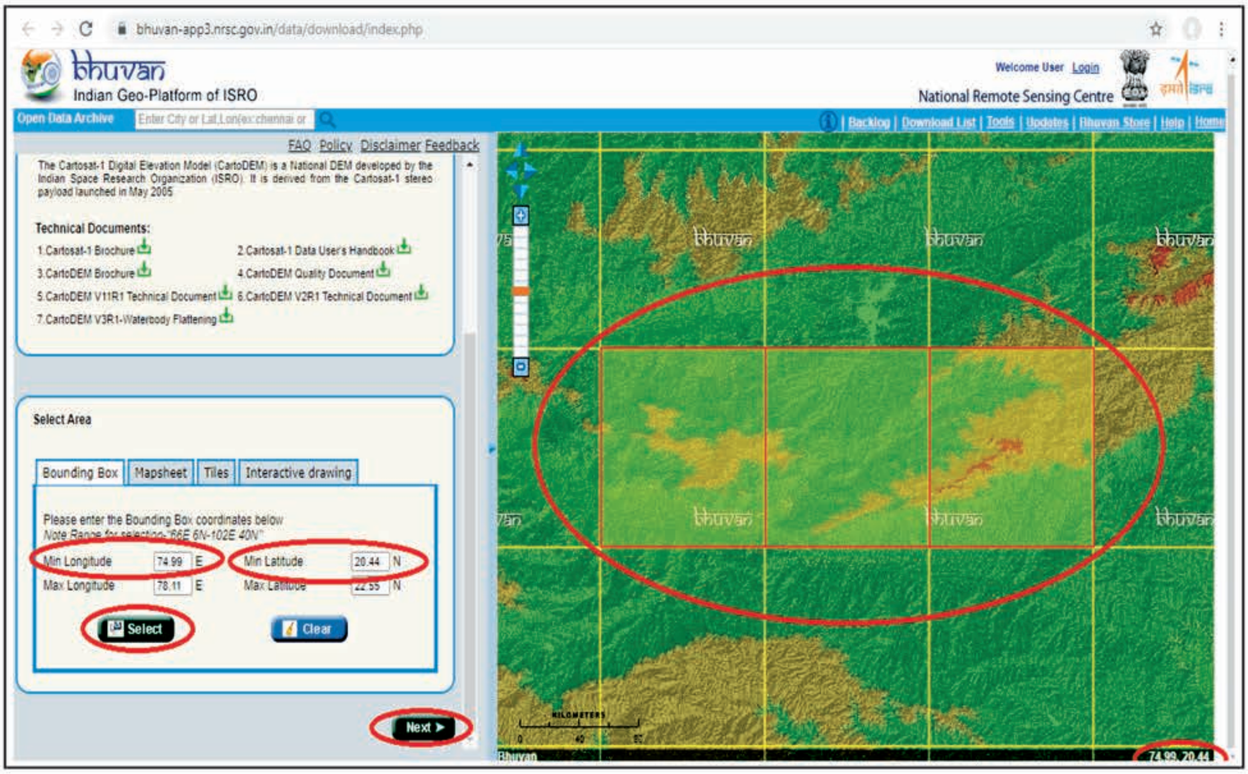
Step 3 : Select Sub Product as “CartoDEM All Versions”



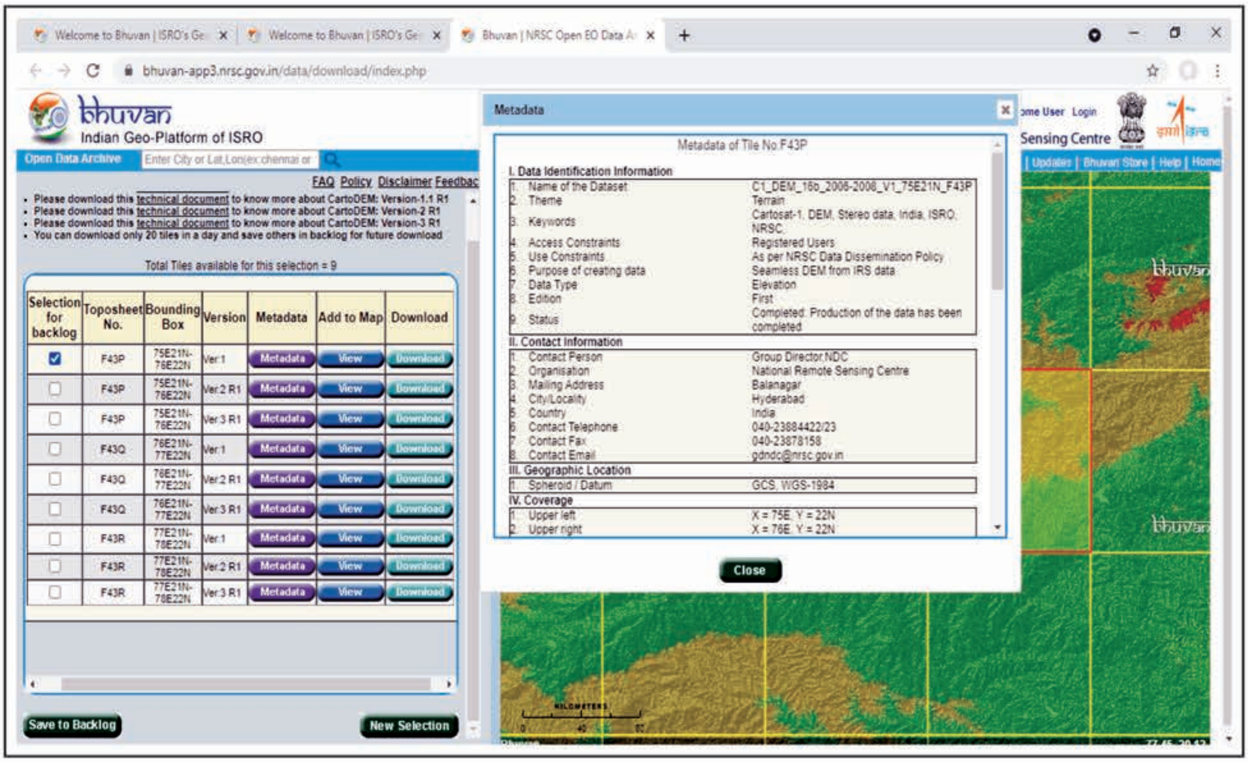
Step 4 : CARTOSAT imagery can be downloaded through “Bounding box” or “Mapsheet” or “Tiles” or “Interactive drawing” in “Select Area” box.



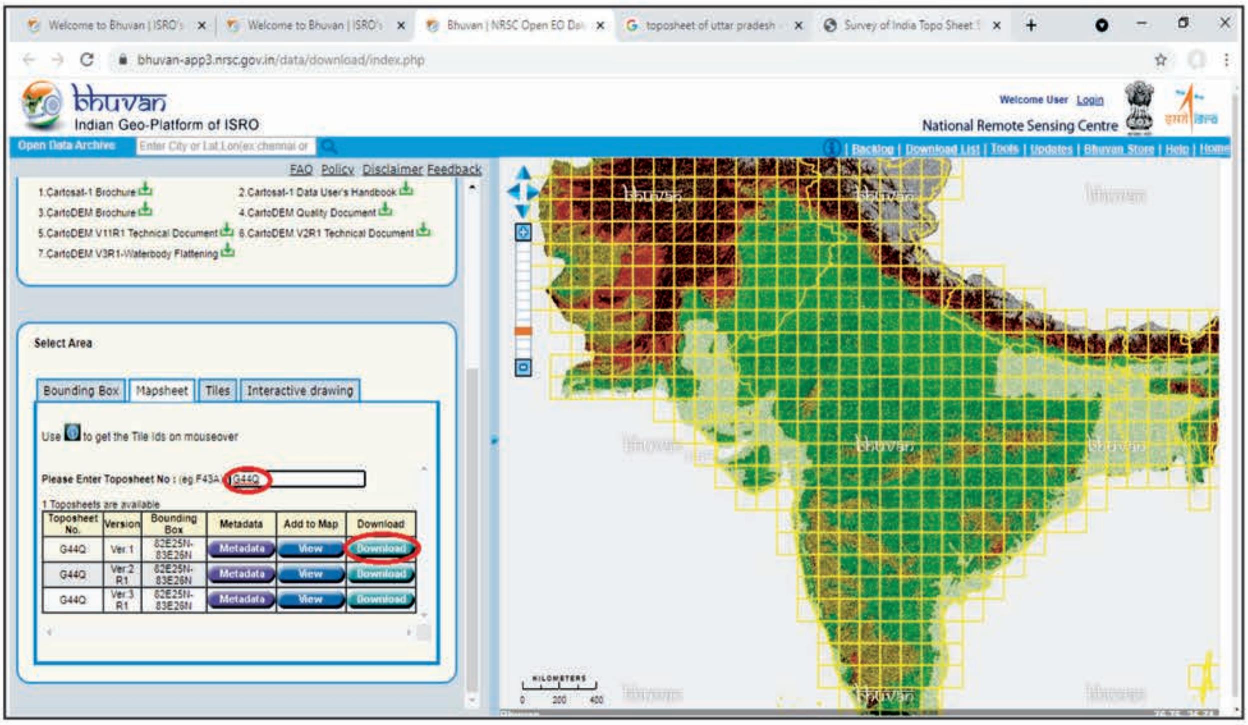
Note:- (a) Bounding Box method- (i) On the map, we select tiles bound by the longitudinal and latitudinal extent. To do this, pointer is placed on map and on right hand side bottom, longitude and latitude values are displayed. These values are entered as maximum/ minimum latitude and longitude values and “Select” key is pressed.



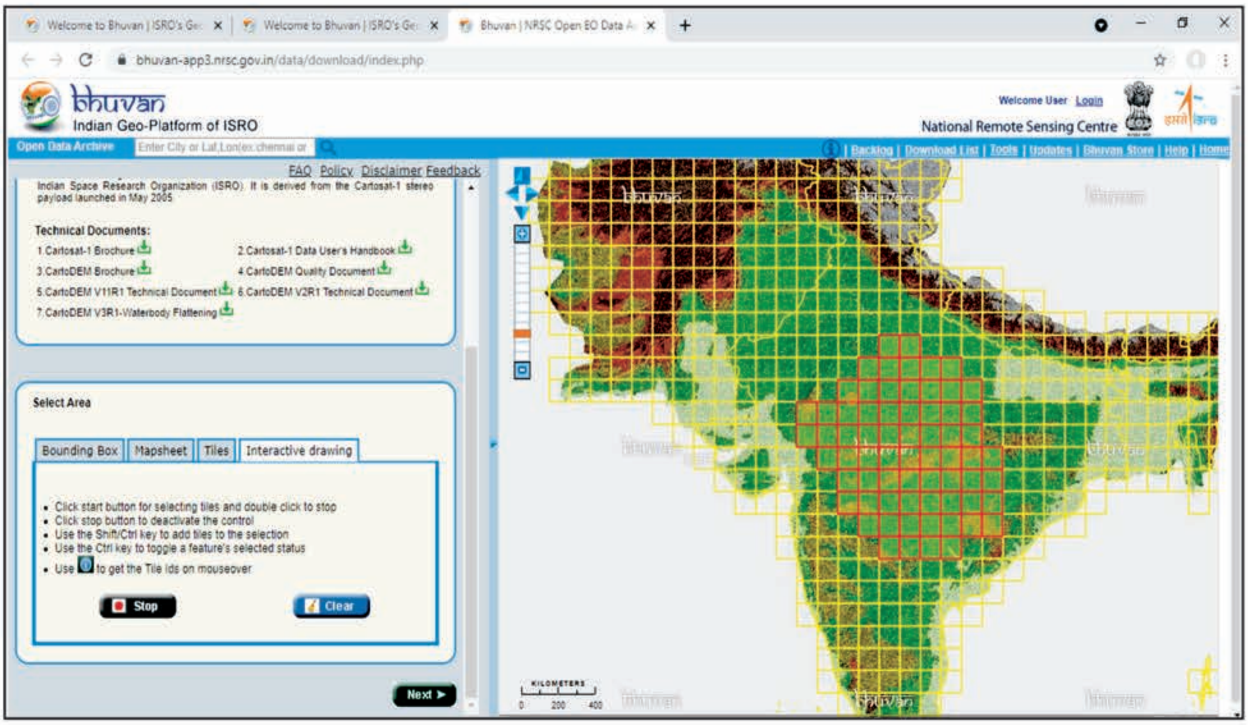
(ii) After Clicking " Next" , window opens which contains download option by clicking on which satellite imagery can be downloaded.



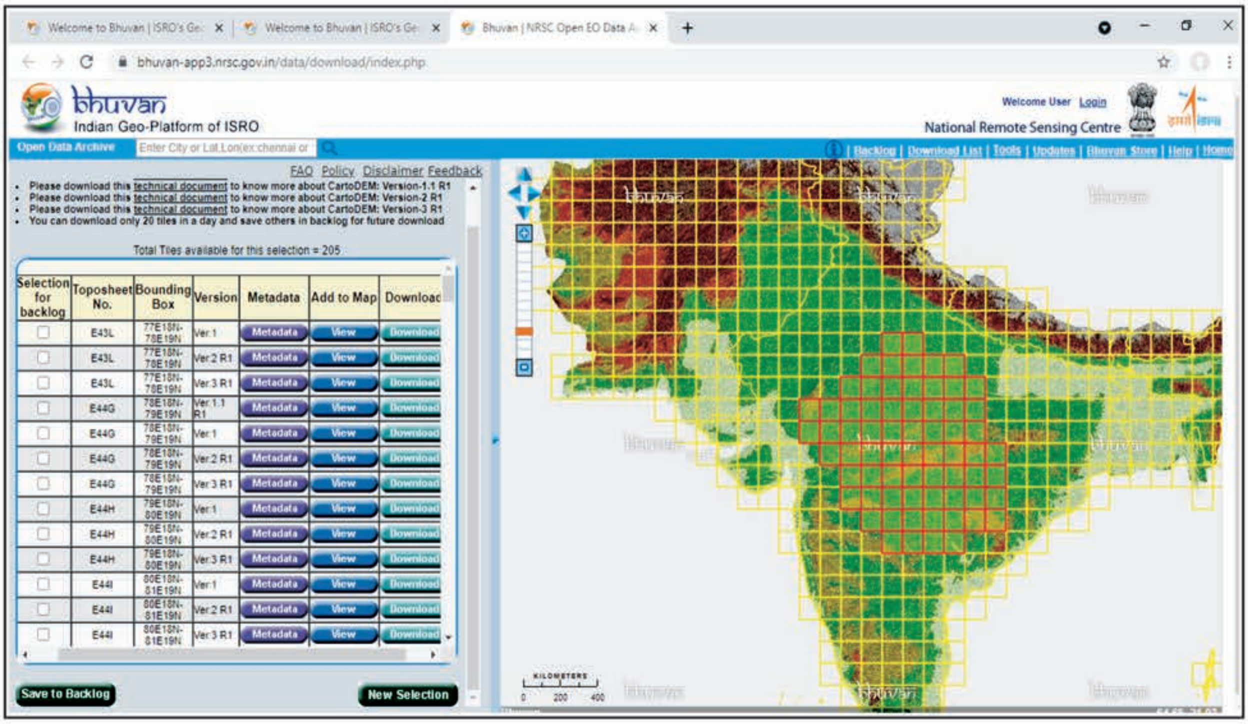
(b) Mapsheet method:-If we know the toposheet no, we can select the Satellite imagery using Toposheet No. option.



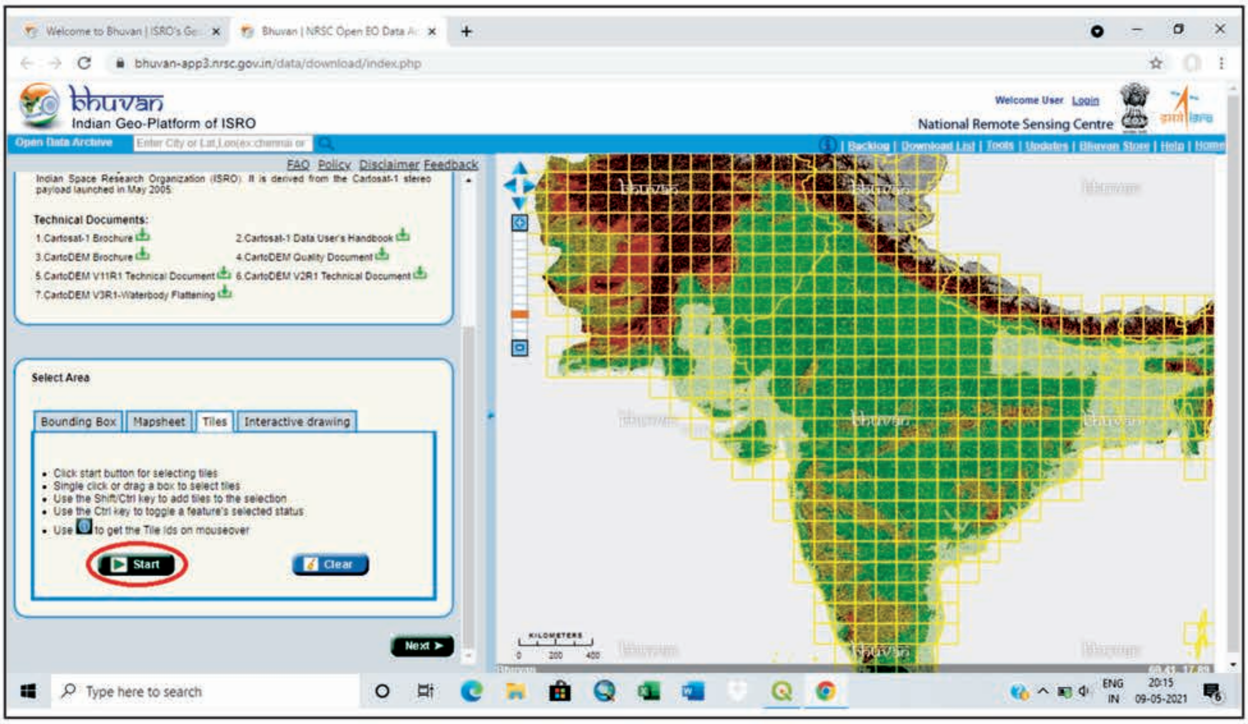
(c) Interactive Drawing method :- After pressing “Start” button, we select tiles on the map.



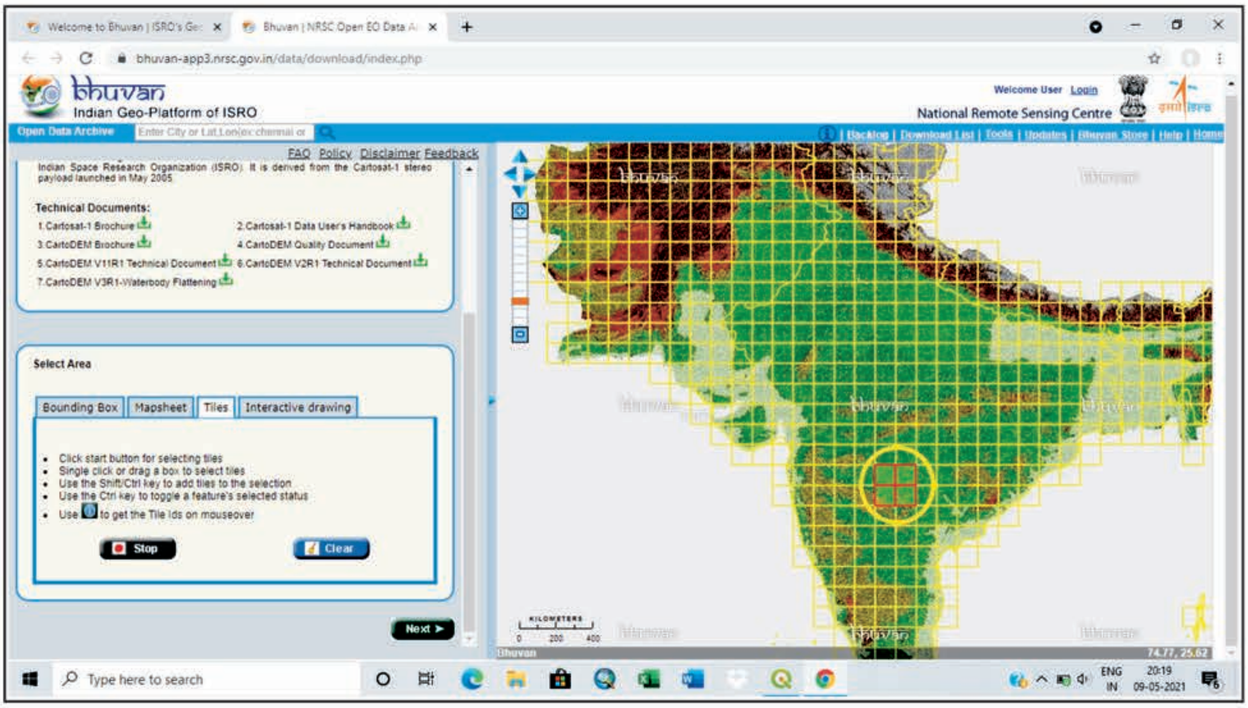
After pressing “Next” button, following window opens which has “Download” option from where satellite imagery can be downloaded.



(d) Tiles Method:- We will be downloading satellite imagery using "Tiles" option in "Select Area" by clicking on "Start" button.

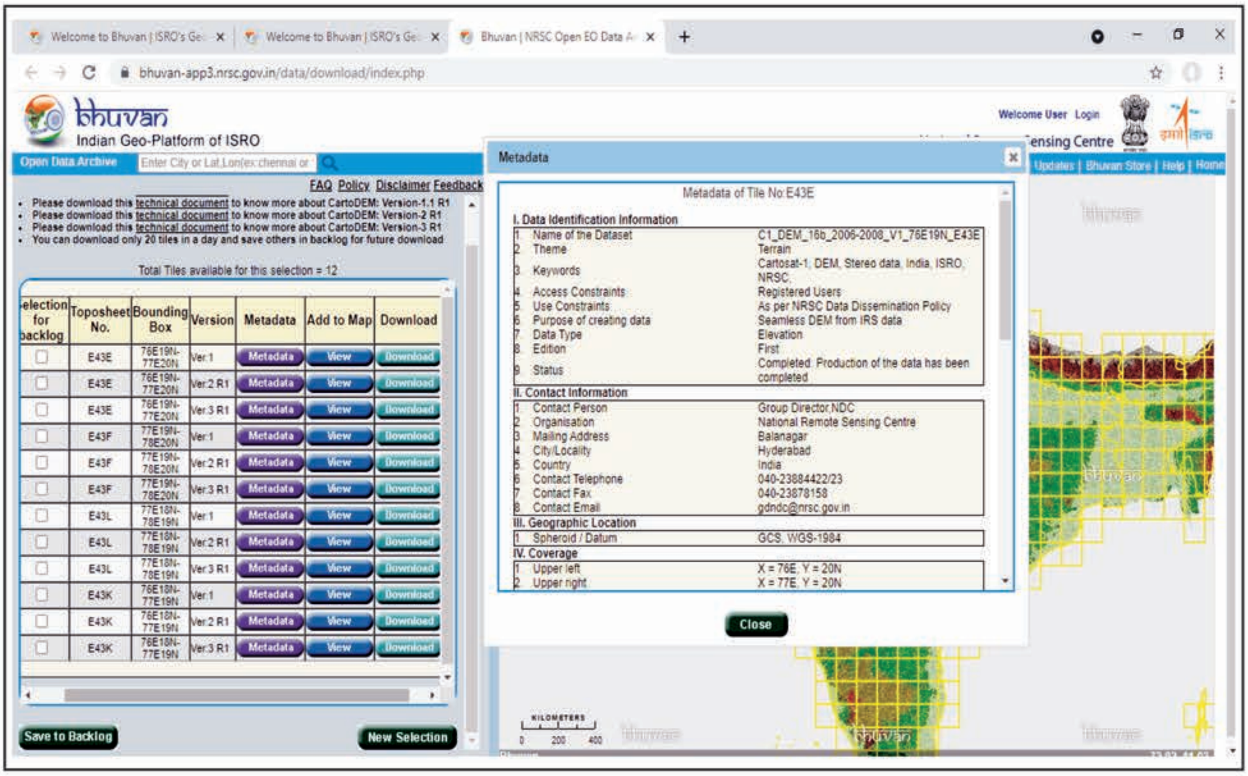


Step 5: Tile on the Map is then Selected by clicking on individual tile on the map.



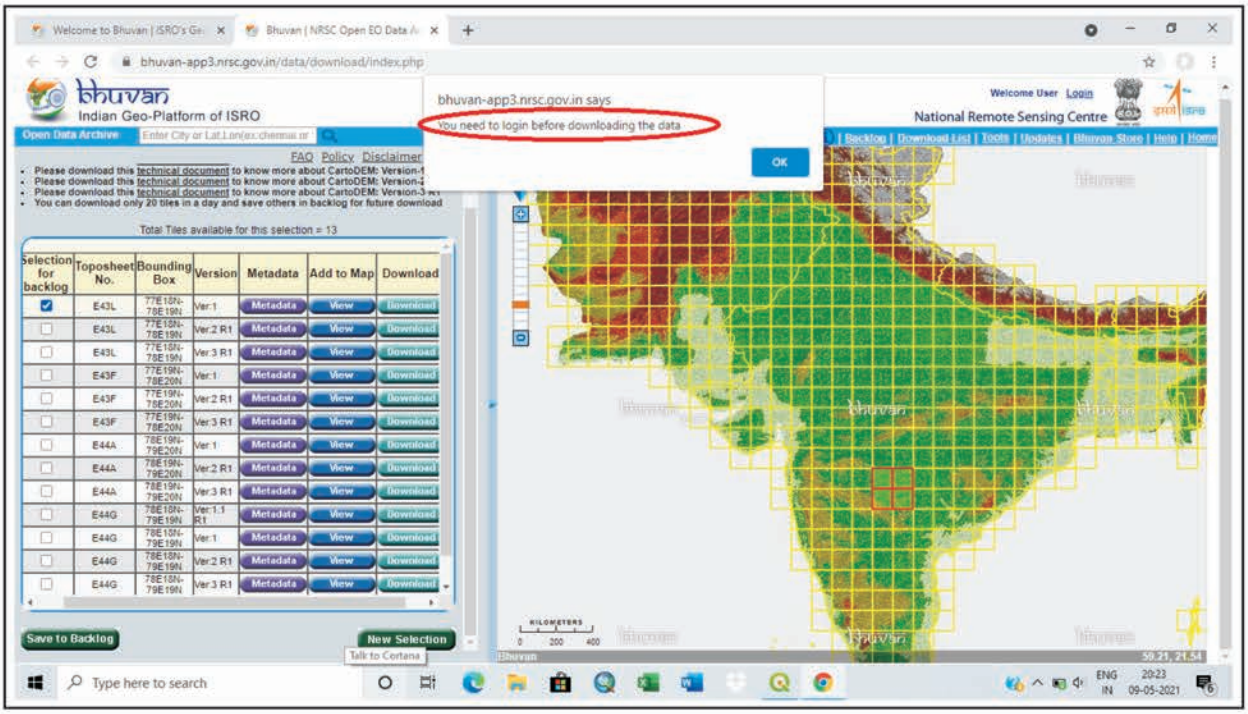
(Note:- To select multiple tiles,selection is done by pressing "ctrl" key)

Step 6 : After pressing Next button, option for downloading satellite imagery appears as below.

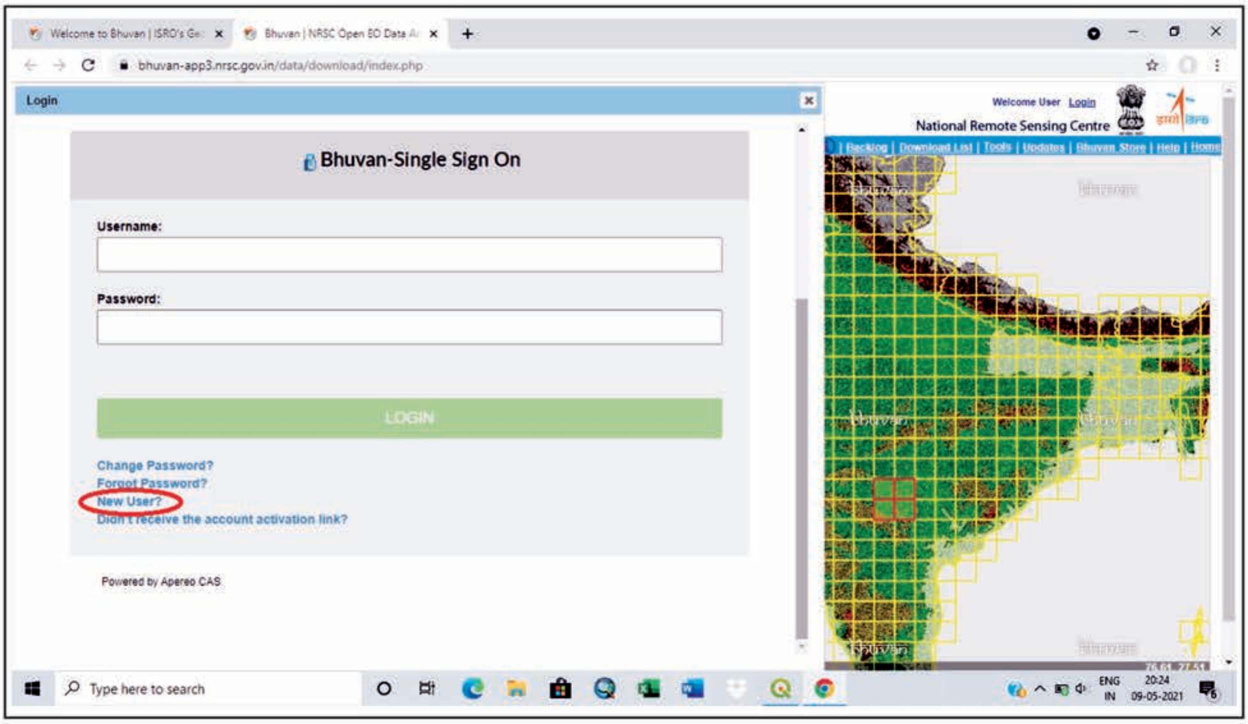


Note :- Metadata(Data about data) in the table above contains information about terrain, elevation, status of dataset,contactinformation,geographic location, citation, coverage, metadatastamp,dataset topic category, language, data identification abstract and information regarding image (satellite.sensor, fileformat, bits per pixel & Spatial resolution with units).

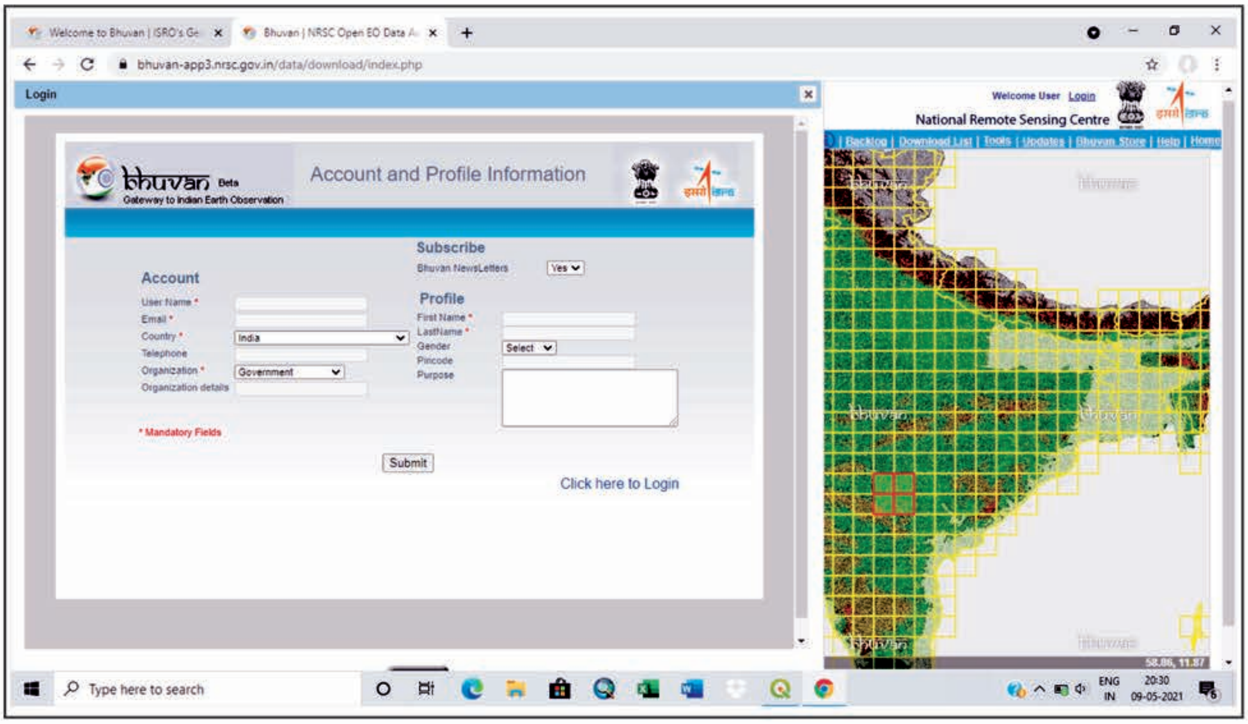
Step 7 : Select imagery to be downloaded by ticking in “Selection for backlog” and pressing on “Download” button. Window requiring prior login before downloading imagery in BHUVAN portal pops up.



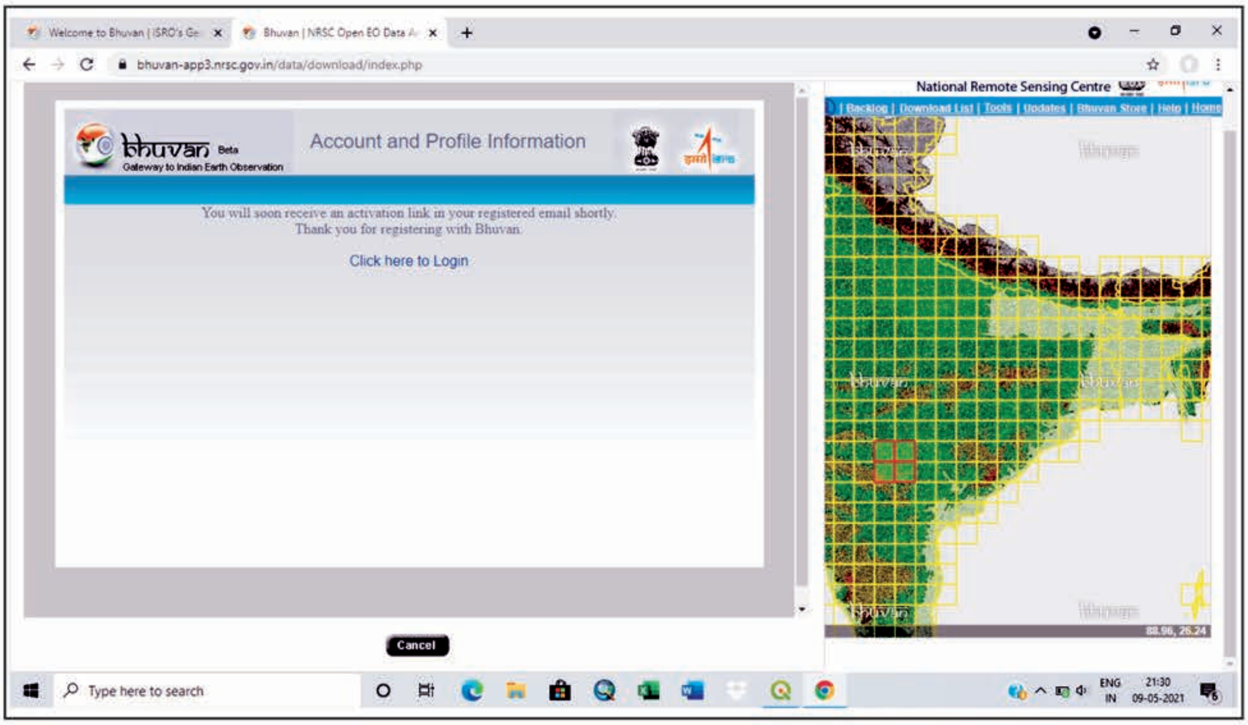
Step 8: Register in BHUVAN portal through New Users option.



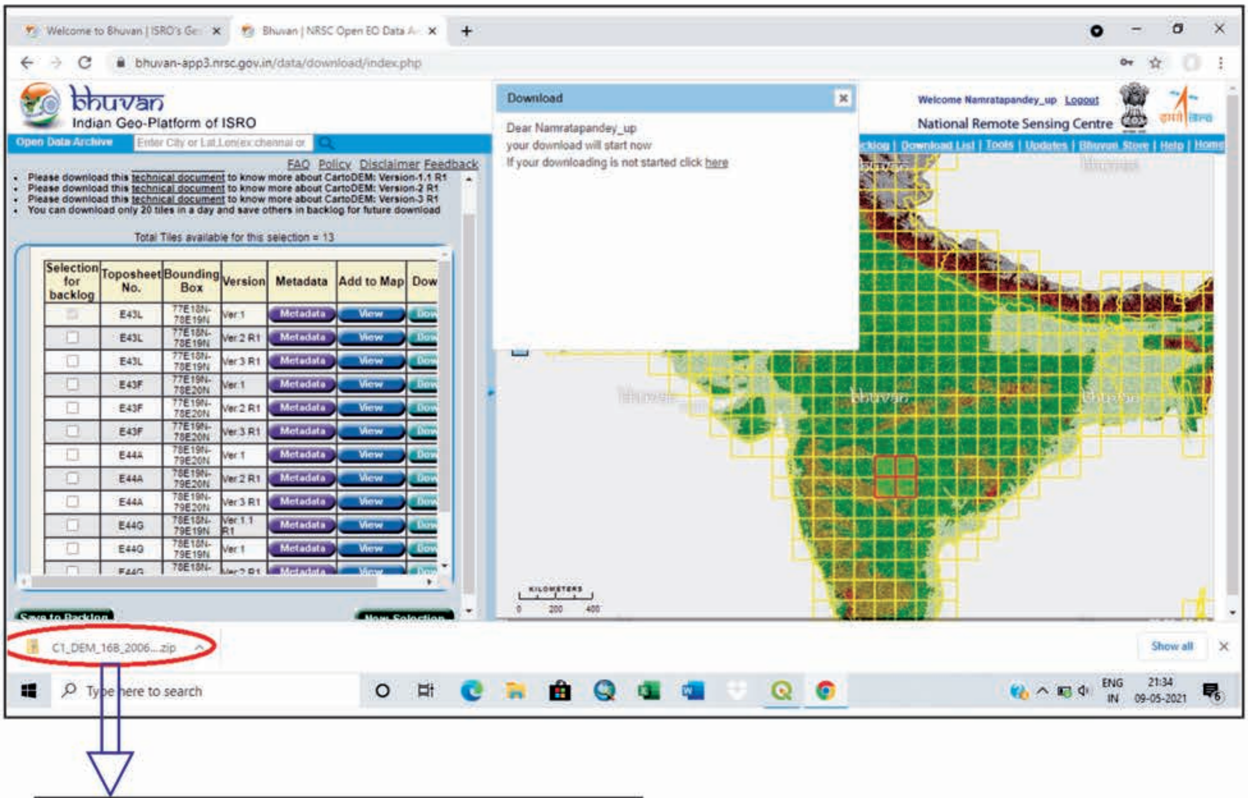
Step 9: Registration on the portal is done by filling following credentials



Step 10 : Activation link is mailed on registered email id (as above).By clicking on activation link in mail,password is generated and registration is completed.

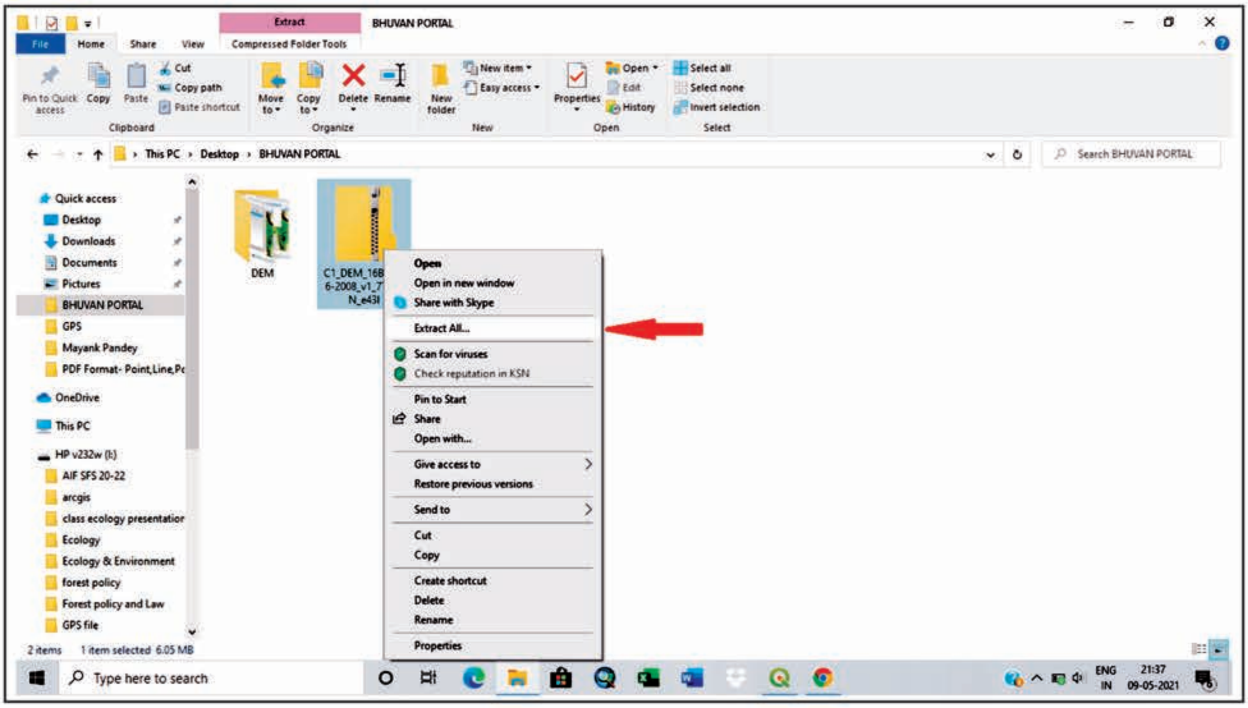


Step 11 : After successful registration, satellite imagery can be downloaded by clicking on "Download" button. A " .zip" file is downloaded

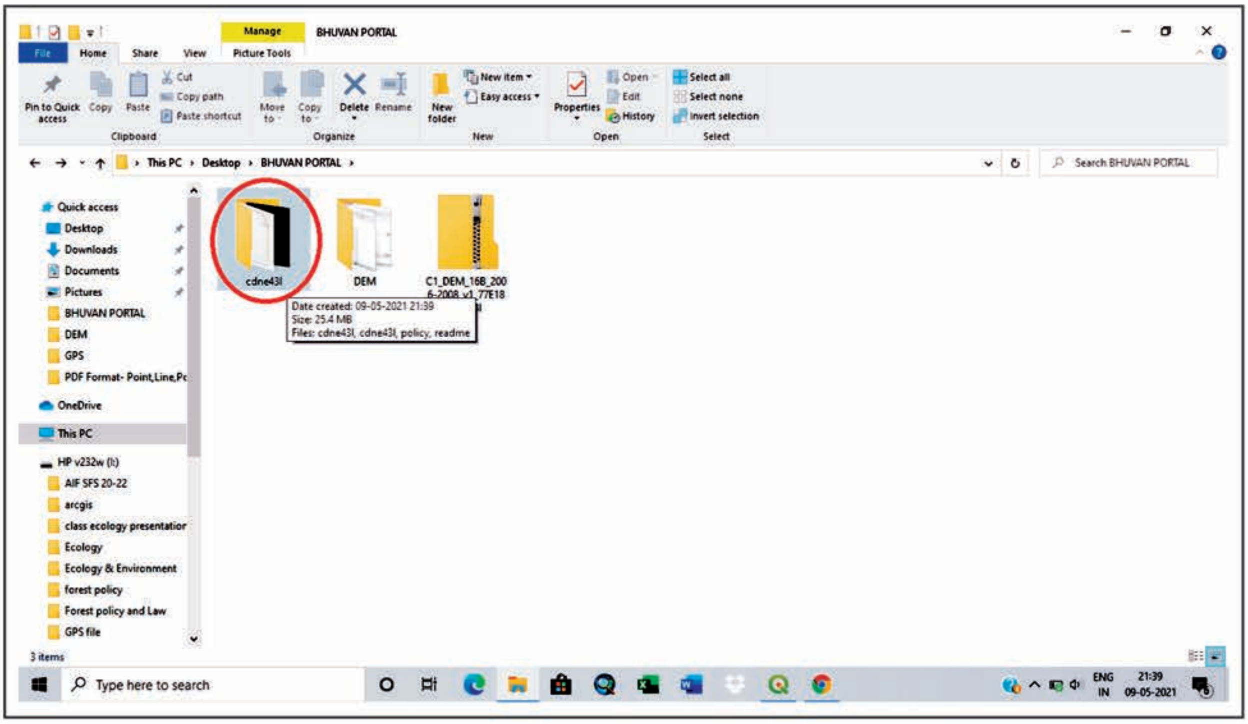


Downloaded .zip file of satellite imagery

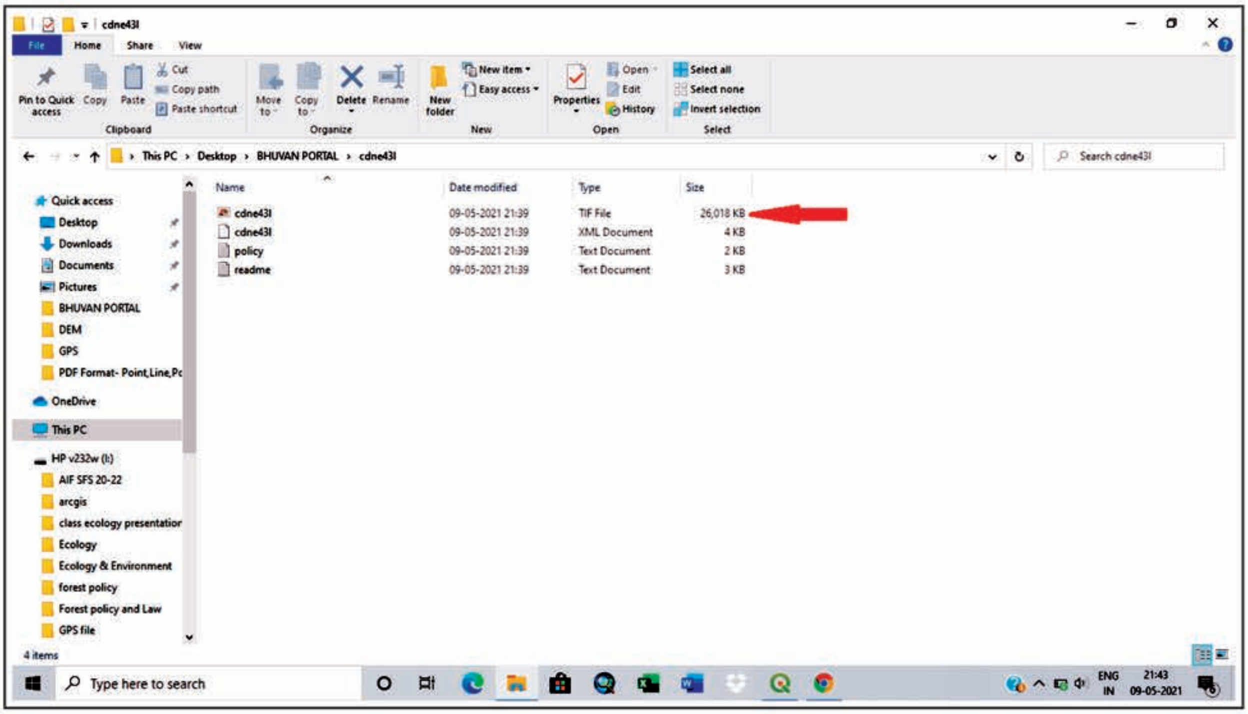
Step 12 : All files from Zip folder are extracted by right clicking on zip folder and extracting data.



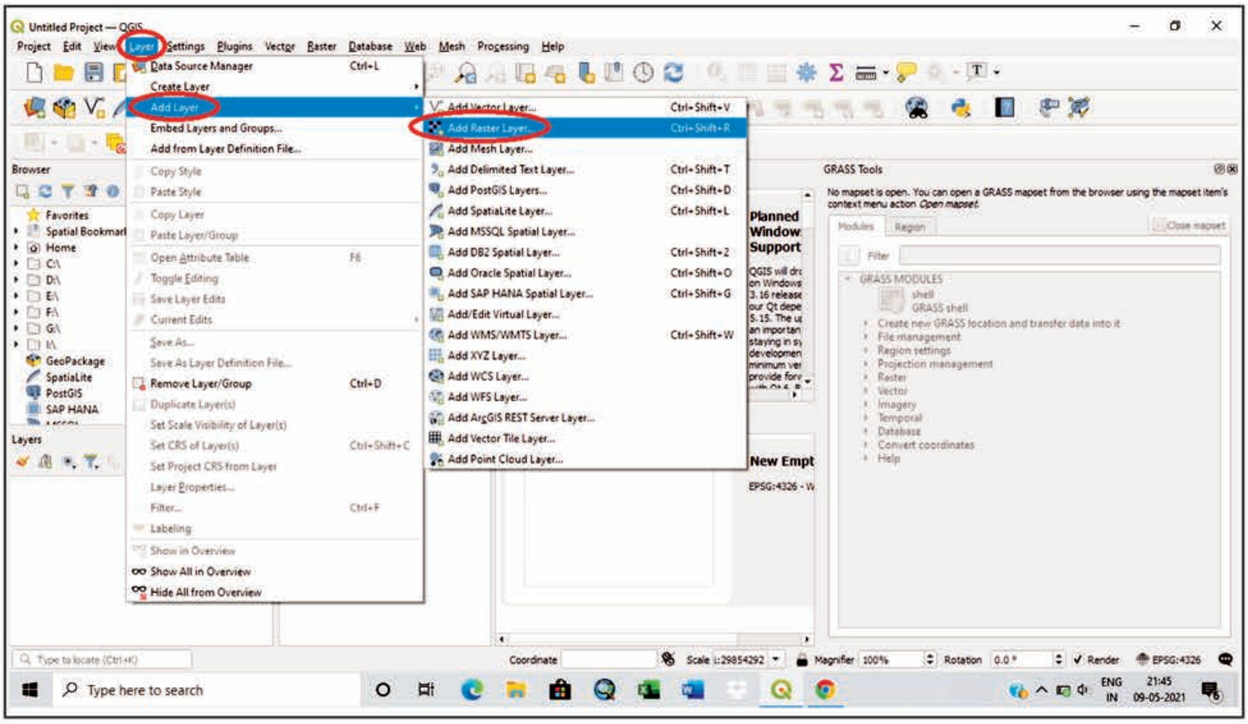
Step 13: The extracted file appears as a folder in the selected destination



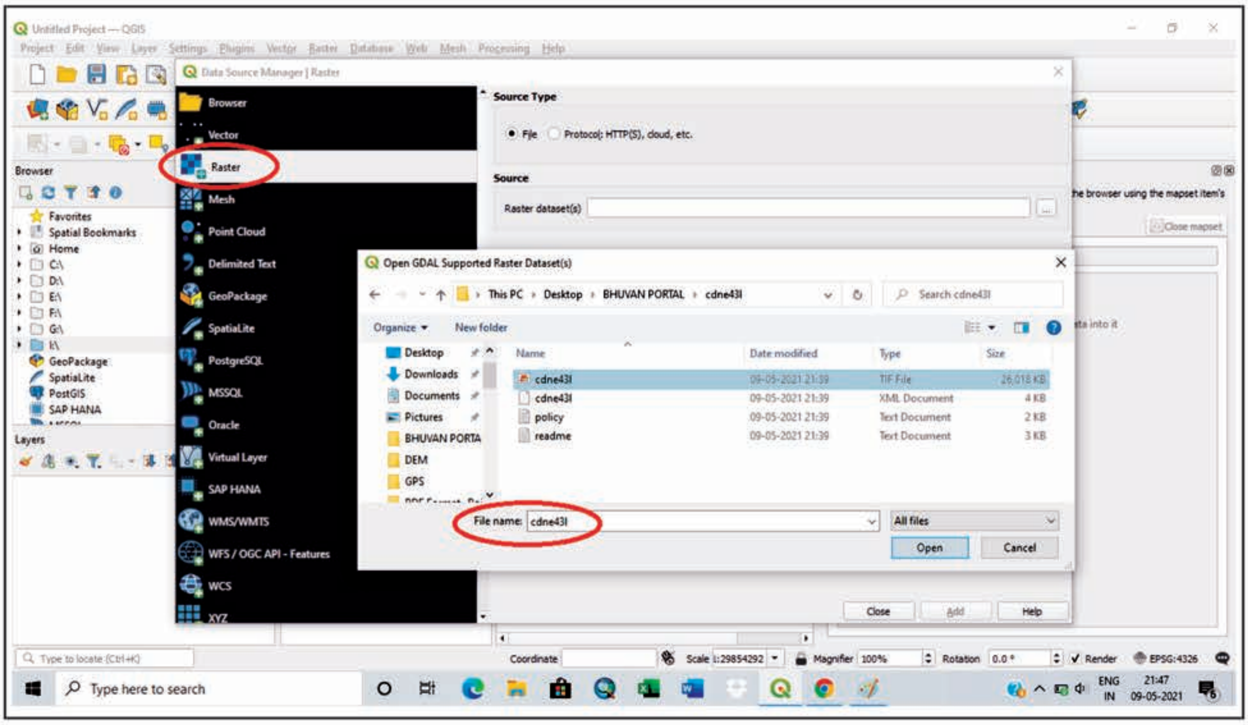
Step 14 : The extracted folder has various documents as shown below.
Image downloaded as ".tif" file is used for further analysis in QGIS.



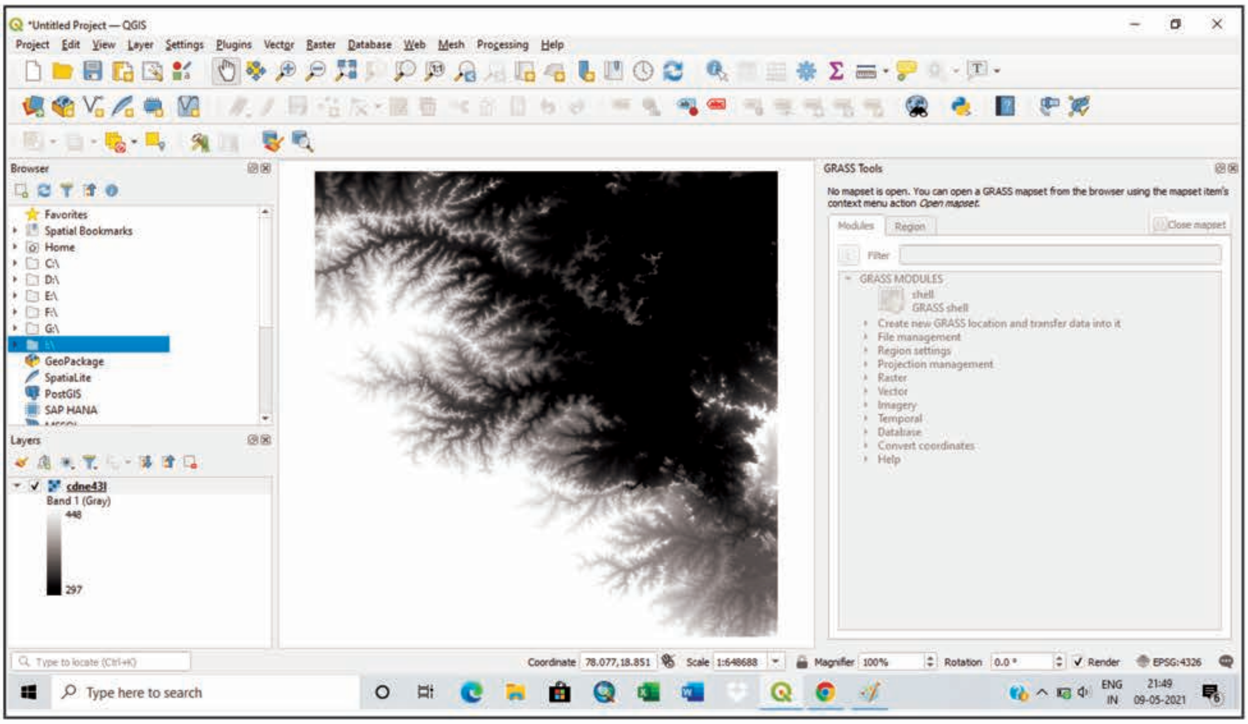
Step 15 (a) : Open QGIS software and "Add raster layer" by clicking on "Layer" in the ribbon.



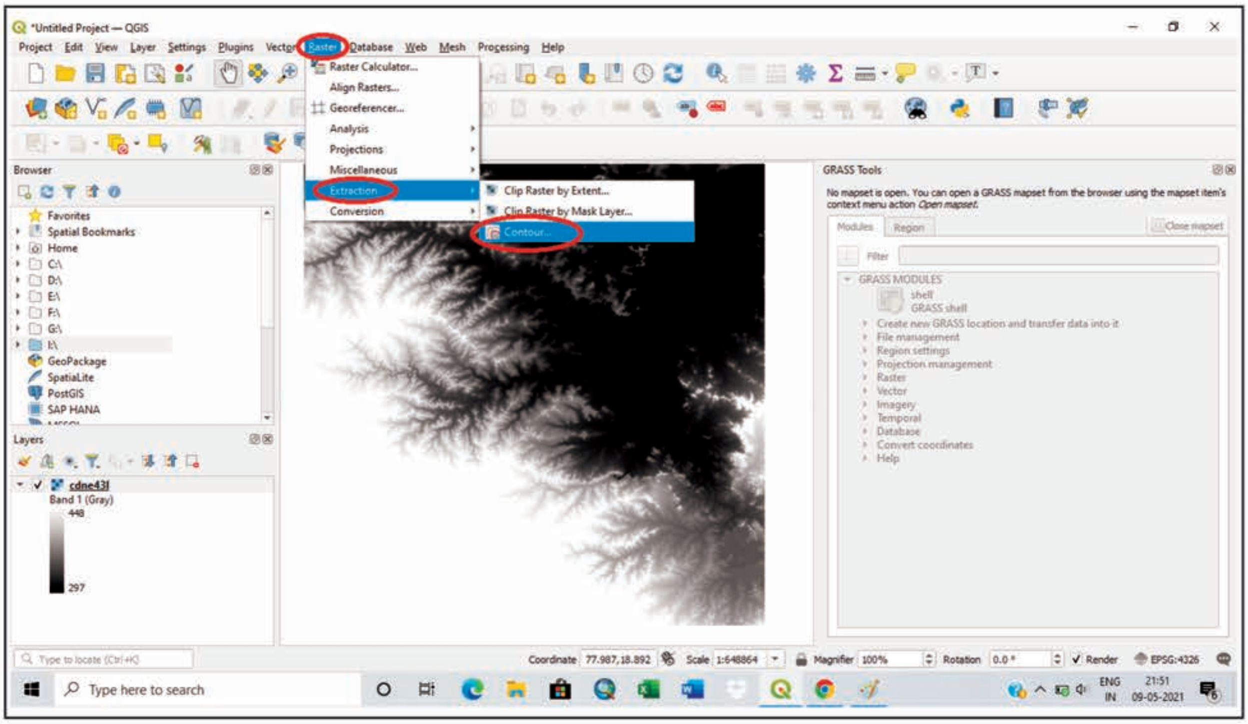
(b) The extracted .tif file is then added as a raster layer by selecting "Raster dataset".



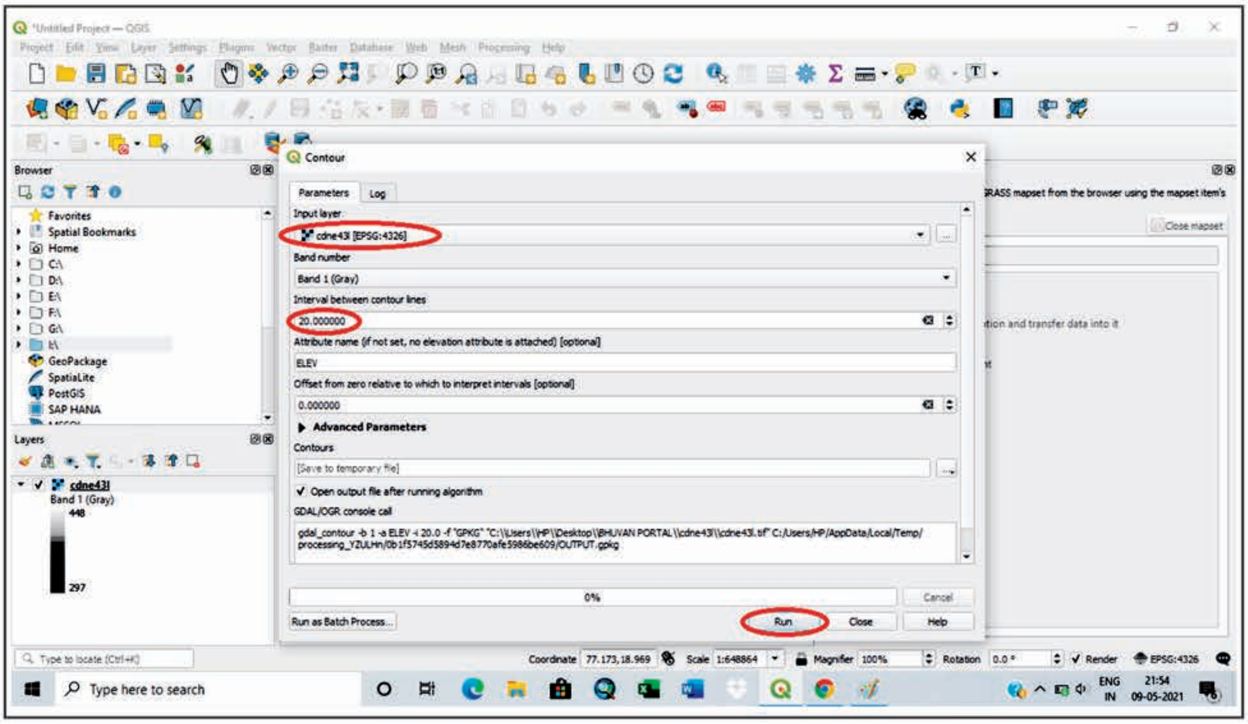
(c) The added raster layer in QGIS appears as below.



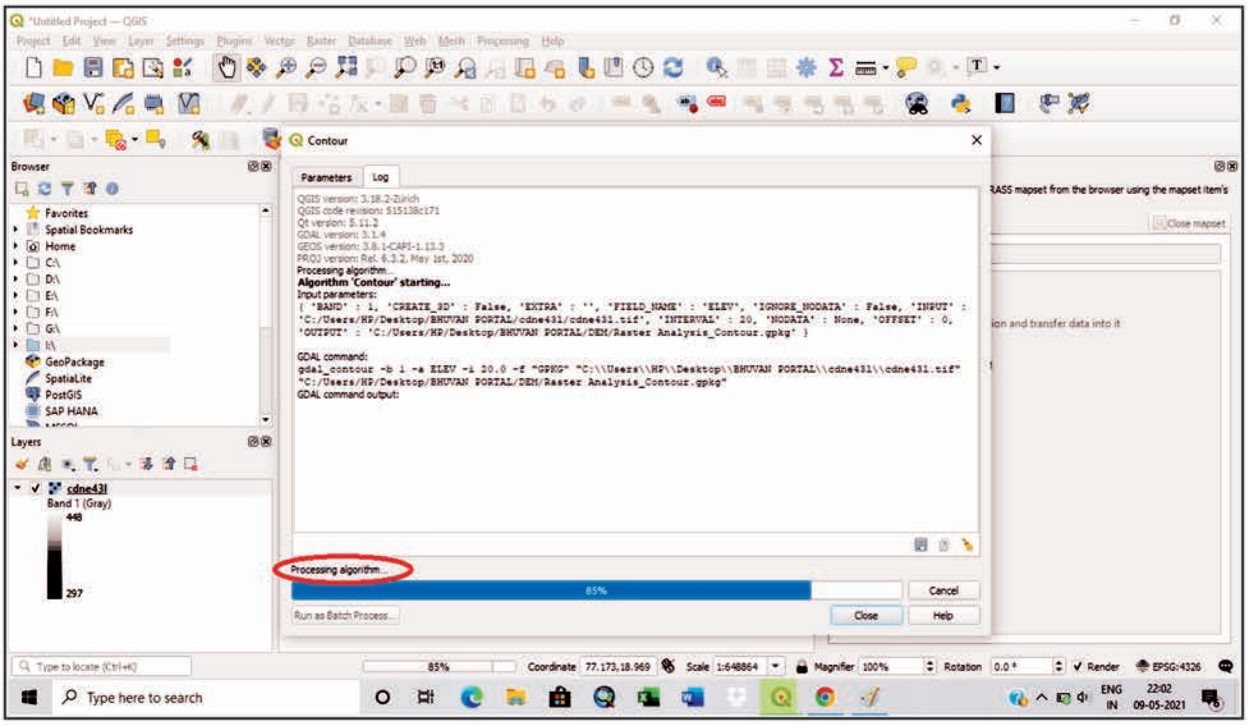
Step 16 : In order to create contour of the satellite imagery , go to "Raster" on top ribbon ,select "Extraction" and click on "Contour".



Step 17 : The contour parameters are set as below (Contour interval set as 20 metres). In advanced parameters, contours are saved to selected file location and Run button is pressed.



Step 18 : The algorithm processing goes on and contour map is generated.



(Fig.(a) Algorithm processing takes place)

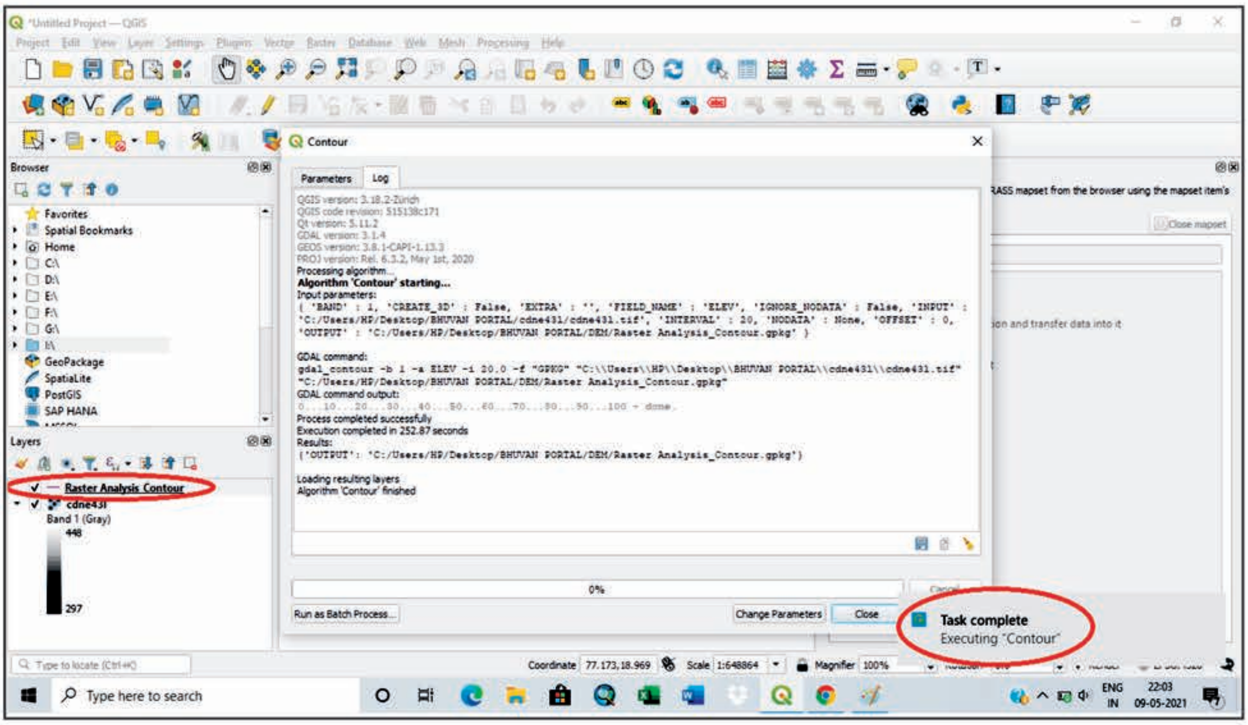


Fig.(b) “Task complete” pops up and contour is executed.
Contour is added as a layer (here named as” Raster_Analysis_Contour” layer)

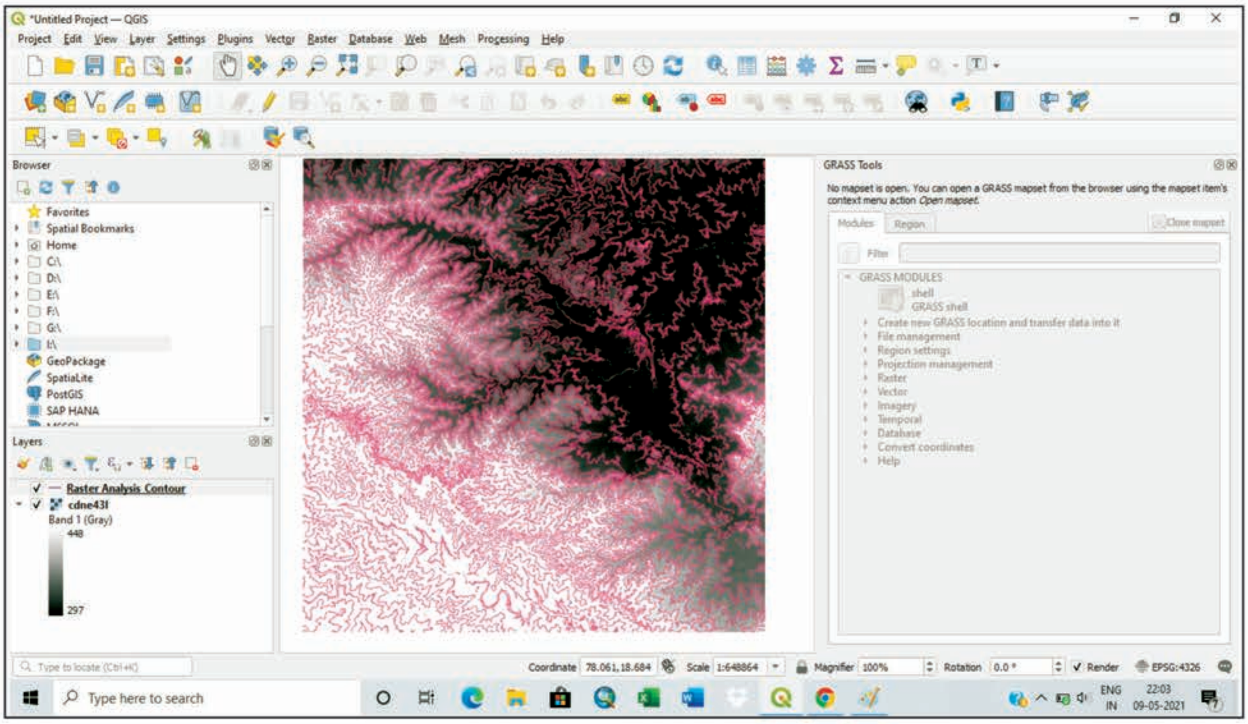


Fig.(c) The contour is generated as shown in picture above

Step 19: In order to number the contour, right click on the Contour layer . Select "Properties" and in the layer properties add the values as below

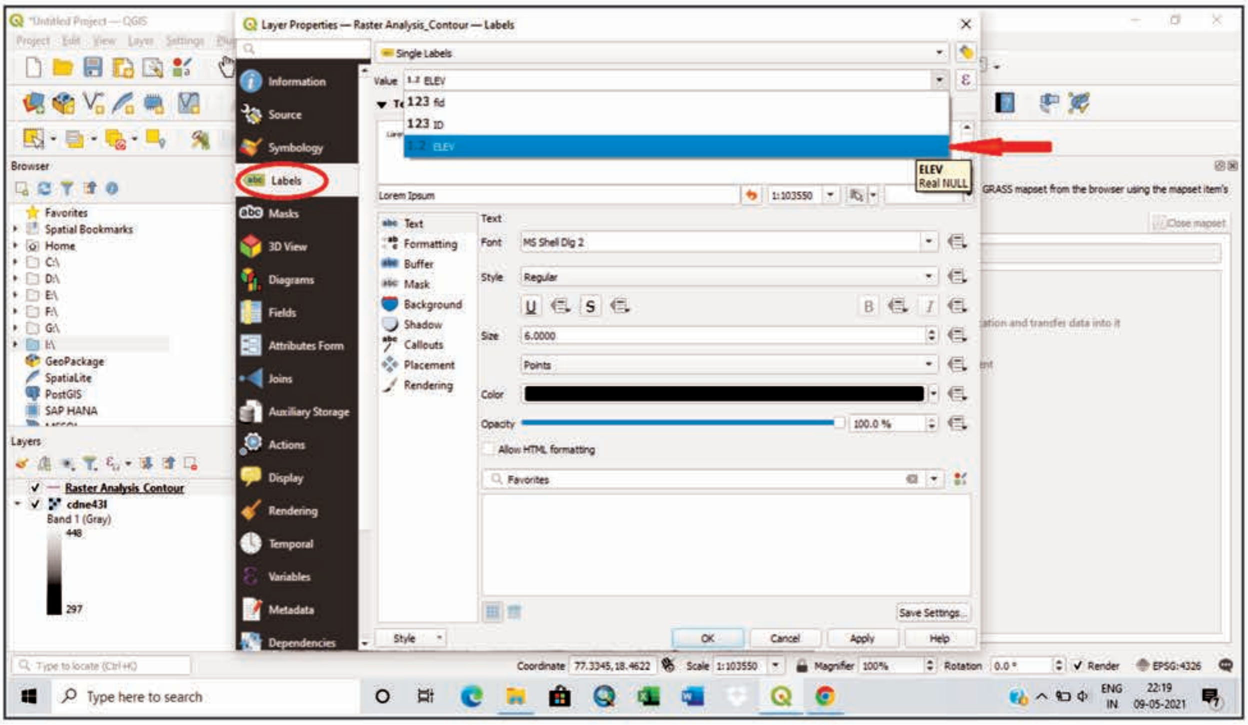


Fig.(a) Setting Value as "1.2 ELEV"

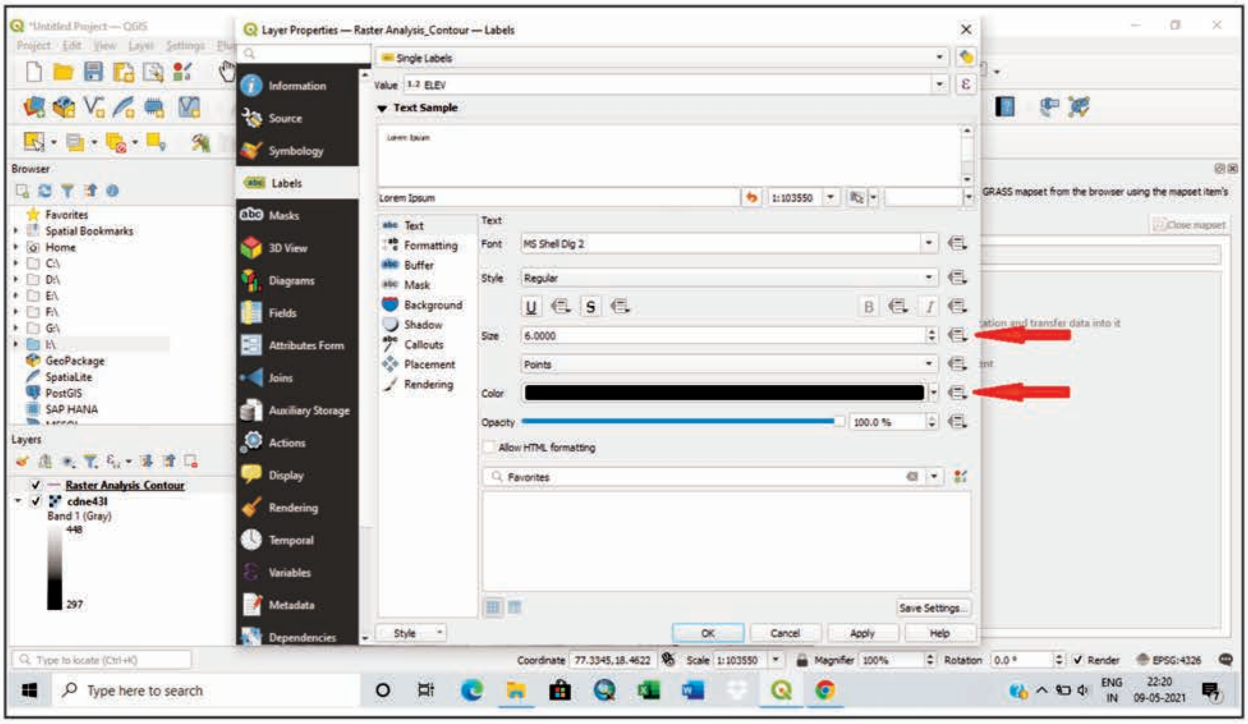


Fig.(b) Setting size and color of contour

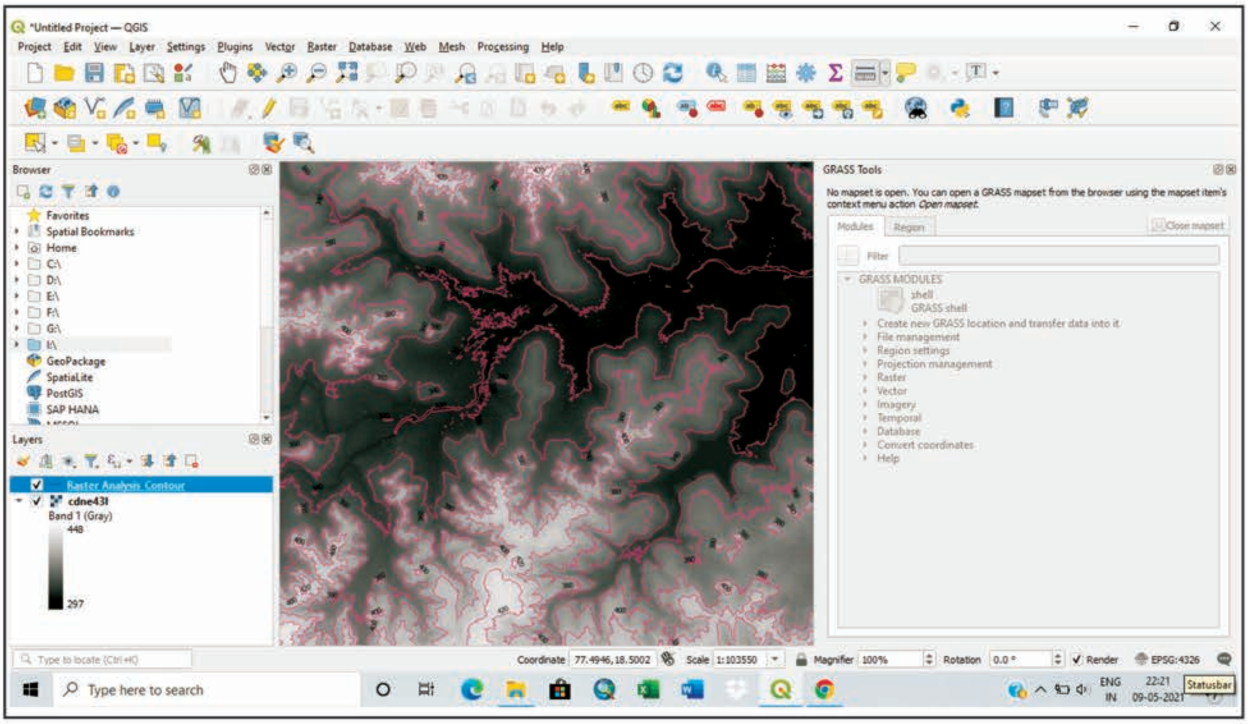
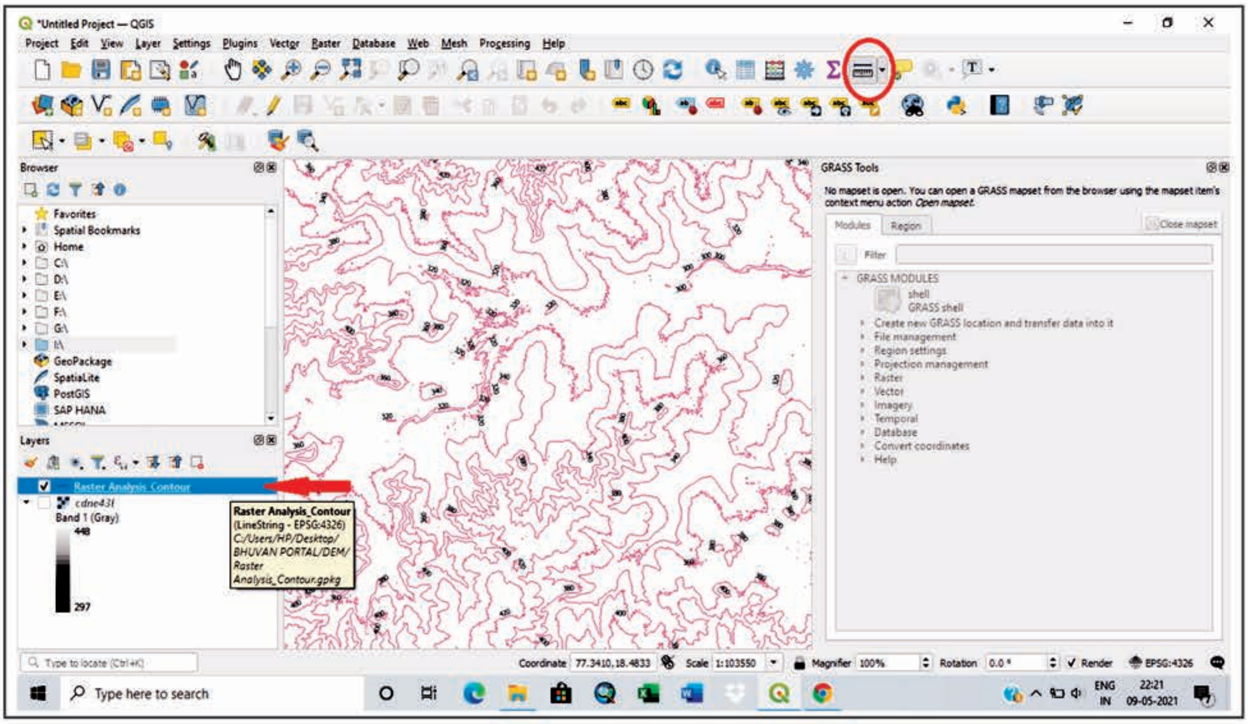
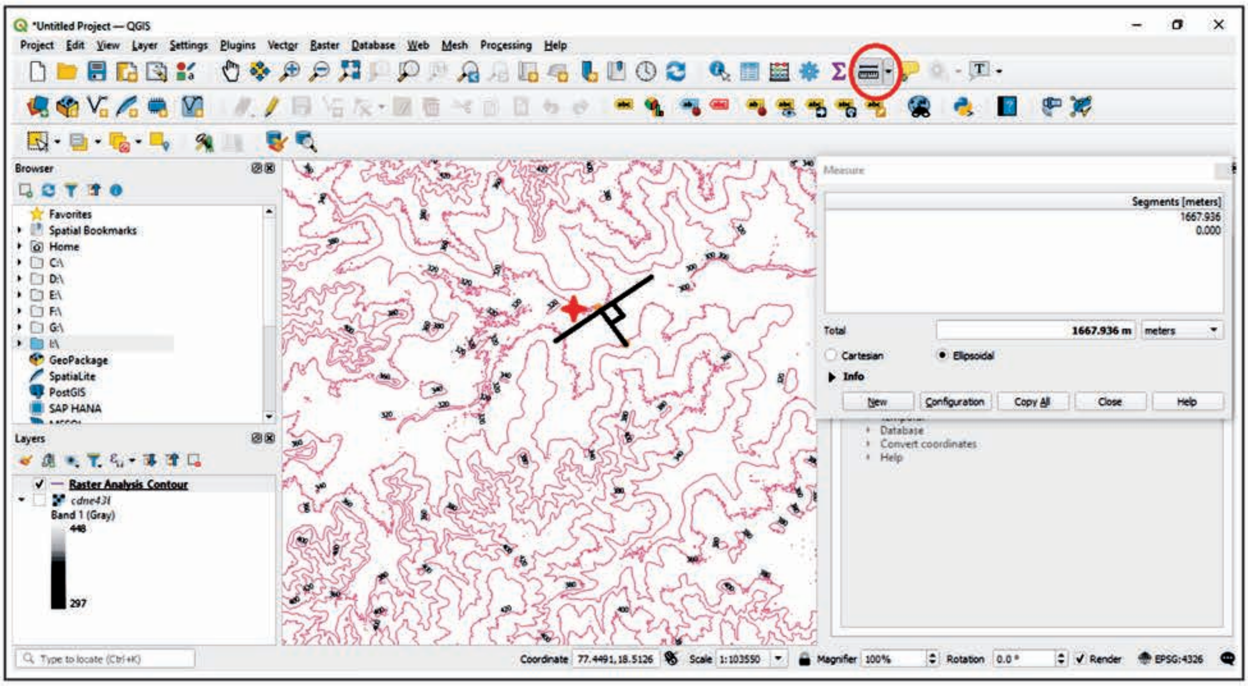


Fig.(c) The generated contour superimposed on the downloaded satellite imagery

Step 20 : In order to separate the satellite layer from contour layer, uncheck on the satellite imagery layer in “Layers” on left hand side. The contour layer appears as below.



Step 21 : The linear distance between two contours can be calculated using Measure line options in the top ribbon.



(Fig.(a) Measure Line option in the top ribbon)

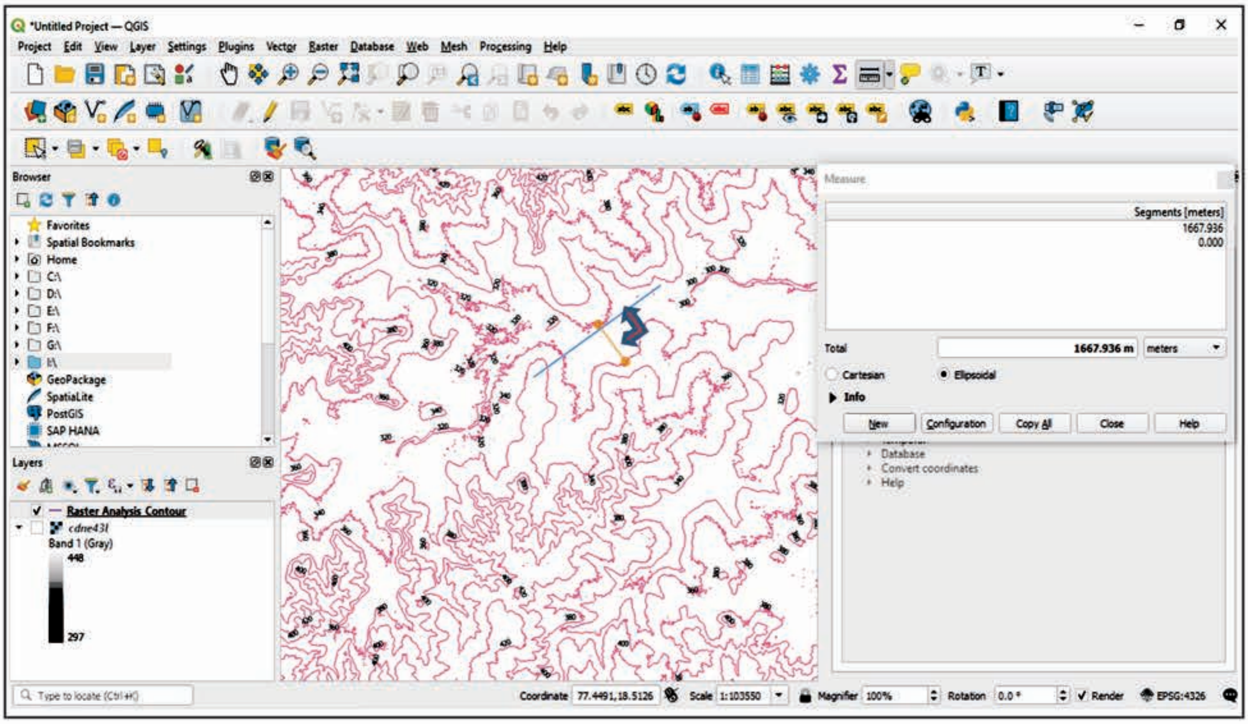
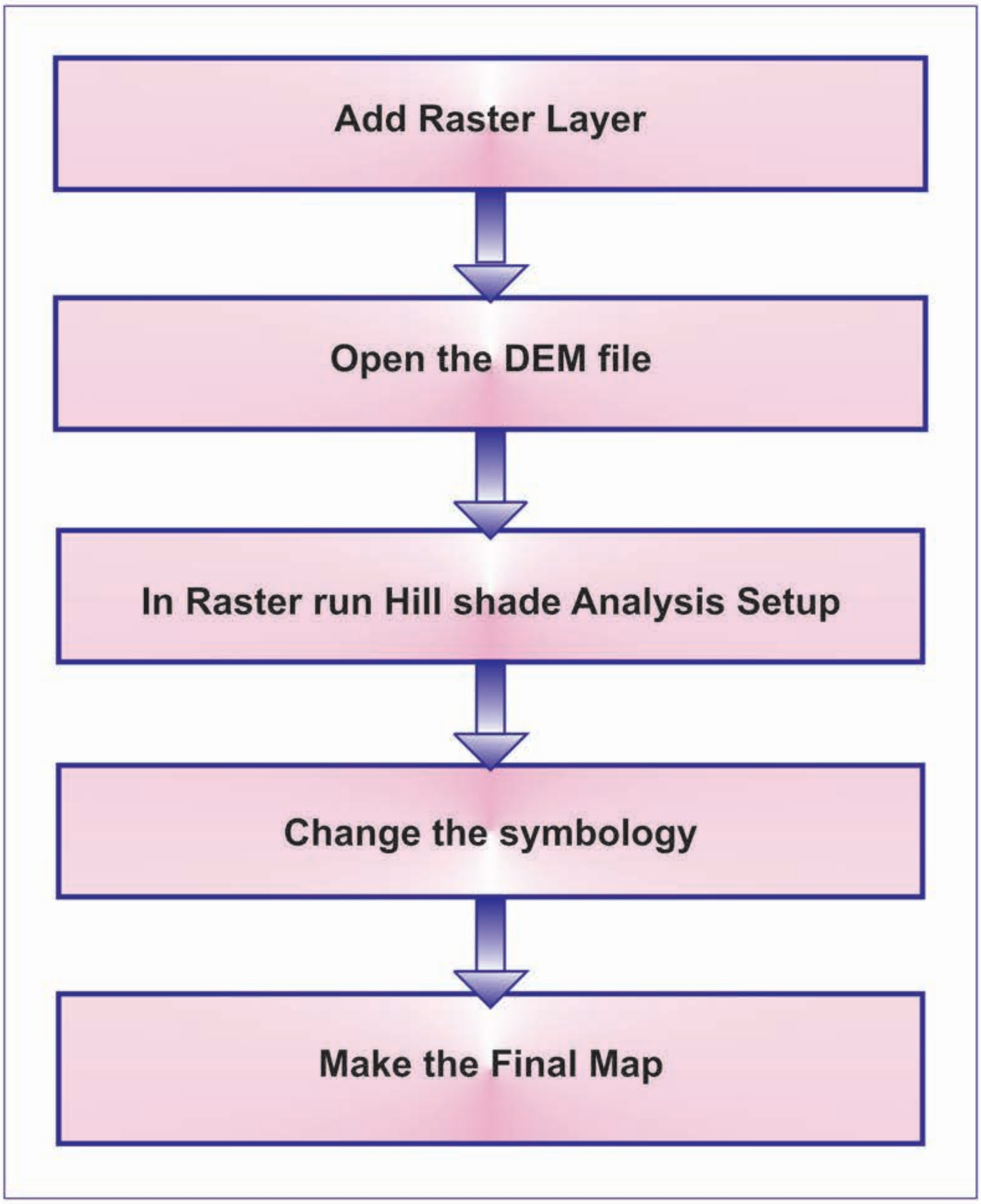


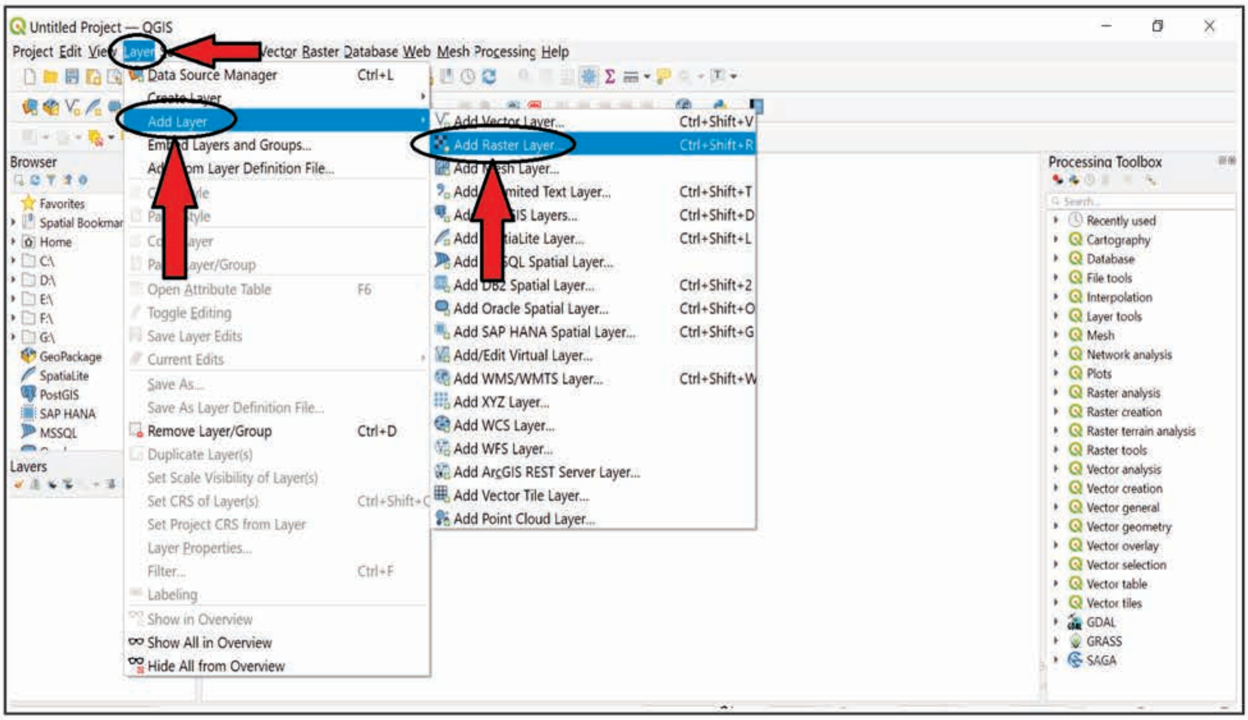
Fig.(b) Horizontal equivalent (line perpendicular to tangent at a point on contour and meeting adjacent contour, here shown as light orange line and right angle shown by perpendicular angle symbol in red) is measurement between two contours shown by orange measure line and length of segment shown in the Measure table on right hand side.

12. RASTER ANALYSIS – 'SHADE'

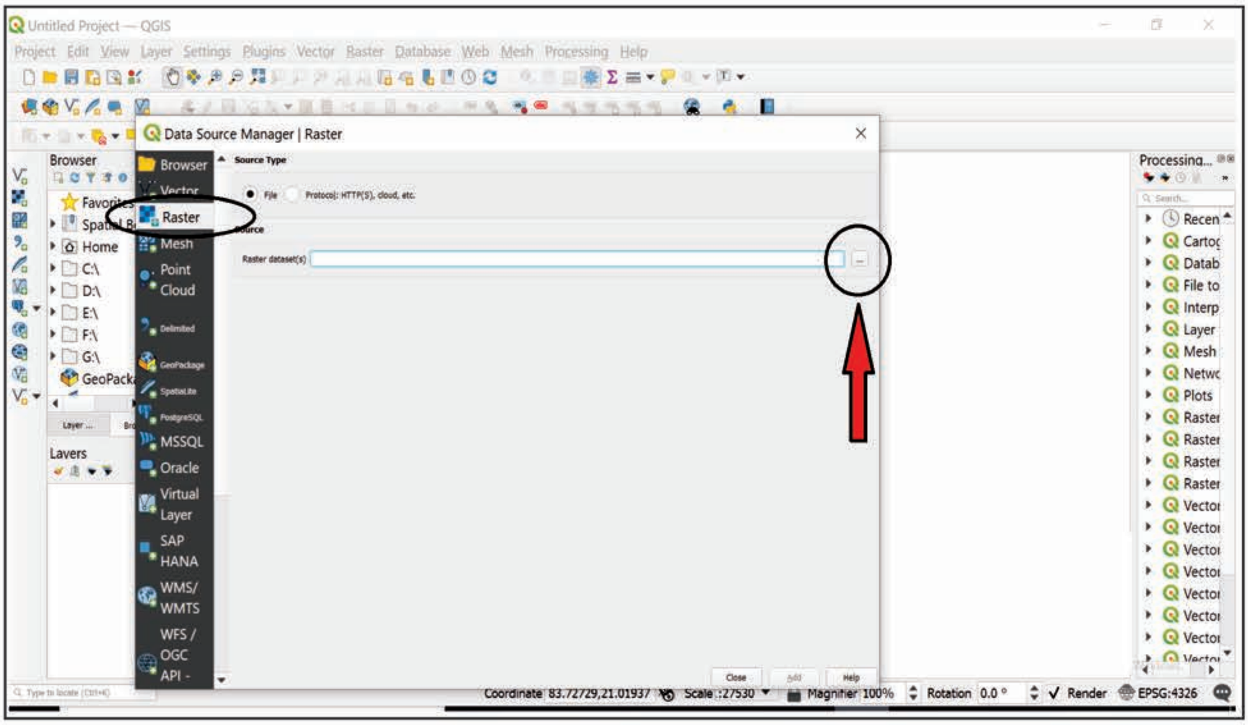
Hillshade illumination of the surface, determined by illuminational value in a raster. Hill shade analysis finds application in deciding the species that are to be planted as per their light or shade preference, For example Deodar comes well in shade whereas Kail (Pinus wallichiana) prefers light. This exercise will as such assist in such decision makings.



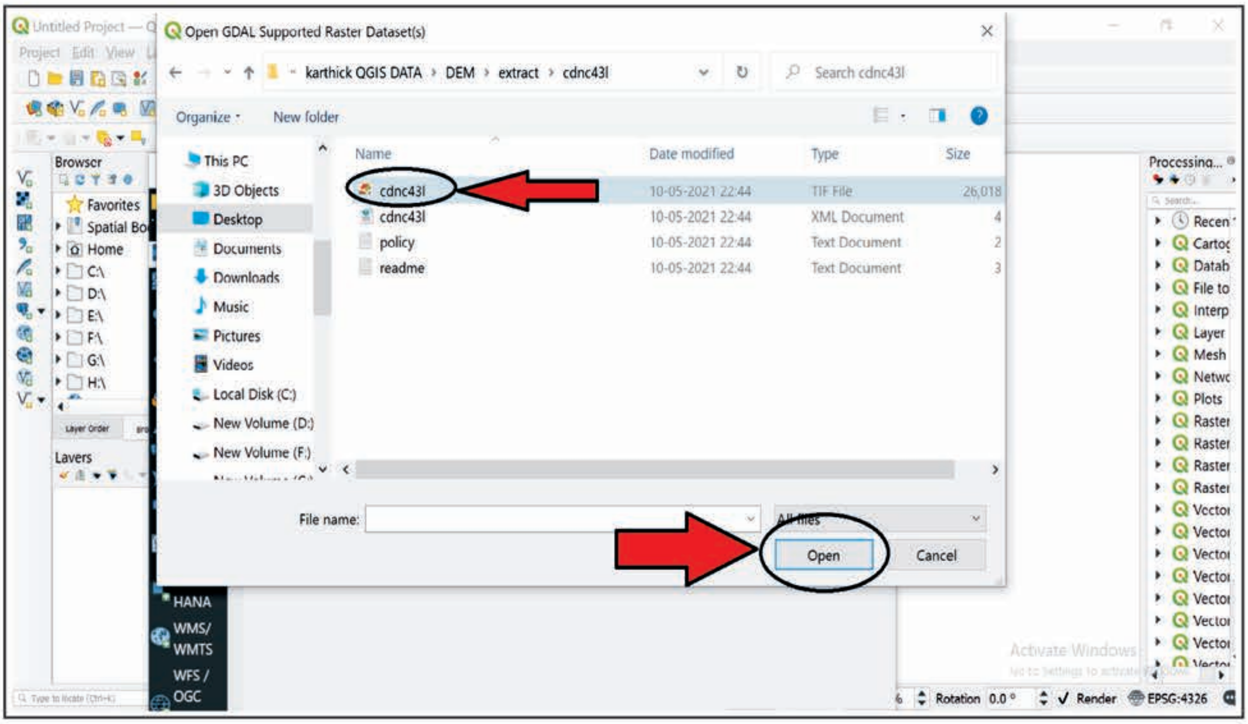
Step 01: Click on 'Layer', go to 'Add Layer' then select 'Add Raster Layer'.



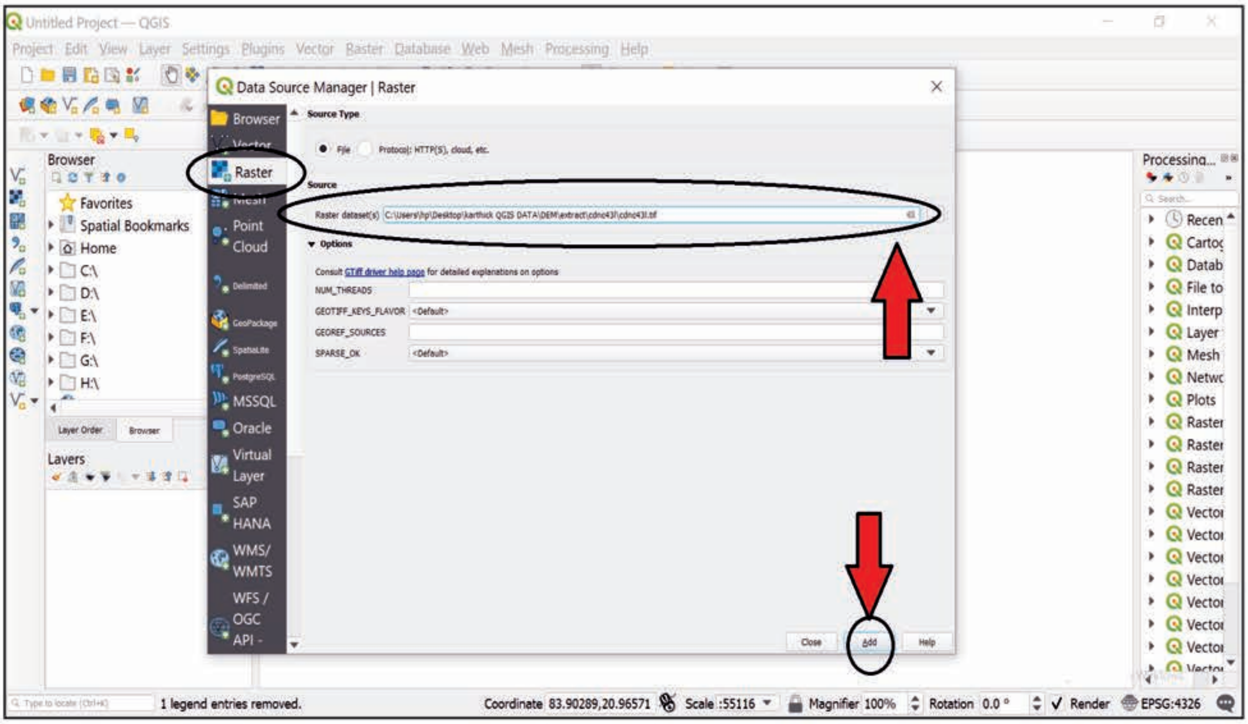
Step 02 : Open the Folder where you have downloaded DEM file (example DEM Downloaded from Bhuvan)



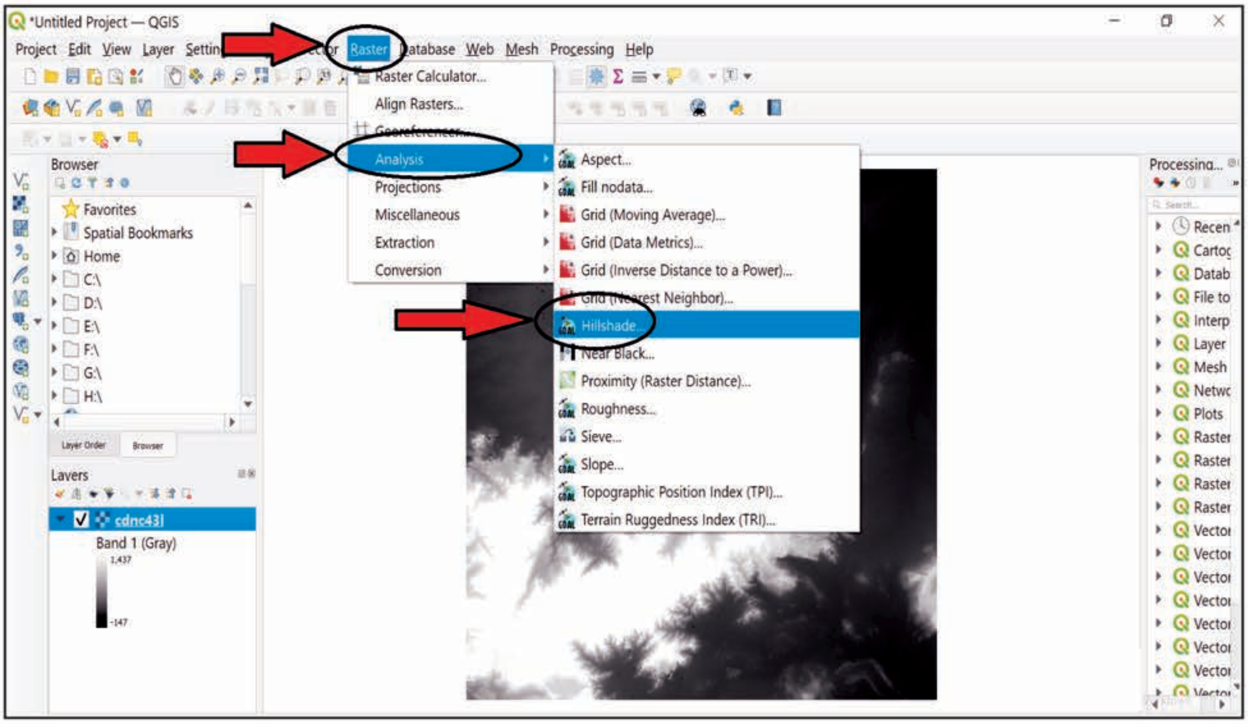
Step 03 : Open the DEM file.



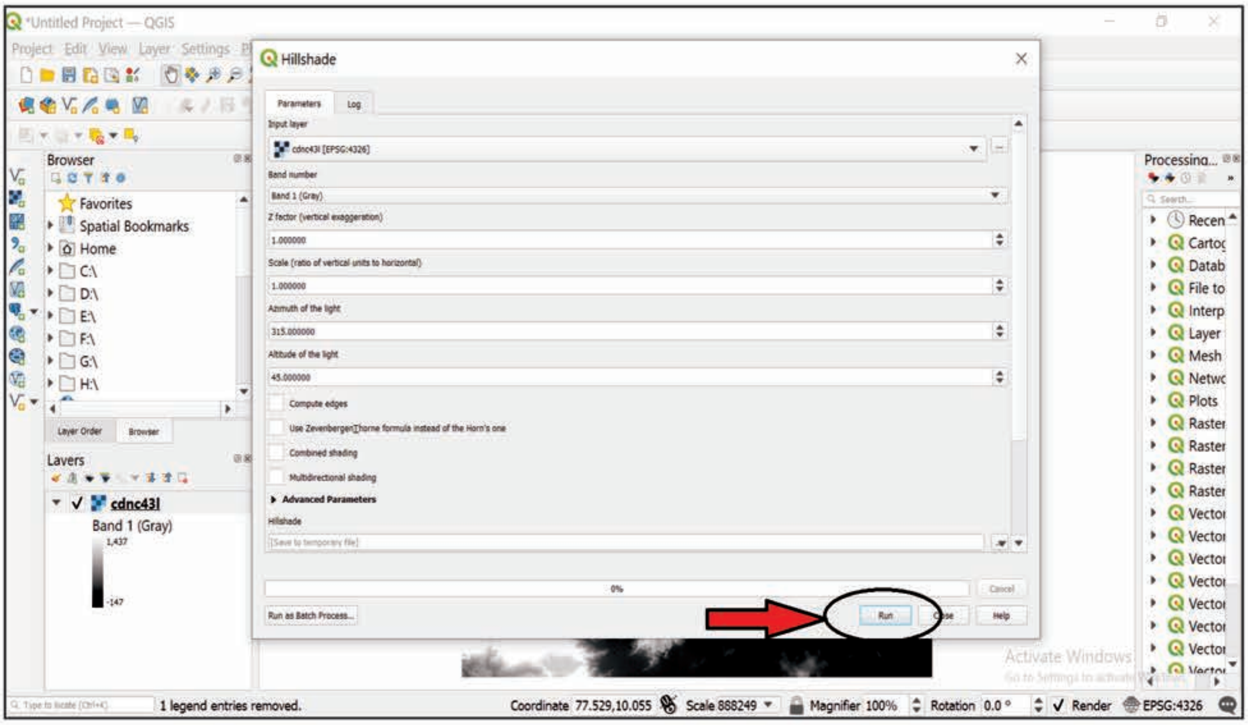
Step 04 : Add the file to Layer.

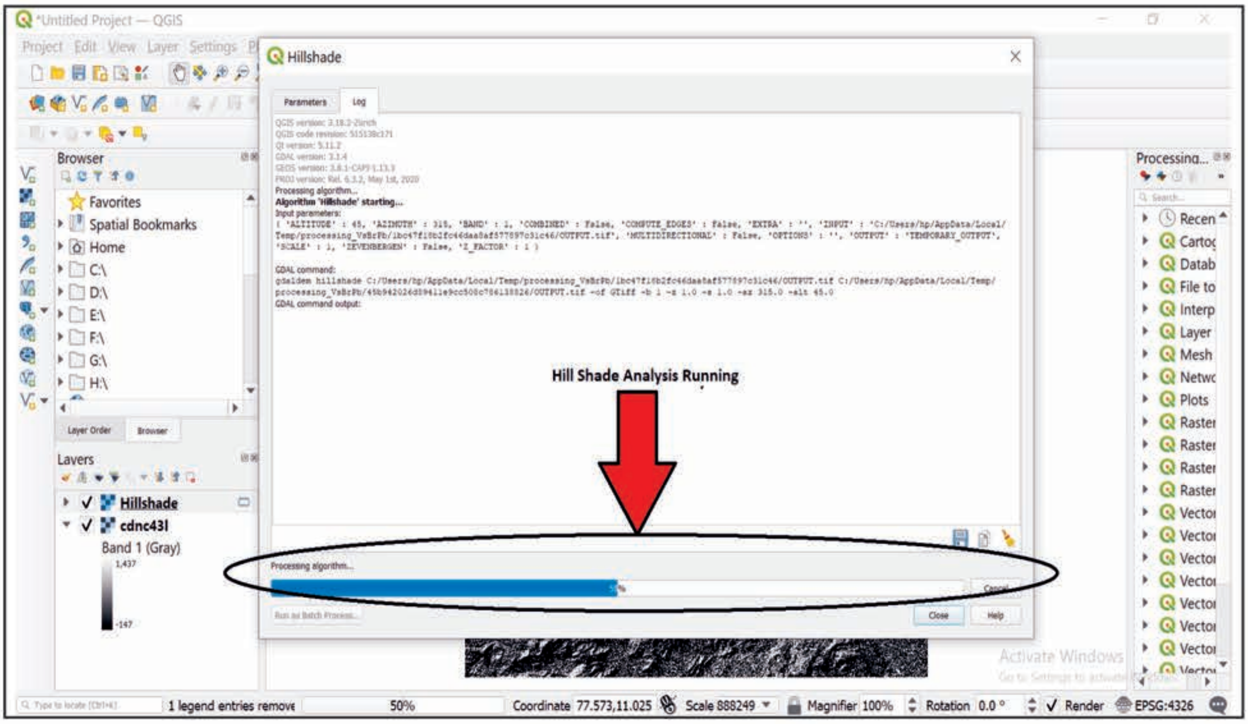


Step 05: Click on 'Raster'. Select 'Analysis' and then click 'Hillshade...'.

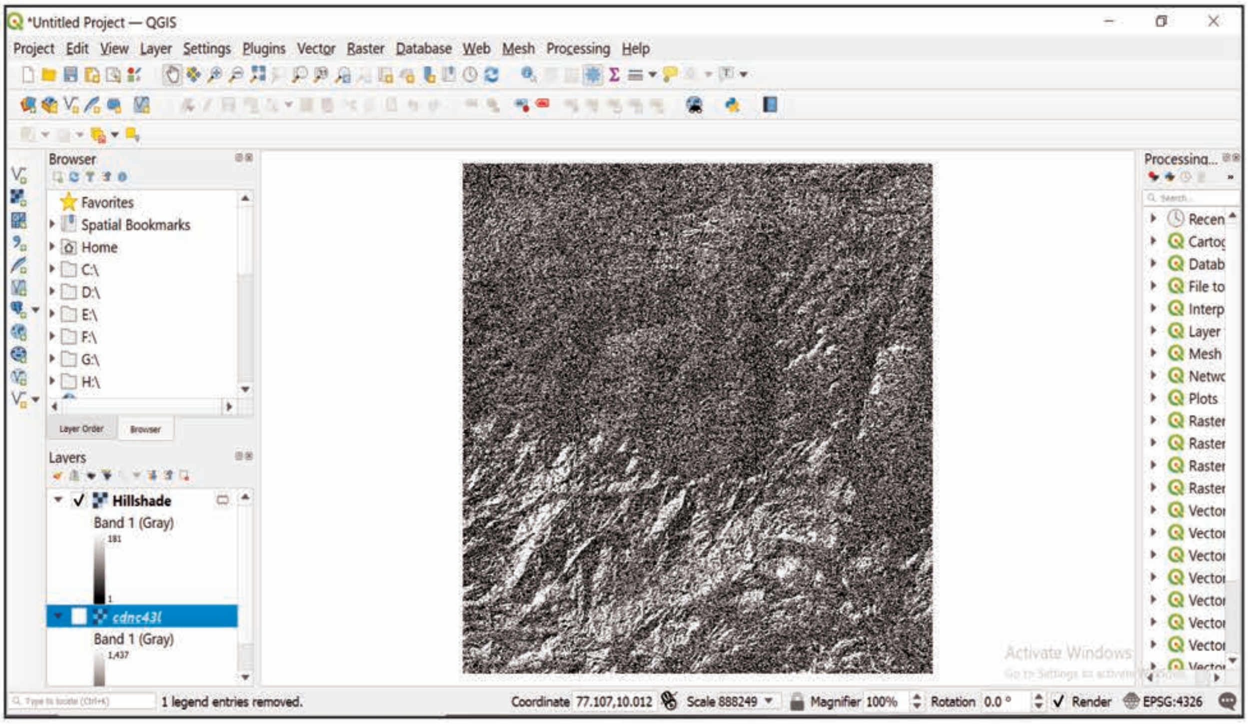


Step 06: Run the 'Setup'.

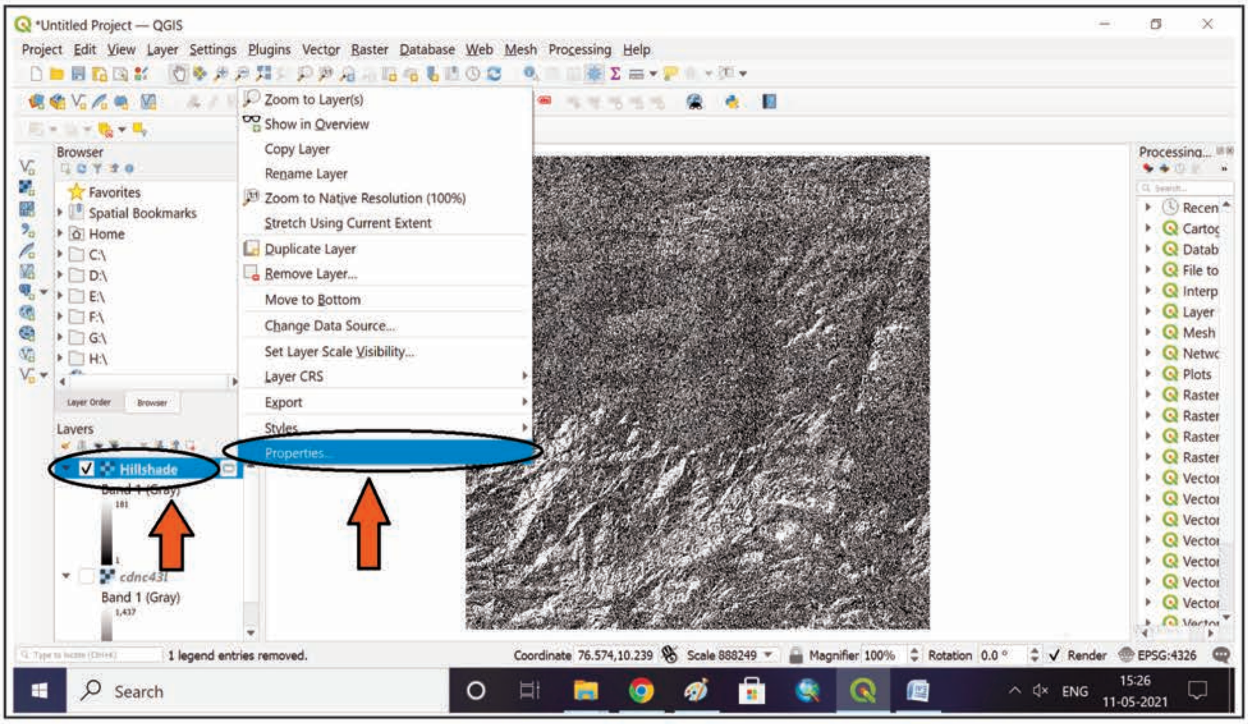




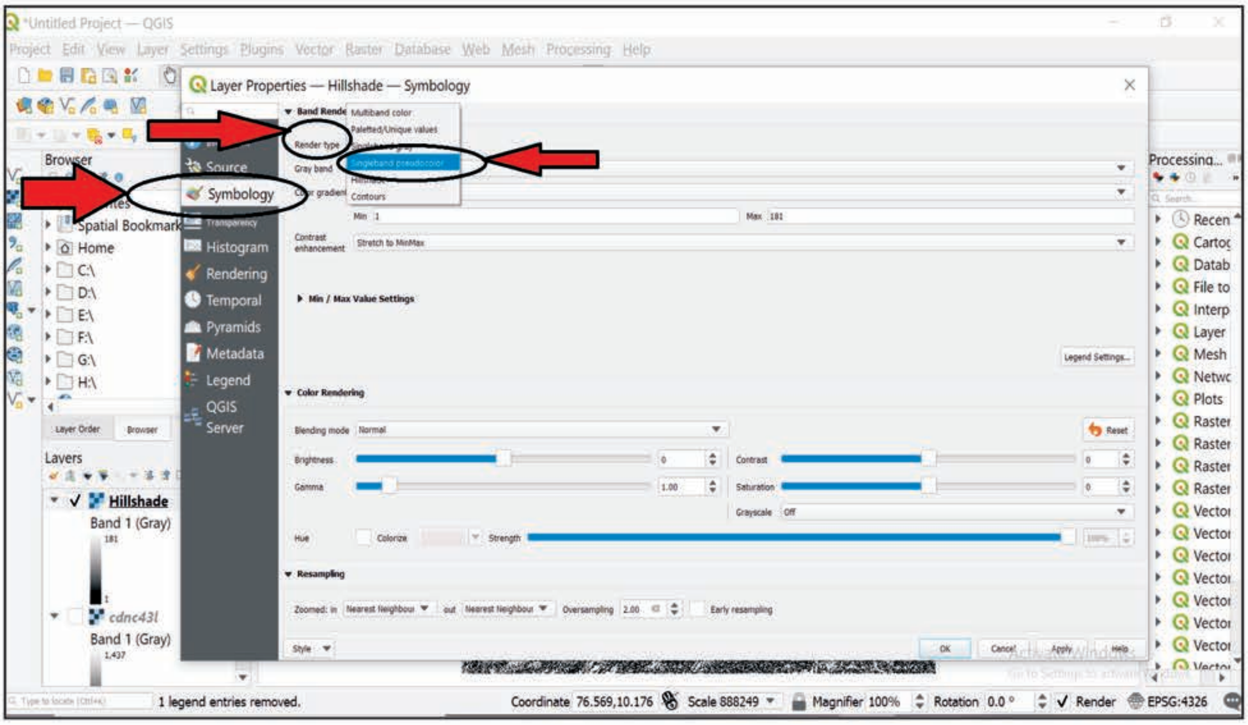
You can see the hill shade in gray band.



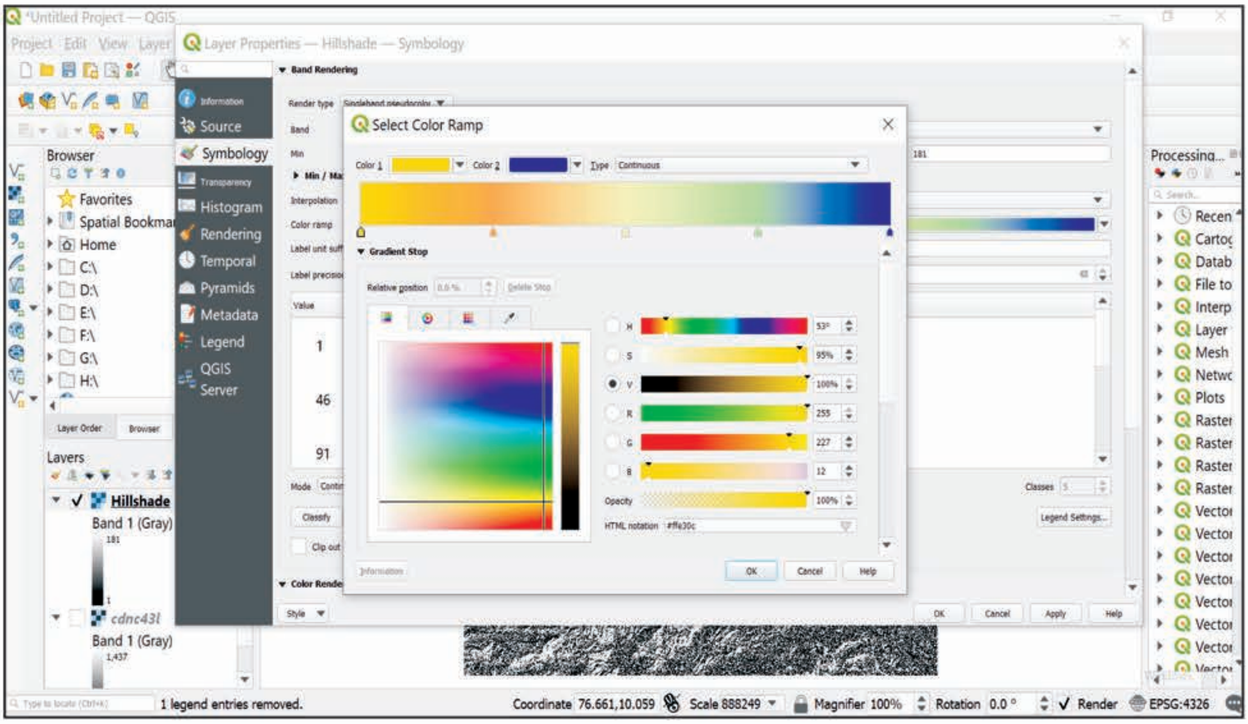
Step 09 : To change the symbology, Right click in the newly created 'Hillshade Layer'. Click on properties.



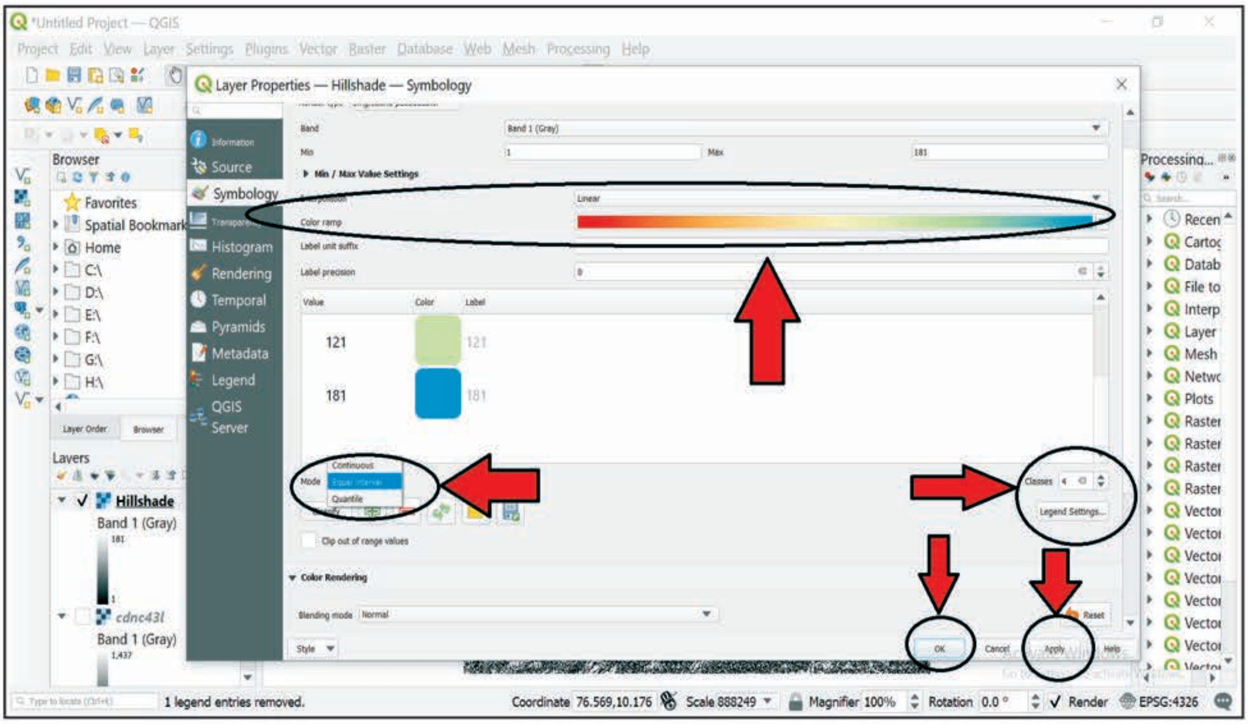
Step 10 : In popup window, in 'Render type', Select 'SinglebandPseudocolor'.



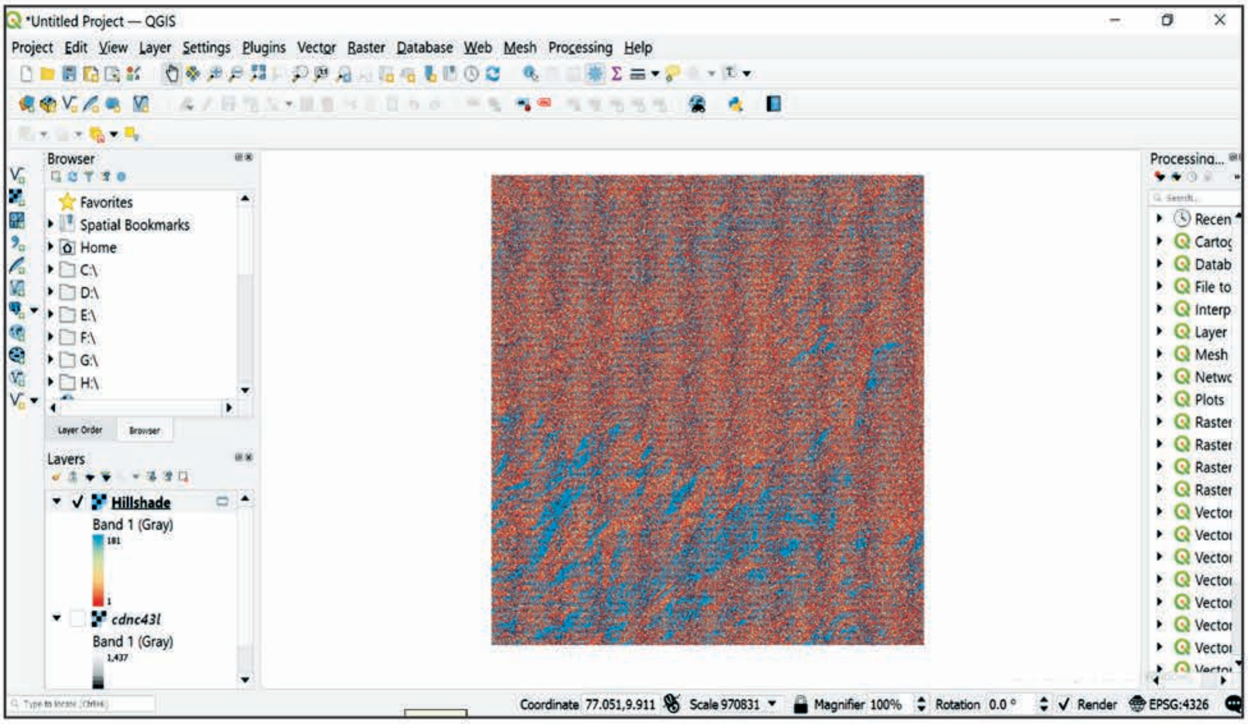
Step 11 : Select the colour ramp.



Step 12 : In 'Mode' select 'Equal interval'. Select 'Classes' as per requirement. Click 'Apply' & then 'OK'.



Step 13: You can see the Hillshade gradient as per the color ramp you have selected.



13. NDVI Analysis Steps in QGIS

It is the index to measure the condition of vegetation by quantifying the difference between NIR & Red region. The value ranges between -1 to +1. Negative value indicate no vegetation (Cloud, snow, non-vegetative structure) &+1 indicates healthy vegetation, 0 indicates close to soil and rock. NDVI is important index in quantifying forest cover changes.

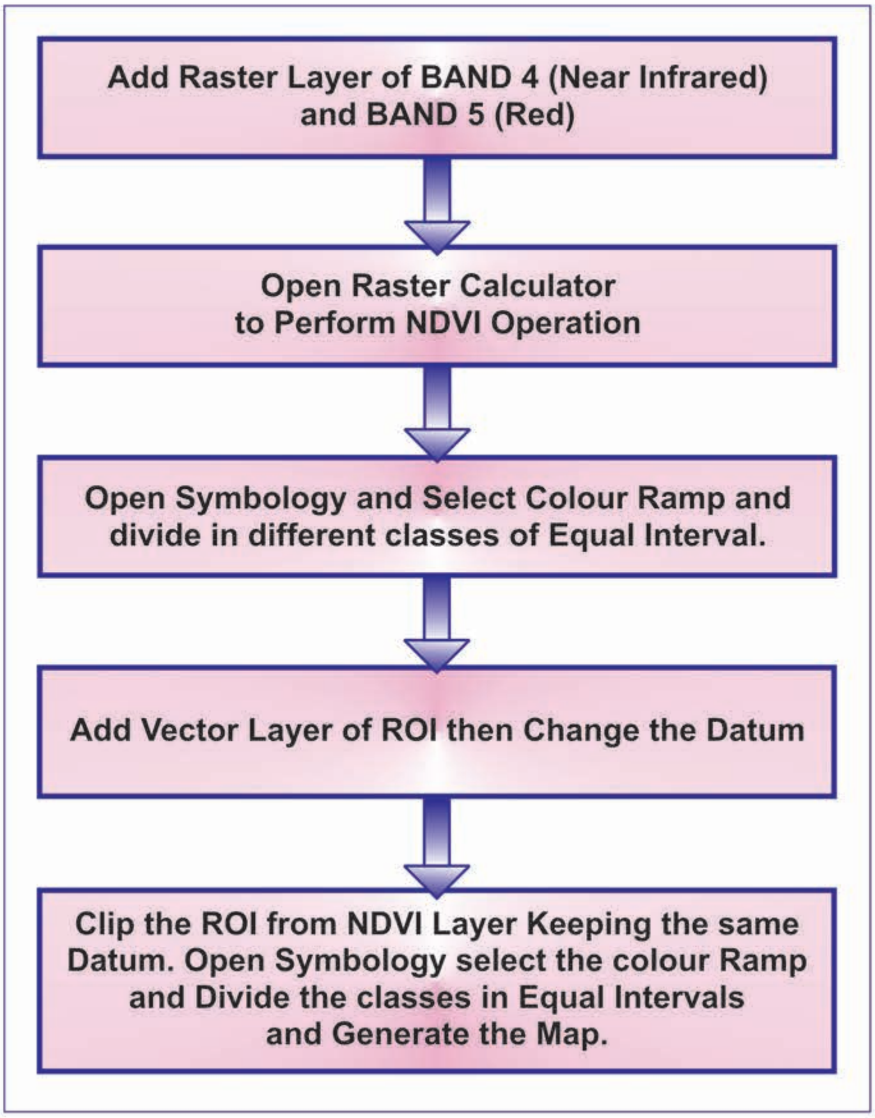
$$NDVI = (NIR - R)/(NIR + R)$$

Applications:

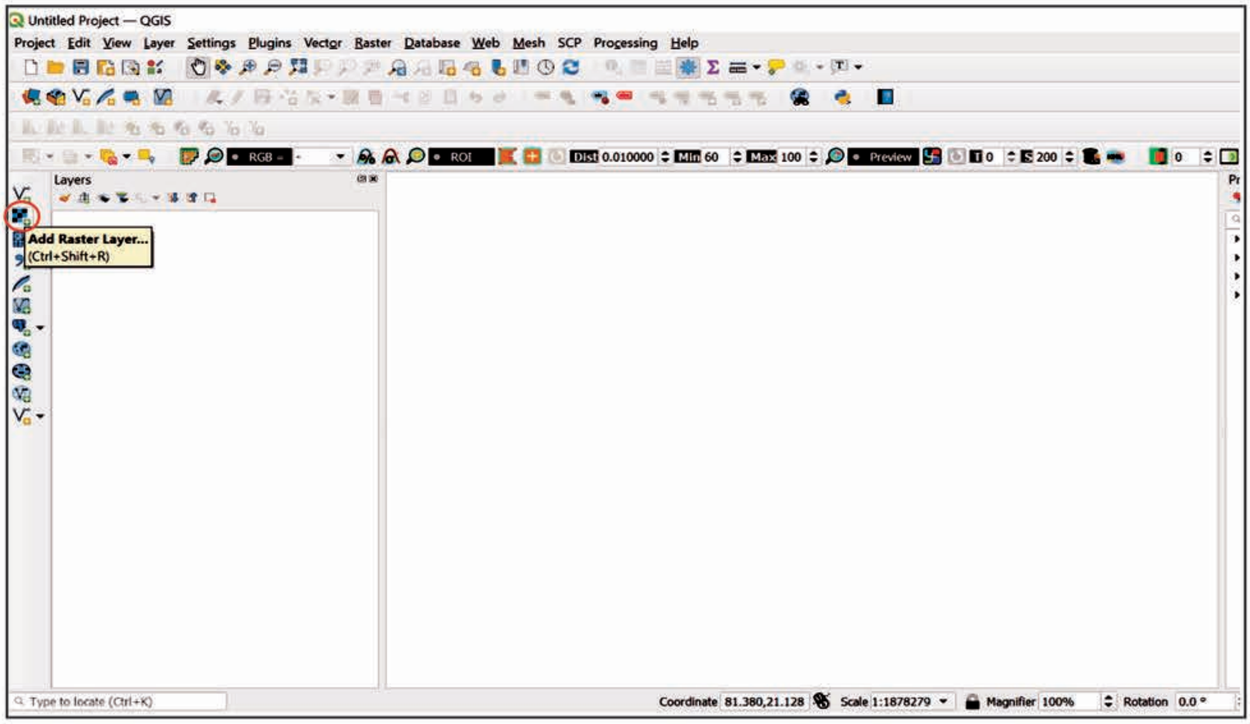
1. Sessional changes vegetative growth
2. Leaf area index measurements
3. Biomass estimation
4. Deforestation assessment

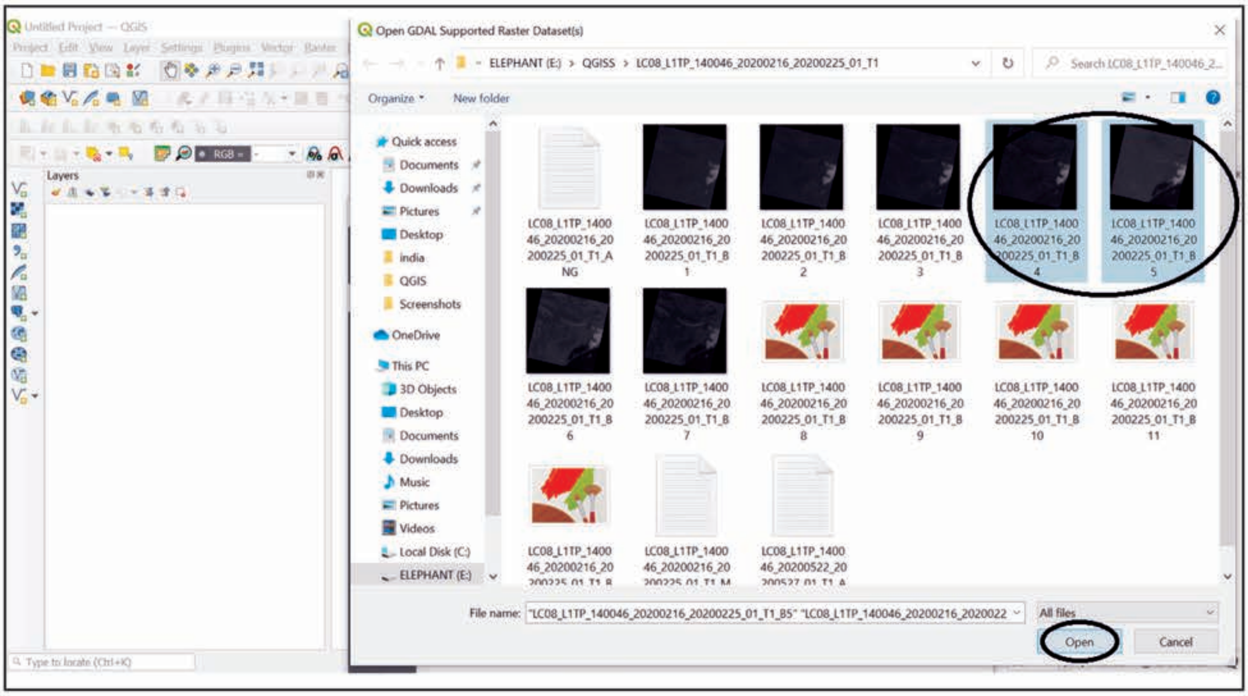
NDVI Uses:

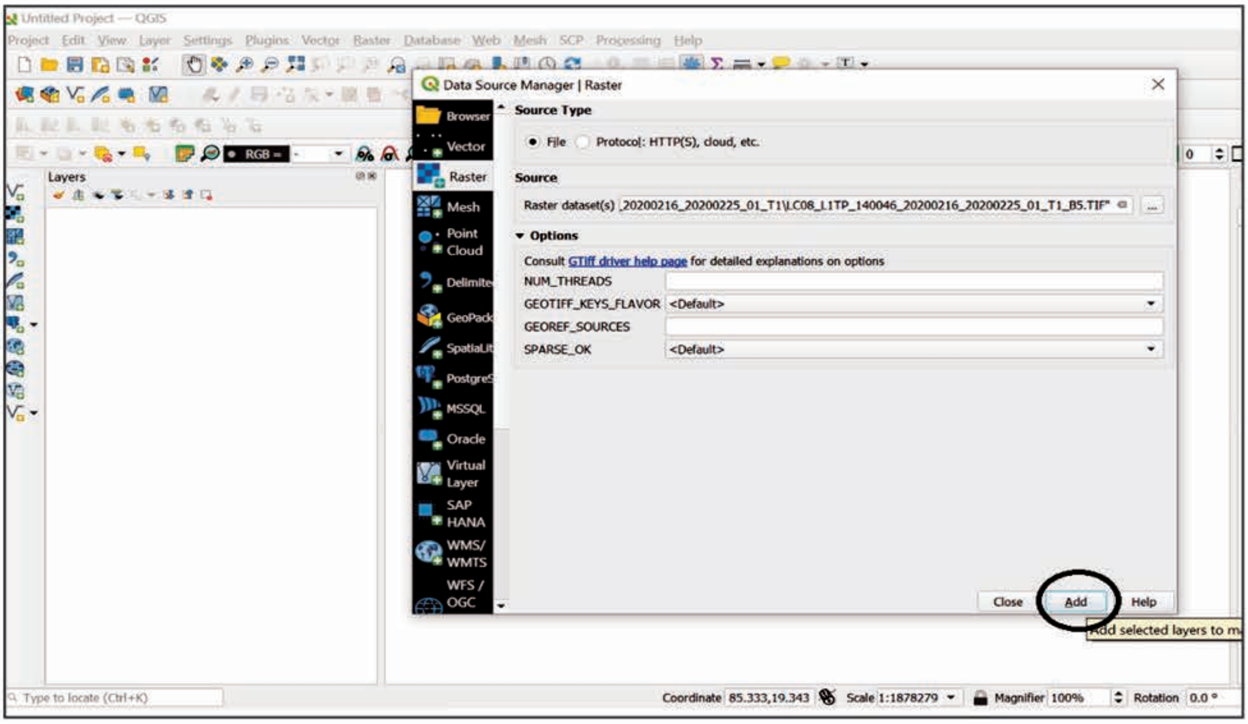
- NDVI is an index to measure healthy green vegetation.
- NDVI helps to differentiate vegetation from other types of land cover(artificial) and determines its overall state.
- It also allows defining and visualizing vegetated areas on the map as well as defect abnormal changes in the growth process.



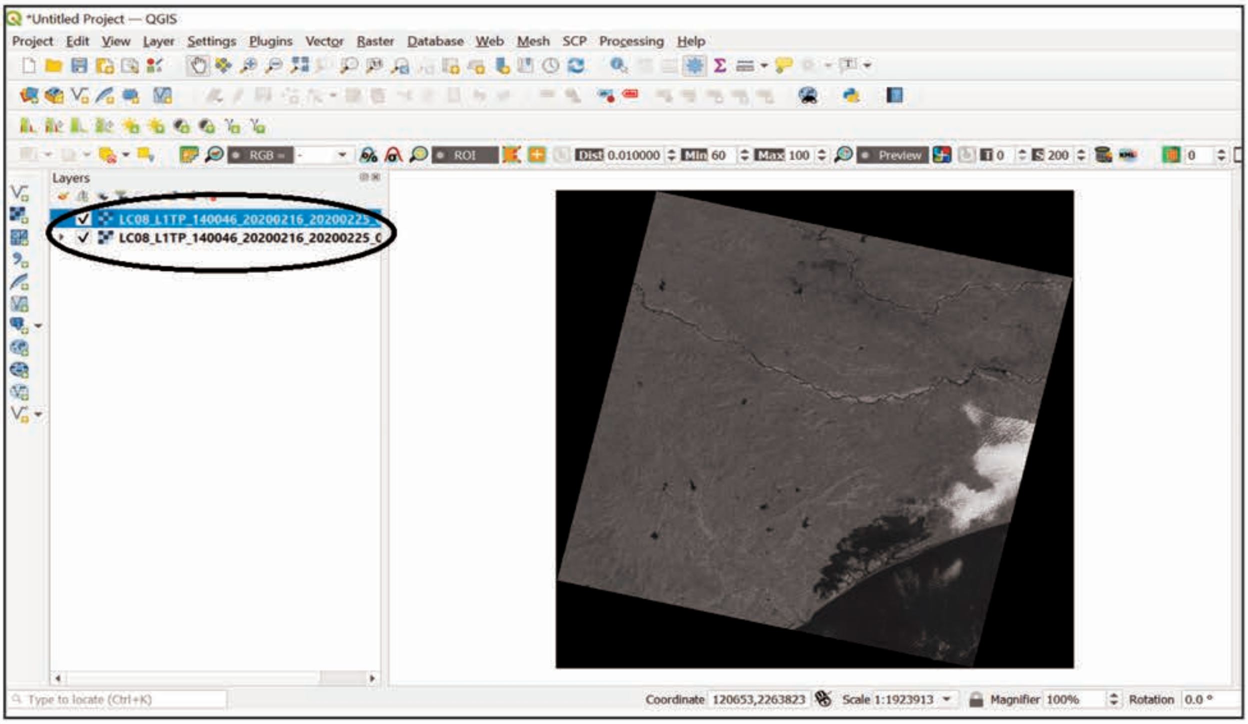
Step1- Add the Raster layer of Band 4 and Band 5 from satellite imagery.





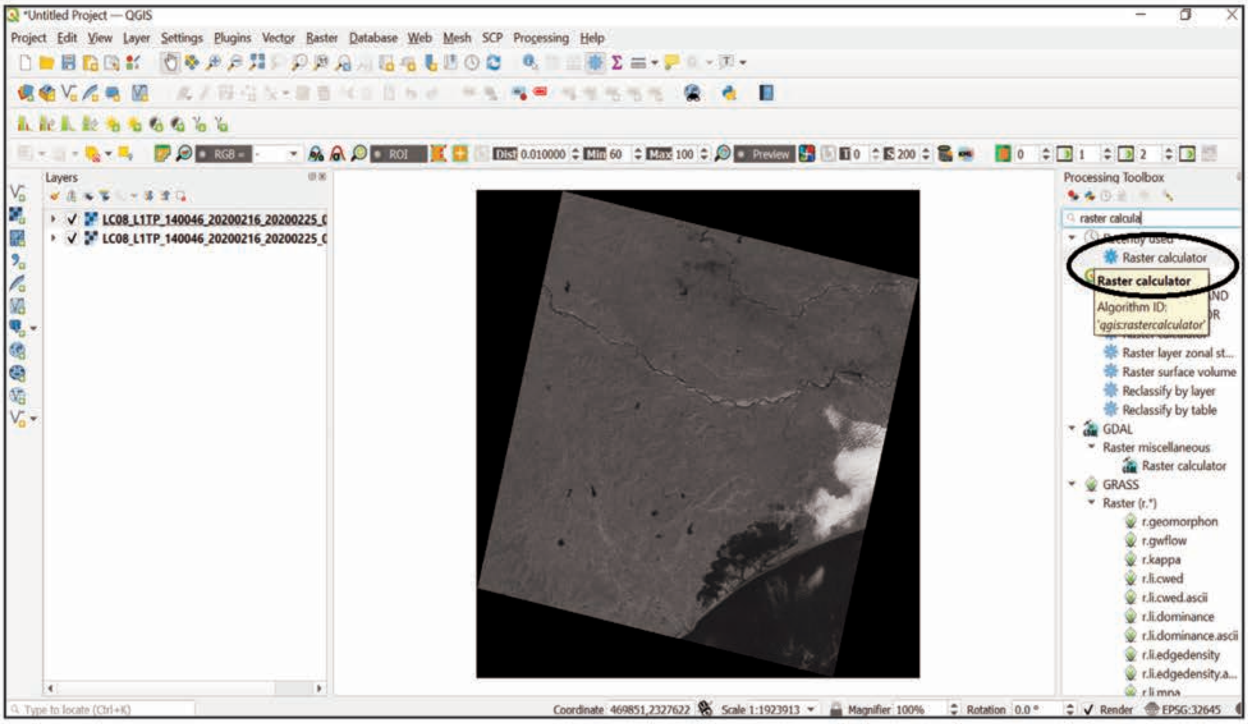


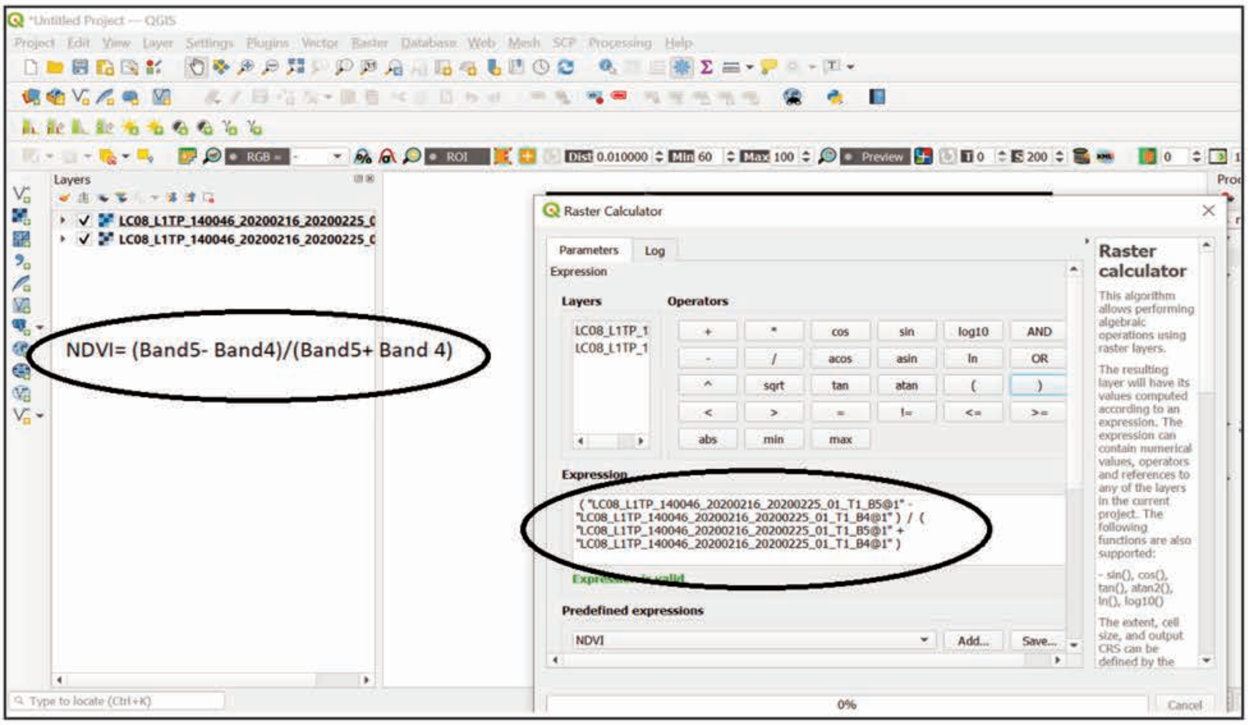
Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh SCP Processing Help
Layers
Data Source Manager | Raster
Browser
Vector
Raster
Mesh
Point Cloud
Virtual Layer
SAP HANA
WMS/ WMTS
WFS / OGC
Source Type
File
Protocol: HTTP(S), cloud, etc.
Source
Raster dataset(s) _20200216_20200225_01_T1\LC08_L1TP_140046_20200216_20200225_01_T1_B5.TIF"
Options
Consult GTiff driver help page for detailed explanations on options
NUM_THREADS
GEOTIFF_KEYS_FLAVOR <Default>
GEOREF_SOURCES
SPARSE_OK <Default>
Close
Add
Help
Type to locate (Ctrl+K)
Coordinate 85.333,19.343
Scale 1:1878279
Magnifier 100%
Rotation 0.0 °



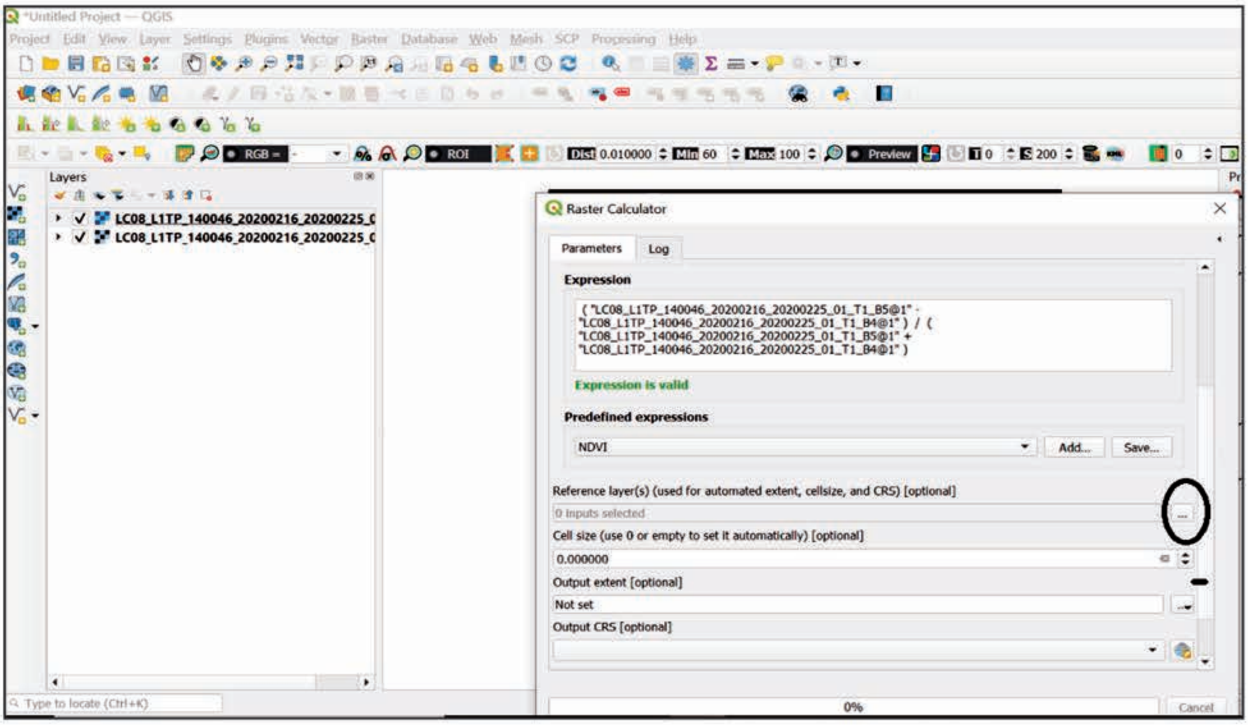
*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh SCP Processing Help
Layers
LC08_L1TP_140046_20200216_20200225_
LC08_L1TP_140046_20200216_20200225_0
Type to locate (Ctrl+K)
Coordinate 120653,2263823
Scale 1:1923913
Magnifier 100%
Rotation 0.0 °

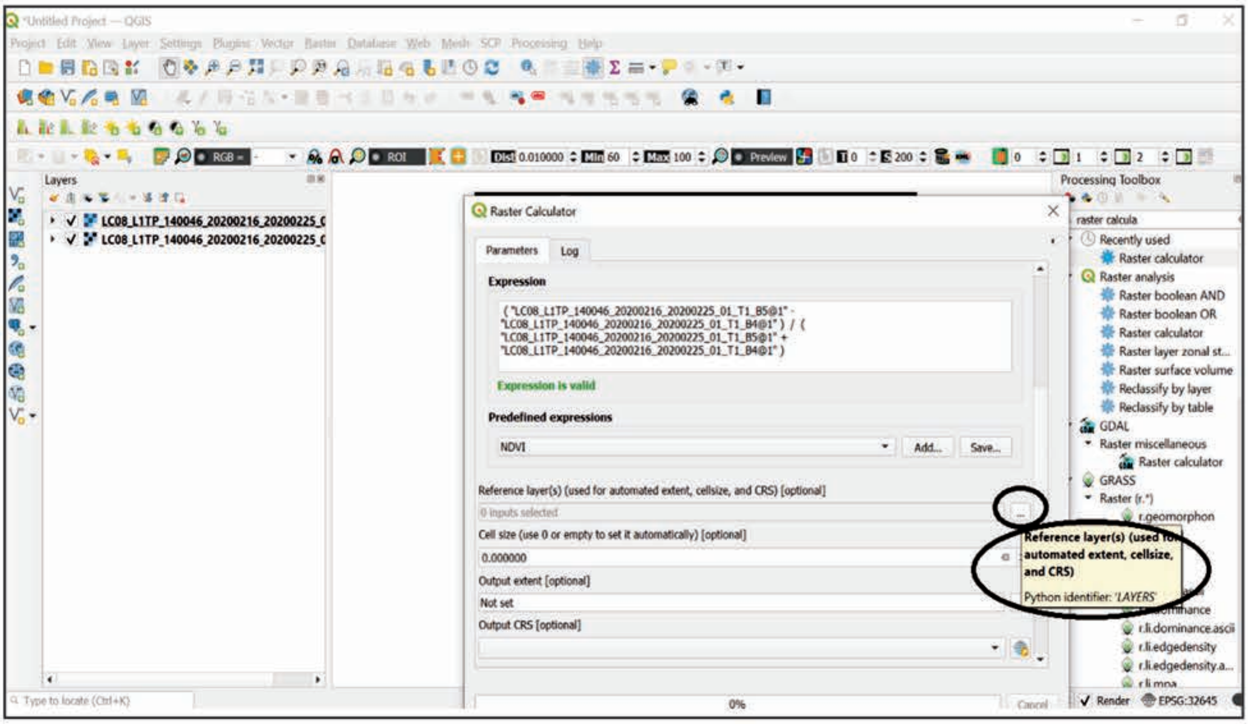
Step-2 Open raster calculator to perform the normalized difference vegetation index (NDVI) operation.

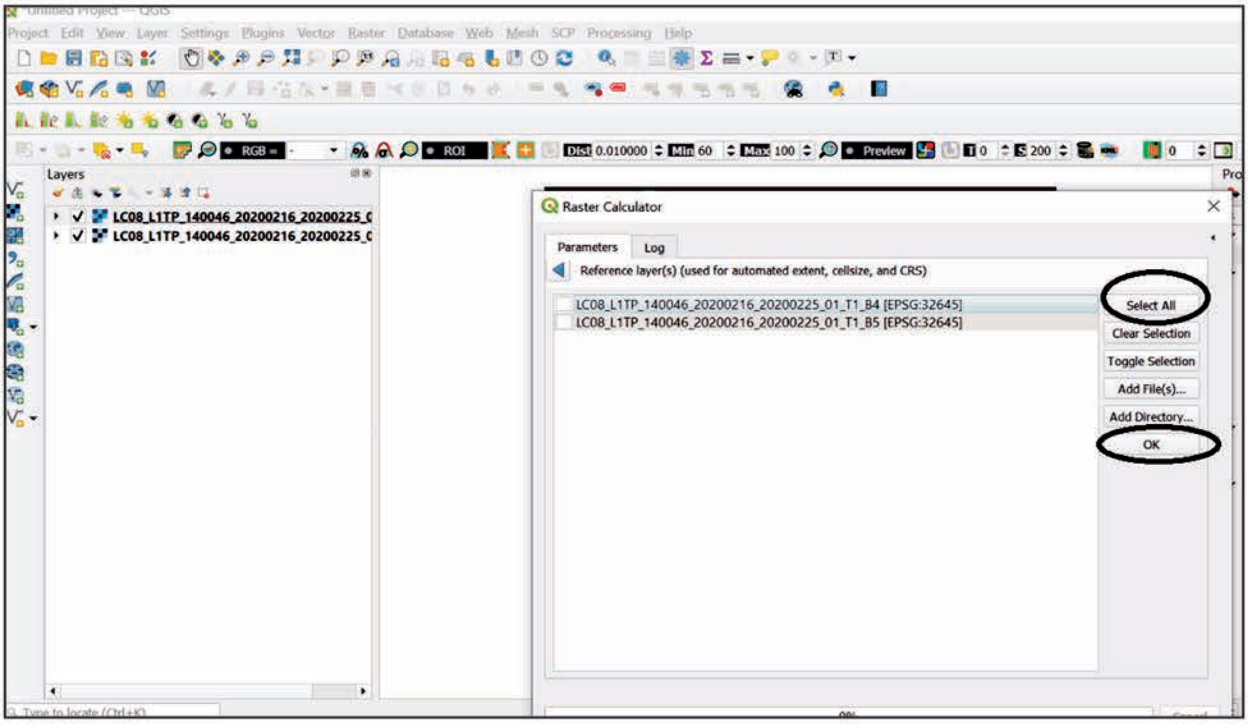


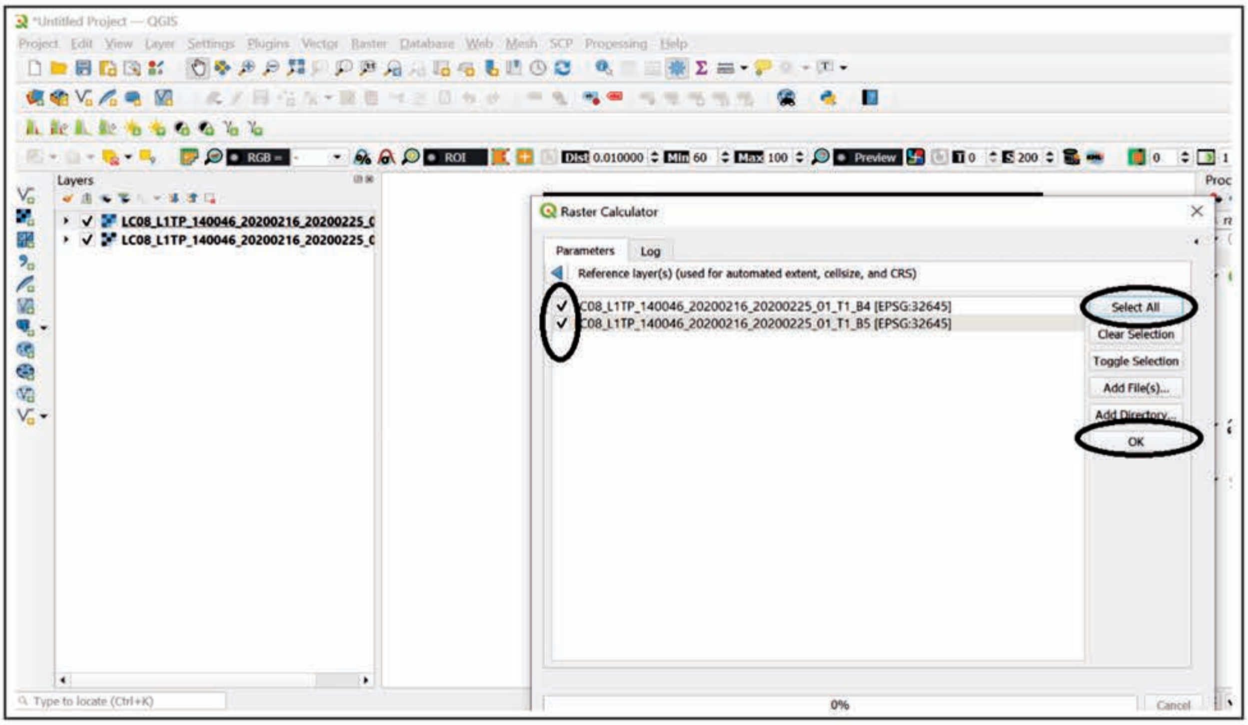


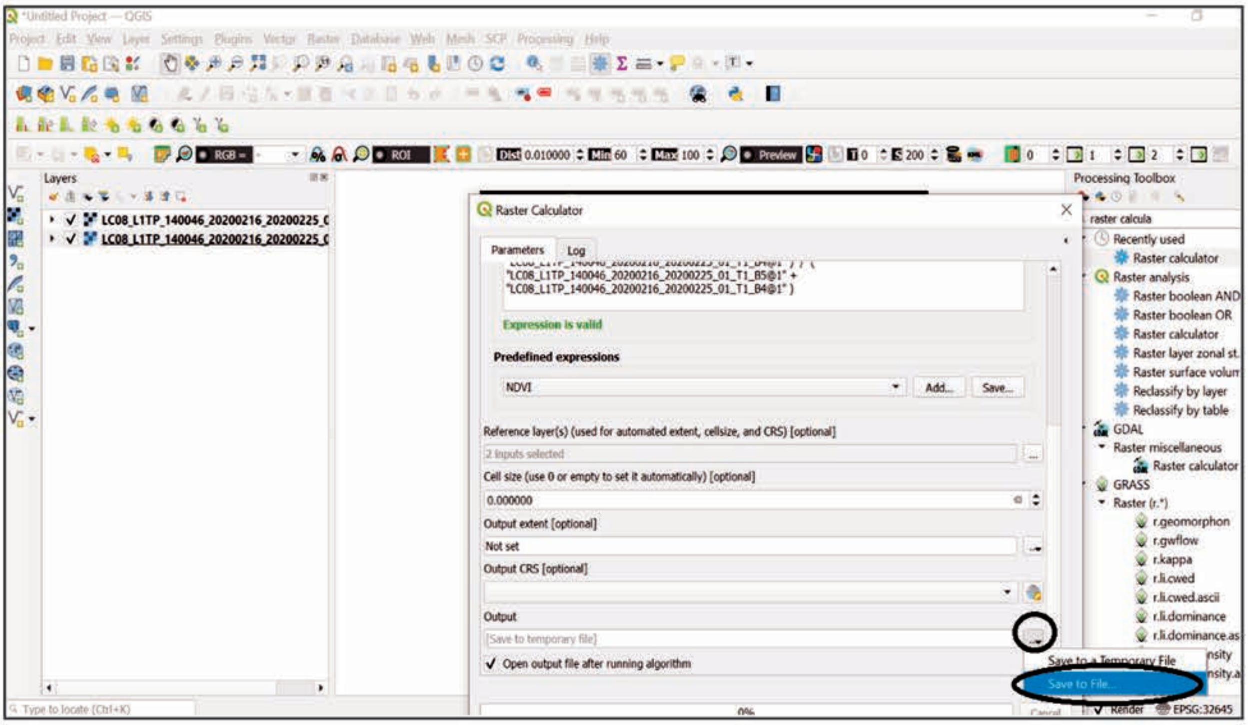
Step-3 click reference layer, select layers used in the Raster calculator then click ok, save to temporary file, and run it.

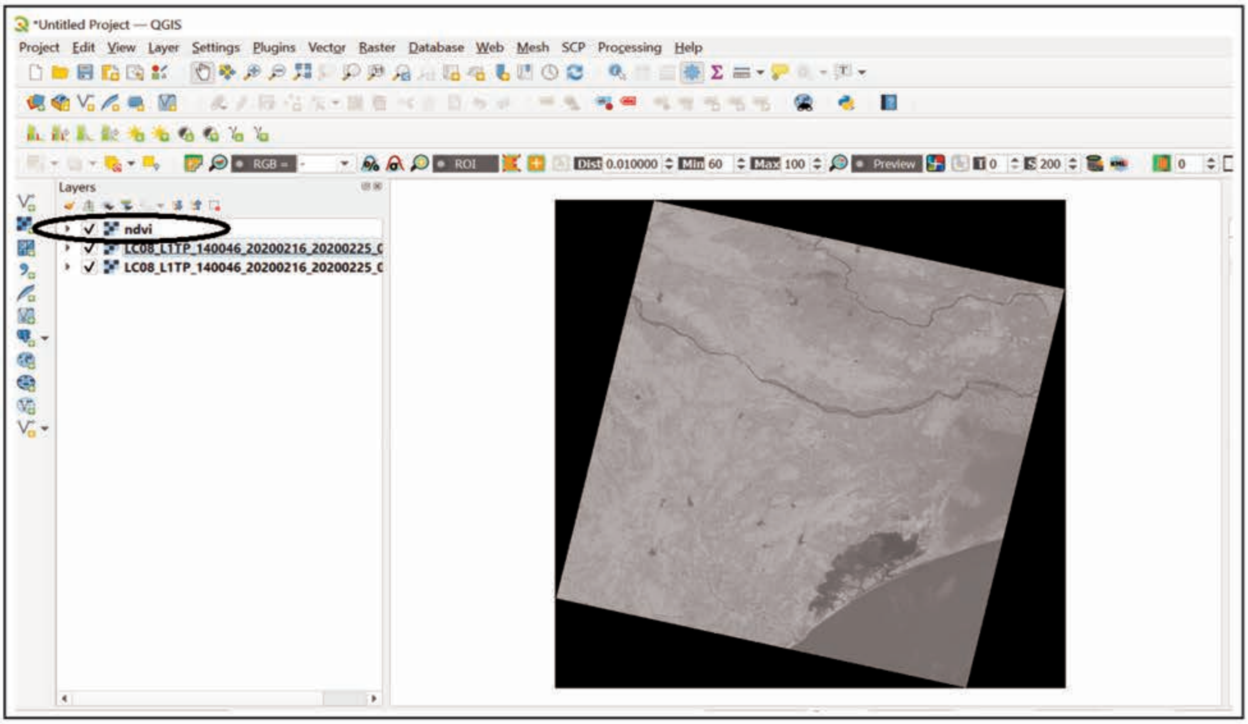




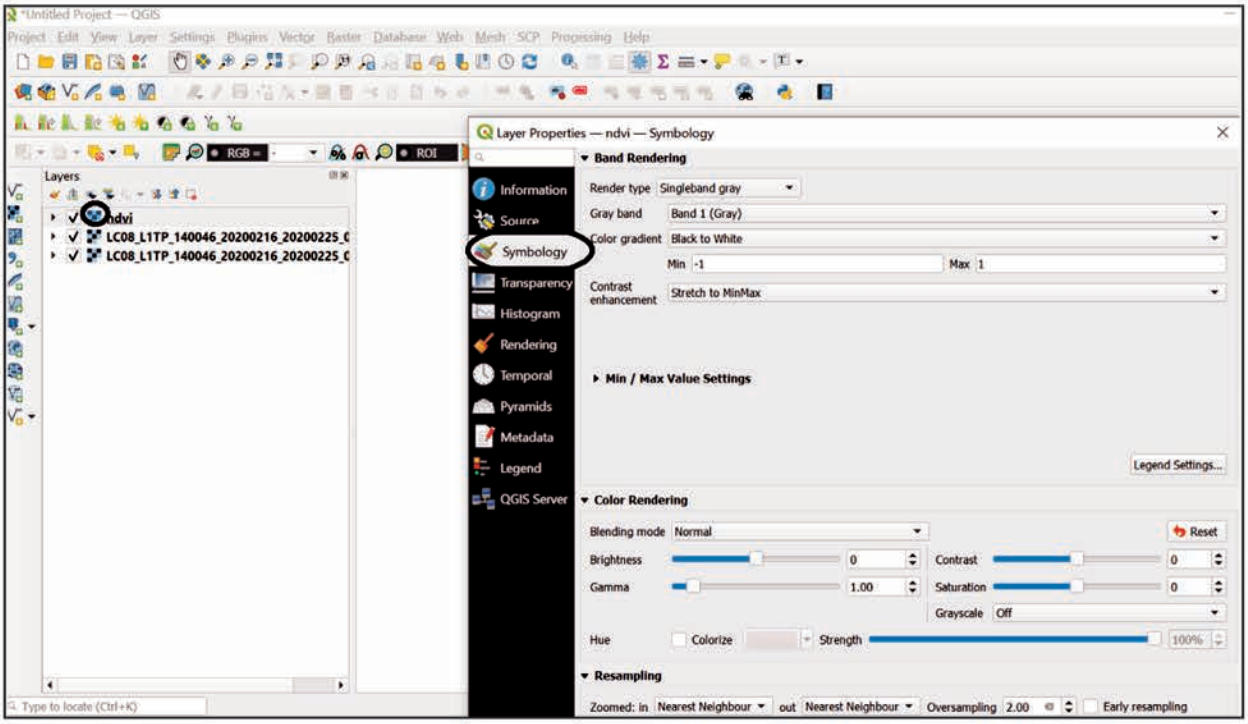

Raster Calculator
Parameters
Log
Reference layer(s) (used for automated extent, cellsize, and CRS)
LC08_L1TP_140046_20200216_20200225_01_T1_B4 [EPSG:32645]
LC08_L1TP_140046_20200216_20200225_01_T1_B5 [EPSG:32645]
Select All
Clear Selection
Toggle Selection
Add File(s)...
Add Directory...
OK

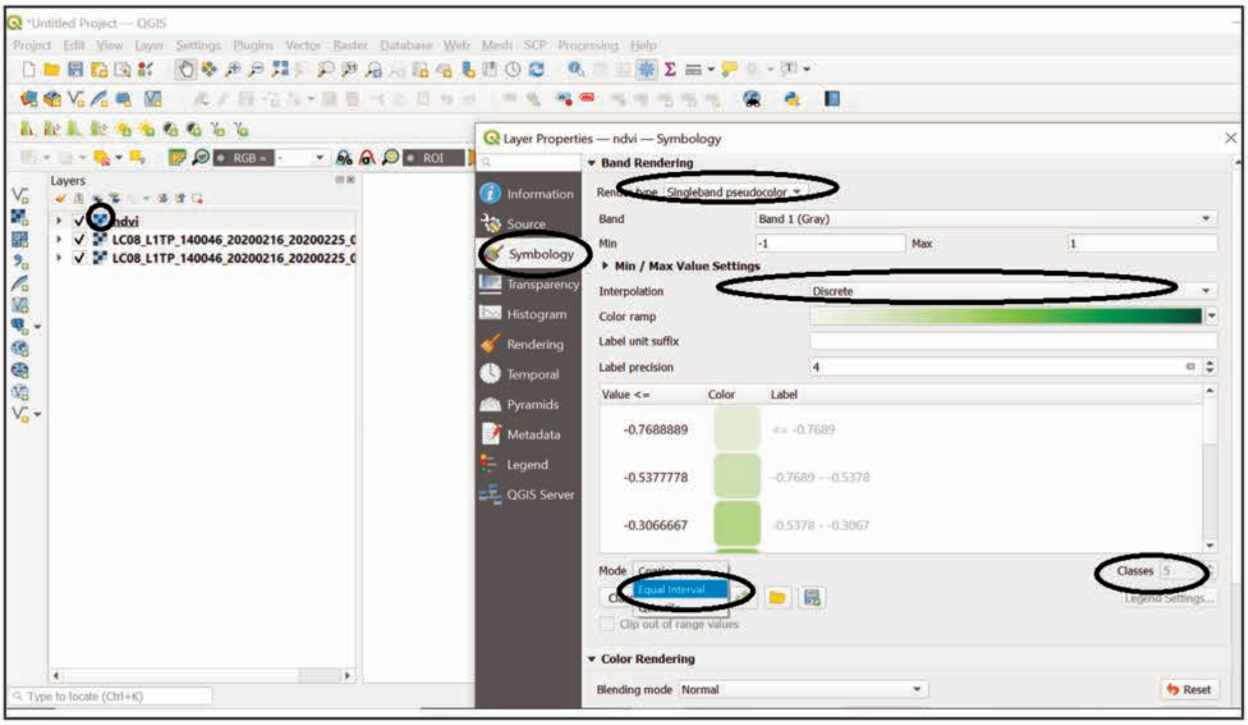

*Untitled Project — QGIS
Raster Calculator
Parameters
Log
Reference layer(s) (used for automated extent, cellsize, and CRS)
LC08_L1TP_140046_20200216_20200225_01_T1_B4 [EPSG:32645]
LC08_L1TP_140046_20200216_20200225_01_T1_B5 [EPSG:32645]
Select All
Clear Selection
Toggle Selection
Add File(s)...
OK
0%
Cancel

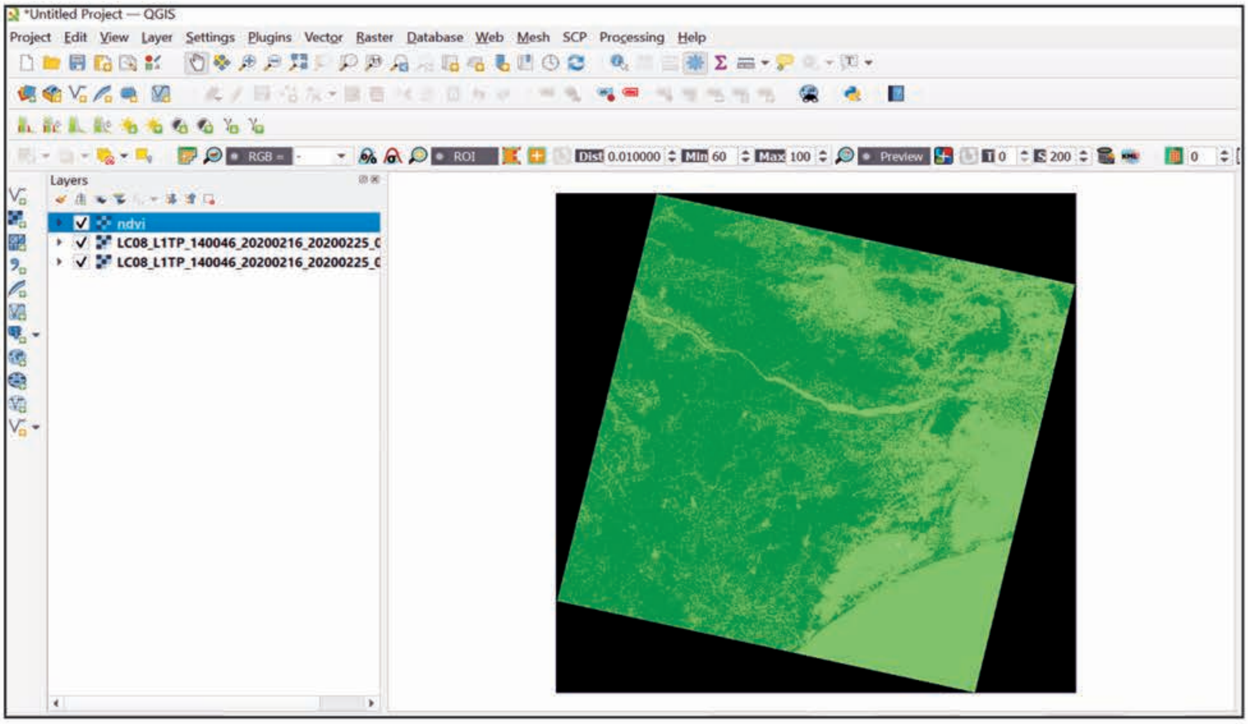

*Untitled Project — QGIS
Layers
Raster Calculator
Parameters
Log
Expression is valid
Predefined expressions
NDVI
Add...
Save...
Reference layer(s) (used for automated extent, cellsize, and CRS) [optional]
Cell size (use 0 or empty to set it automatically) [optional]
0.000000
Output extent [optional]
Not set
Output CRS [optional]
Output
[Save to temporary file]
Open output file after running algorithm
Save to a Temporary File
Save to File...
Processing Toolbox
Recently used
Raster calculator
Raster analysis
GDAL
GRASS


*Untitled Project — QGIS
Project
Edit
View
Layer
Settings
Plugins
Vector
Raster
Database
Web
Mesh
SCP
Processing
Help
Layers
ndvi
LC08_L1TP_140046_20200216_20200225_0
LC08_L1TP_140046_20200216_20200225_0

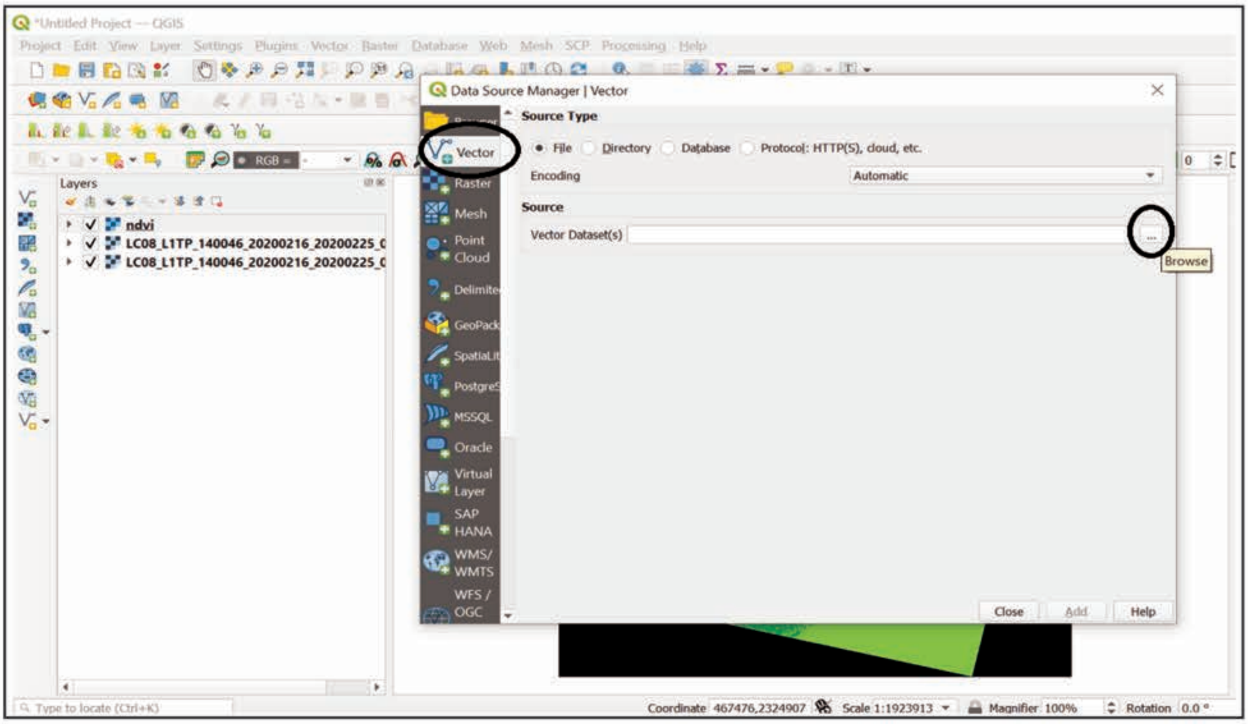
Step 4 - Open symbology and Select render type single band pseudo color, interpolation discrete, ramp color according to vegetation, mode equal interval, classes 5 then apply and ok.

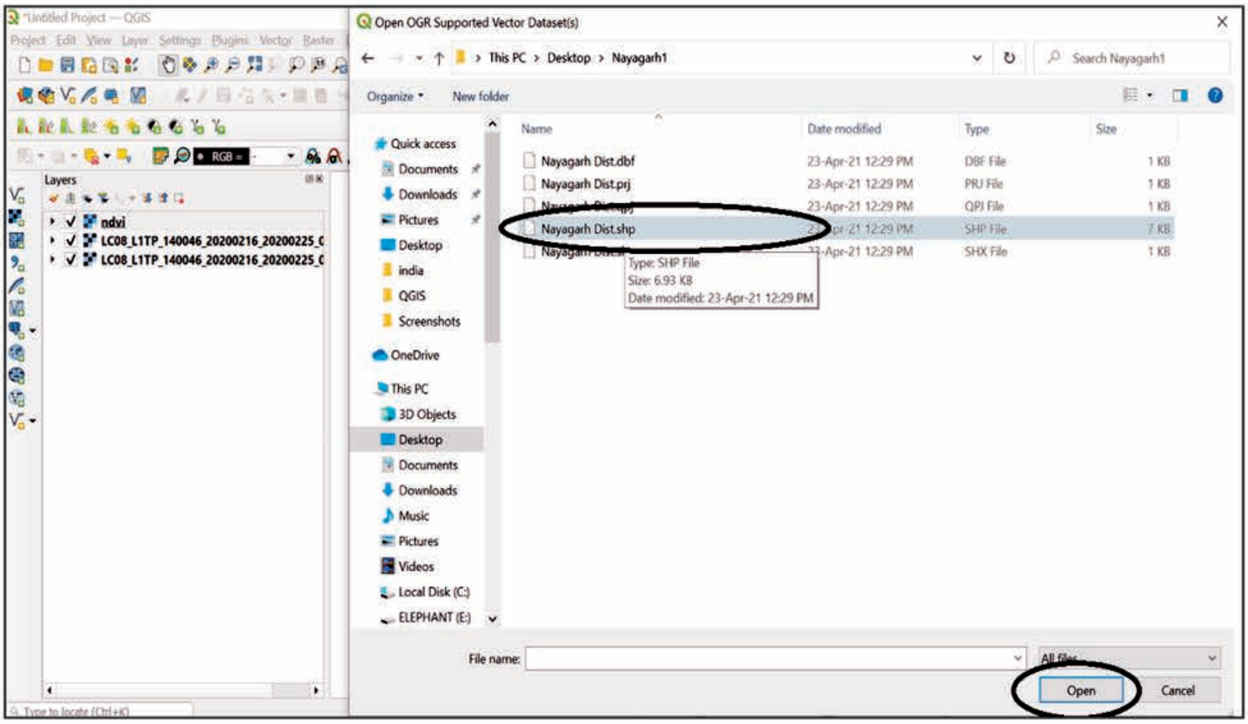




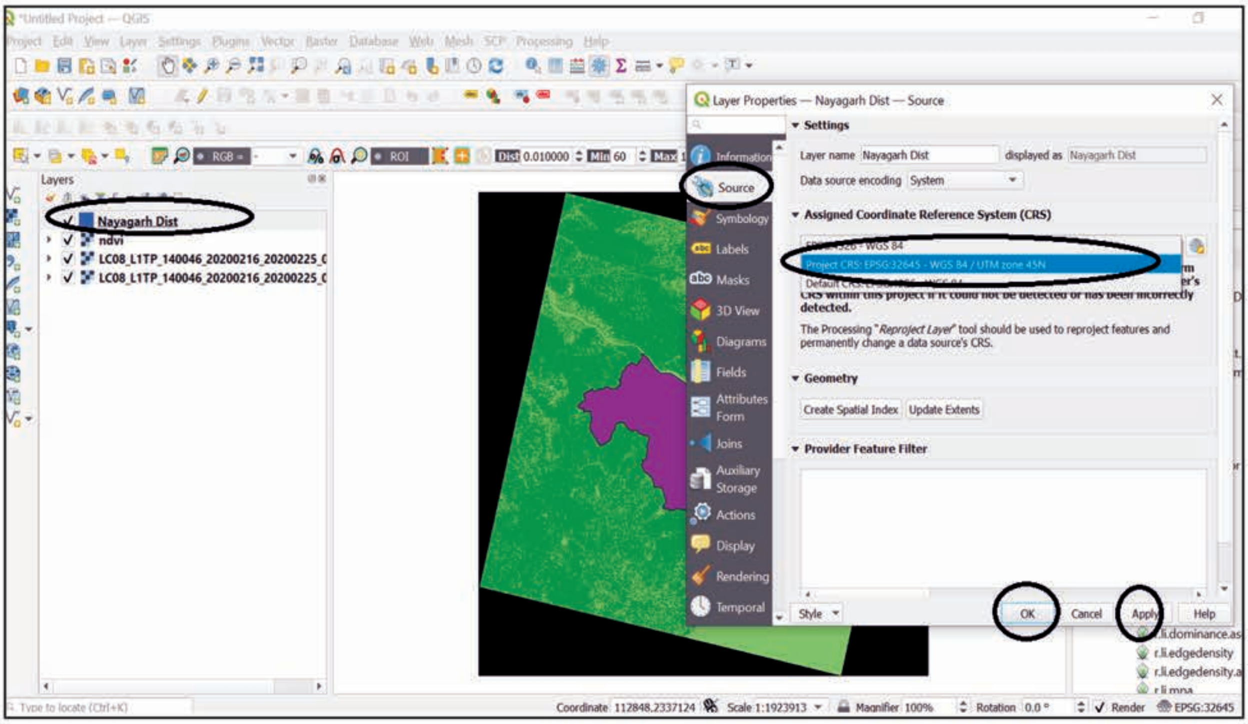


Step-5 Add vector layer of NayagarhDistrict, shape file.





Step 6-Set the layer properties: Change the Datum.



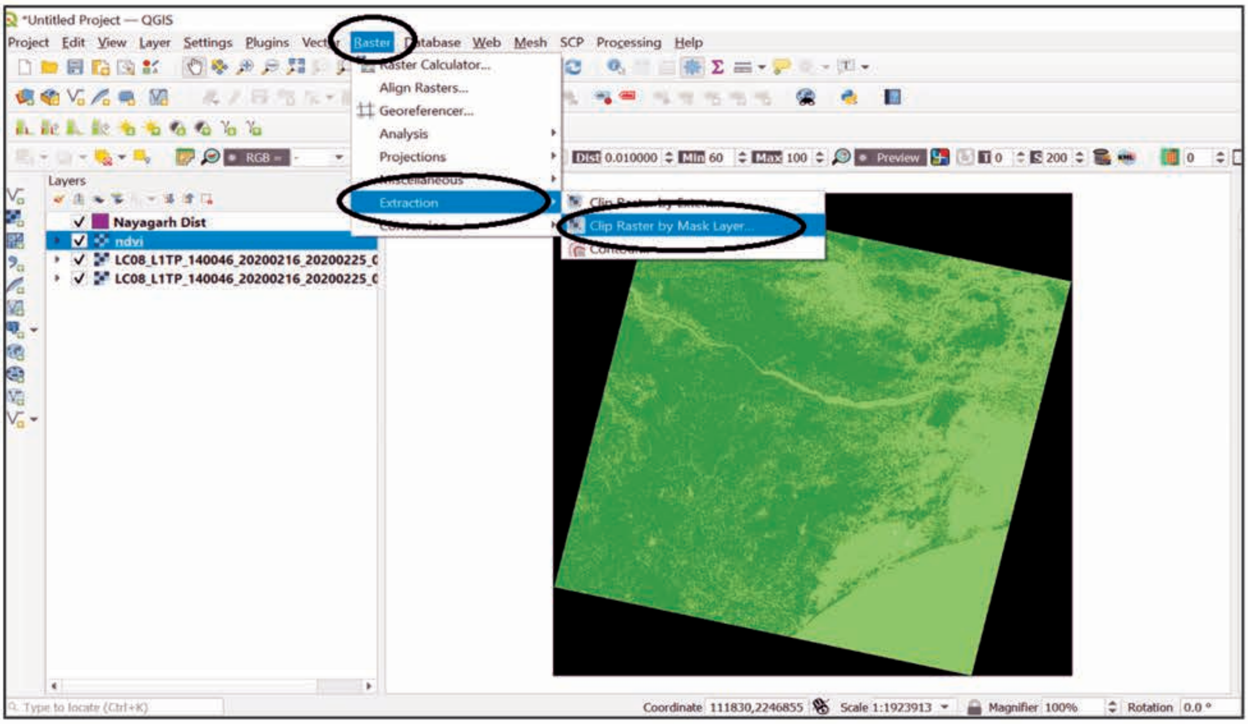
Step-7 Clip the region of interest (ROI) from NDVI Layer

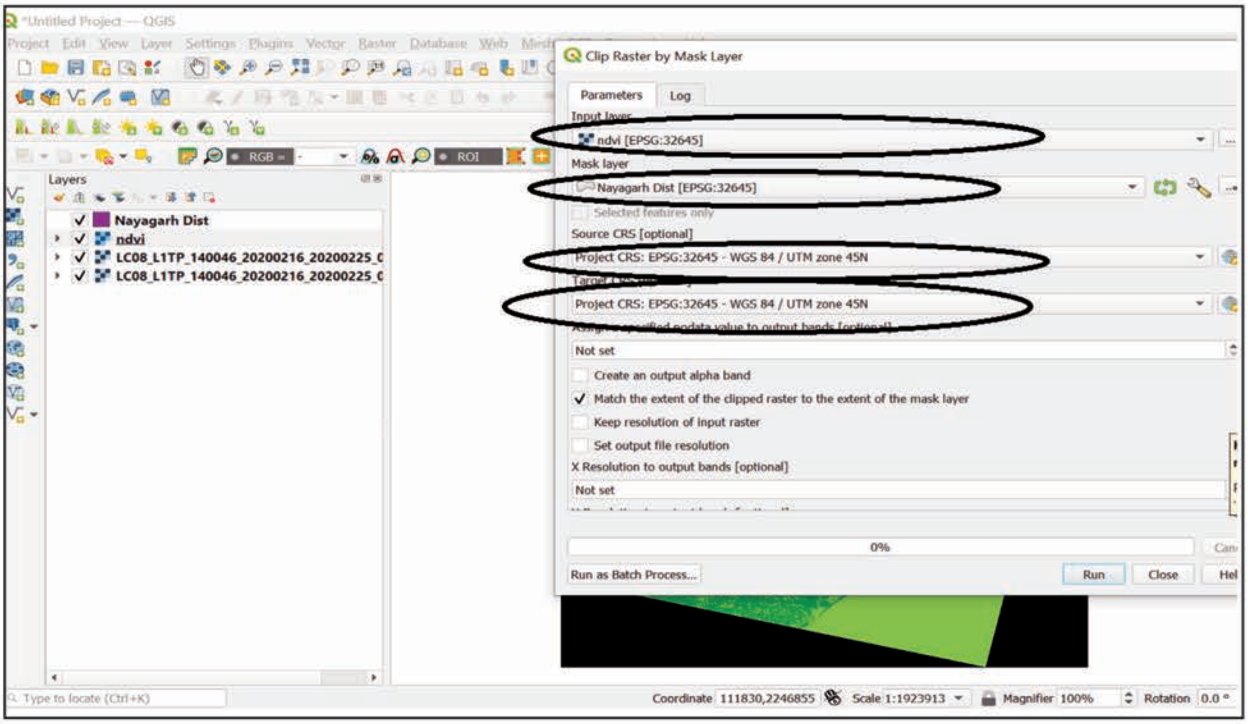
Click Raster>> Extraction>> Clip Raster by Mask Layer.

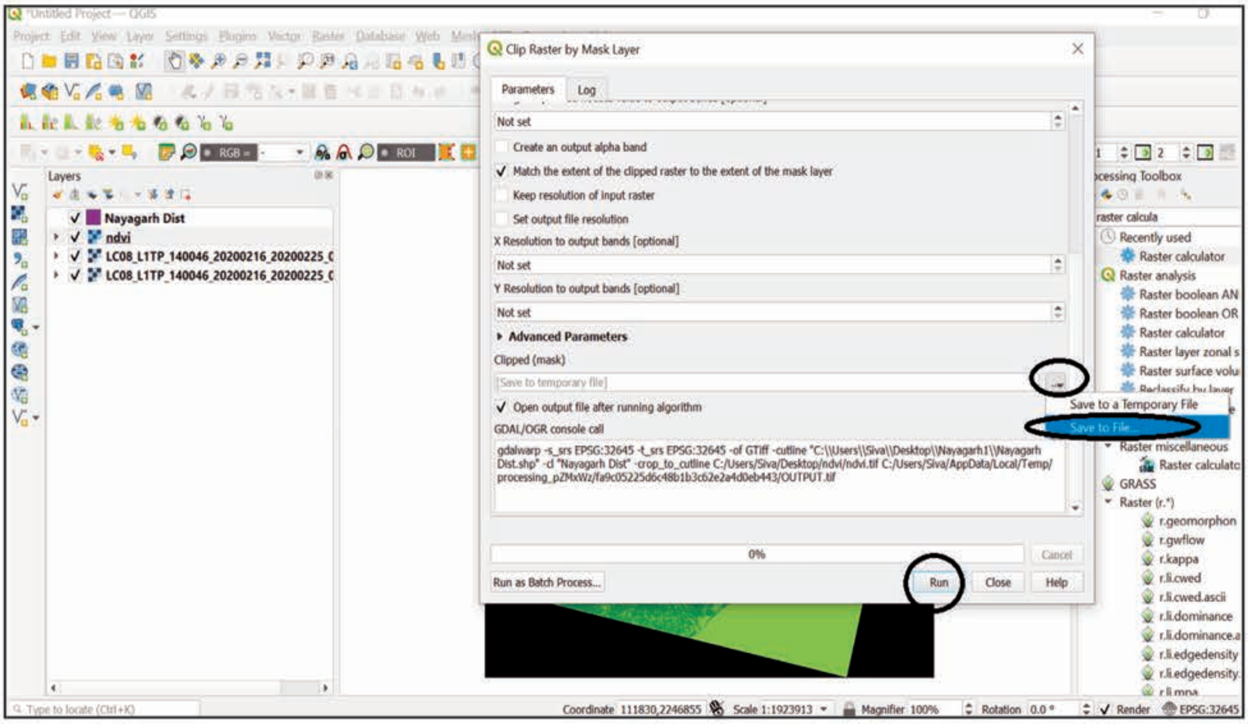
I. **Select the input layer as NDVI,**

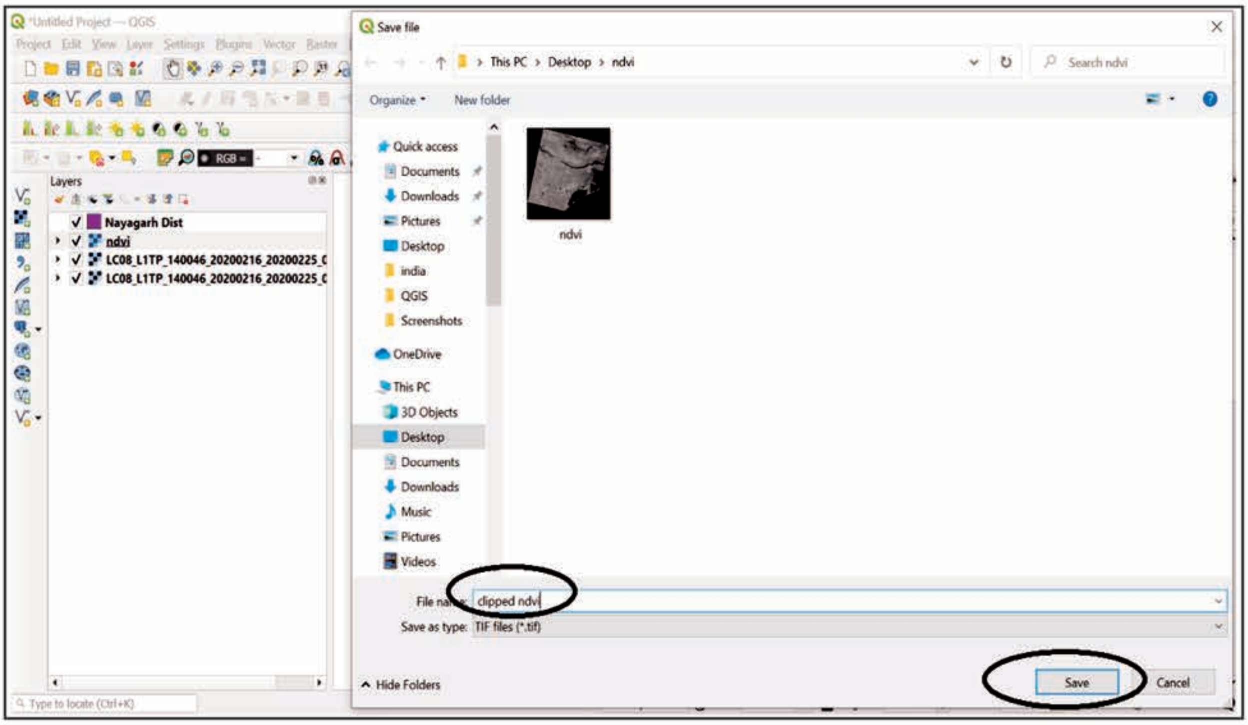
II. **Mask Layer as Nayagarh District masking same datum.**

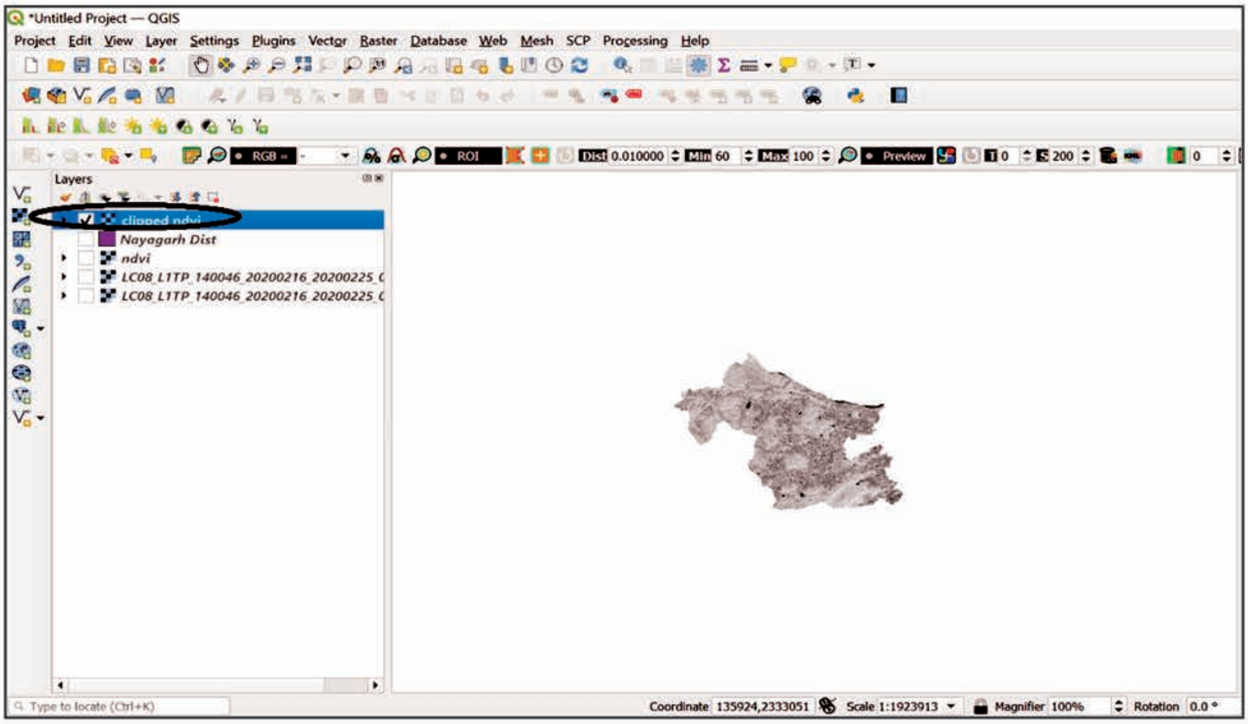
III. **Save the temporary file as clipped ndvi and run it.**



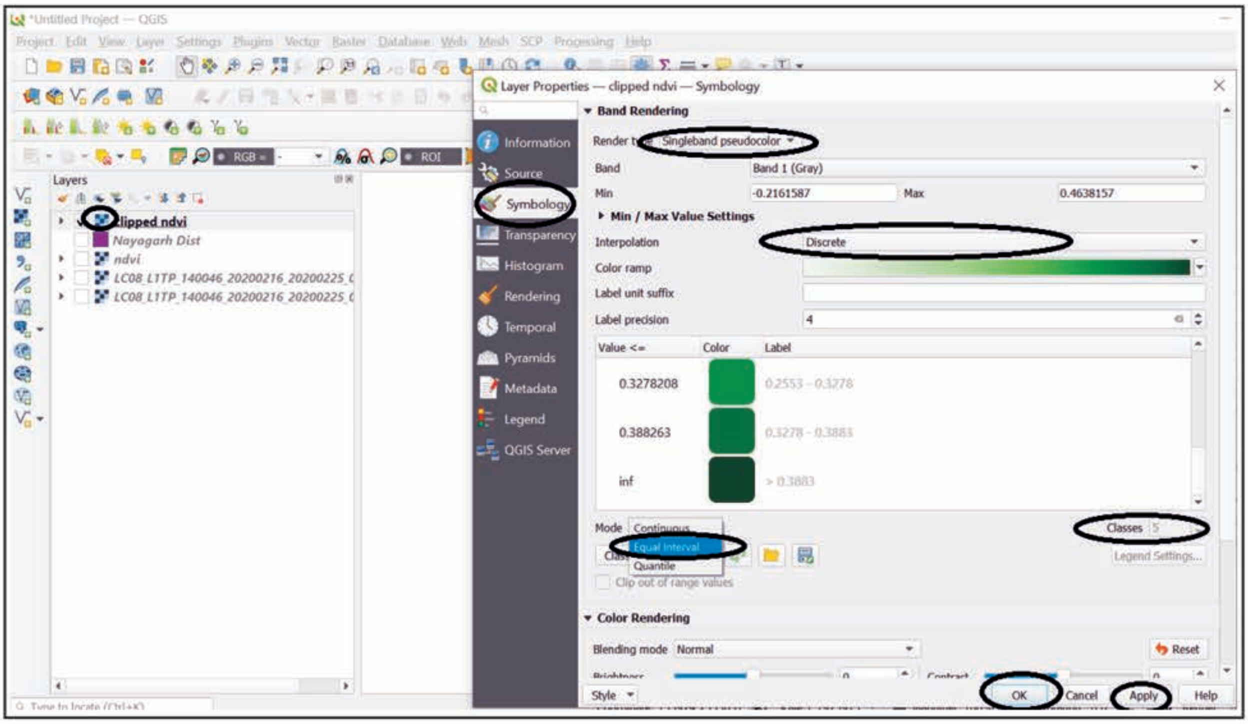


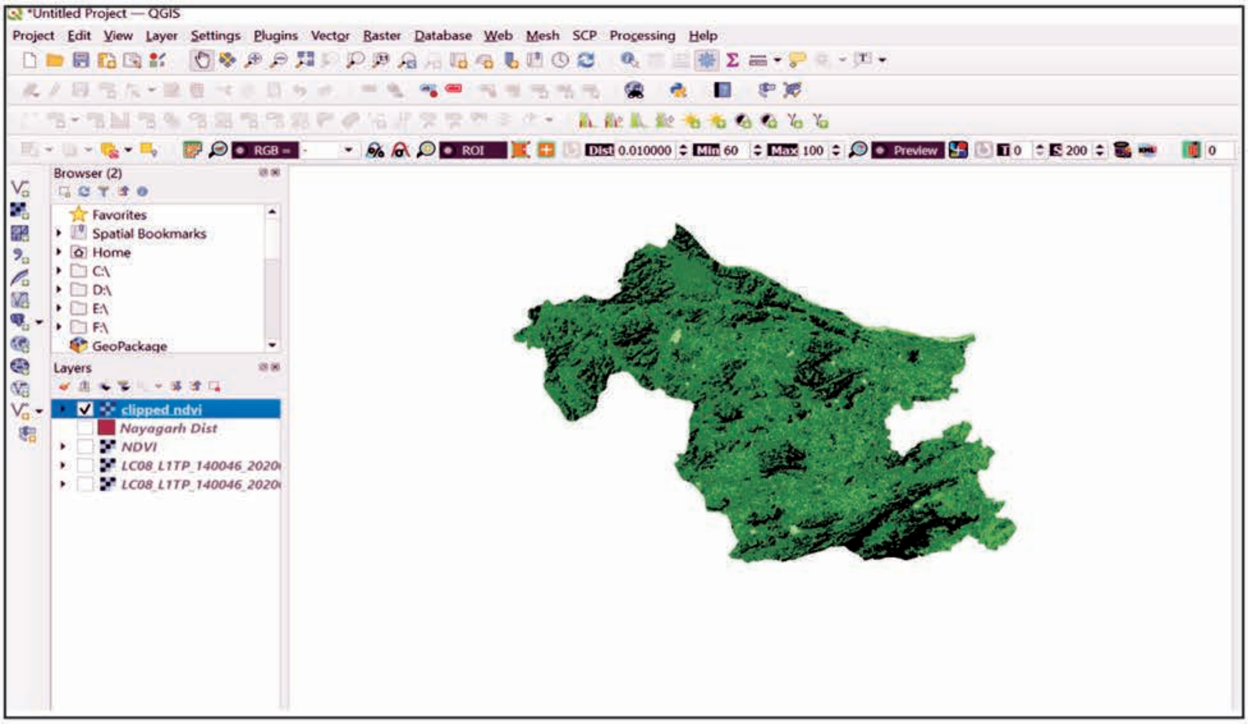

Clip Raster by Mask Layer
Parameters
Log
Not set
Create an output alpha band
Match the extent of the clipped raster to the extent of the mask layer
Keep resolution of input raster
Set output file resolution
X Resolution to output bands [optional]
Y Resolution to output bands [optional]
Advanced Parameters
Clipped (mask)
[Save to temporary file]
Save to a Temporary File
Save to File...
Open output file after running algorithm
GDAL/OGR console call
Run as Batch Process...
Run
Close
Help
Cancel


Save file
This PC › Desktop › ndvi
Search ndvi
Organize
New folder
Quick access
Documents
Downloads
Pictures
Desktop
india
QGIS
Screenshots
OneDrive
This PC
3D Objects
Music
Videos
ndvi
File name: clipped ndvi
Save as type: TIF files (*.tif)
Hide Folders
Save
Cancel

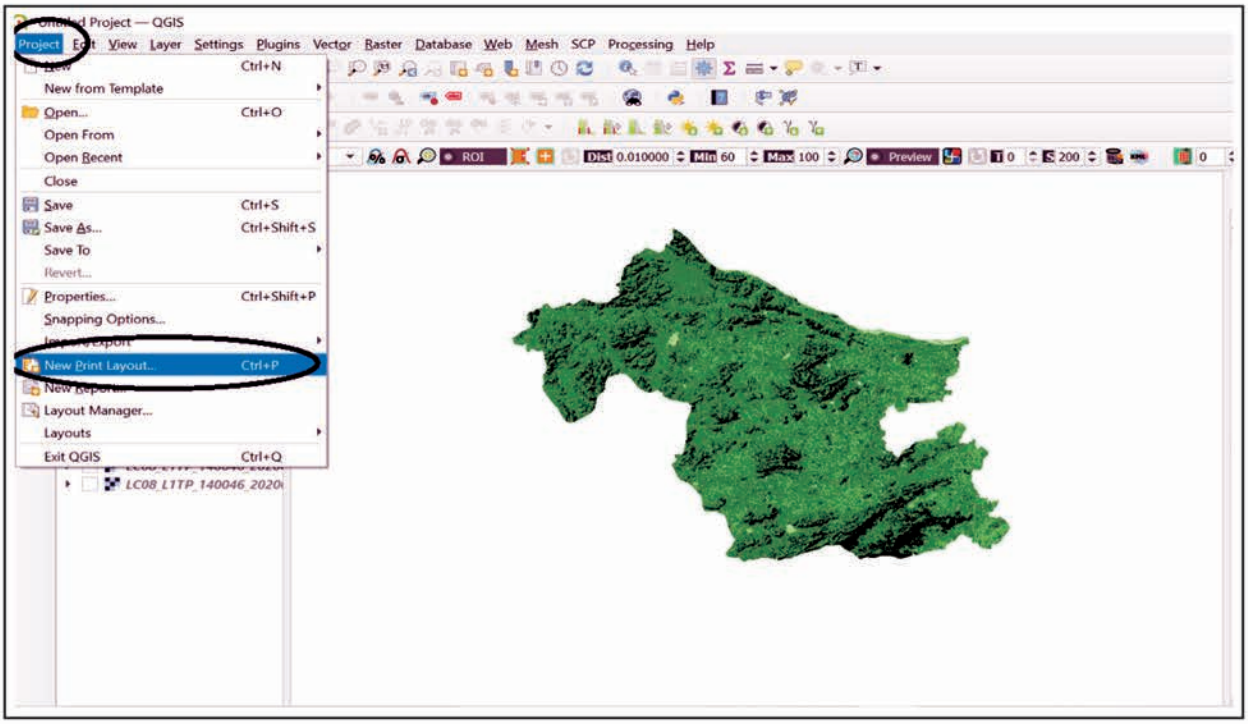


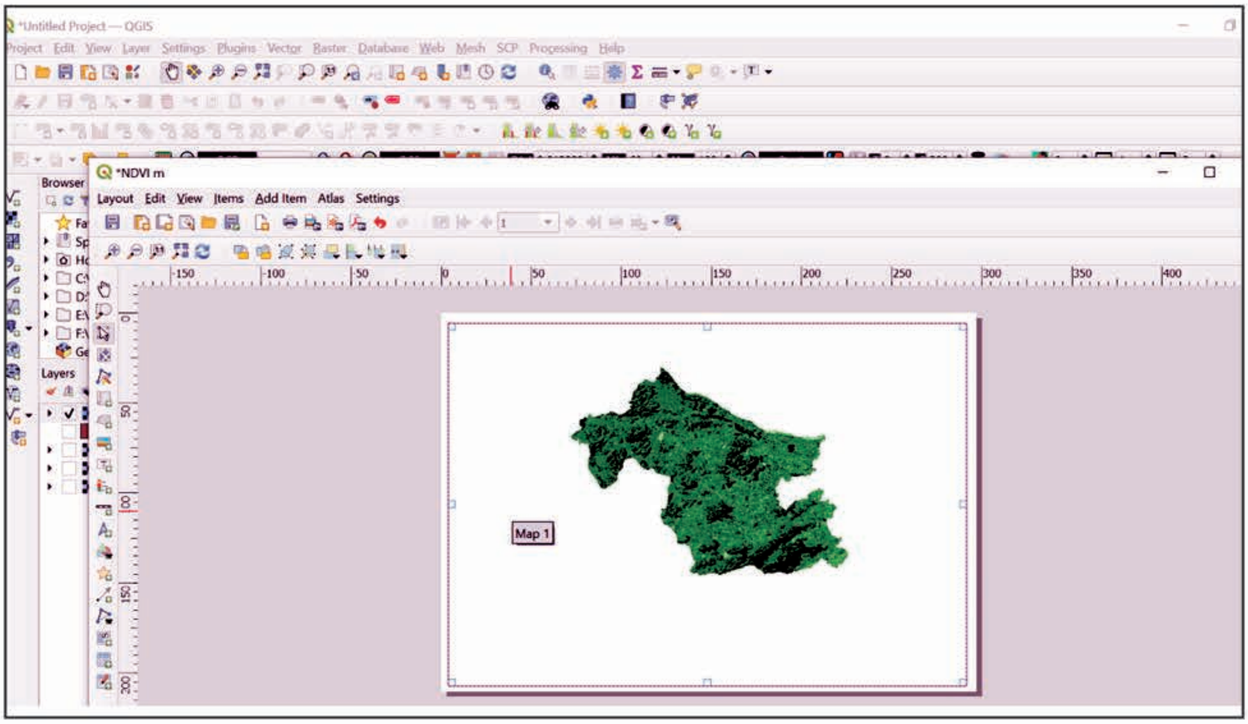
Step-8 Open clipped ndvi symbology and select the fields then apply and ok.



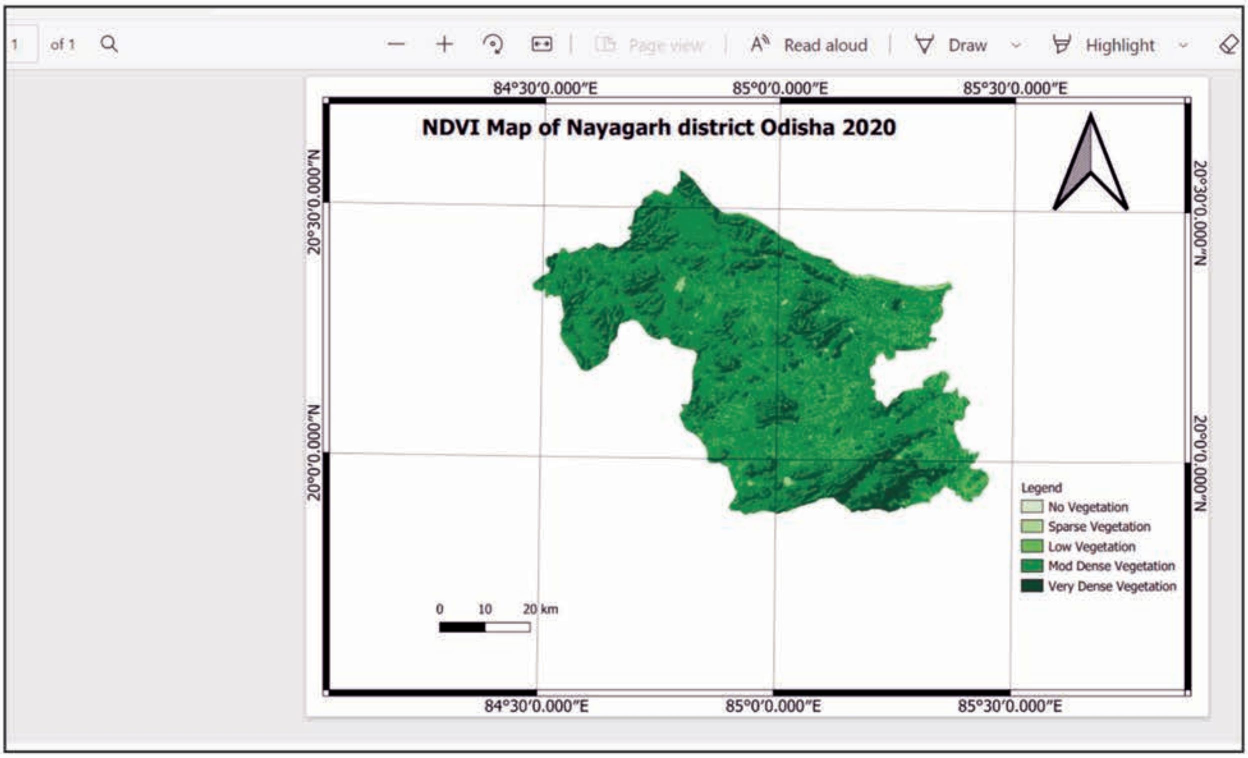


Step-9 Generate the map of vegetation cover. Click project select new print layout and select grids, direction symbol, legend, scale, and title.



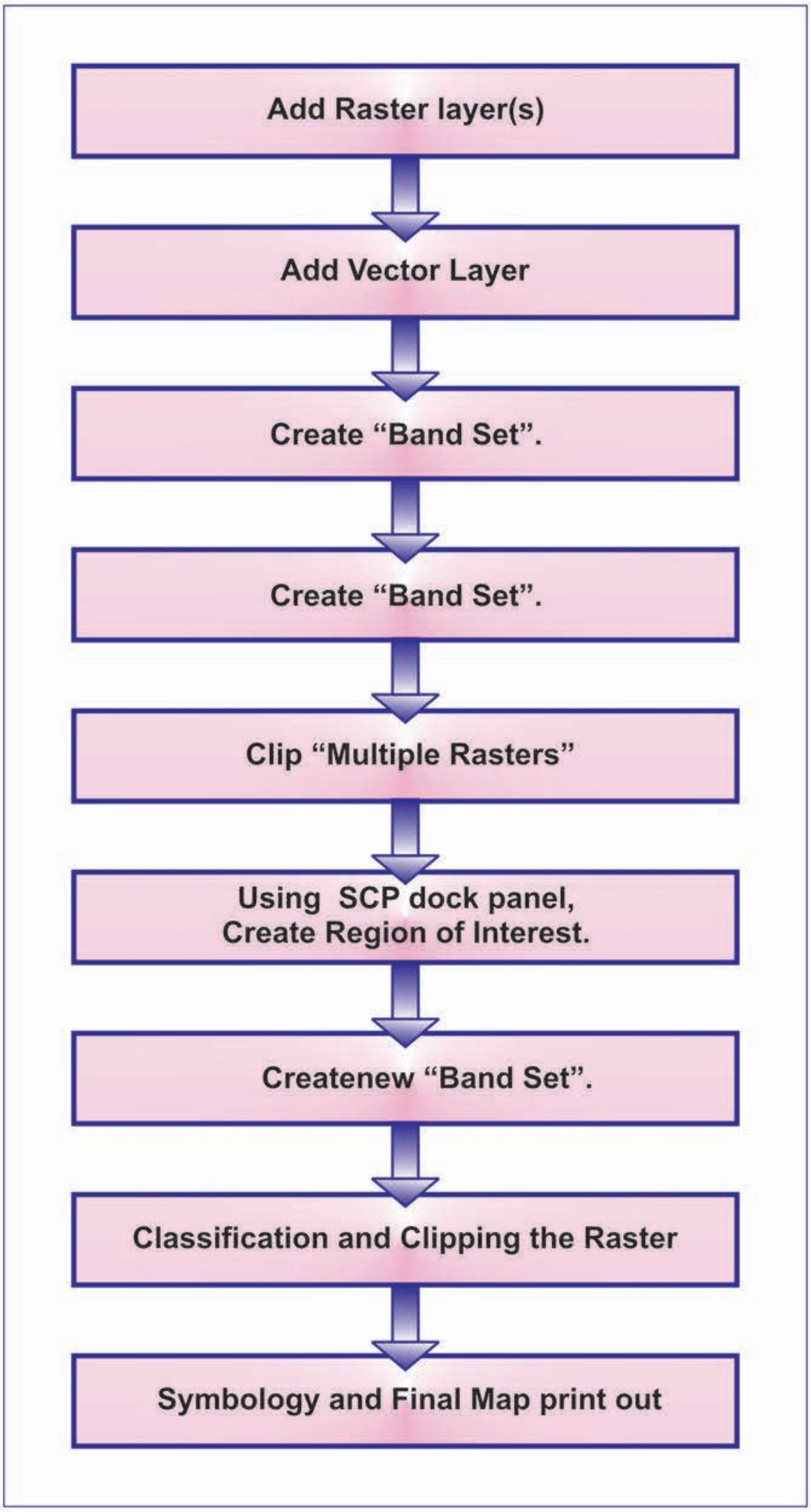


Final NDVI Map of Nayagarh Dist. Odisha, 2020.



14. SUPERVISED CLASSIFICATION IN QGIS

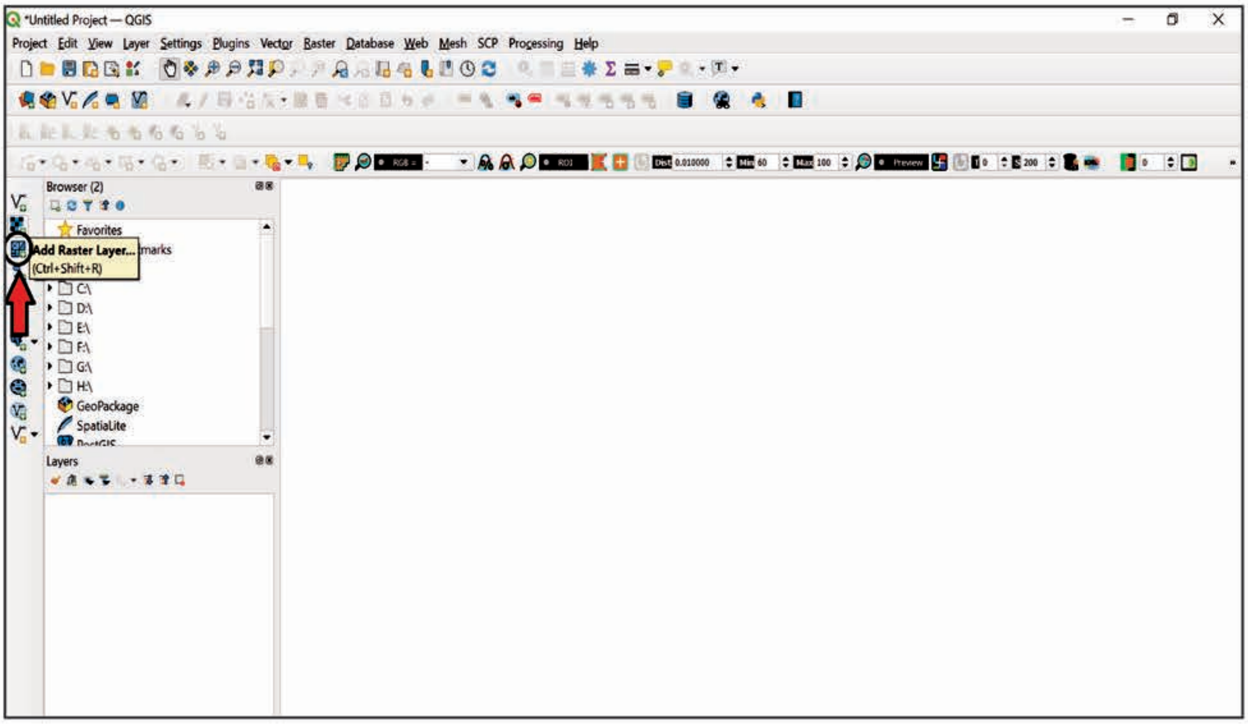
Land use & Land cover classification (LULC) can be done in two ways by classifying the area of interest using supervised and unsupervised classification. In Supervised classification, the user will define the Training Set by using Region of Interest (ROI). The Algorithm will identify the rest of the pixels in the image by the Training Set, by employing any one of the method as preferred by the used (Spectre Angle Mapping).

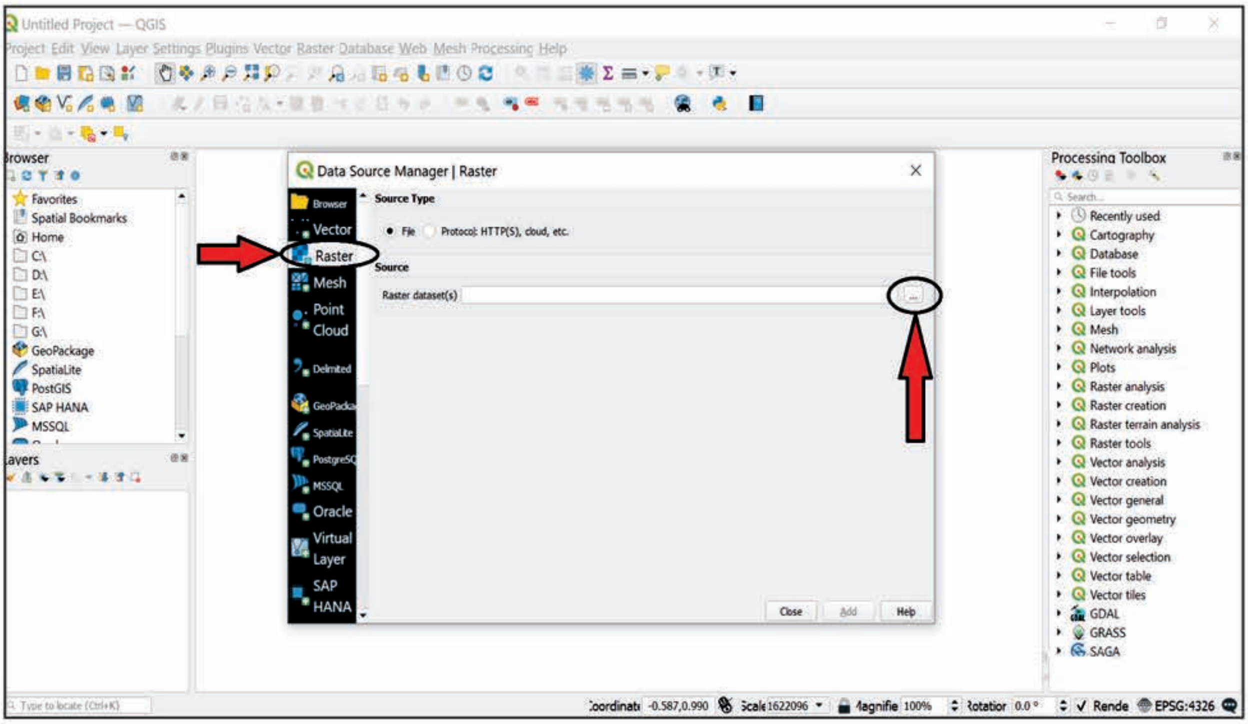


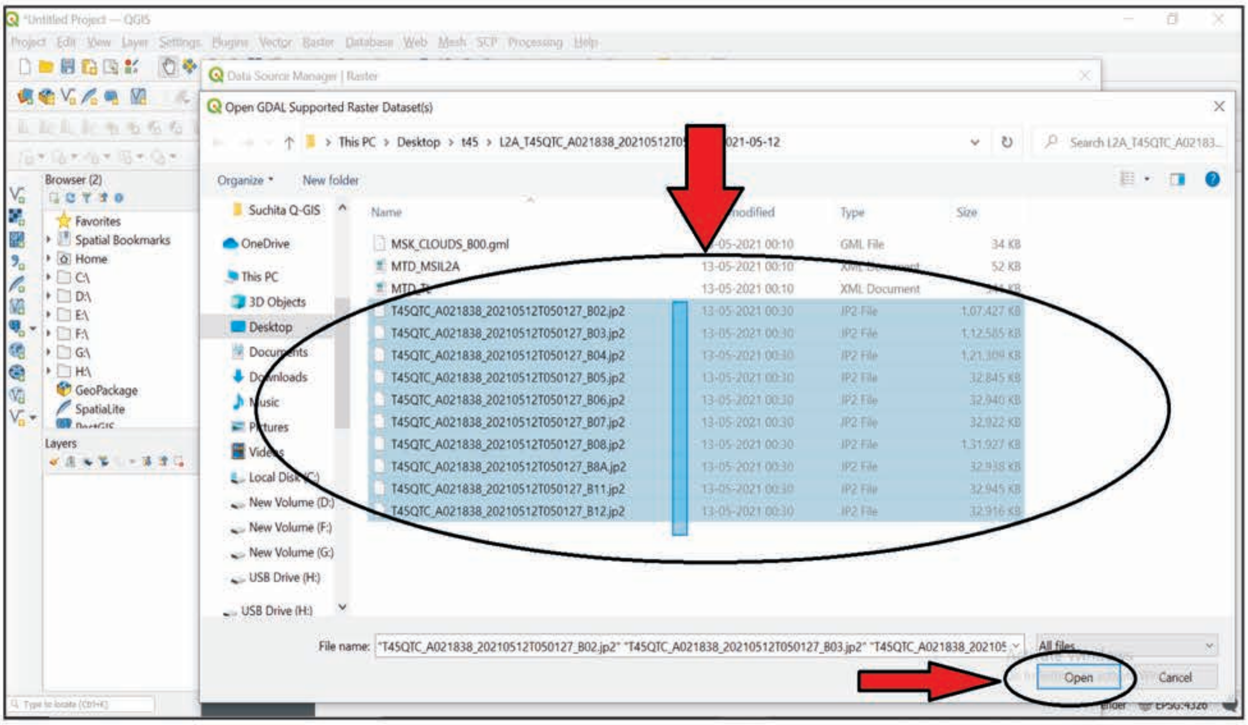
Land use classification is very important for finding the important drivers of degradation. Land use classification can be done in two ways supervised classification and unsupervised classification. In supervised classification user identified the spectral classes by the Region of interest under macro class using semi automatic classification plug in QGIS.

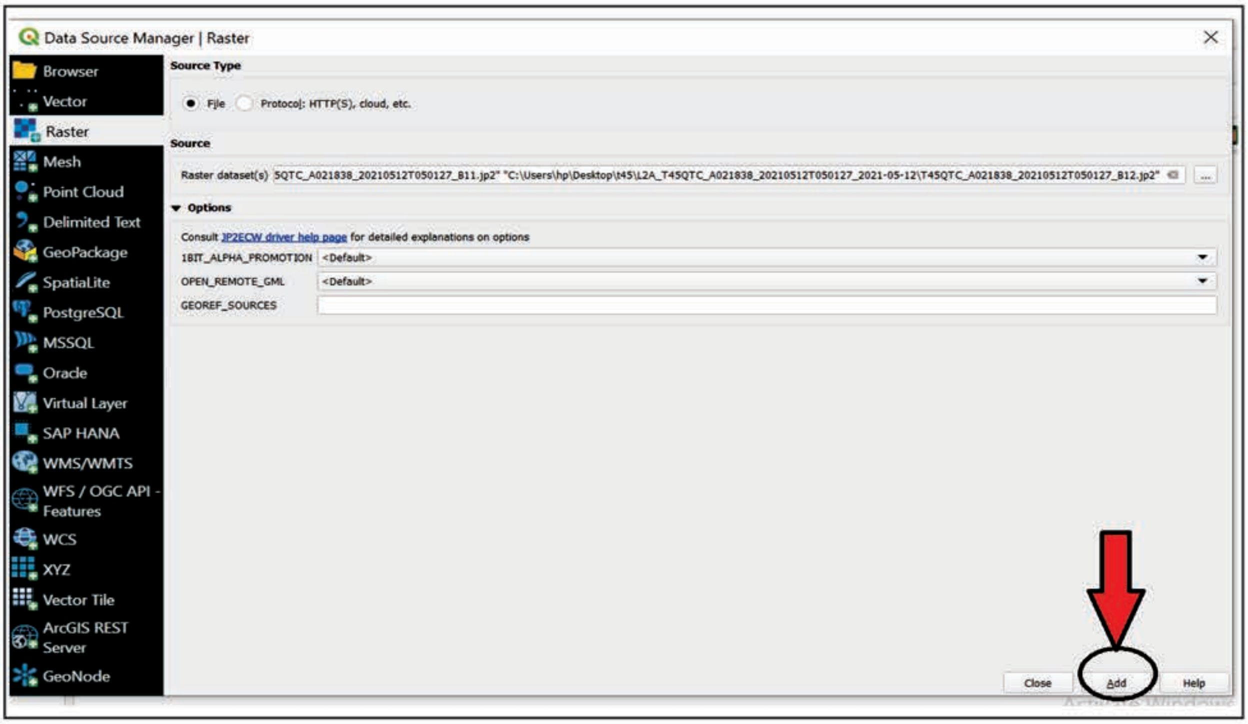
Step 1:

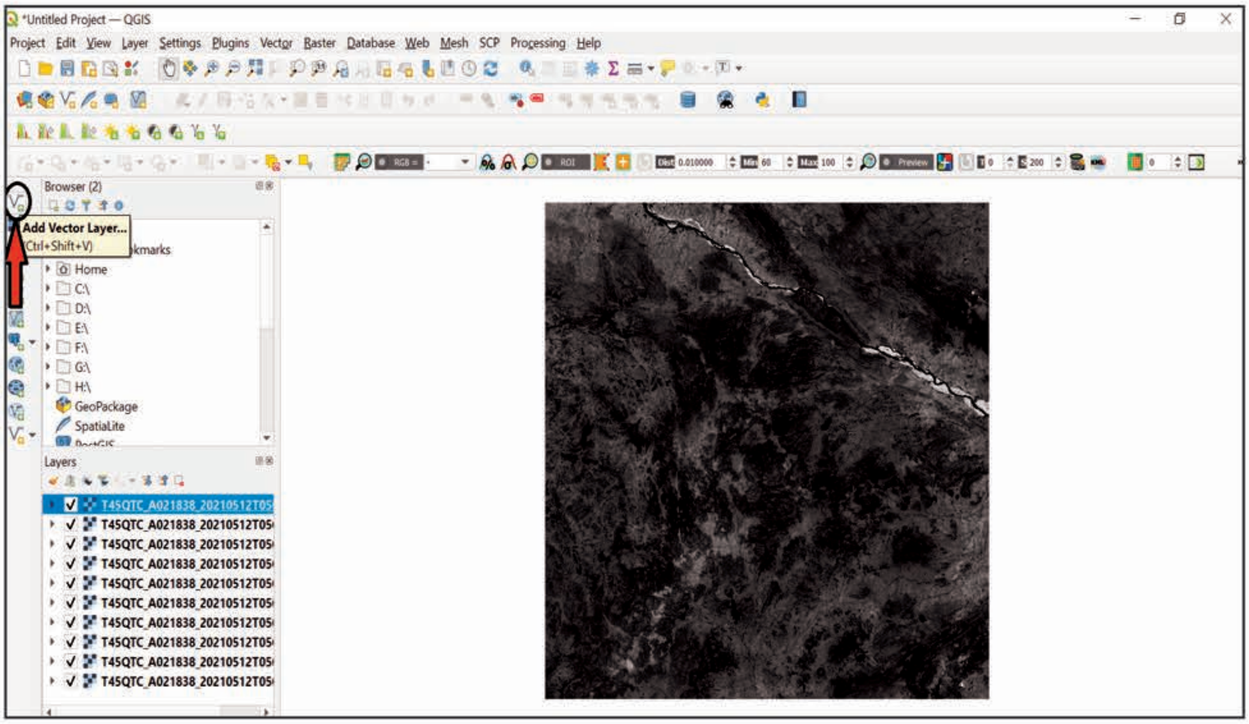
1. Select 'Layer' and 'Add layer' click "Add Raster layer"
2. Browse the Raster file.
3. Click 'Add' the file.





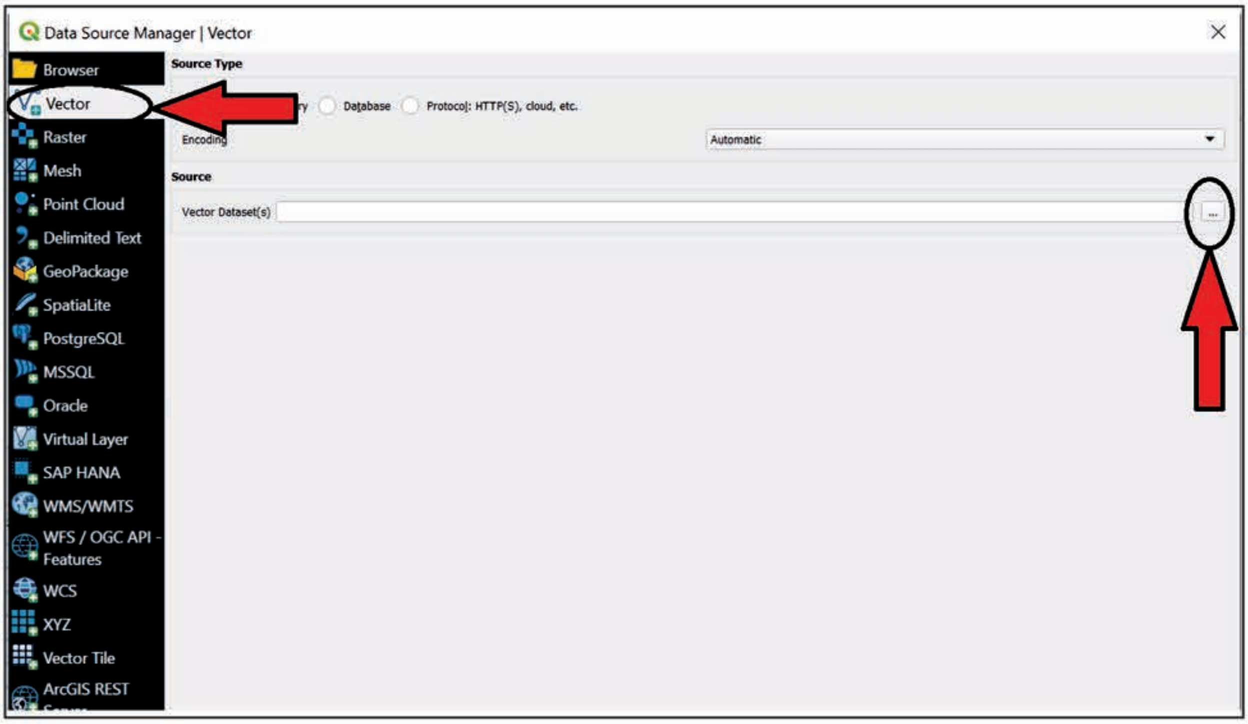

*Untitled Project — QGIS
Data Source Manager | Raster
Open GDAL Supported Raster Dataset(s)
This PC > Desktop > t45 > L2A_T45QTC_A021838_20210512T0
Organize
New folder
Name
Type
Size
MSK_CLOUDS_B00.gml
MTD_MSIL2A
T45QTC_A021838_20210512T050127_B02.jp2
T45QTC_A021838_20210512T050127_B03.jp2
T45QTC_A021838_20210512T050127_B04.jp2
T45QTC_A021838_20210512T050127_B05.jp2
T45QTC_A021838_20210512T050127_B06.jp2
T45QTC_A021838_20210512T050127_B07.jp2
T45QTC_A021838_20210512T050127_B08.jp2
T45QTC_A021838_20210512T050127_B8A.jp2
T45QTC_A021838_20210512T050127_B11.jp2
T45QTC_A021838_20210512T050127_B12.jp2
File name:
Open
Cancel

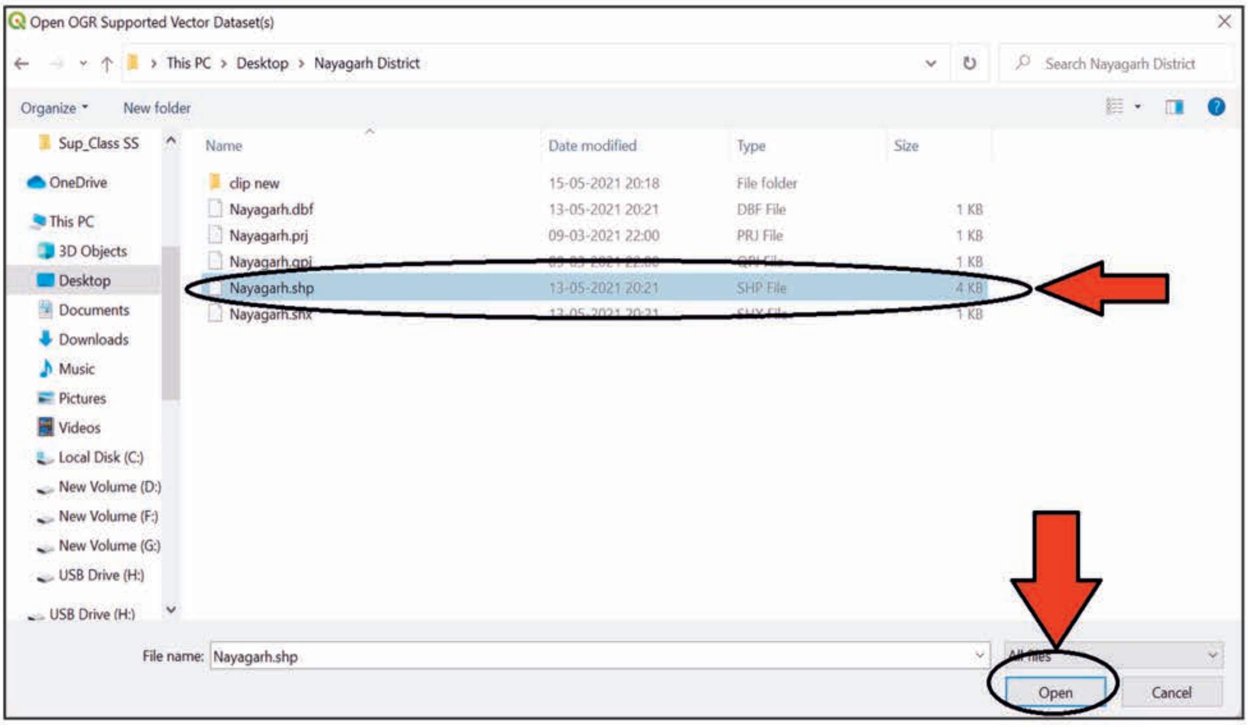

Data Source Manager | Raster
Browser
Vector
Raster
Mesh
Point Cloud
Delimited Text
GeoPackage
SpatiaLite
PostgreSQL
MSSQL
Oracle
Virtual Layer
SAP HANA
WMS/WMTS
WFS / OGC API - Features
WCS
XYZ
Vector Tile
ArcGIS REST Server
GeoNode
Source Type
File
Protocol: HTTP(S), cloud, etc.
Source
Raster dataset(s)
Options
Consult JP2ECW driver help page for detailed explanations on options
1BIT_ALPHA_PROMOTION
OPEN_REMOTE_GML
GEOREF_SOURCES
Close
Add
Help

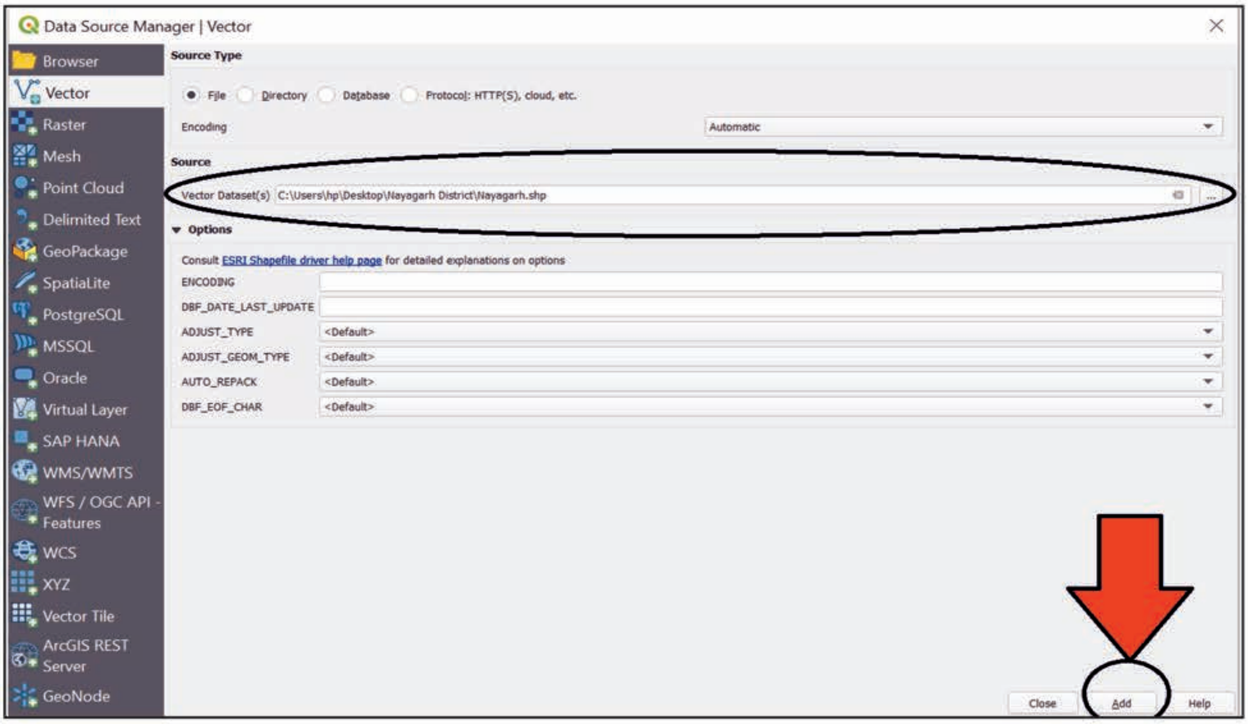


Step 2:

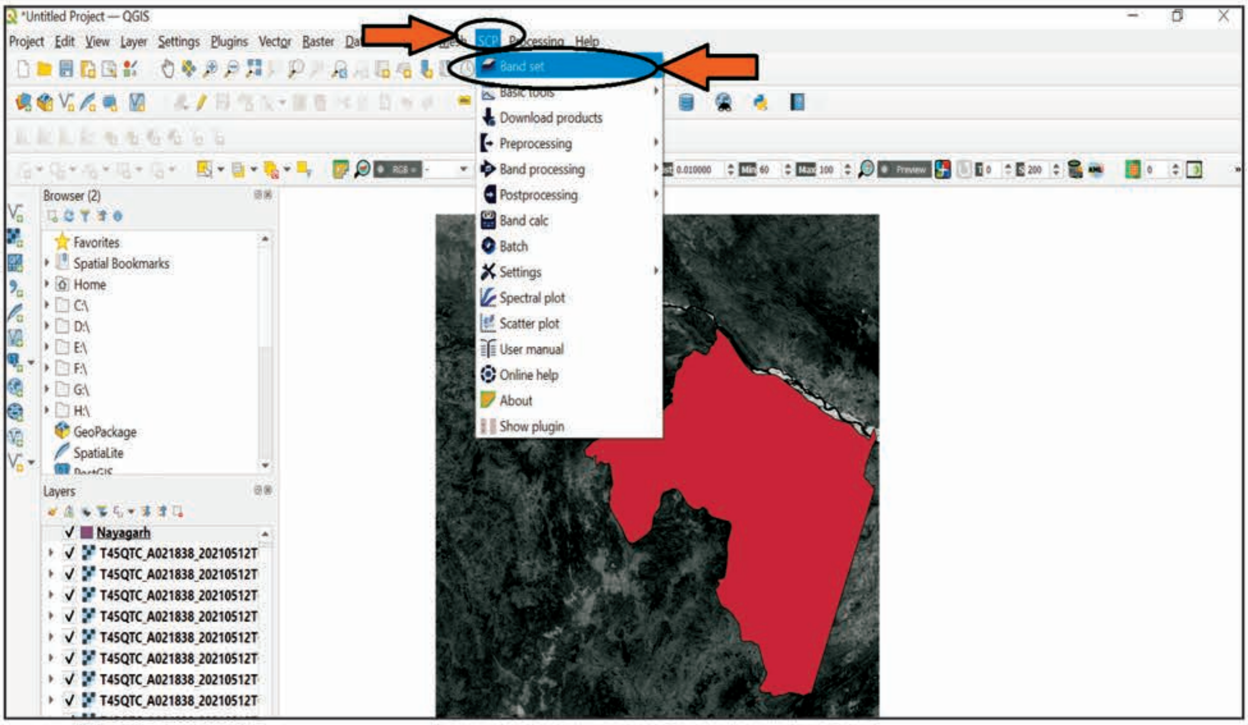
1. Select 'Layer' and 'Add layer' click "Add Vector layer"
2. Browse the Vector file.
3. Click 'Add' the file.

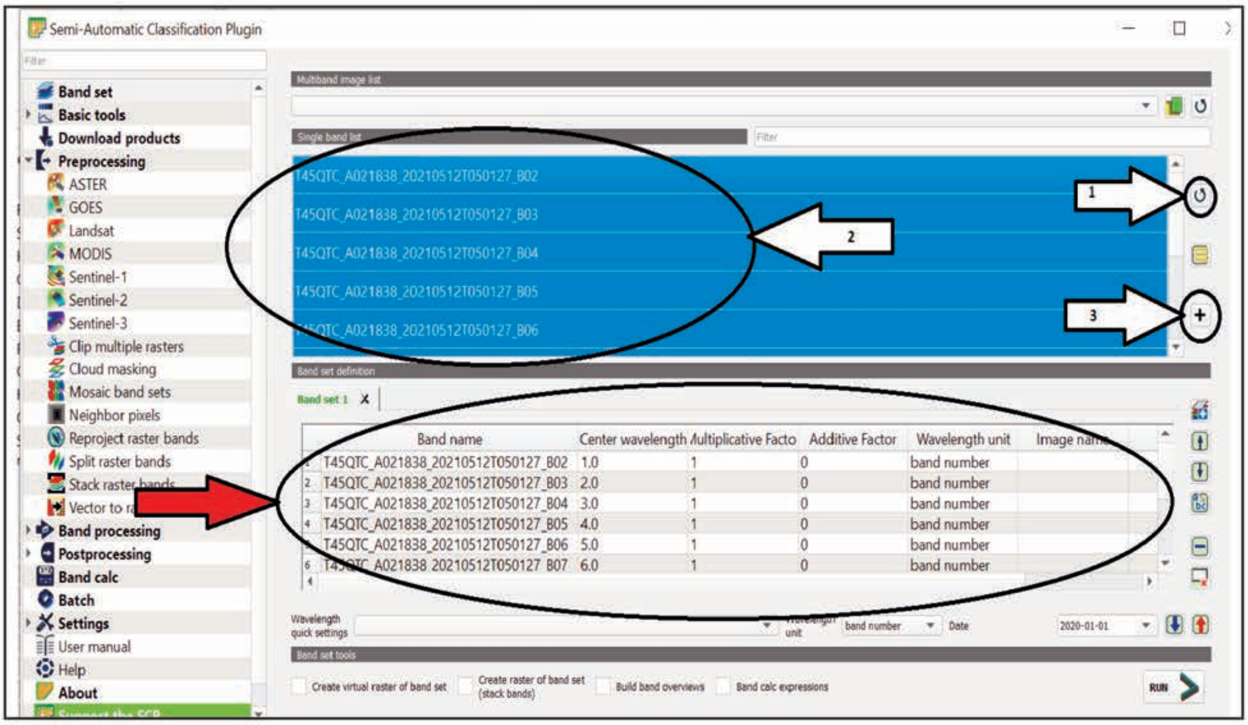


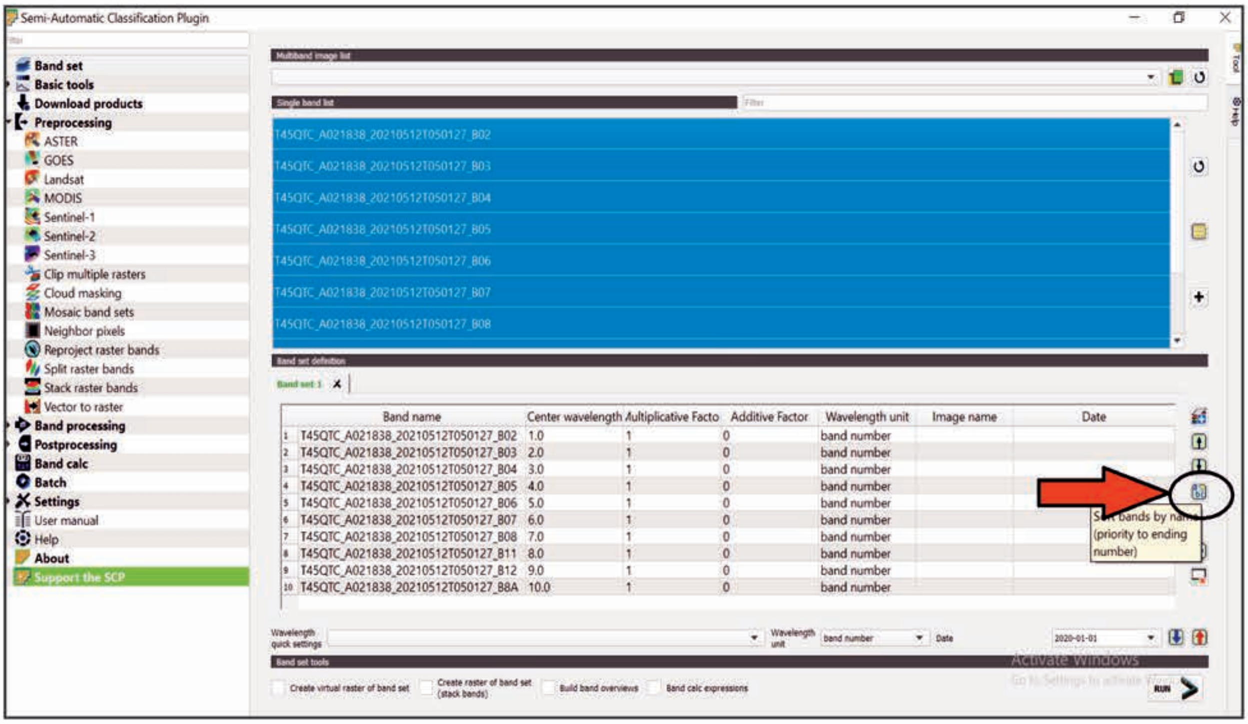

Open OGR Supported Vector Dataset(s)
This PC > Desktop > Nayagarh District
Search Nayagarh District
Organize
New folder
Sup_Class SS
OneDrive
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
New Volume (D:)
New Volume (F:)
New Volume (G:)
USB Drive (H:)
USB Drive (H:)
Name
Date modified
Type
Size
clip new
15-05-2021 20:18
File folder
Nayagarh.dbf
13-05-2021 20:21
DBF File
1 KB
Nayagarh.prj
09-03-2021 22:00
PRJ File
1 KB
Nayagarh.qpj
1 KB
Nayagarh.shp
13-05-2021 20:21
SHP File
4 KB
Nayagarh.shx
1 KB
File name:
Nayagarh.shp
Open
Cancel


Data Source Manager | Vector
Browser
Vector
Raster
Mesh
Point Cloud
Delimited Text
GeoPackage
SpatiaLite
PostgreSQL
MSSQL
Oracle
Virtual Layer
SAP HANA
WMS/WMTS
WFS / OGC API - Features
WCS
XYZ
Vector Tile
ArcGIS REST Server
GeoNode
Source Type
File
Directory
Database
Protocol: HTTP(S), cloud, etc.
Encoding
Automatic
Source
Vector Dataset(s)
C:\Users\hp\Desktop\Nayagarh District\Nayagarh.shp
Options
Consult ESRI Shapefile driver help page for detailed explanations on options
ENCODING
DBF_DATE_LAST_UPDATE
ADJUST_TYPE
<Default>
ADJUST_GEOM_TYPE
<Default>
AUTO_REPACK
<Default>
DBF_EOF_CHAR
<Default>
Close
Add
Help

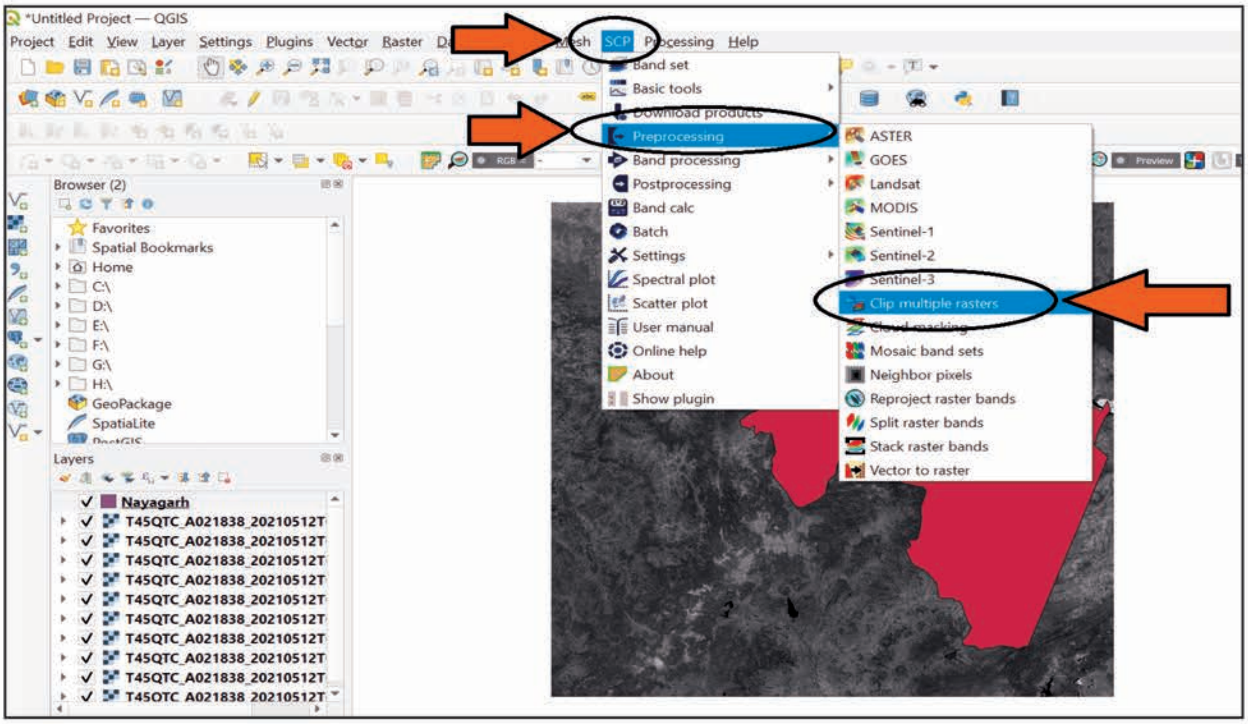
Step 3: Creating Bandset of the Imageries : Select 'SCP' and click “Band Set”.



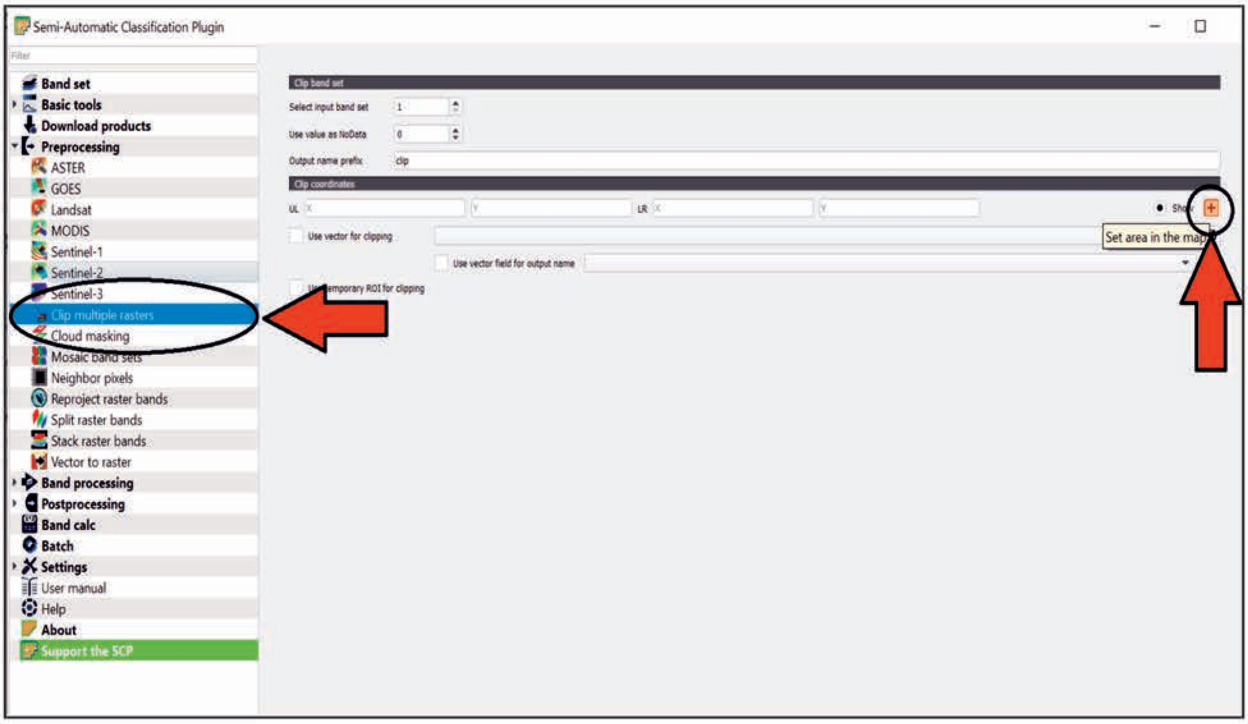




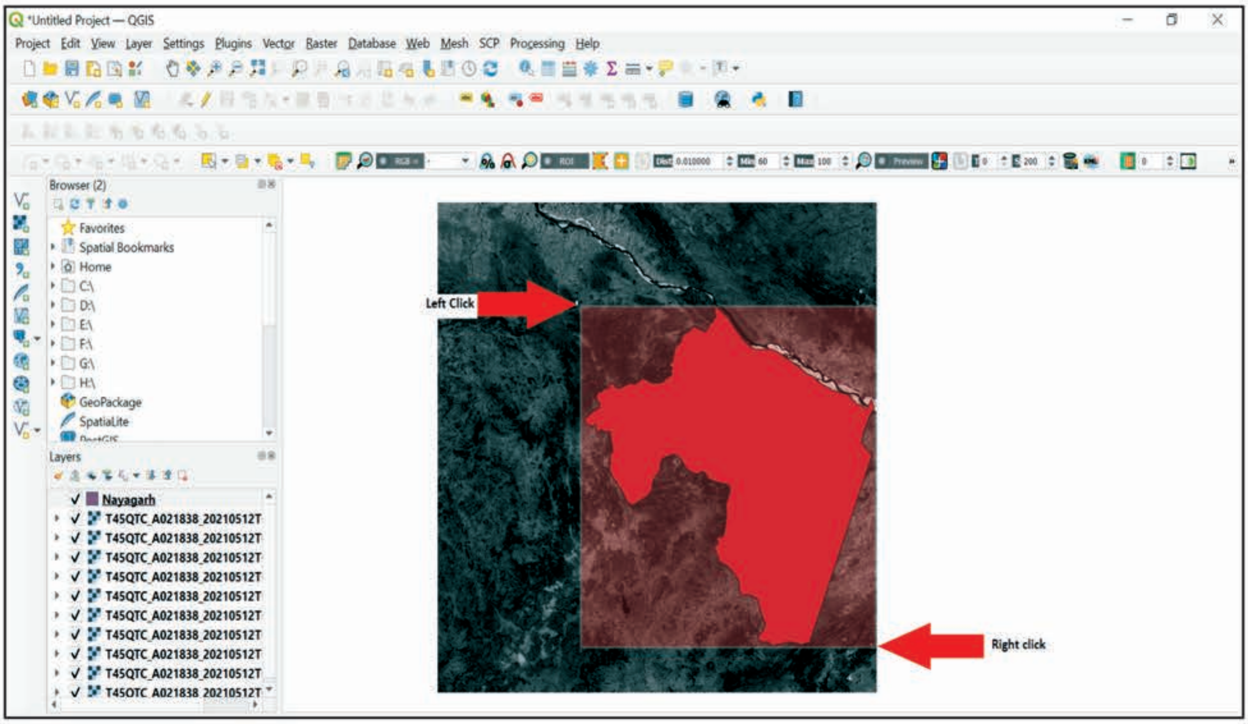
Step 4: Clipping the Raster to Area of Interest: Select 'SCP' and Preprocessing click "Clip multiple raster" tool clip the Nayagarh district.



Click the '+' symbol.

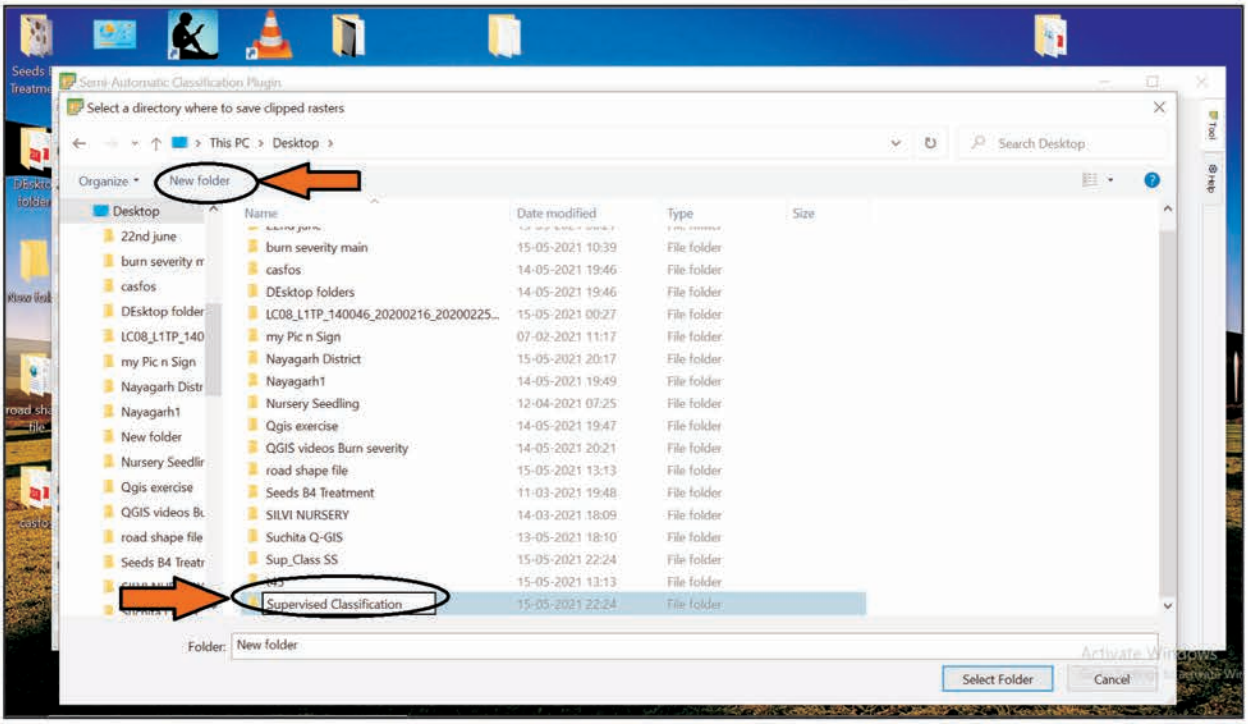


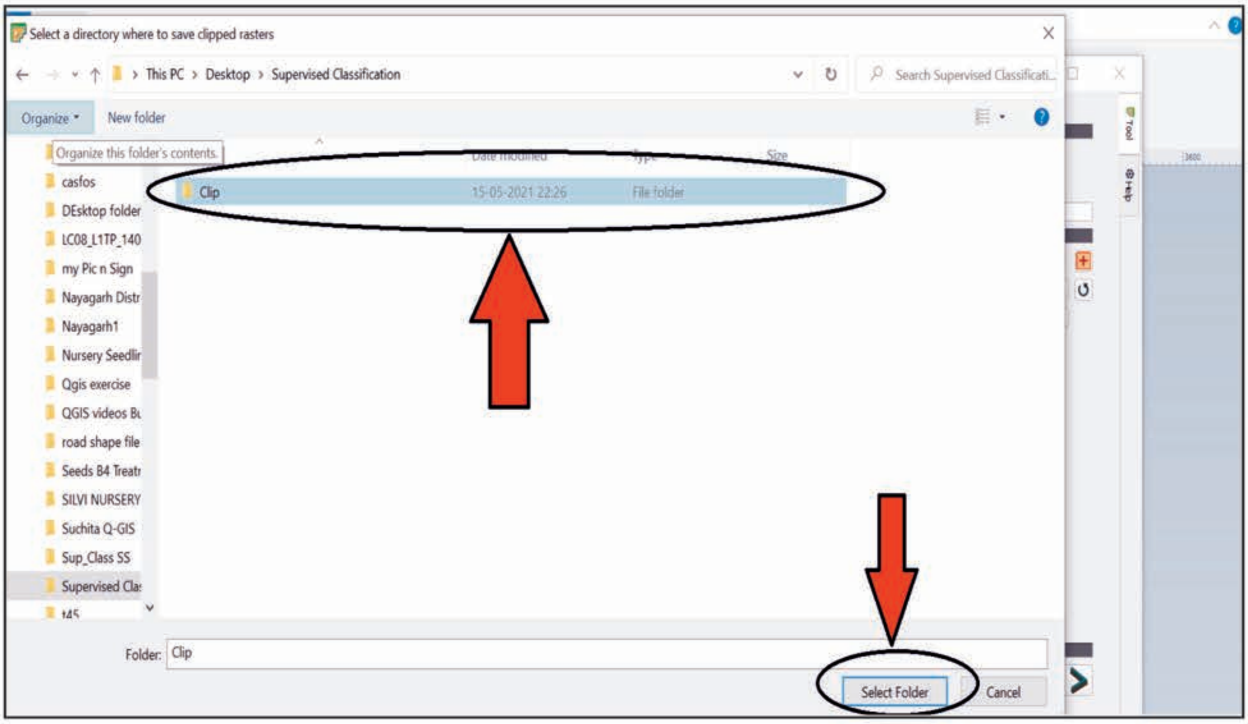
Select the Nayagarh district.

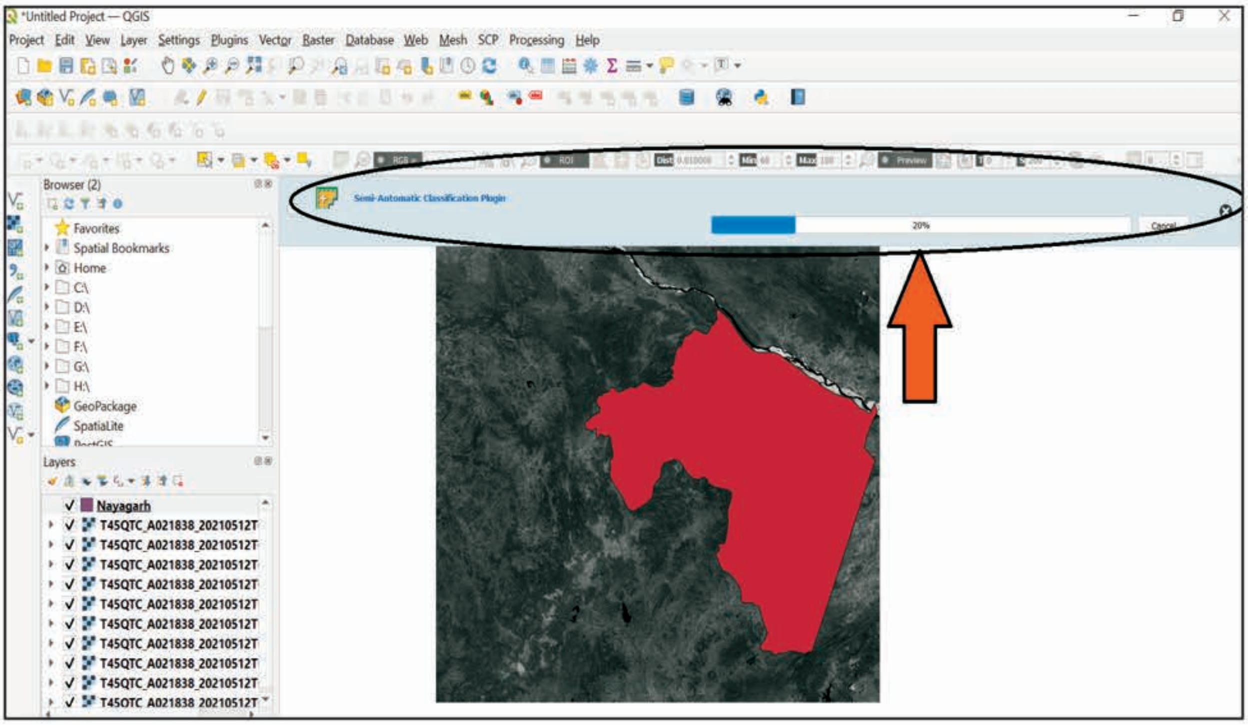


Click the 'Run' tool.

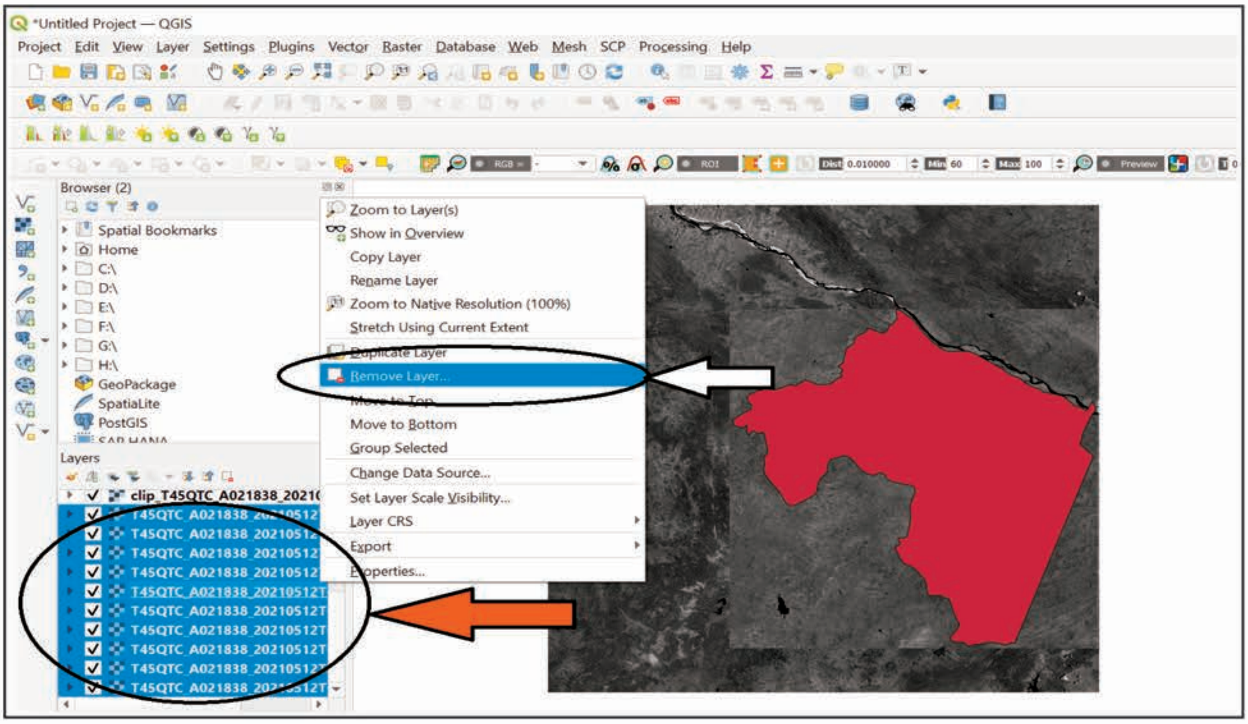
Create the New folder and save the file.



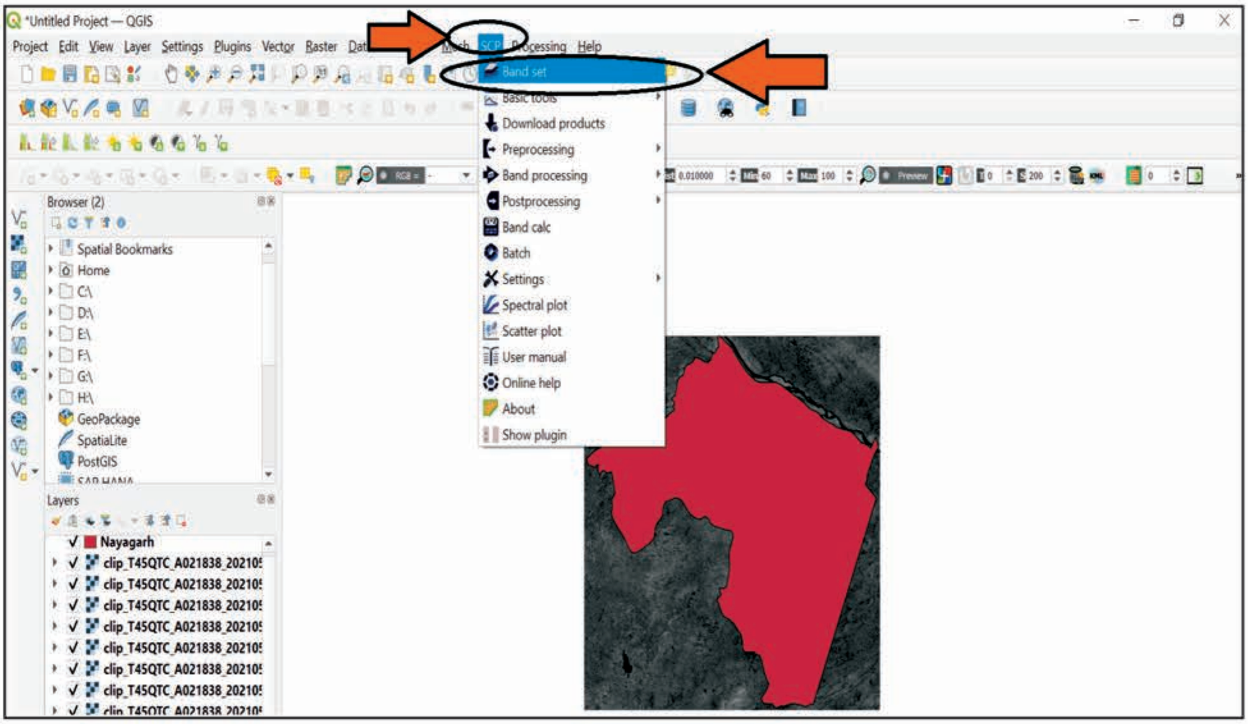

Select a directory where to save clipped rasters
This PC > Desktop > Supervised Classification
Search Supervised Classificati...
Organize
New folder
Organize this folder's contents.
casfos
DEsktop folder
LC08_L1TP_140
my Pic n Sign
Nayagarh Distr
Nayagarh1
Nursery Seedlir
Qgis exercise
QGIS videos Bu
road shape file
Seeds B4 Treatr
SILVI NURSERY
Suchita Q-GIS
Sup_Class SS
Supervised Cla:
Clip
15-05-2021 22:26
File folder
Folder: Clip
Select Folder
Cancel

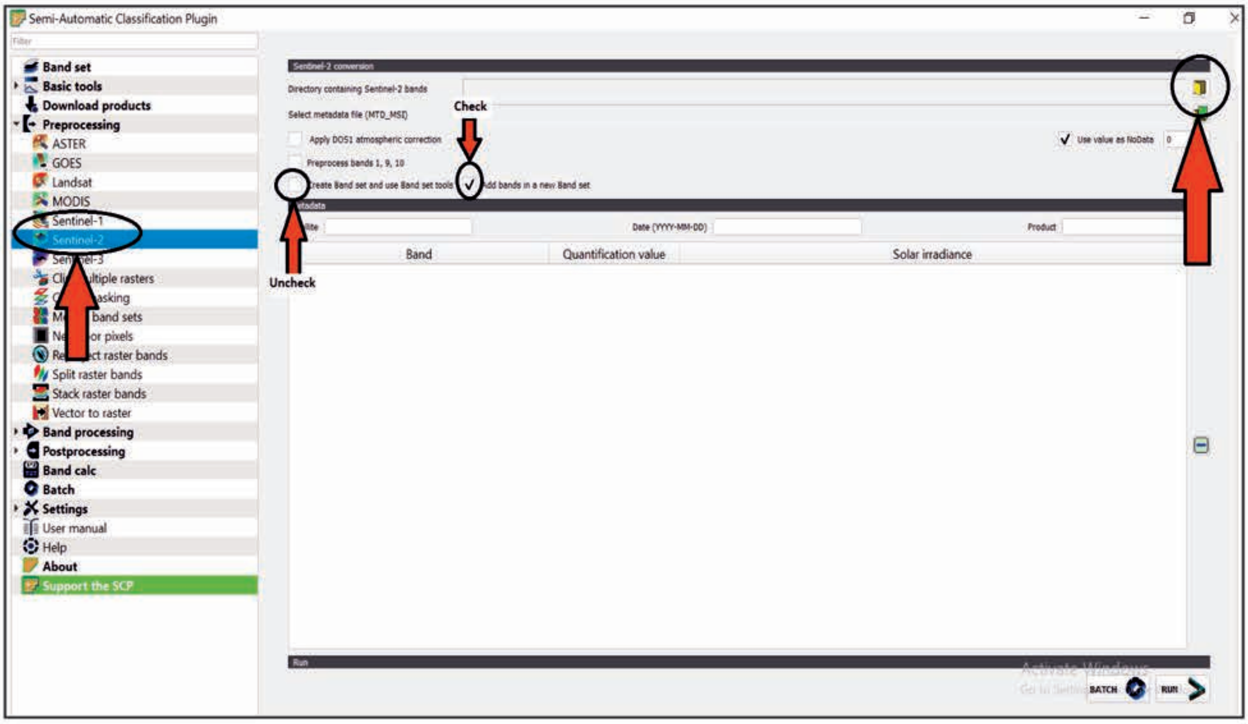

*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh SCP Processing Help
Semi-Automatic Classification Plugin
20%
Cancel
Browser (2)
Favorites
Spatial Bookmarks
Home
C:\
D:\
E:\
F:\
G:\
H:\
GeoPackage
SpatiaLite
Layers
Nayagarh
T45QTC_A021838_20210512T
T45QTC_A021838_20210512T
T45QTC_A021838_20210512T
T45QTC_A021838_20210512T
T45QTC_A021838_20210512T
T45QTC_A021838_20210512T
T45QTC_A021838_20210512T
T45QTC_A021838_20210512T
T45QTC_A021838_20210512T
T45QTC_A021838_20210512T

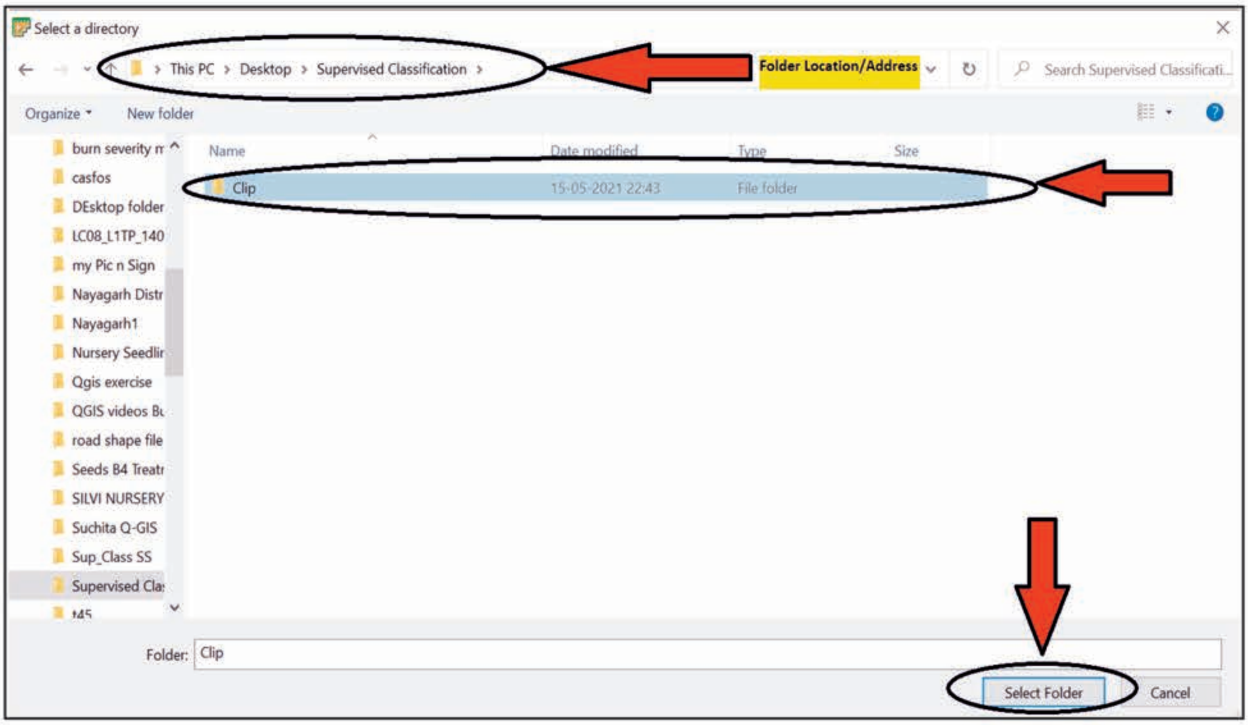
Remove the Band layer and retain the 'clip layer'.

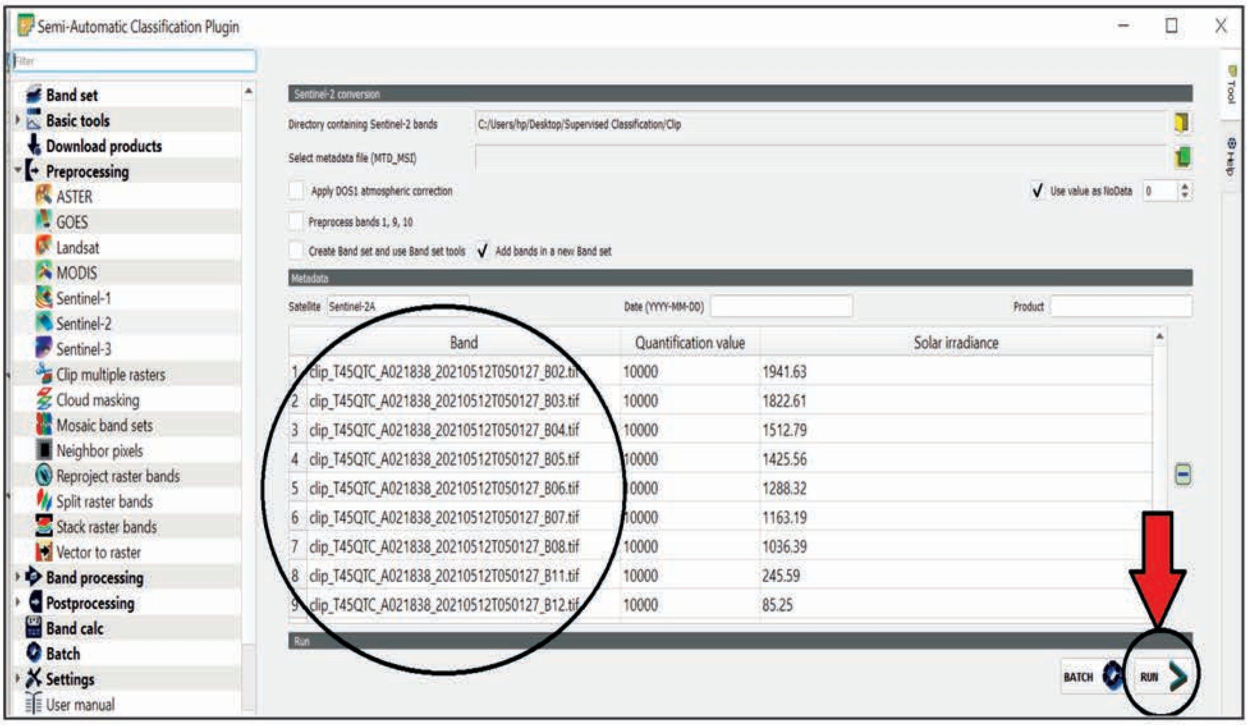


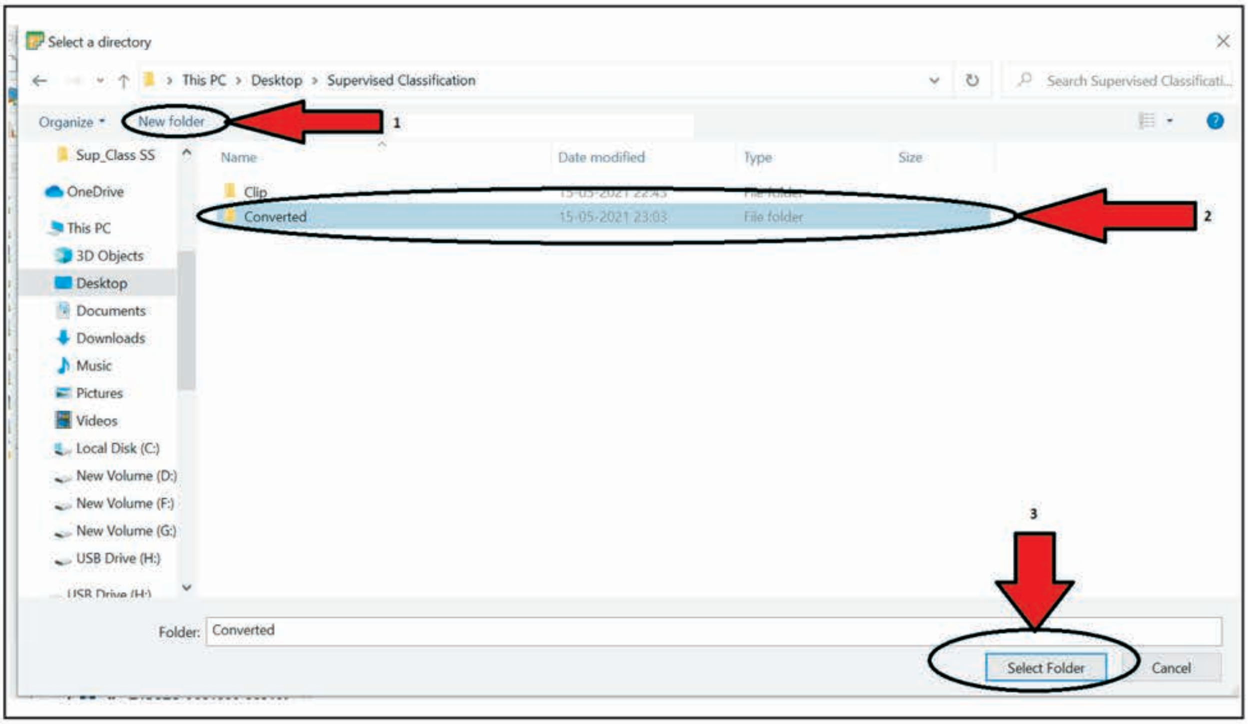
Step 5 : Create a converted file. In Band set select Sentinel-2 Create new folder & click Run.

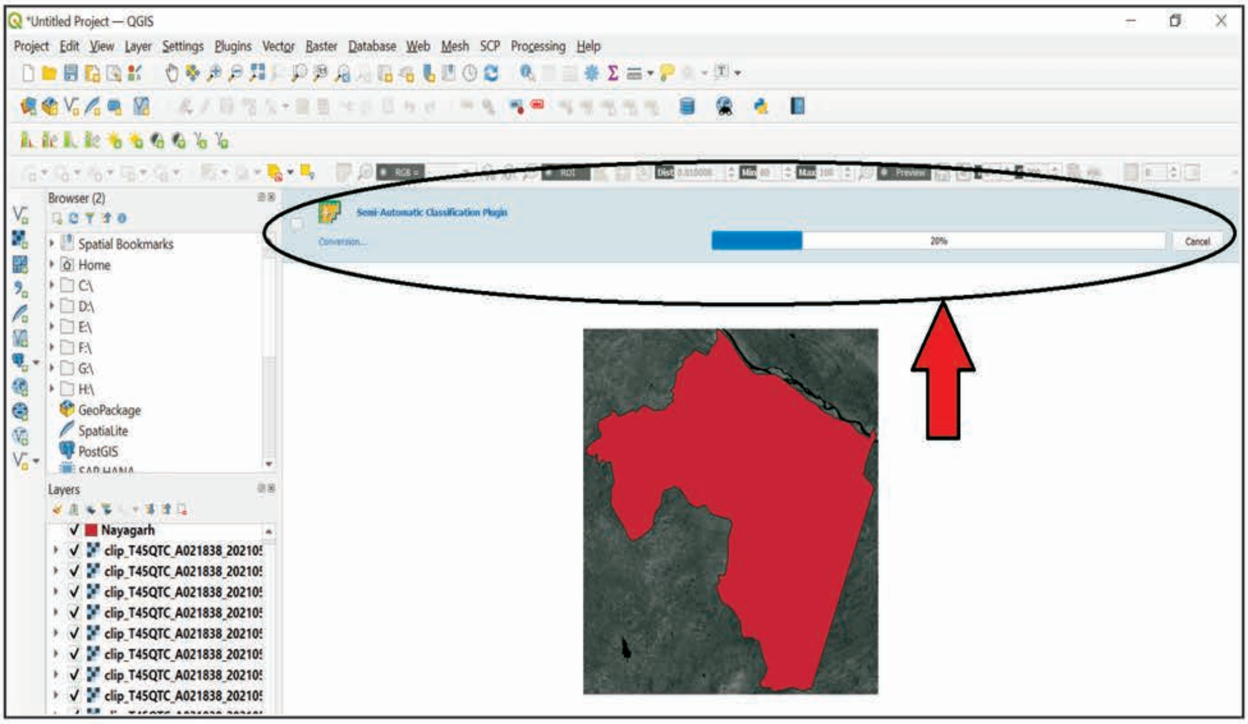


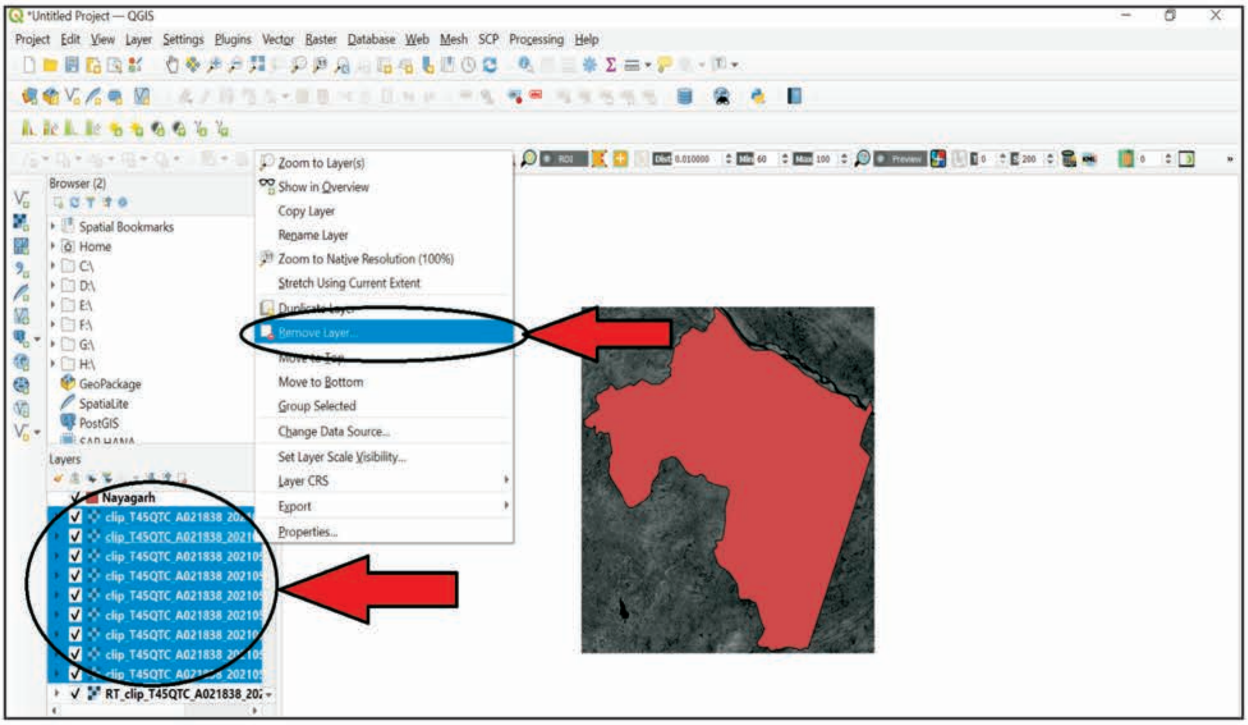

Semi-Automatic Classification Plugin
Band set
Basic tools
Download products
Preprocessing
ASTER
GOES
Landsat
MODIS
Sentinel-1
Sentinel-2
Split raster bands
Stack raster bands
Vector to raster
Band processing
Postprocessing
Band calc
Batch
Settings
User manual
Help
About
Support the SCP
Check
Uncheck
Band
Quantification value
Solar irradiance
BATCH
RUN

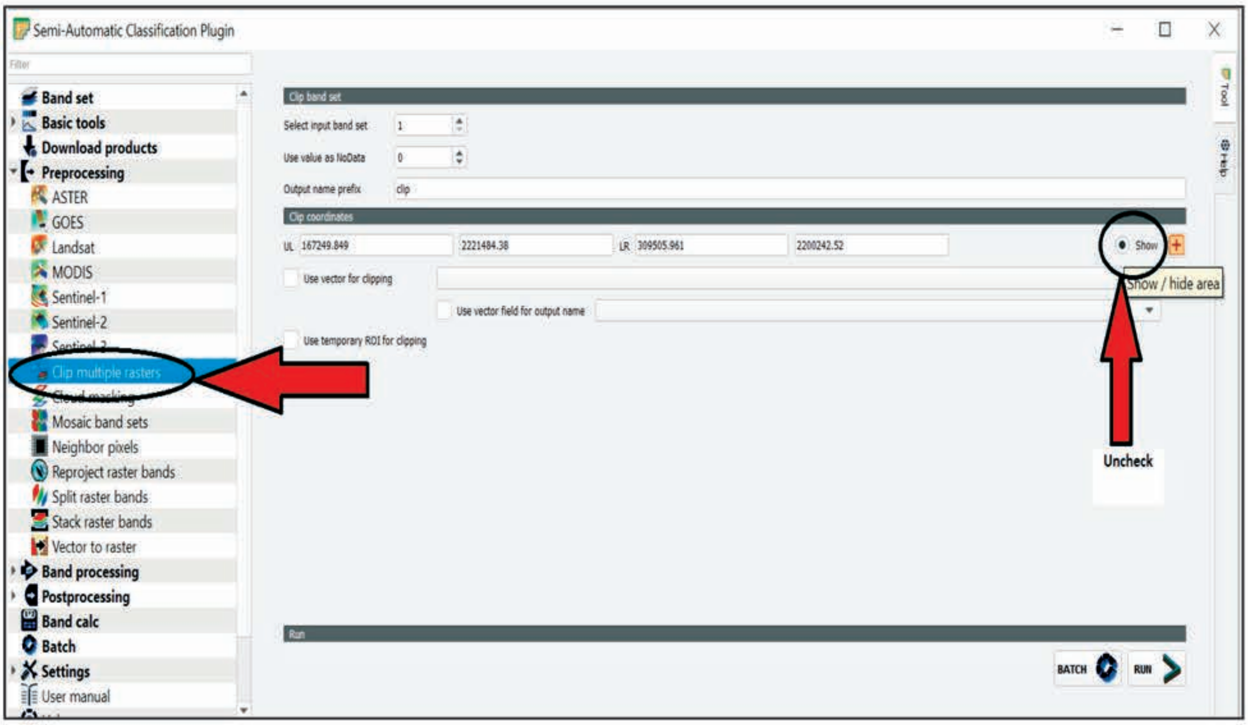

Select a directory
This PC > Desktop > Supervised Classification >
Folder Location/Address
Organize
New folder
Name
Date modified
Type
Size
Clip
15-05-2021 22:43
File folder
casfos
Qgis exercise
SILVI NURSERY
Folder: Clip
Select Folder
Cancel


Semi-Automatic Classification Plugin
Band set
Basic tools
Download products
Preprocessing
ASTER
GOES
Landsat
MODIS
Sentinel-1
Sentinel-2
Sentinel-3
Clip multiple rasters
Cloud masking
Mosaic band sets
Neighbor pixels
Reproject raster bands
Split raster bands
Stack raster bands
Vector to raster
Band processing
Postprocessing
Band calc
Batch
Settings
User manual
Sentinel-2 conversion
Directory containing Sentinel-2 bands
C:/Users/hp/Desktop/Supervised Classification/Clip
Select metadata file (MTD_MSI)
Apply DOS1 atmospheric correction
Use value as NoData
Preprocess bands 1, 9, 10
Create Band set and use Band set tools
Add bands in a new Band set
Metadata
Satellite Sentinel-2A
Date (YYYY-MM-DD)
Product
Band
Quantification value
Solar irradiance
1 clip_T45QTC_A021838_20210512T050127_B02.tif 10000 1941.63
2 clip_T45QTC_A021838_20210512T050127_B03.tif 10000 1822.61
3 clip_T45QTC_A021838_20210512T050127_B04.tif 10000 1512.79
4 clip_T45QTC_A021838_20210512T050127_B05.tif 10000 1425.56
5 clip_T45QTC_A021838_20210512T050127_B06.tif 10000 1288.32
6 clip_T45QTC_A021838_20210512T050127_B07.tif 10000 1163.19
7 clip_T45QTC_A021838_20210512T050127_B08.tif 10000 1036.39
8 clip_T45QTC_A021838_20210512T050127_B11.tif 10000 245.59
9 clip_T45QTC_A021838_20210512T050127_B12.tif 10000 85.25
Run
BATCH
RUN

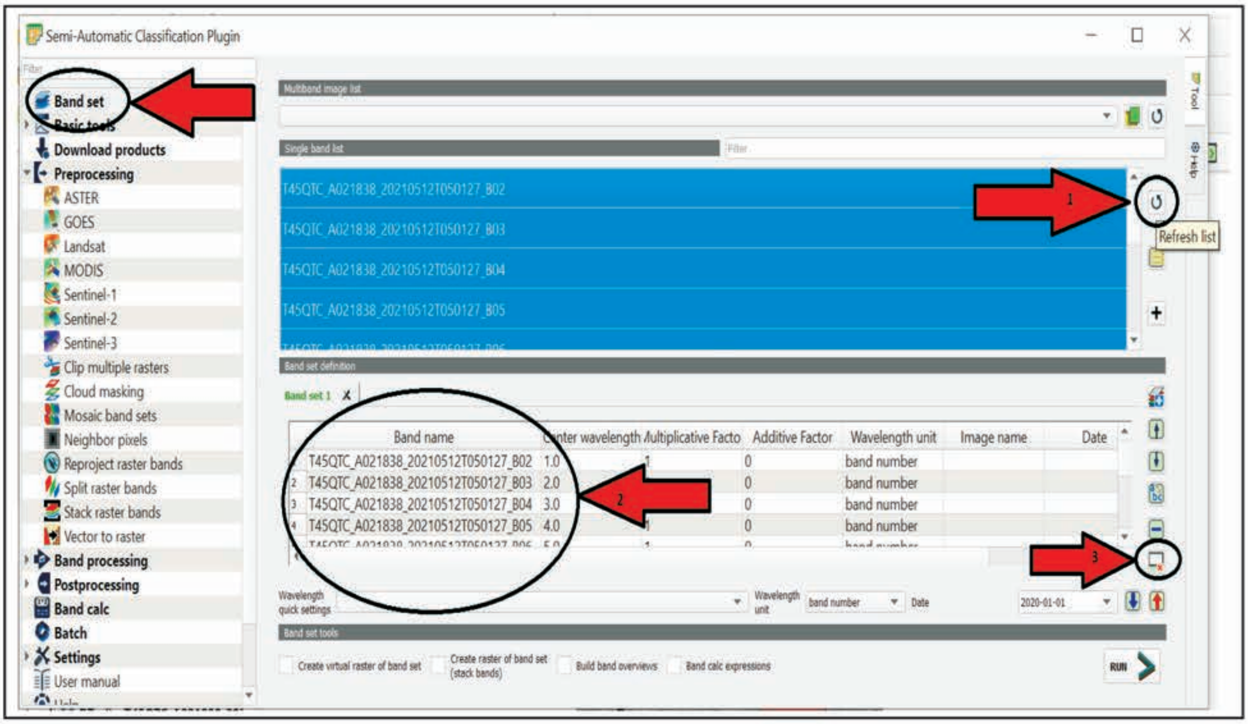

Select a directory
This PC > Desktop > Supervised Classification
Search Supervised Classificati...
Organize
New folder
1
Sup_Class SS
OneDrive
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
New Volume (D:)
New Volume (F:)
New Volume (G:)
USB Drive (H:)
Name
Date modified
Type
Size
Clip
Converted
15-05-2021 23:03
File folder
2
3
Folder: Converted
Select Folder
Cancel

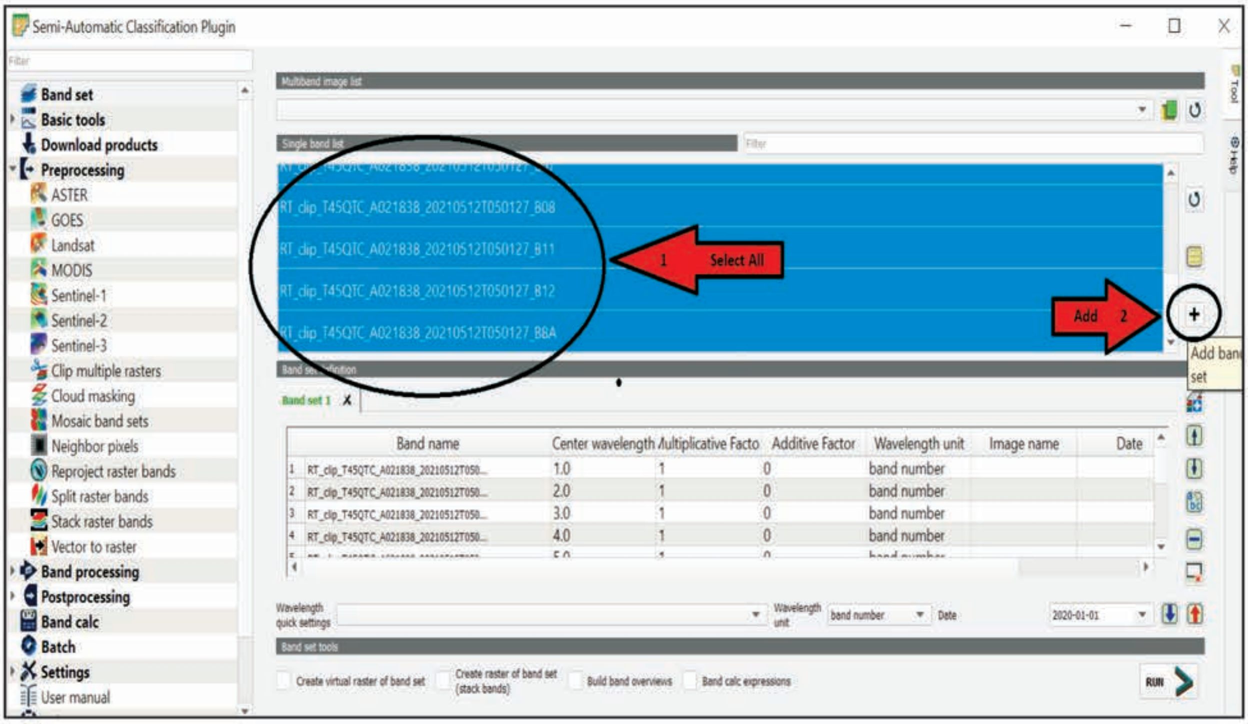

*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh SCP Processing Help
Semi-Automatic Classification Plugin
Conversion...
20%
Cancel
Browser (2)
Spatial Bookmarks
Home
C:\
D:\
E:\
F:\
G:\
H:\
GeoPackage
SpatiaLite
PostGIS
Layers
Nayagarh
clip_T45QTC_A021838_20210!


*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh SCP Processing Help
Zoom to Layer(s)
Show in Overview
Copy Layer
Rename Layer
Zoom to Native Resolution (100%)
Stretch Using Current Extent
Remove Layer...
Move to Bottom
Group Selected
Change Data Source...
Set Layer Scale Visibility...
Layer CRS
Export
Properties...
Browser (2)
Spatial Bookmarks
Home
C:\
D:\
E:\
F:\
G:\
H:\
GeoPackage
SpatiaLite
PostGIS
Layers
Nayagarh
RT_clip_T45QTC_A021838_202

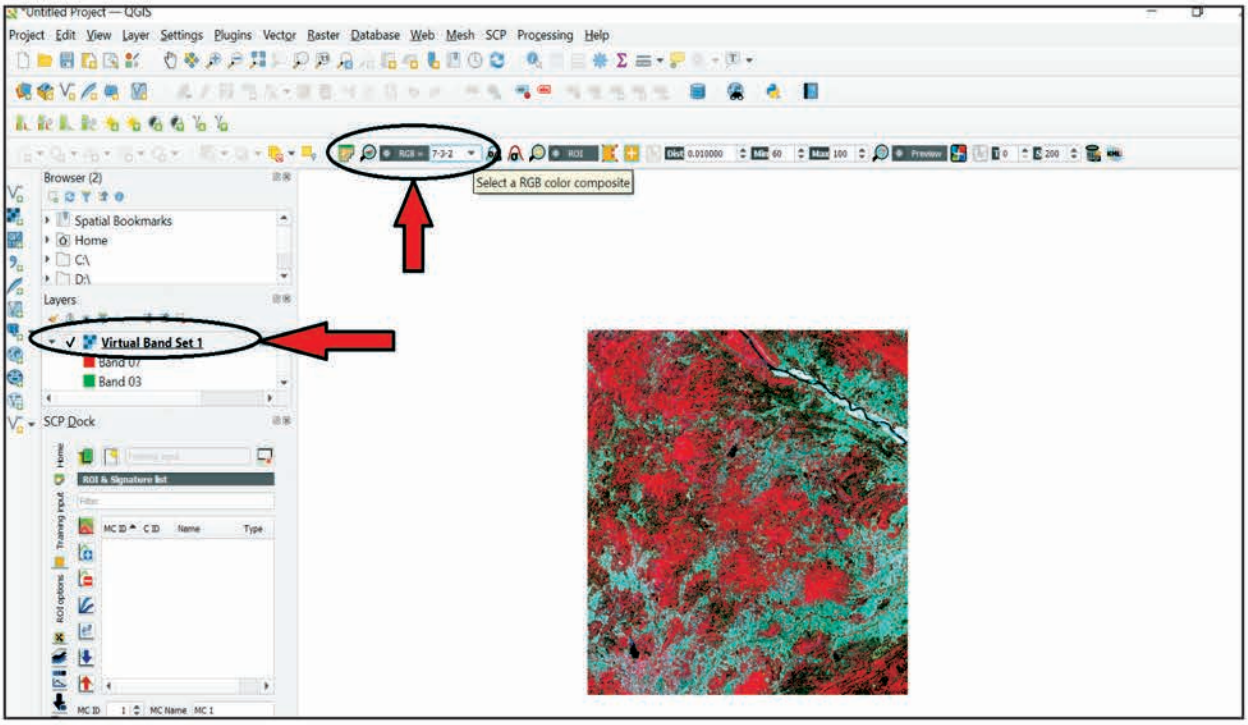


Step 6 : Select the Band set tool.

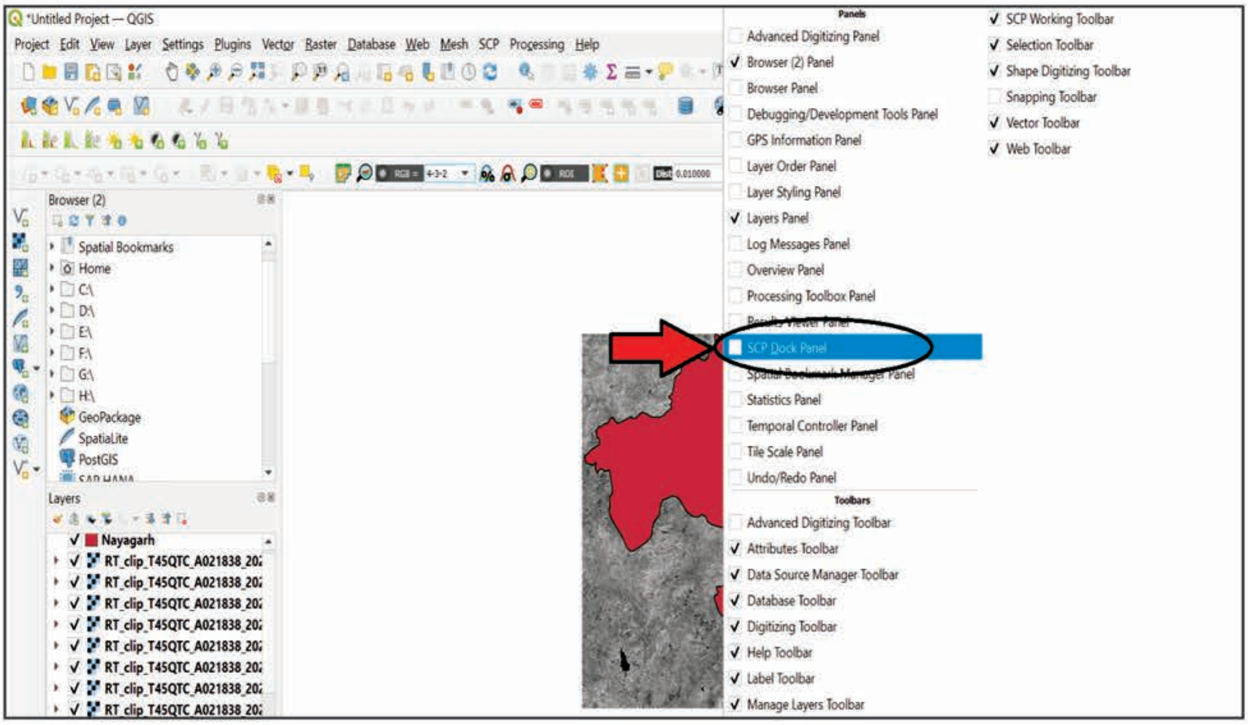




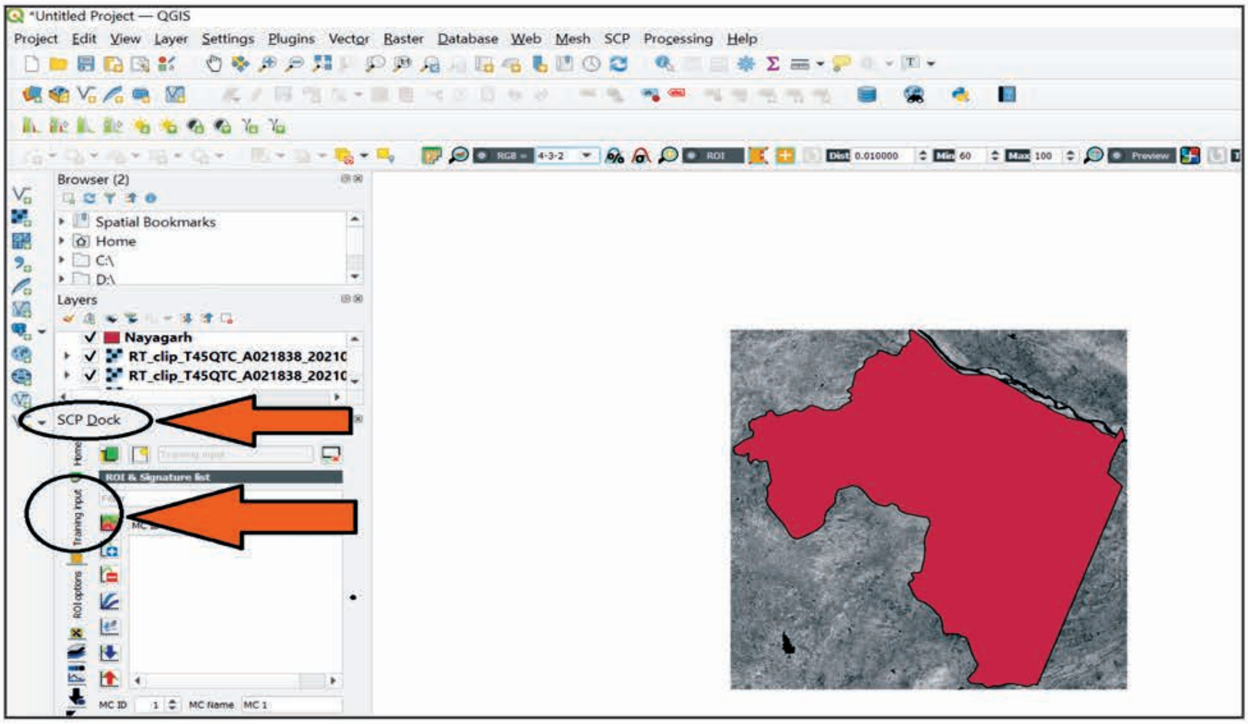
Step 7: Select the 'Virtual Band set' tool and set the color.



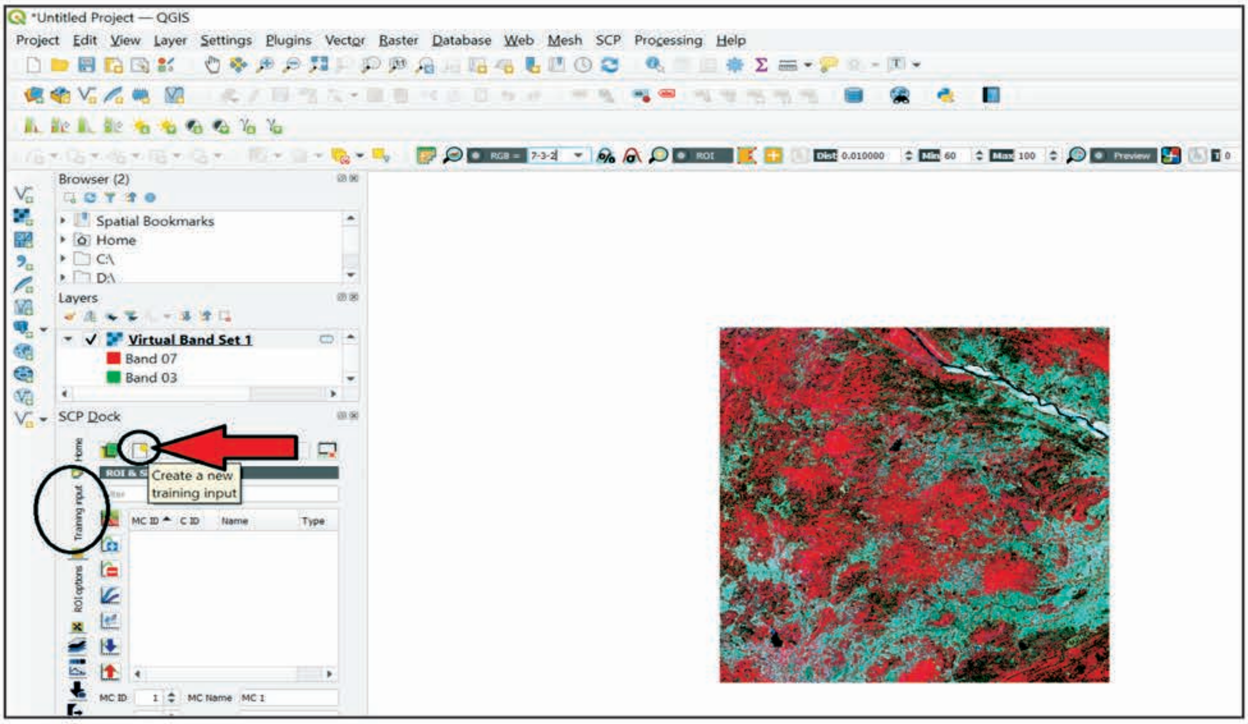
Bring the SCP dock panel from the tool box.



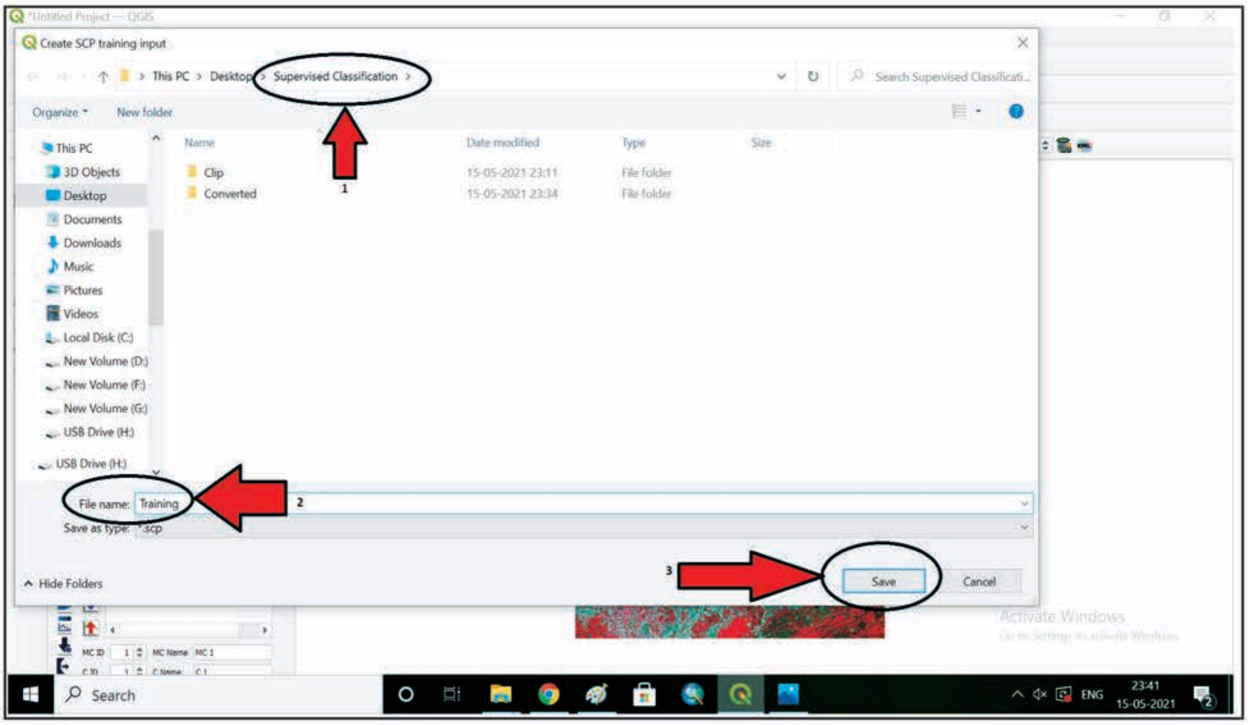
Step 8: Select the Training input.



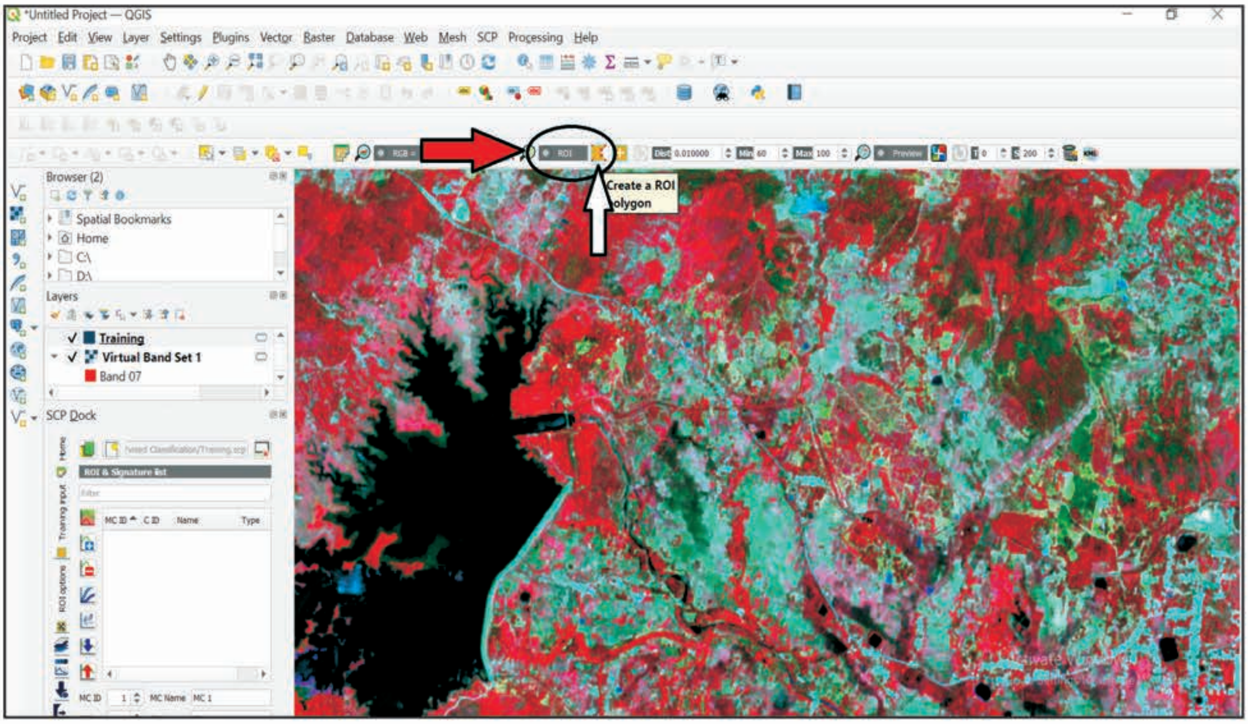
Select 'Create a new training input.



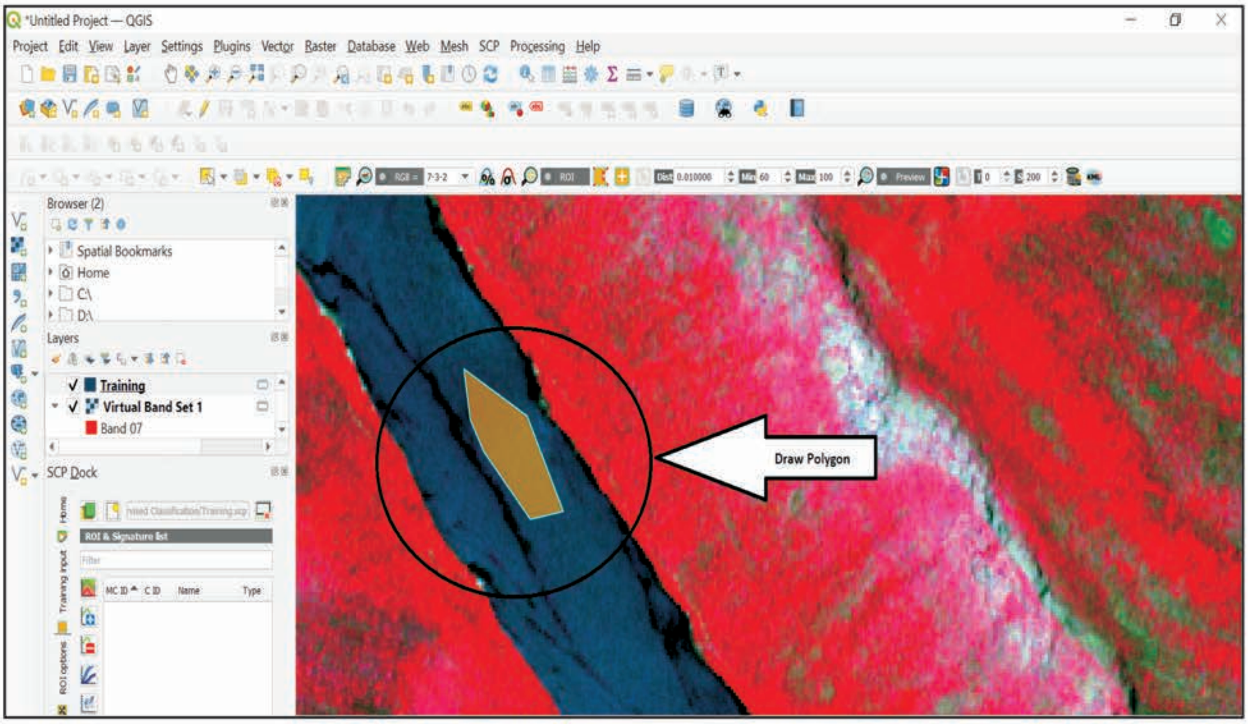
Create a new file and save it.



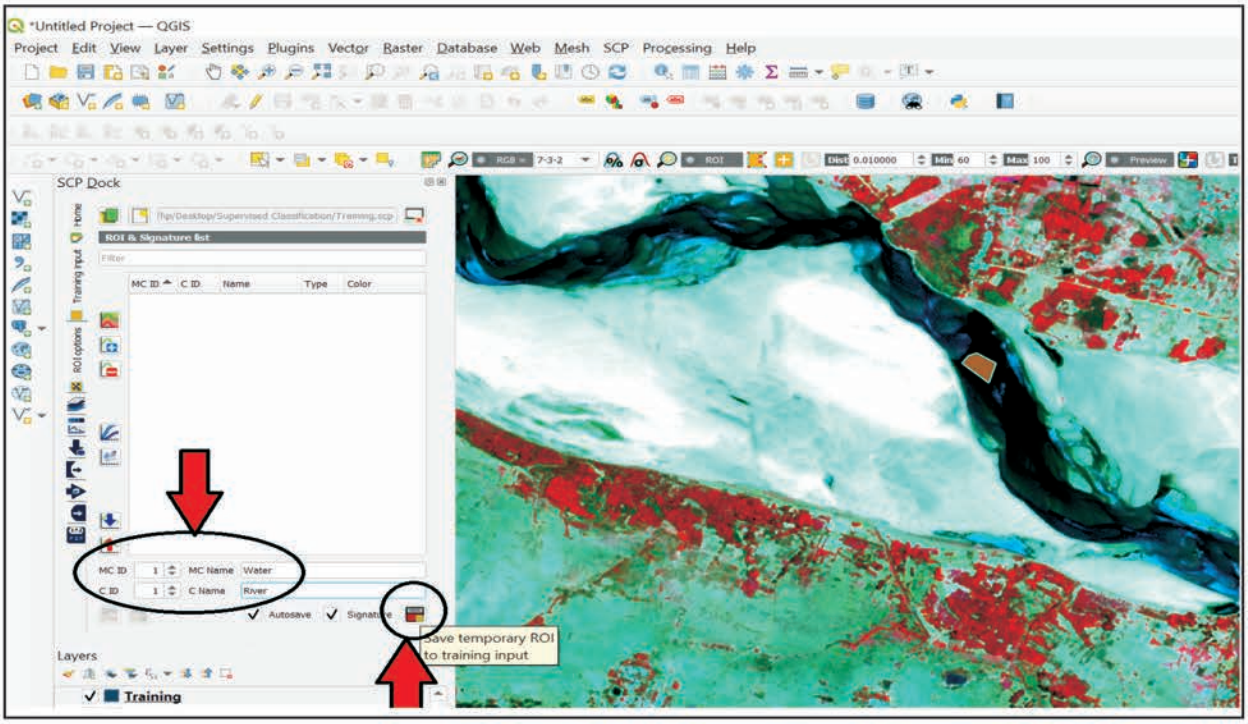
Step 9: 'Create a ROI Polygon' tool draw the polygon and classify the land.

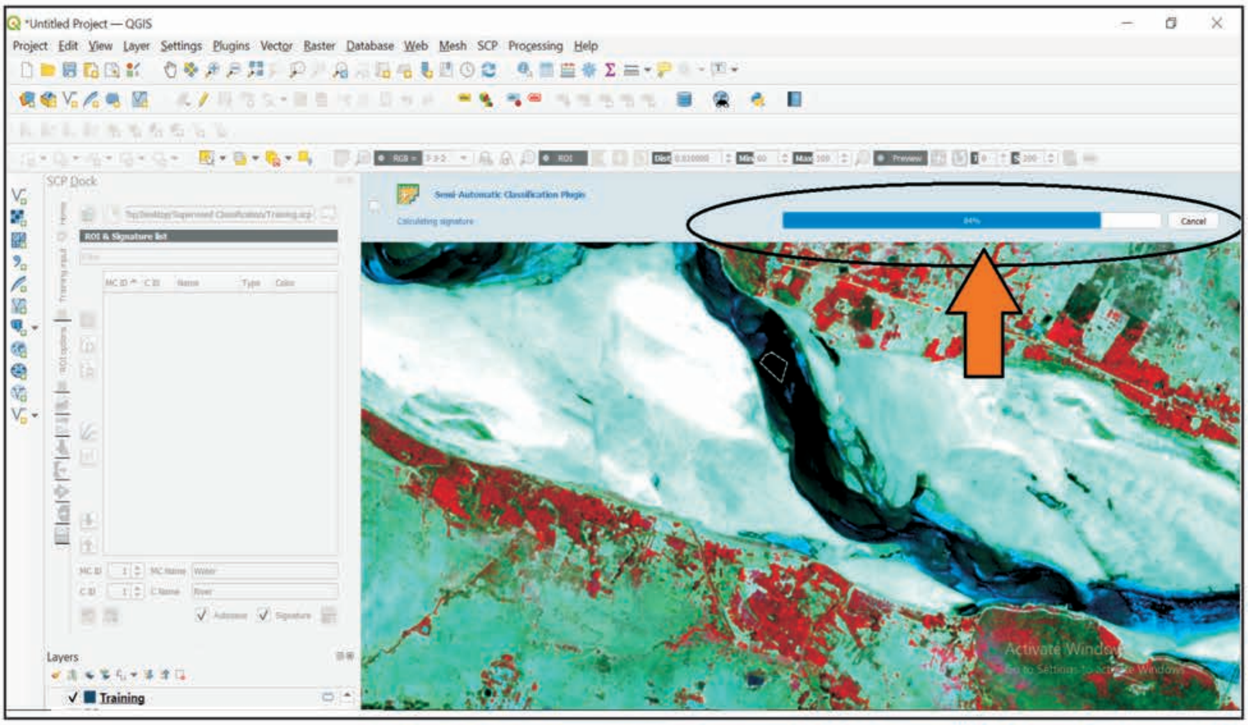


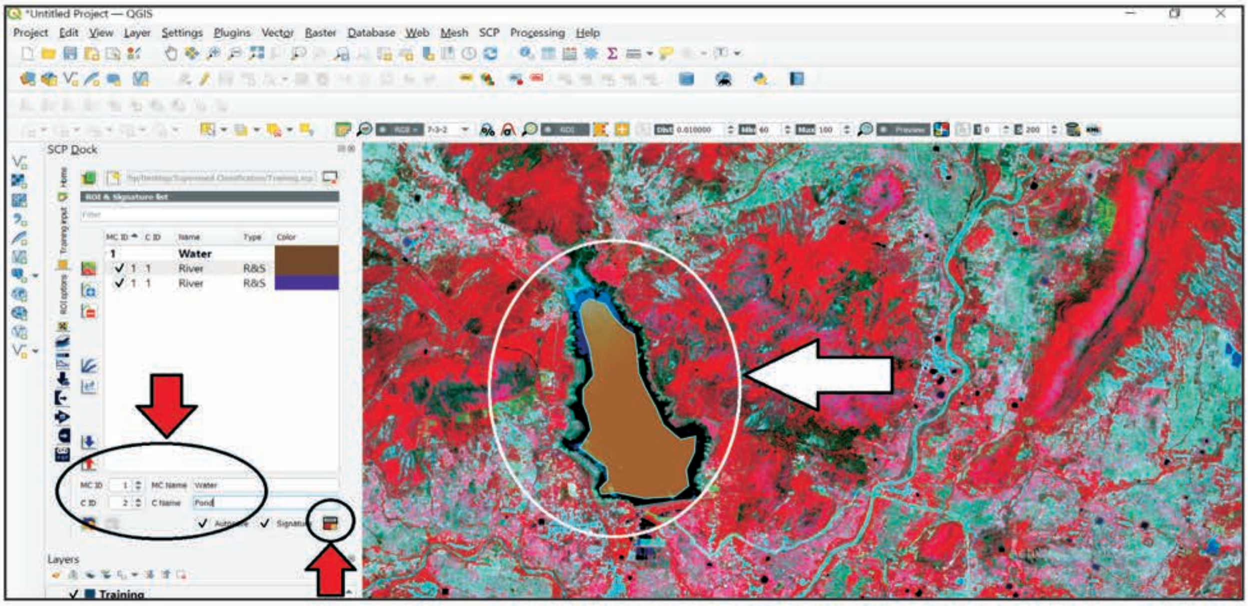
Draw the polygon

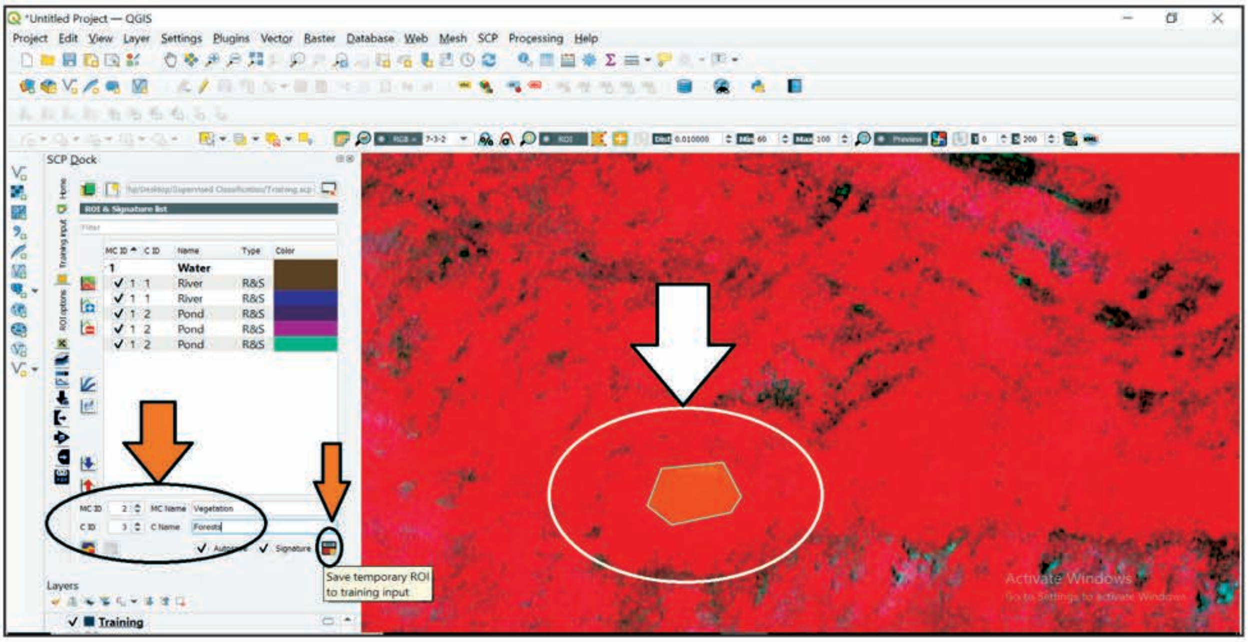


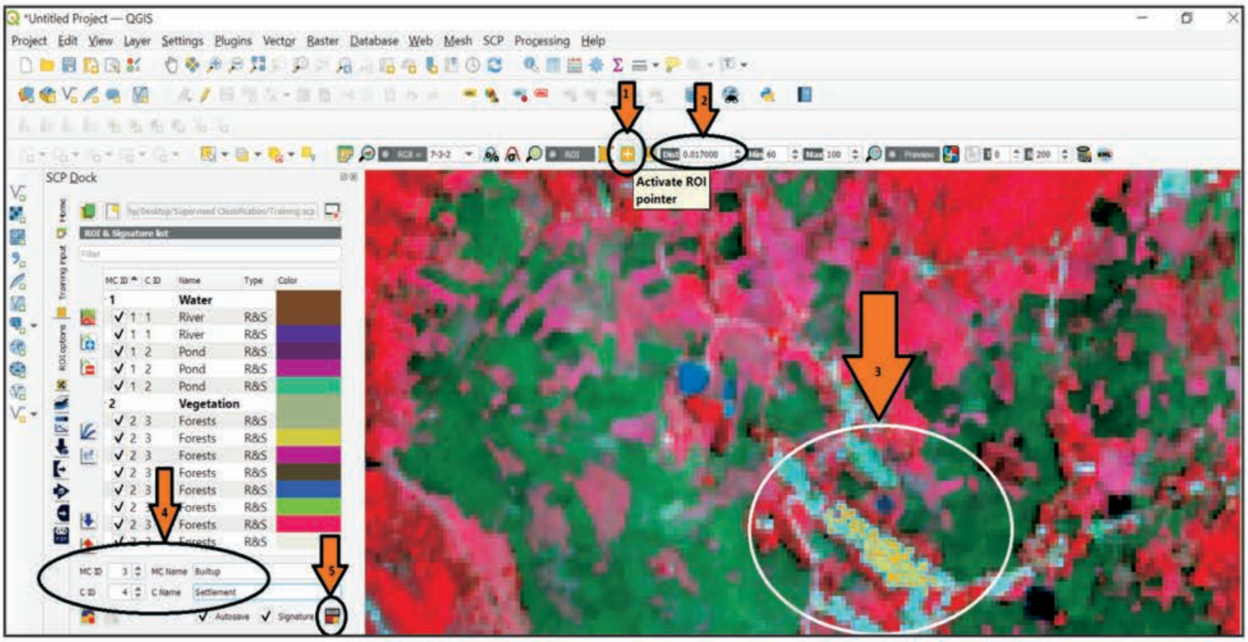
Creating Macro class and Micro class ID: Mention the MC ID and C ID and save as a temporary ROI to training input. There may be more than one more ROI for CID. The color for MC ID and C ID can be changed in ROI & Signature List.

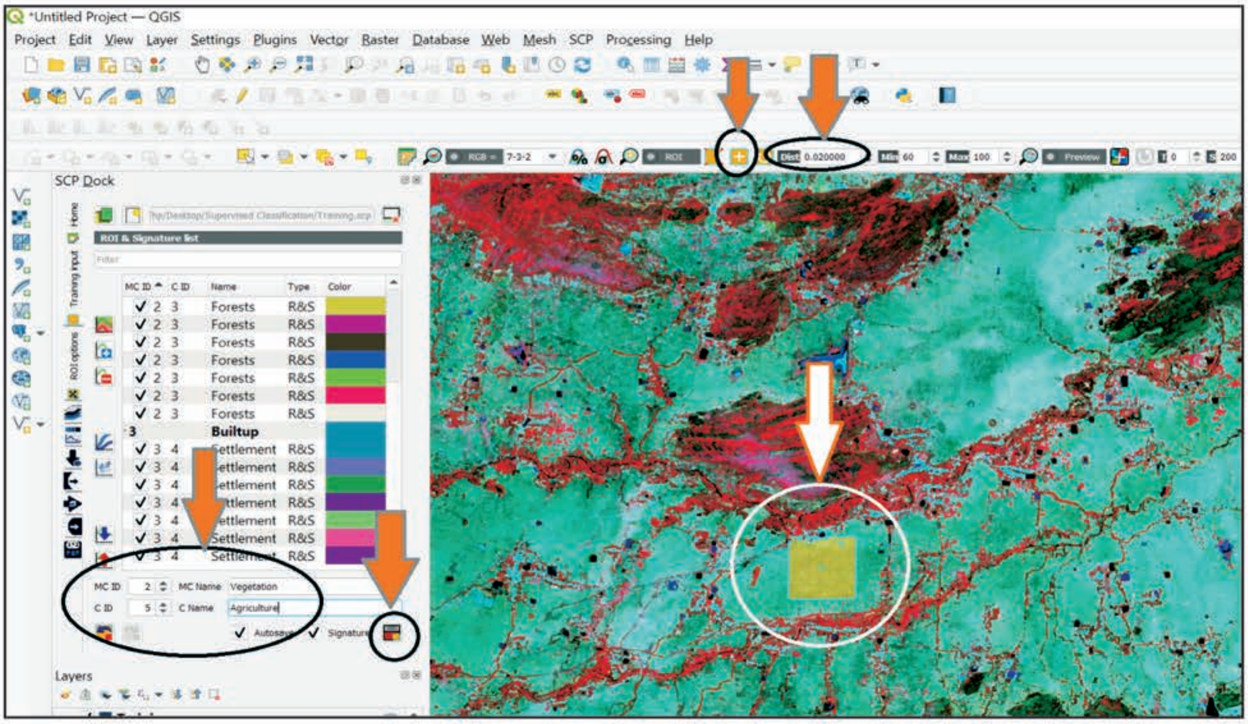


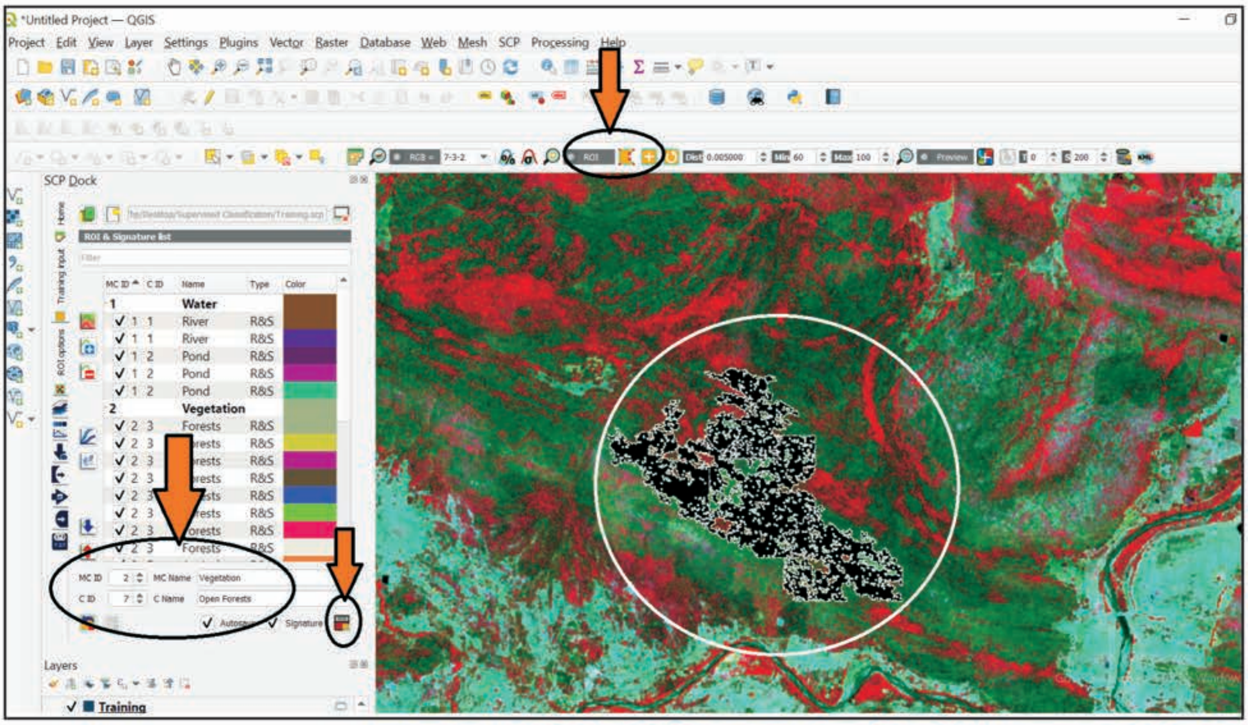


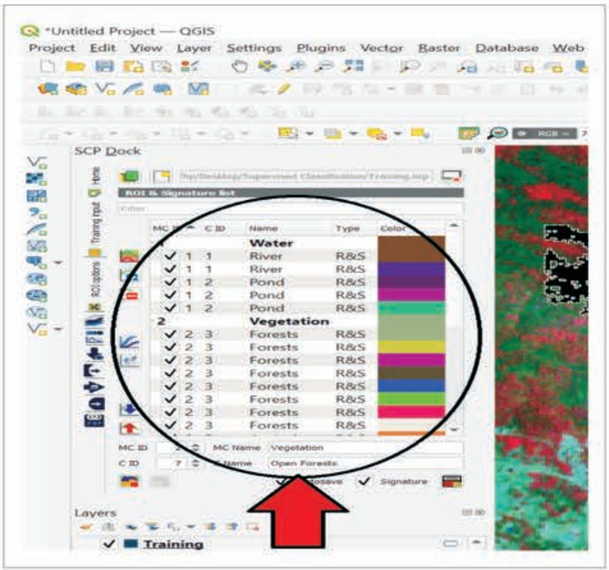

*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh SCP Processing Help
SCP Dock
Water
River
Layers
Training

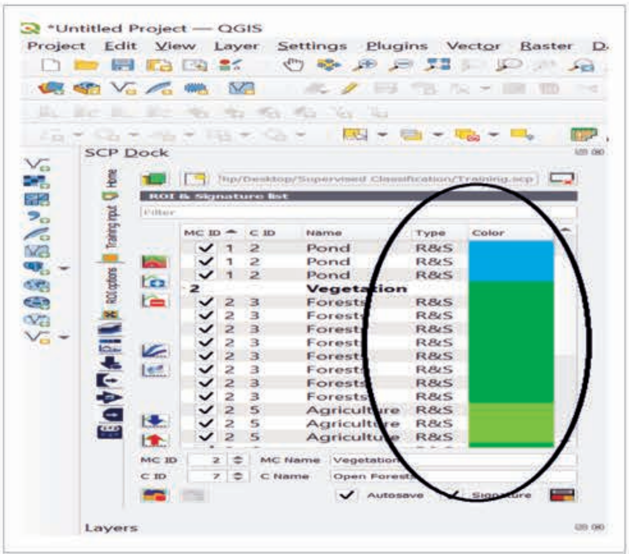

*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh SCP Processing Help
SCP Dock
Water
River
Pond
Save temporary ROI to training input
Layers
Training

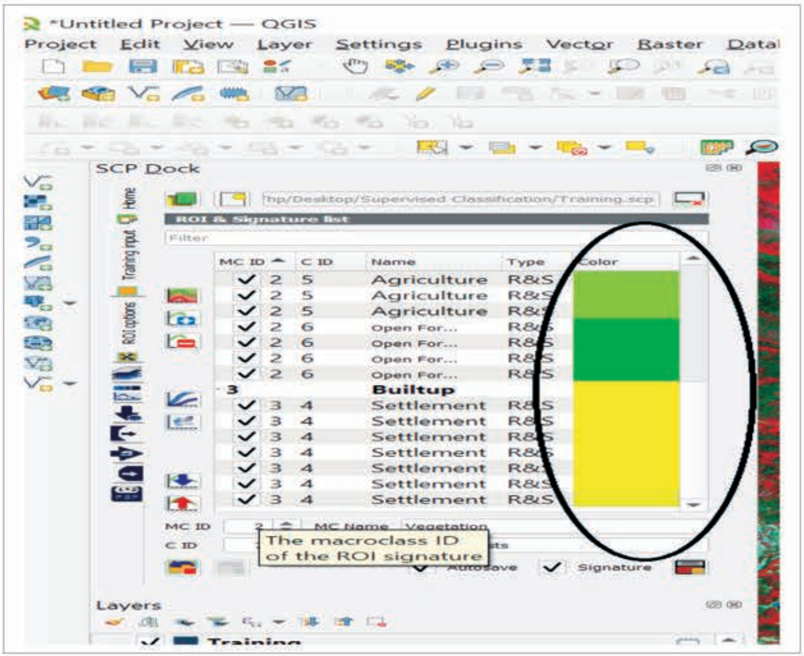

*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh SCP Processing Help
SCP Dock
Activate ROI pointer
Water
River
Pond
Vegetation
Forests
1
2
3
4
5


*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh SCP Processing Help
SCP Dock
ROI & Signature list
MC ID C ID Name Type Color
2 3 Forests R&S
3 Builtup
3 4 Settlement R&S
MC ID 2 MC Name Vegetation
C ID 5 C Name Agriculture
Autosave
Signature
Layers

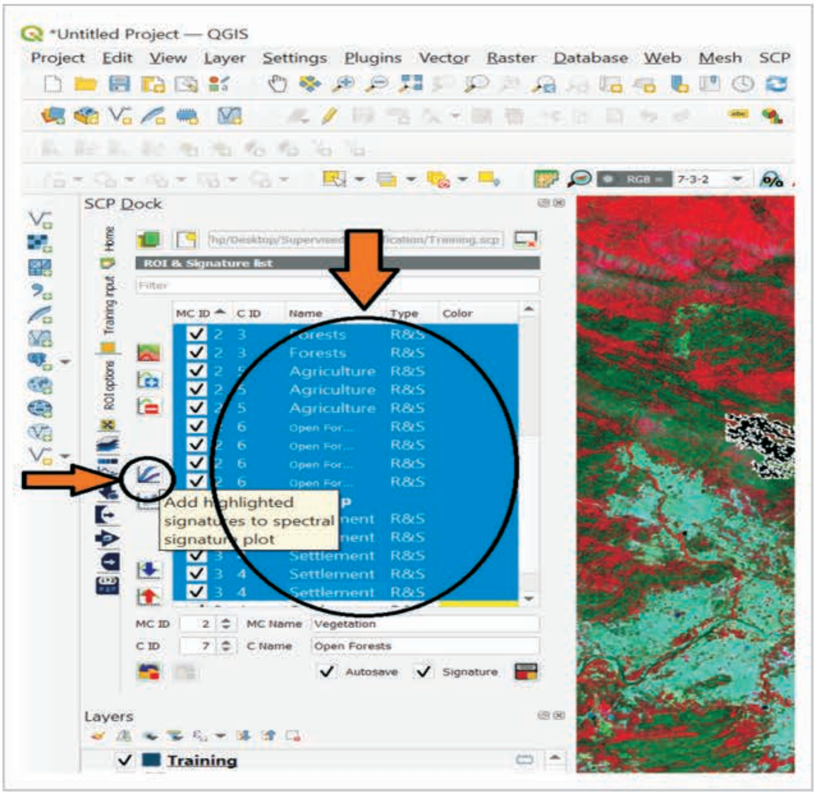

*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh SCP Processing Help
SCP Dock
ROI & Signature list
MC ID C ID Name Type Color
1 Water
1 1 River R&S
1 2 Pond R&S
2 Vegetation
2 3 Forests R&S
MC ID 2 MC Name Vegetation
C ID 7 C Name Open Forests
Autosave
Signature
Layers
Training

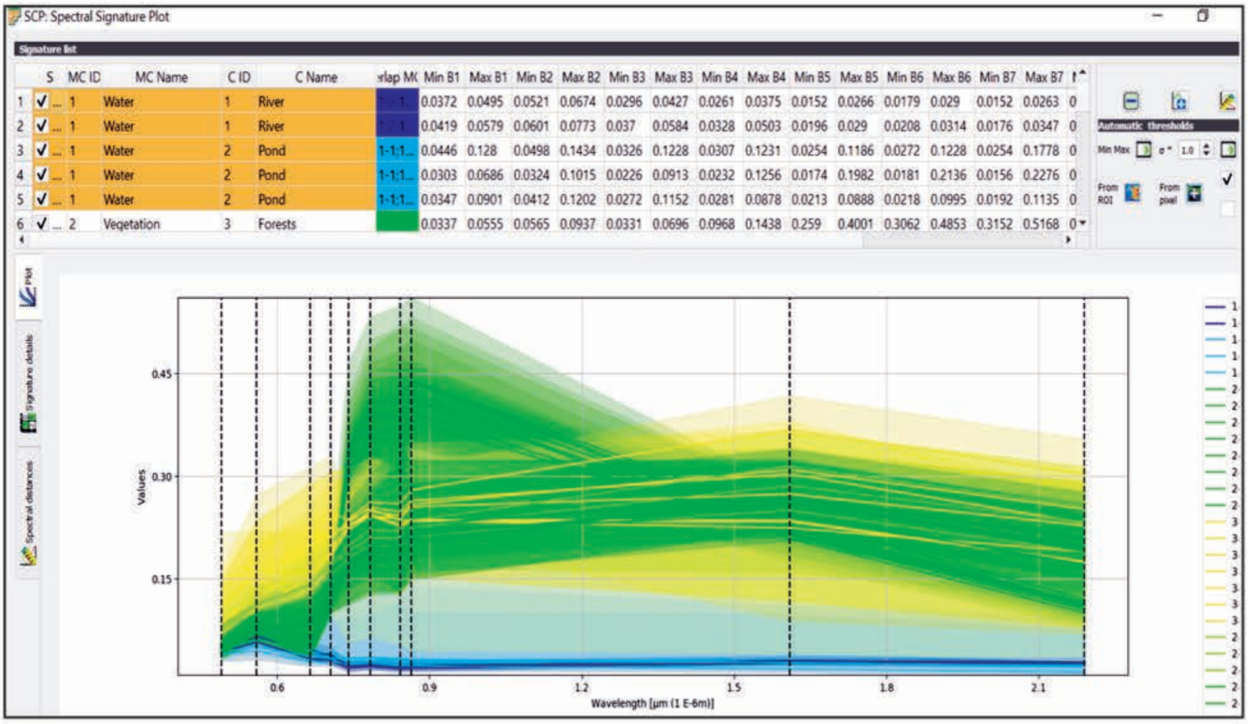

*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web
SCP Dock
ROI & Signature list
MC ID C ID Name Type Color
Water
1 1 River R&S
1 1 River R&S
1 2 Pond R&S
1 2 Pond R&S
1 2 Pond R&S
2 Vegetation
2 3 Forests R&S
2 3 Forests R&S
2 3 Forests R&S
2 3 Forests R&S
2 3 Forests R&S
2 3 Forests R&S
2 3 Forests R&S
2 3 Forests R&S
MC ID MC Name Vegetation
C ID 7 C Name Open Forests
Signature
Layers
Training


*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster D
SCP Dock
ROI & Signature list
Filter
MC ID C ID Name Type Color
1 2 Pond R&S
1 2 Pond R&S
1 2 Pond R&S
2 Vegetation
2 3 Forest R&S
2 3 Forest R&S
2 3 Forest R&S
2 3 Forest R&S
2 3 Forest R&S
2 3 Forest R&S
2 3 Forest R&S
2 3 Forest R&S
2 5 Agriculture R&S
2 5 Agriculture R&S
2 5 Agriculture R&S
MC ID 2 MC Name Vegetation
C ID 7 C Name Open Forest
Autosave Signature
Layers

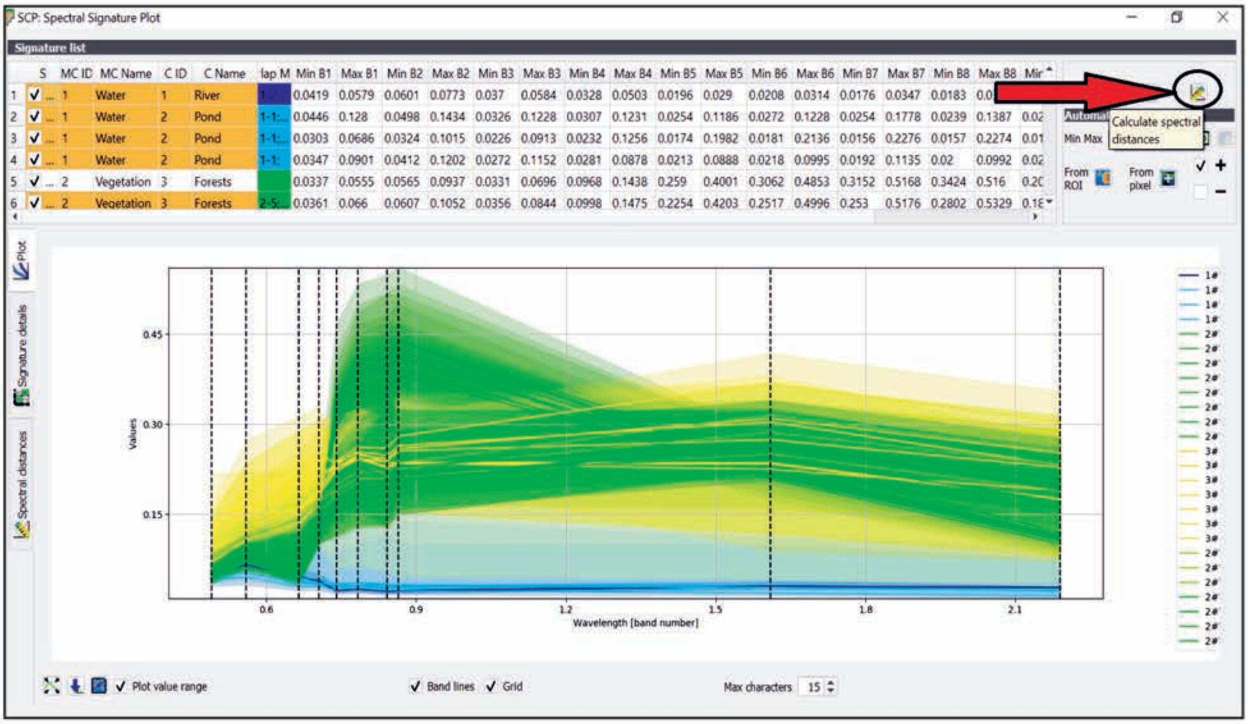


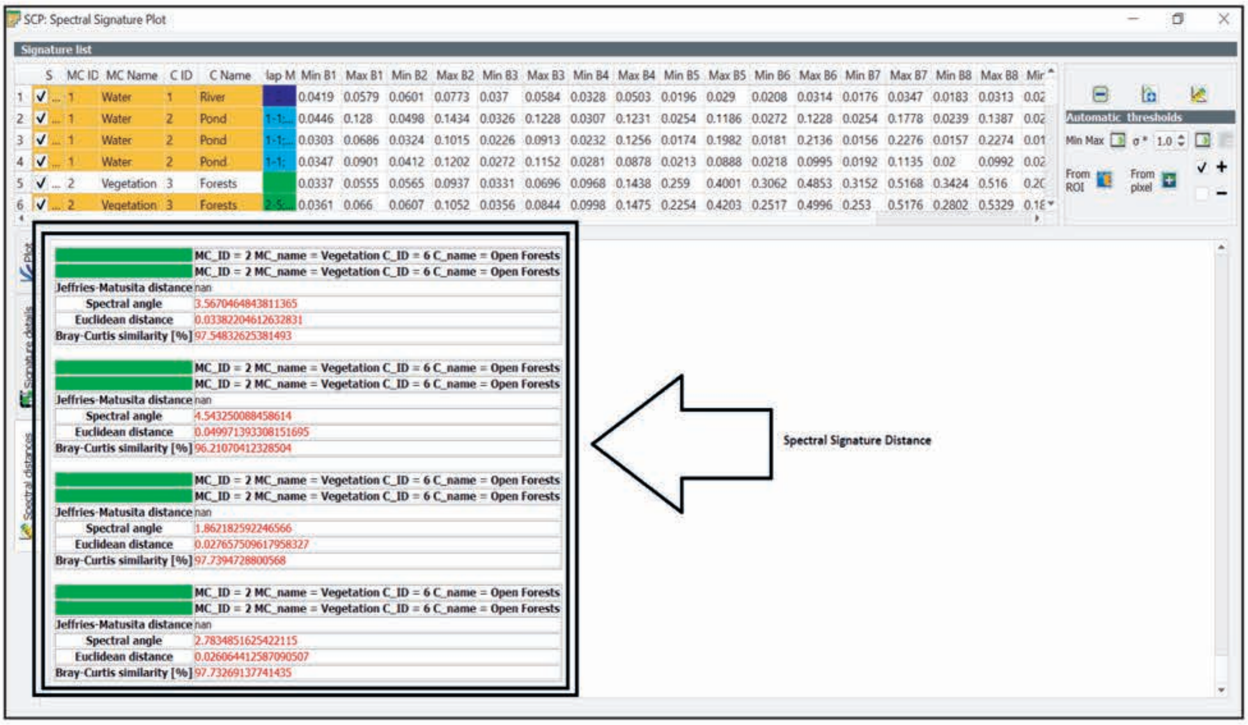
>>After adding the required MC ID and C ID, we can see the spectral signature plot by using the option >> Add Highlighted signature to spectral signature plot.



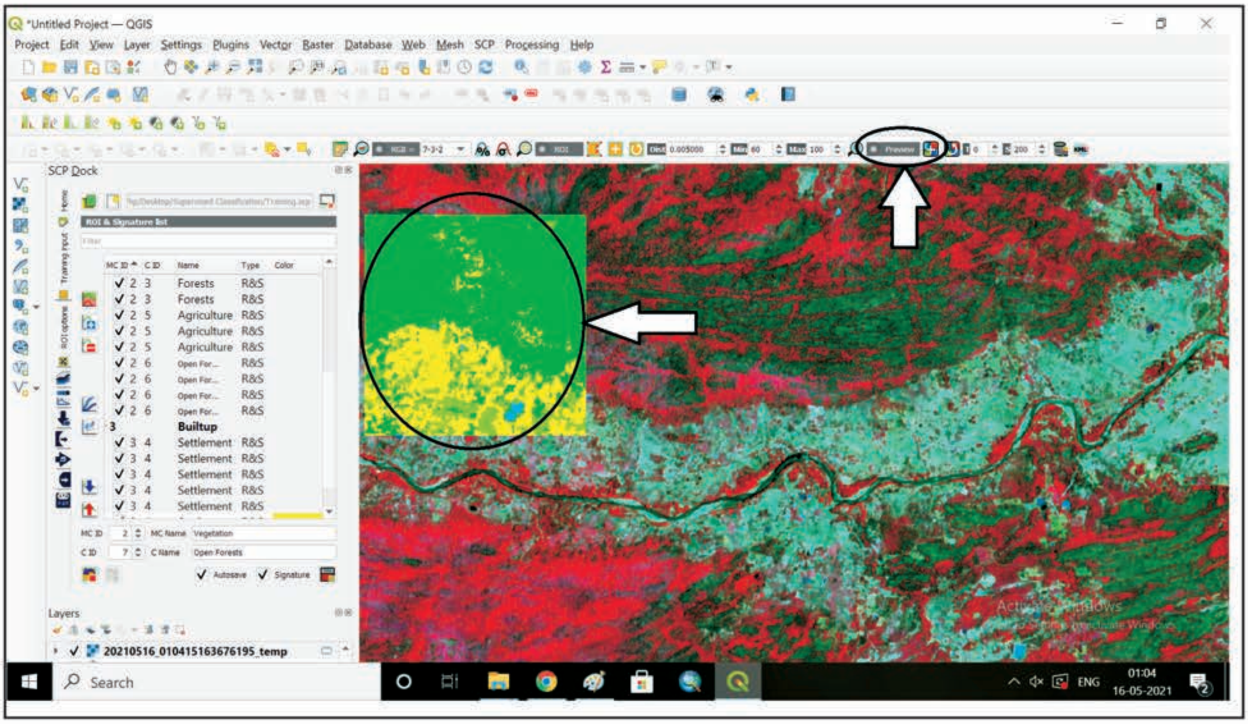


The Euclidean distance between the identified Macro class and Class is shown in the graph, from which the user can identify how the spectral classes are distanced.

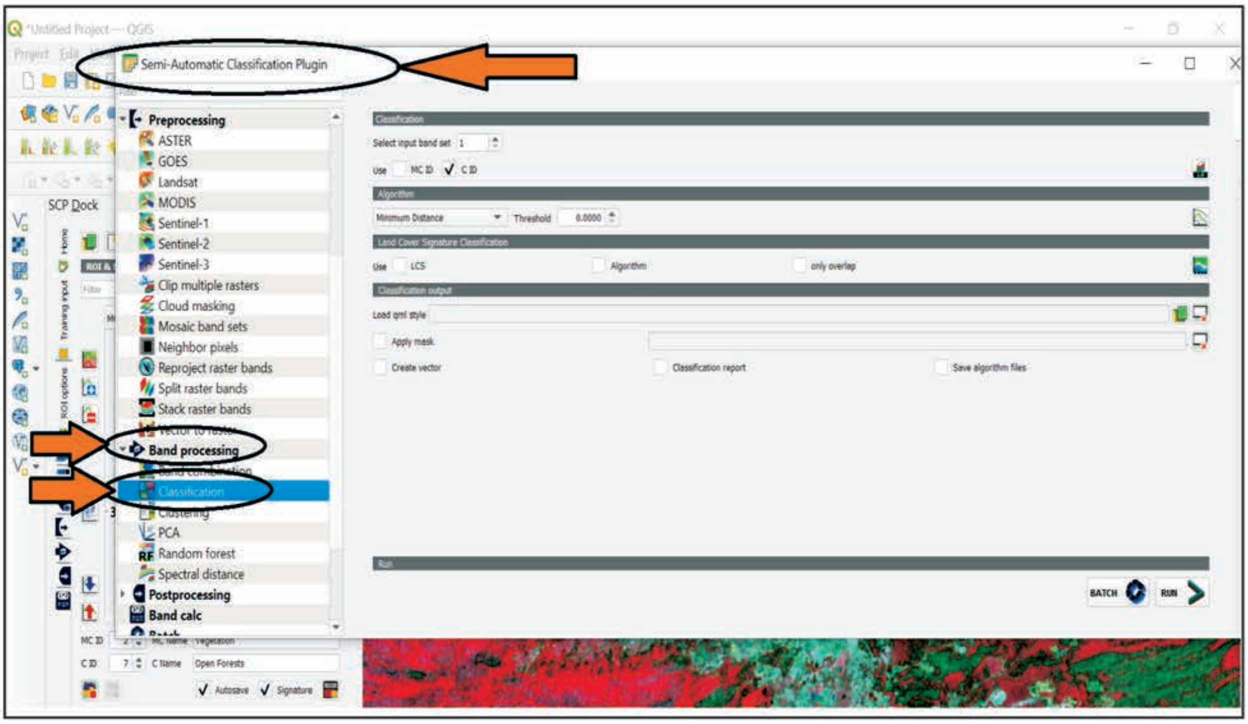


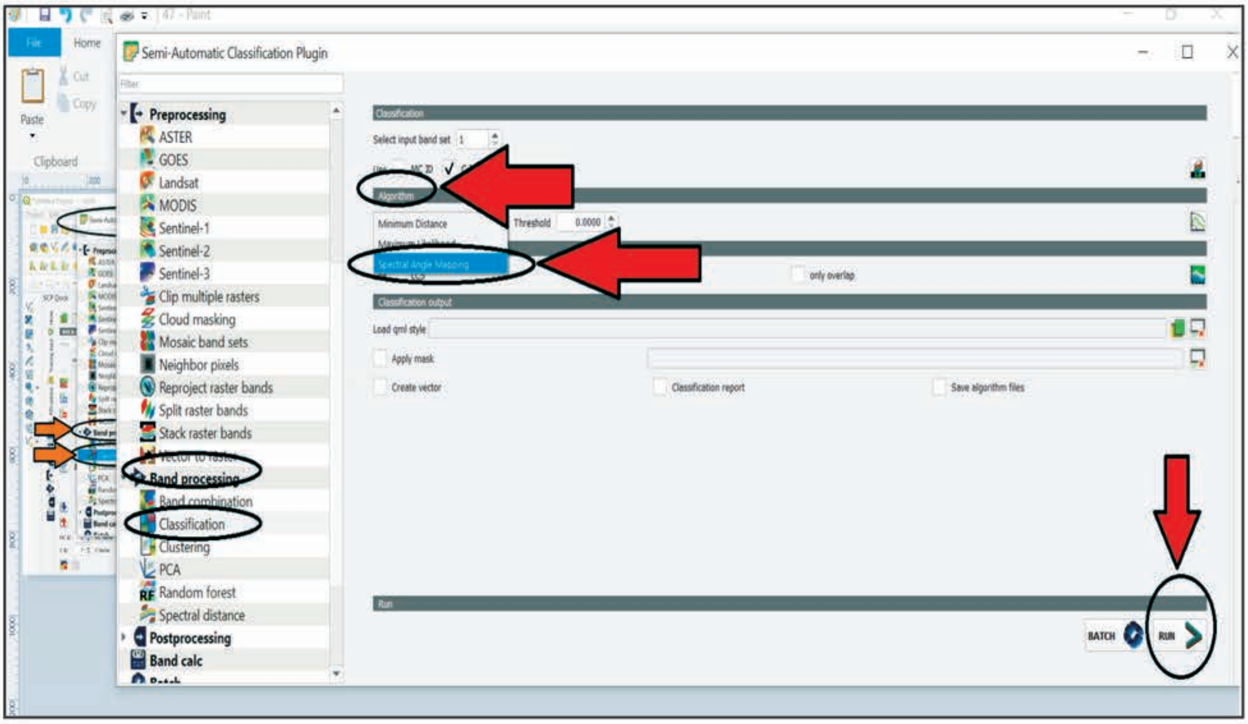


Preview the training input : using the preview icon, we can preview the output map in specific area in the map .

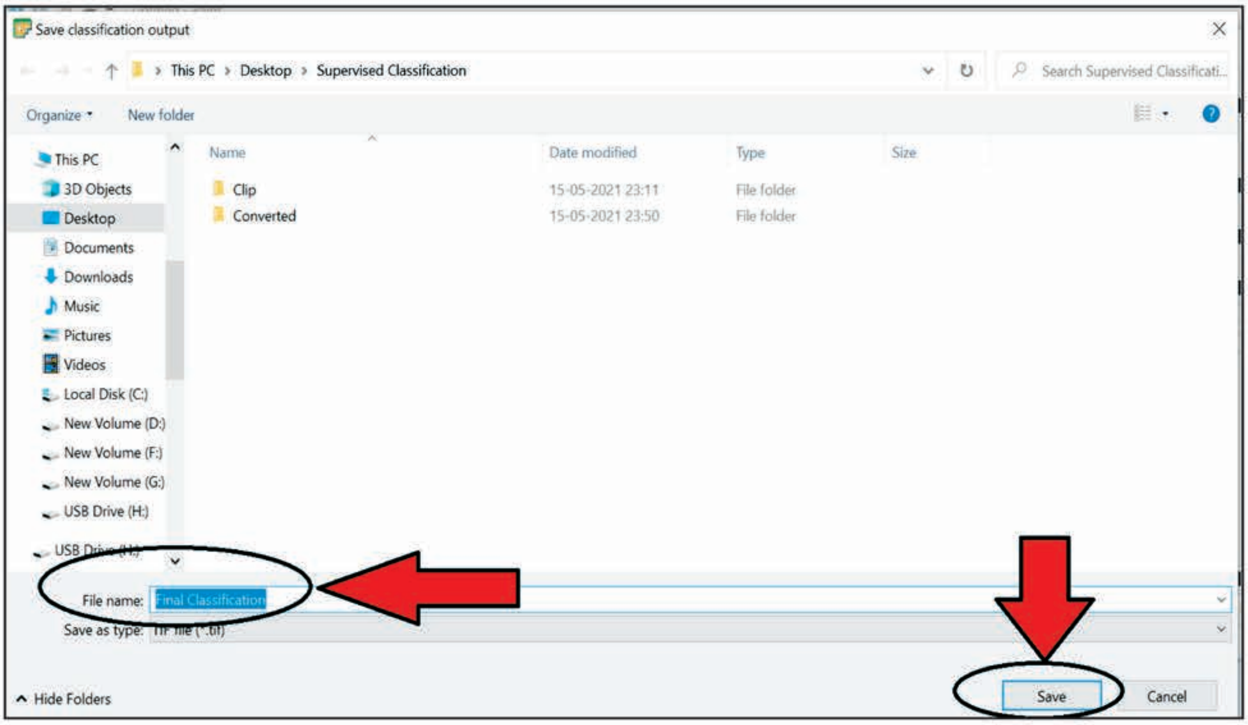


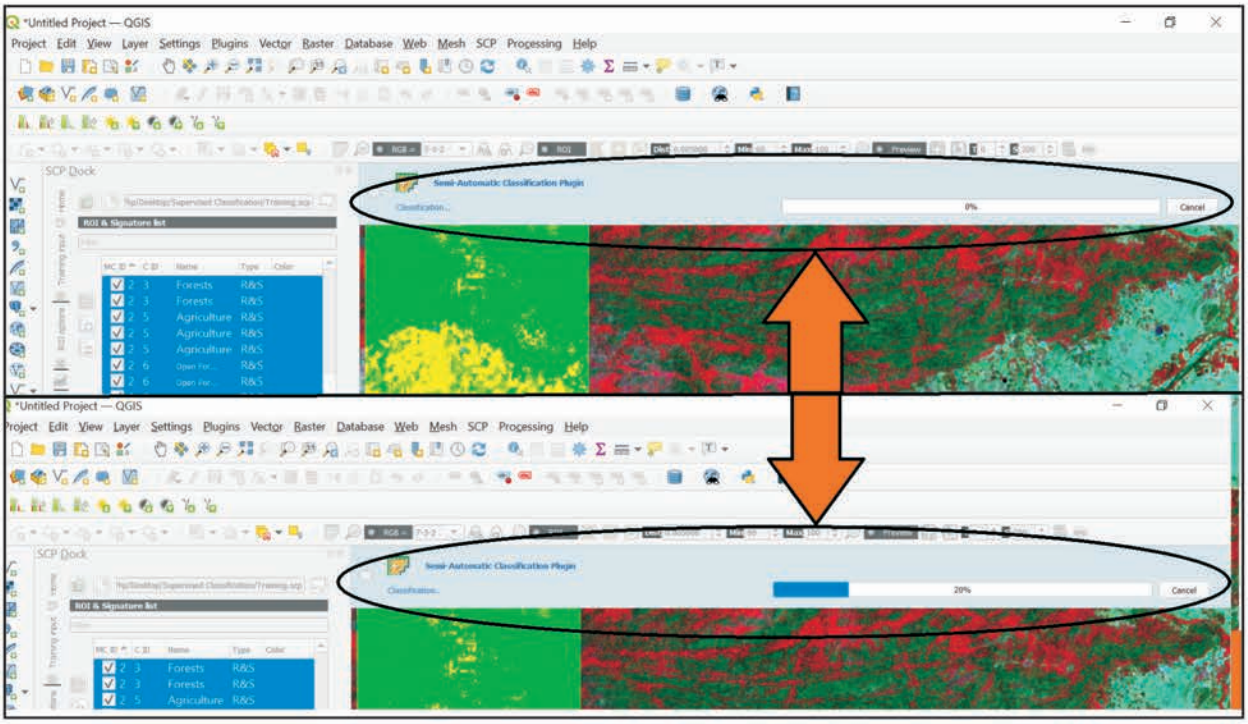
Step 10: Classification : Click the Classification tool in SCP plugin >> select the Algorithm for supervised classification, you can try different algorithm for supervised classification. In this method we use spectral angle mapping algorithm for supervised classification. Run the Algorithm.



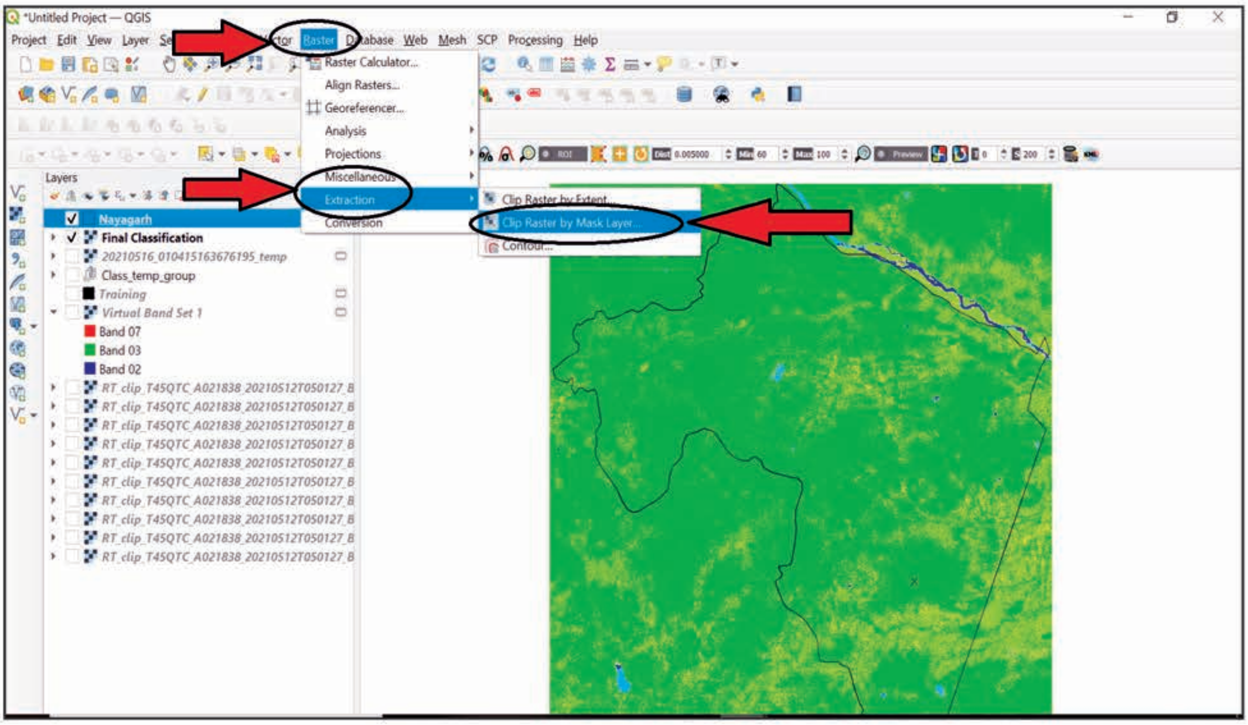


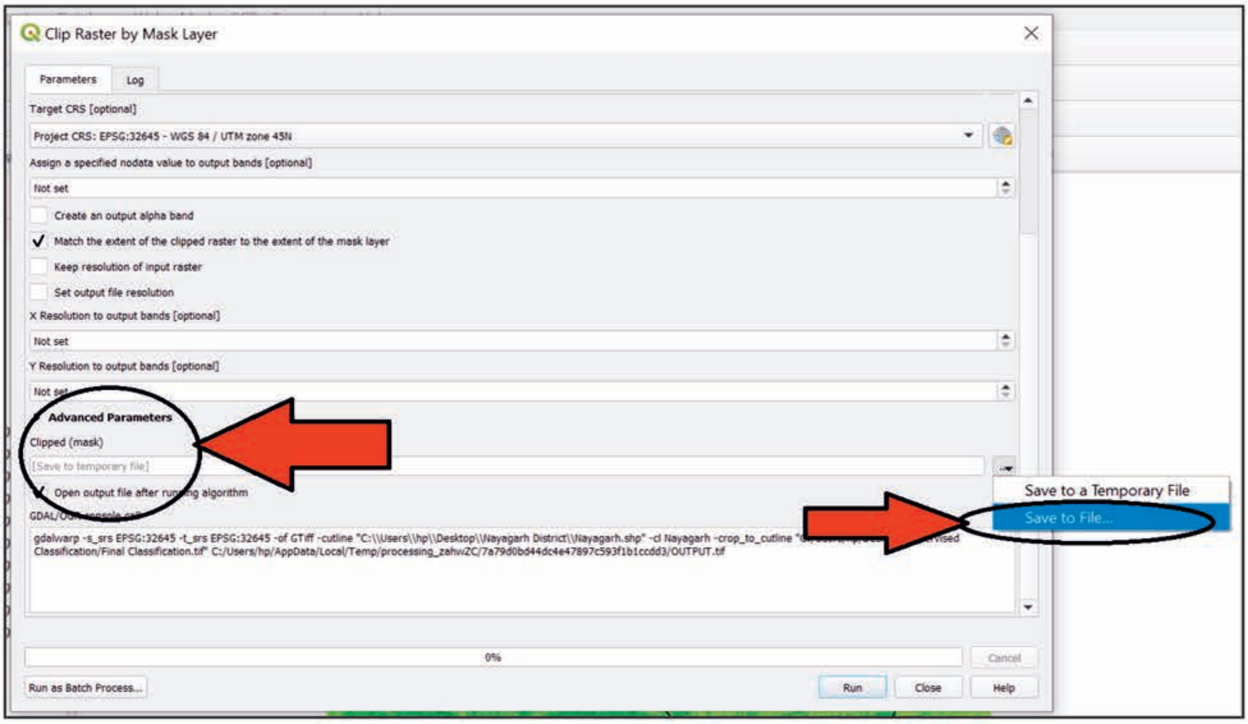
Create the New folder and save the file.



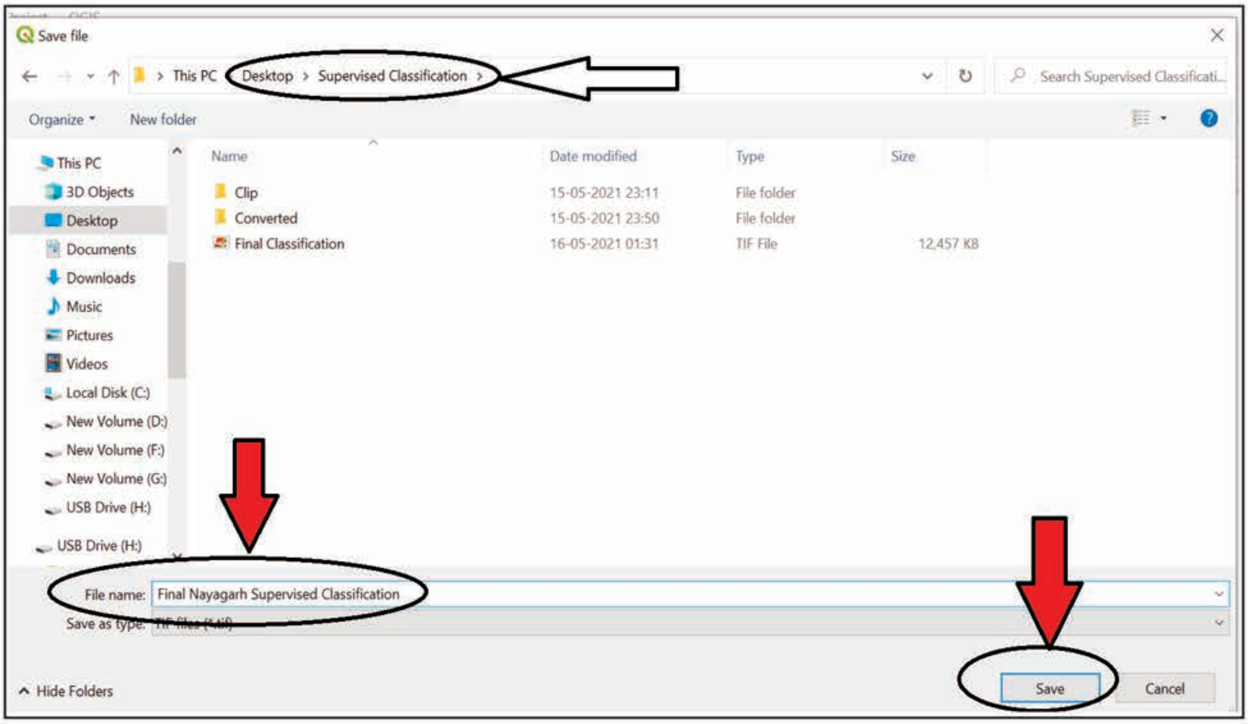


Step 11: Extraction of Raster to Area of Interest: Select 'Raster' extraction and click "Clip Raster by Mask Layer".

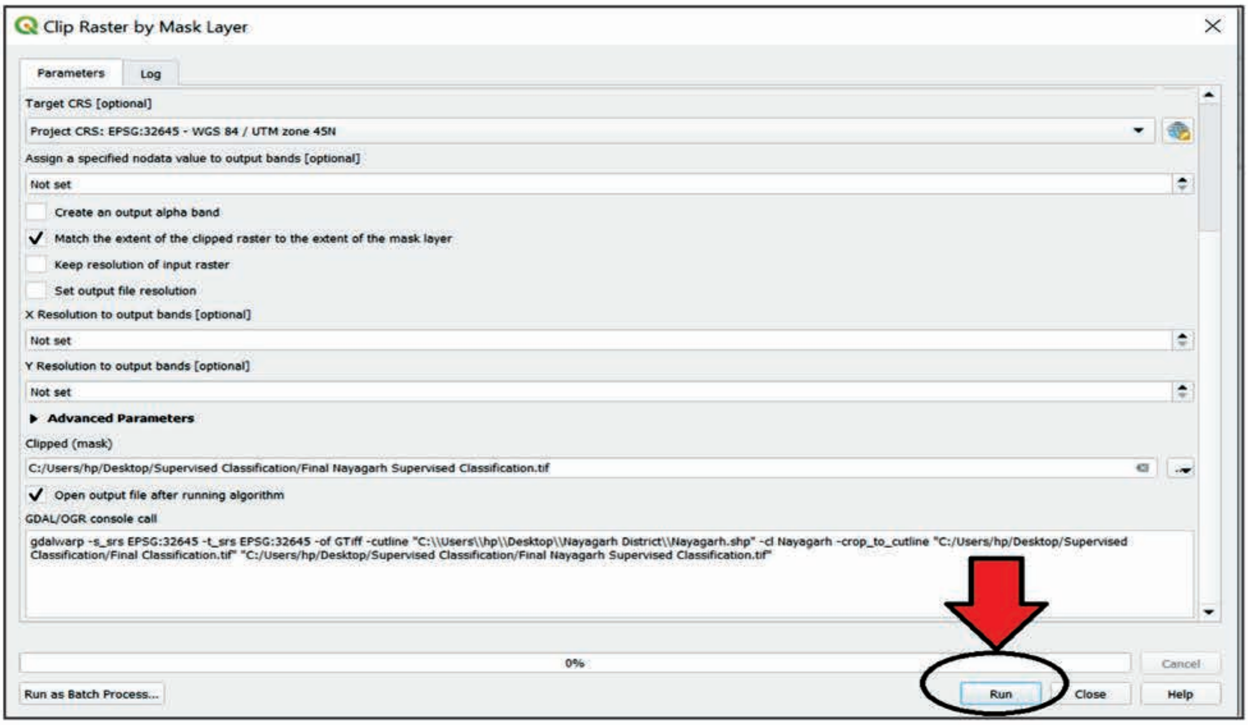


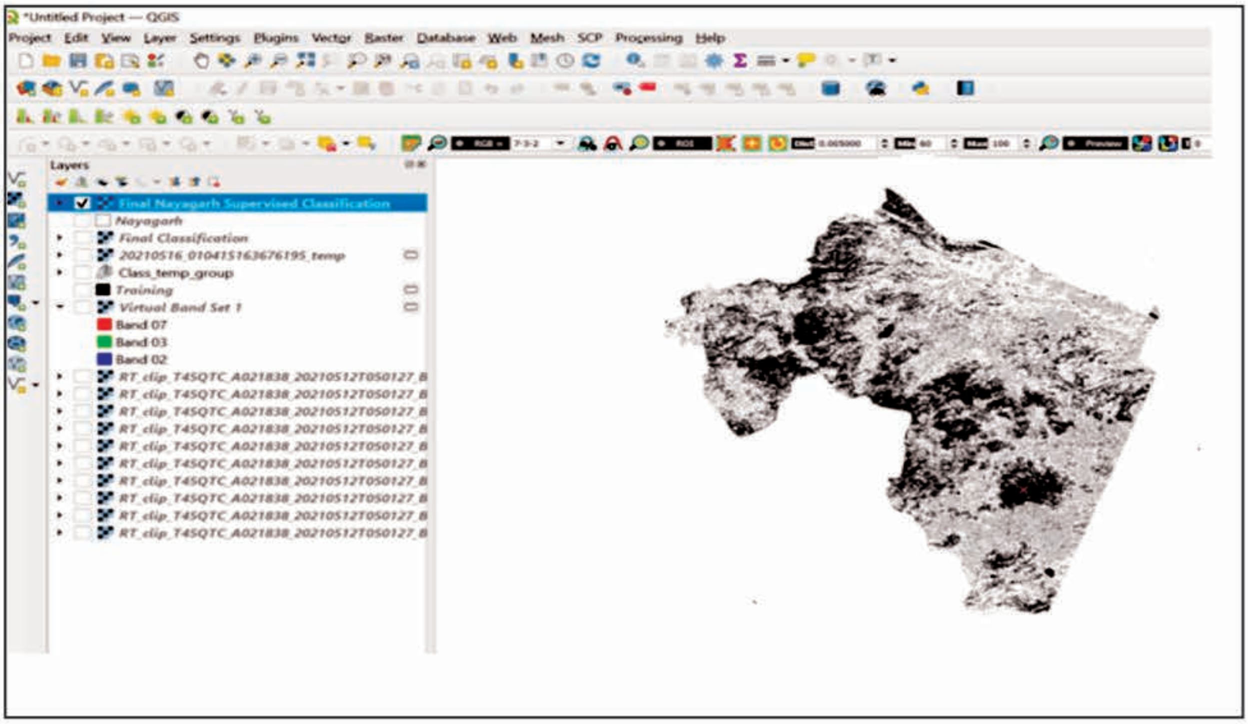


Clip Raster by Mask Layer
Parameters
Log
Target CRS [optional]
Project CRS: EPSG:32645 - WGS 84 / UTM zone 45N
Assign a specified nodata value to output bands [optional]
Not set
Create an output alpha band
Match the extent of the clipped raster to the extent of the mask layer
Keep resolution of input raster
Set output file resolution
X Resolution to output bands [optional]
Not set
Y Resolution to output bands [optional]
Advanced Parameters
Clipped (mask)
[Save to temporary file]
Save to a Temporary File
Save to File...
0%
Cancel
Run as Batch Process...
Run
Close
Help

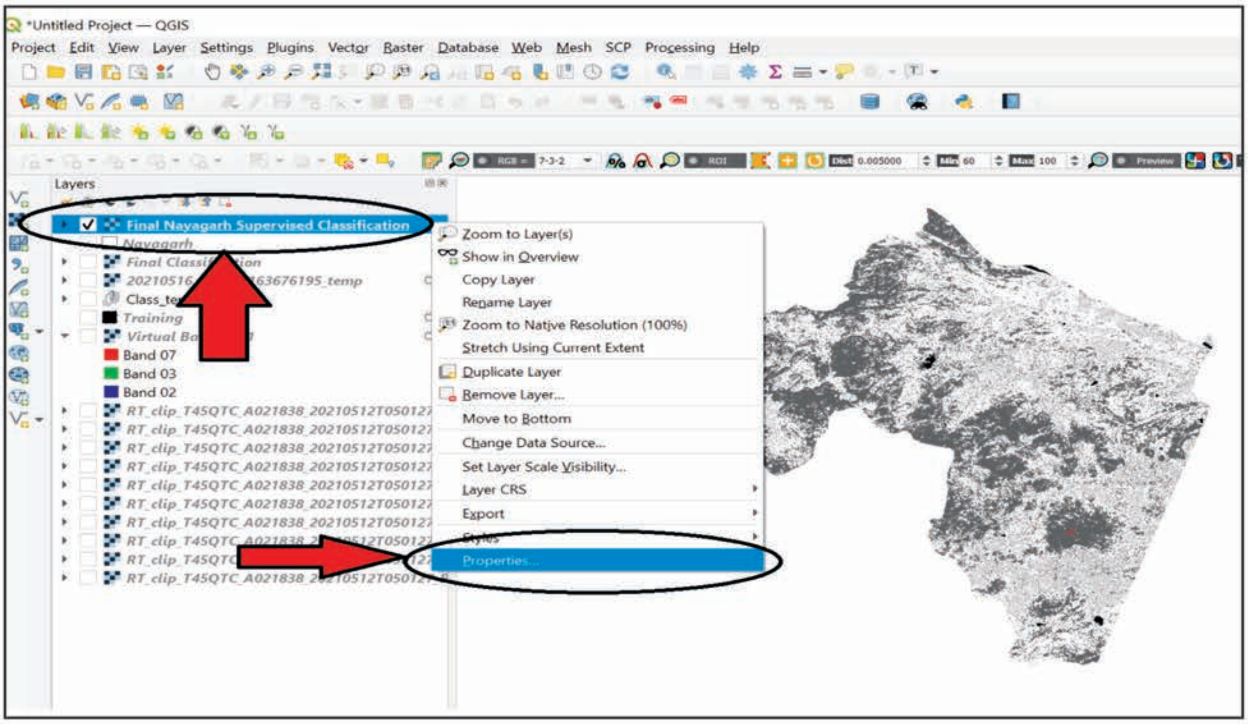


Save file
This PC
Desktop
Supervised Classification
Search Supervised Classificati...
Organize
New folder
Name
Date modified
Type
Size
Clip
15-05-2021 23:11
File folder
Converted
15-05-2021 23:50
File folder
Final Classification
16-05-2021 01:31
TIF File
12,457 KB
This PC
3D Objects
Desktop
Documents
Downloads
Music
Pictures
Videos
Local Disk (C:)
New Volume (D:)
New Volume (F:)
New Volume (G:)
USB Drive (H:)
USB Drive (H:)
File name:
Final Nayagarh Supervised Classification
Save as type:
Hide Folders
Save
Cancel

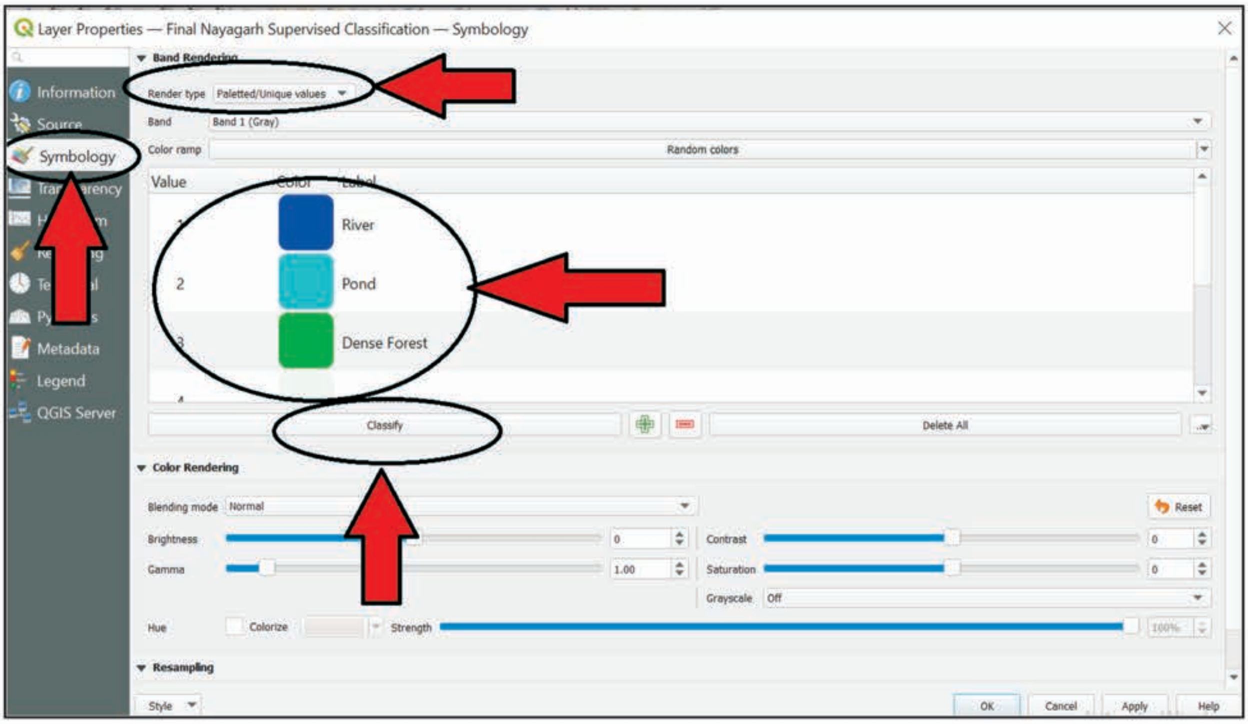




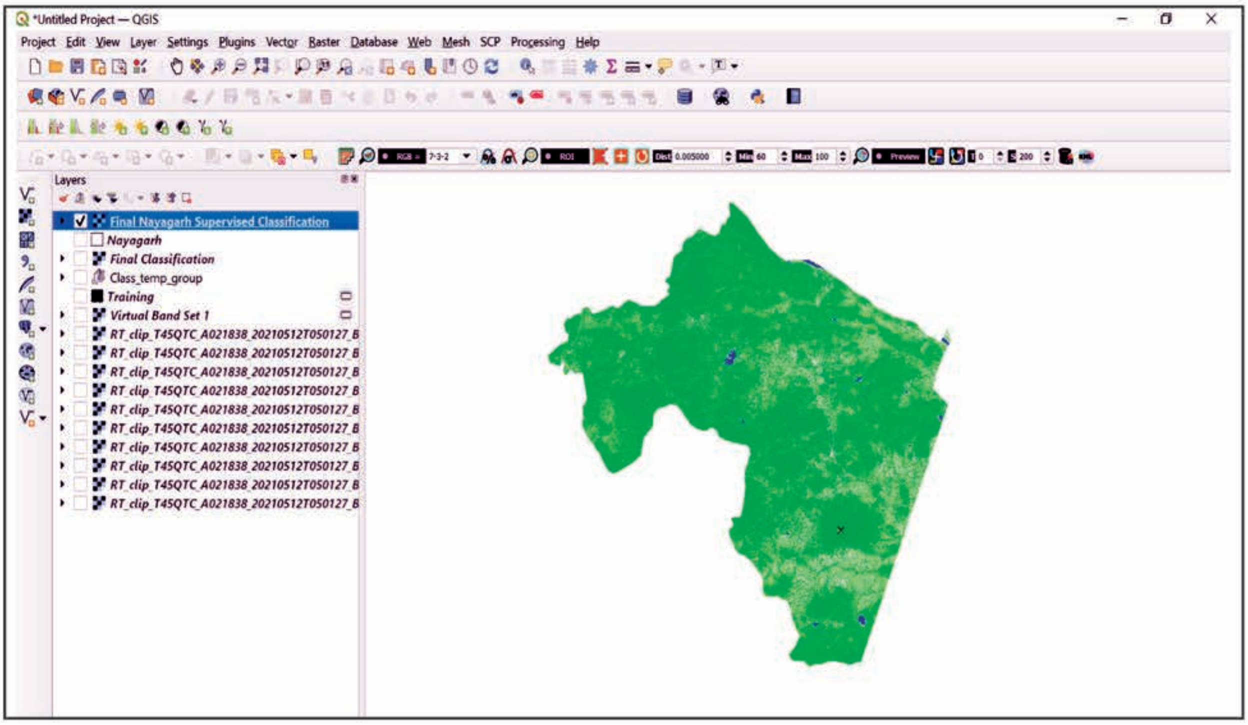
Select the Properties and change the Properties.



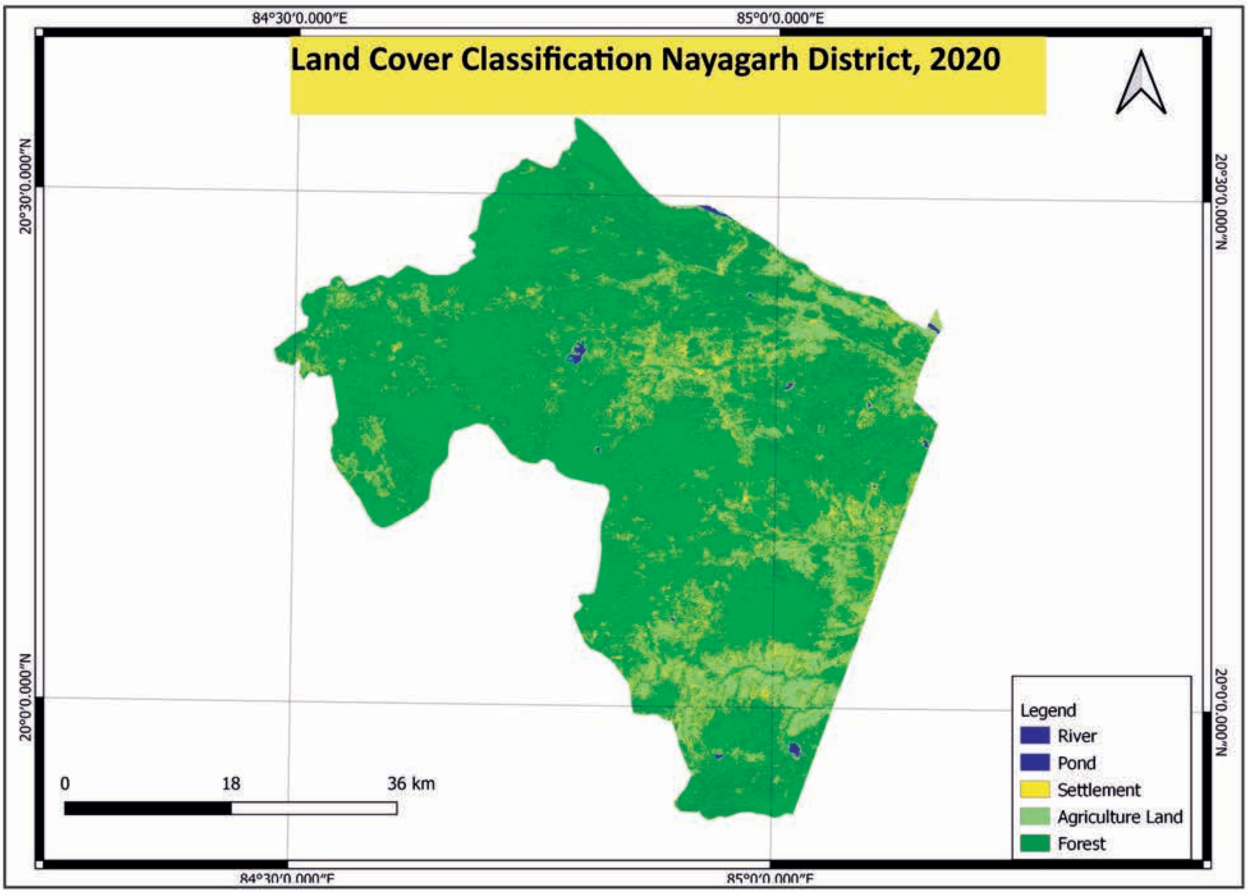
Select the Raster type-paletted/unique values



Final classification File.



Classification Map.



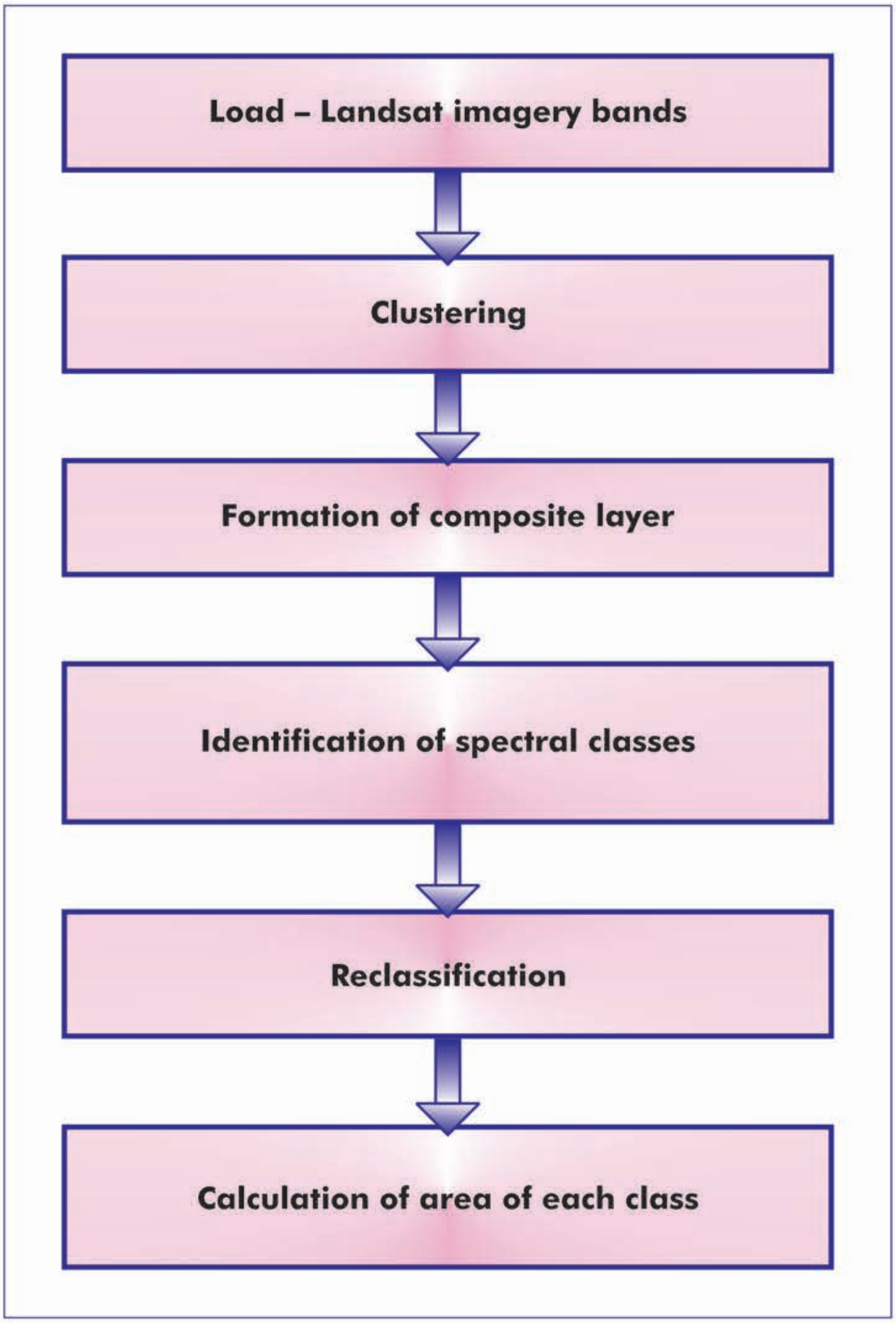
16. UNSUPERVISED CLASSIFICATION

Land use classification is very significant for forestry planning and decision making. It helps us in detection of change and impact of one land use over other.

In Remote sensing, we use two different types of classifications:

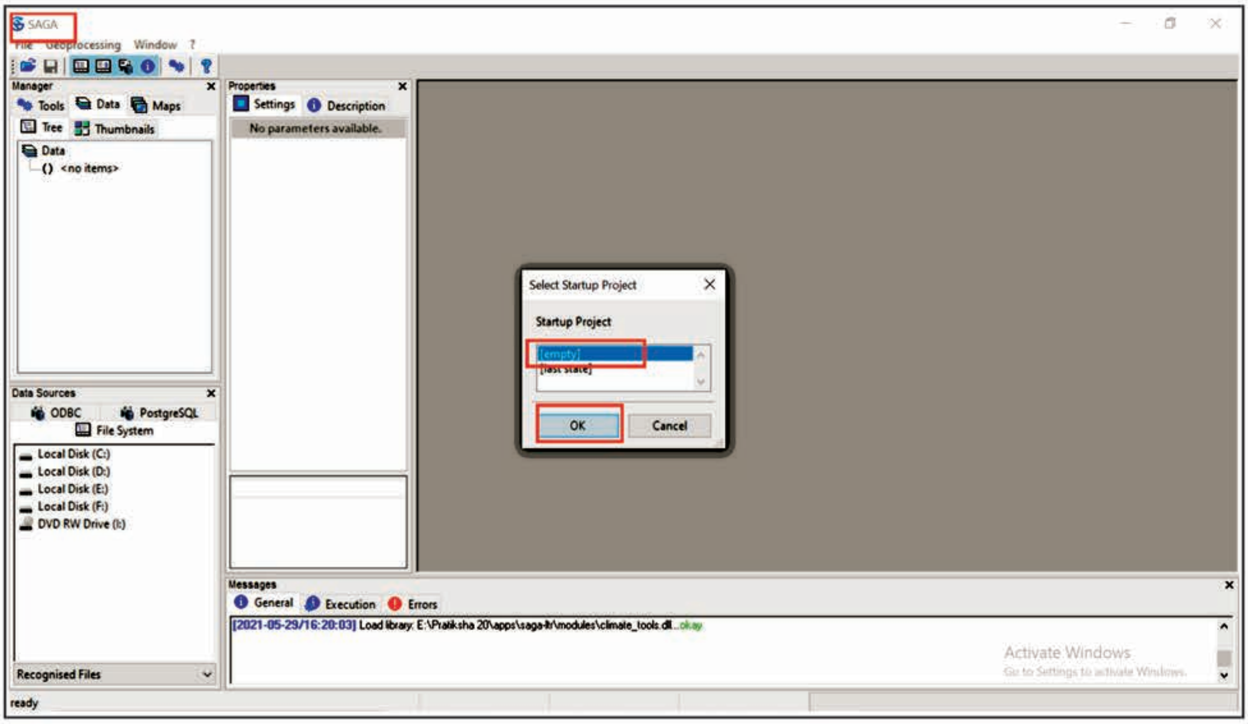
a. Supervised Classification
b. Unsupervised Classification.

In unsupervised classification, spectral classes are clustered, and user has to identify the classes for classification. Some spectral classes are very tough to identify. This is the major disadvantage of unsupervised classification.

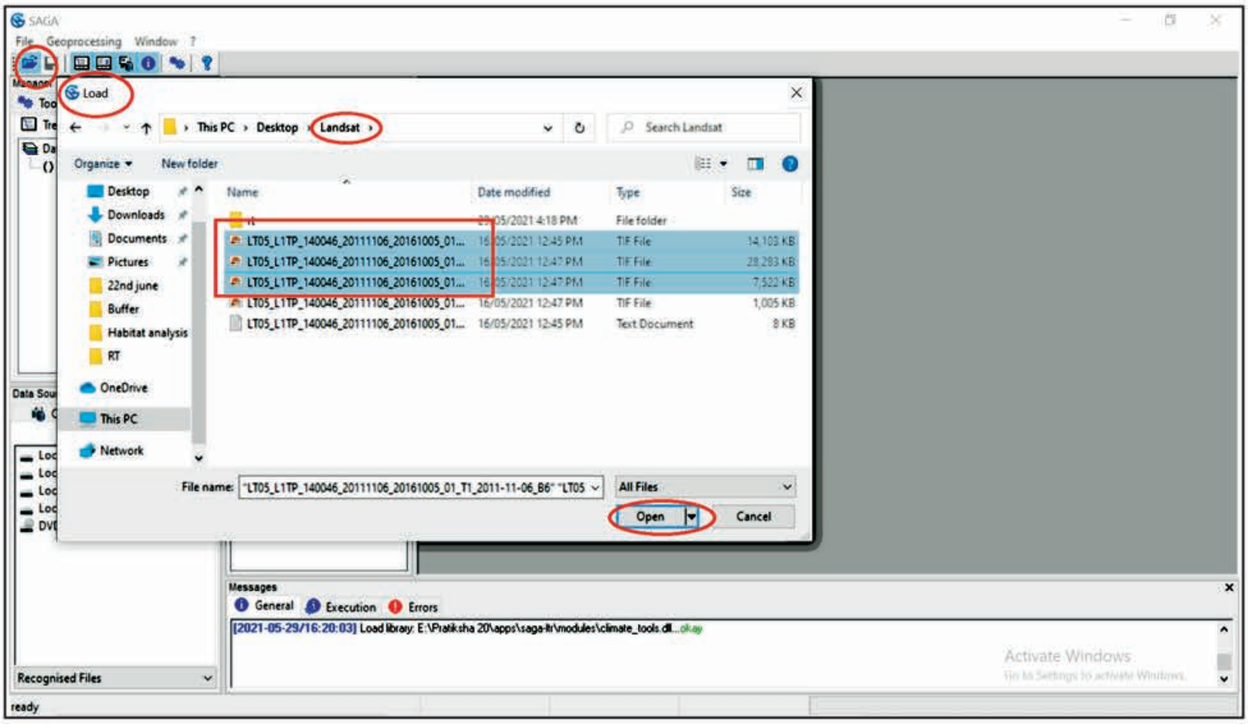


STEPS FOR UNSUPERVISED CLASSIFICATION

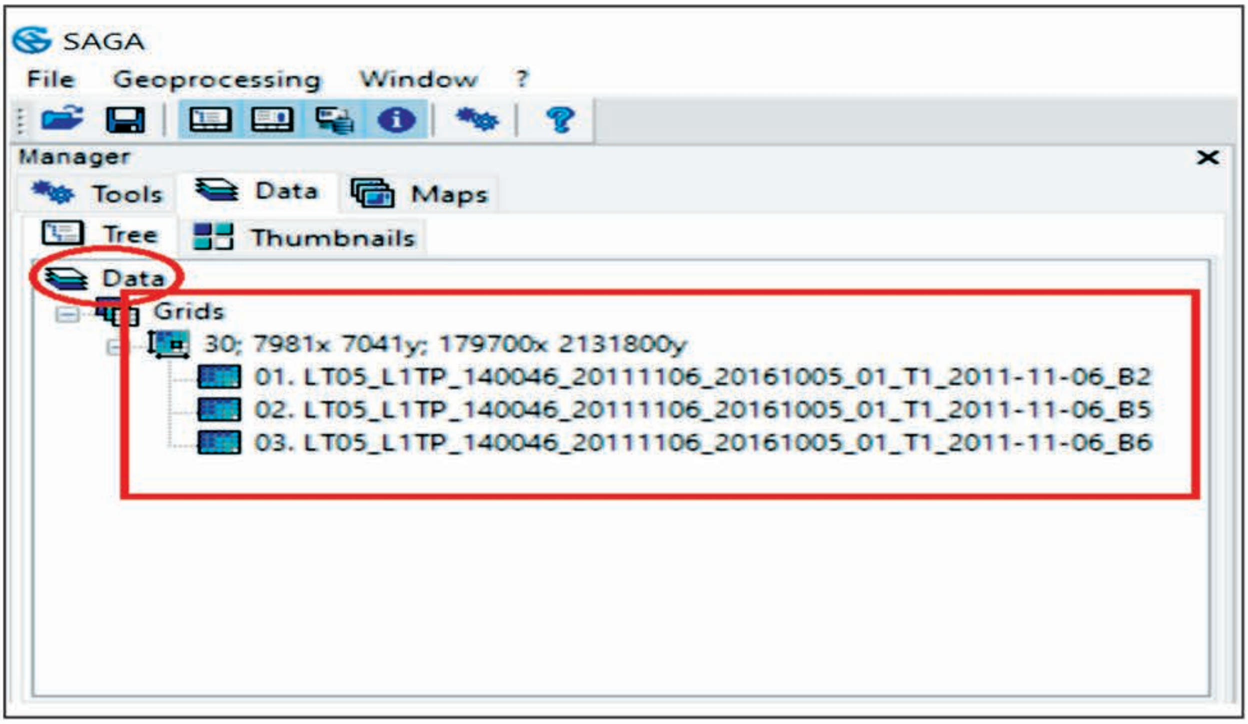
1. Open SAGA - GIS.



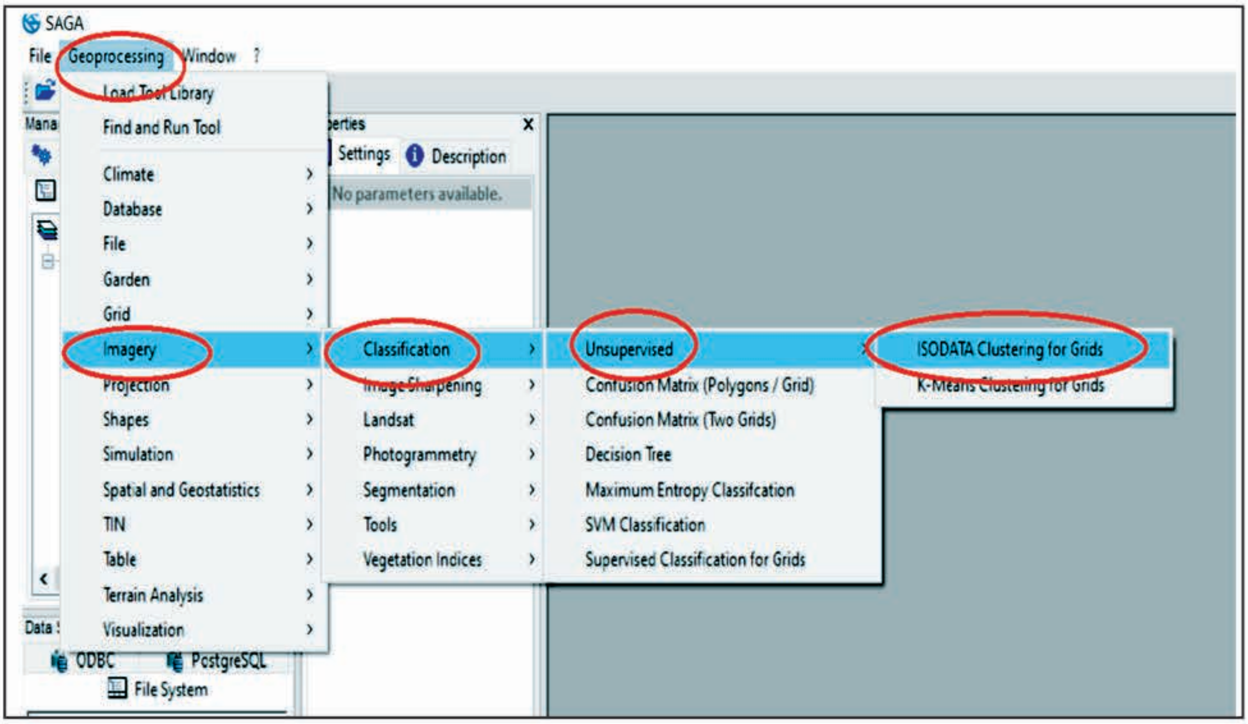
2. Go to File > Load.
   Select Landsat bands from desktop.



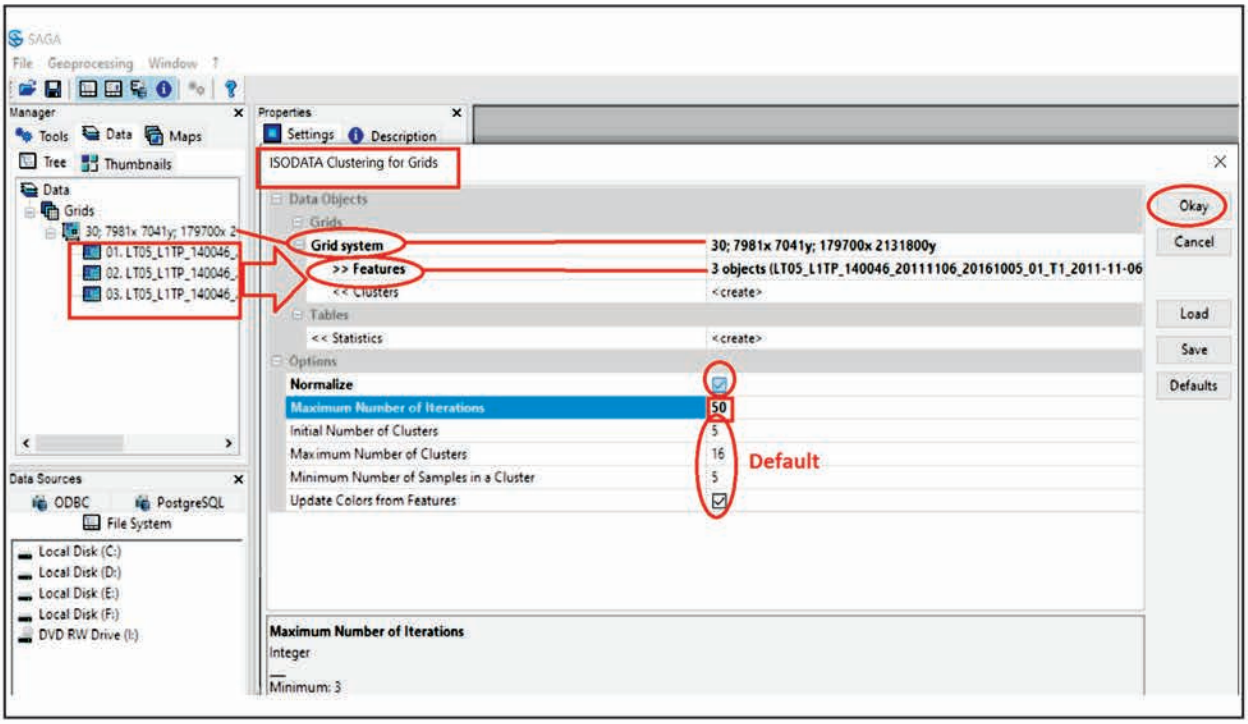
* The added bands will appear like this.
Data >> Grid >> Band



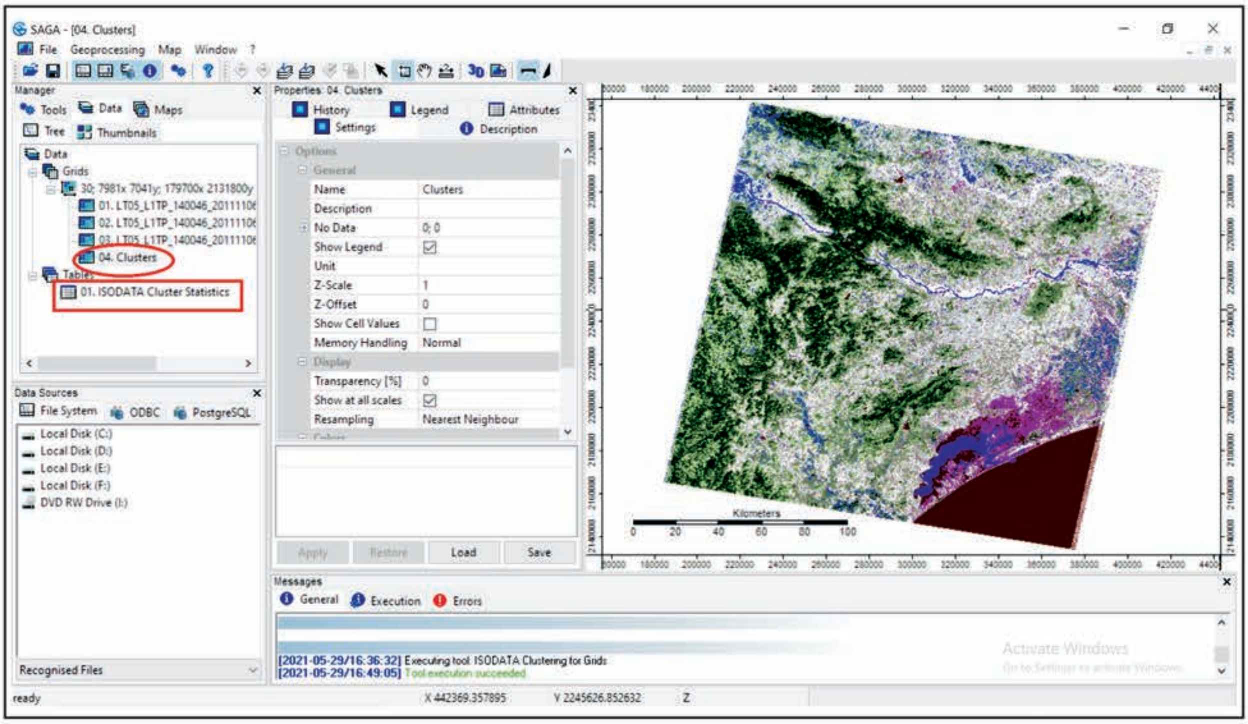
3. Making Cluster :
Geoprocessing > Classification > Unsupervised > ISODATA Clustering for Grids.



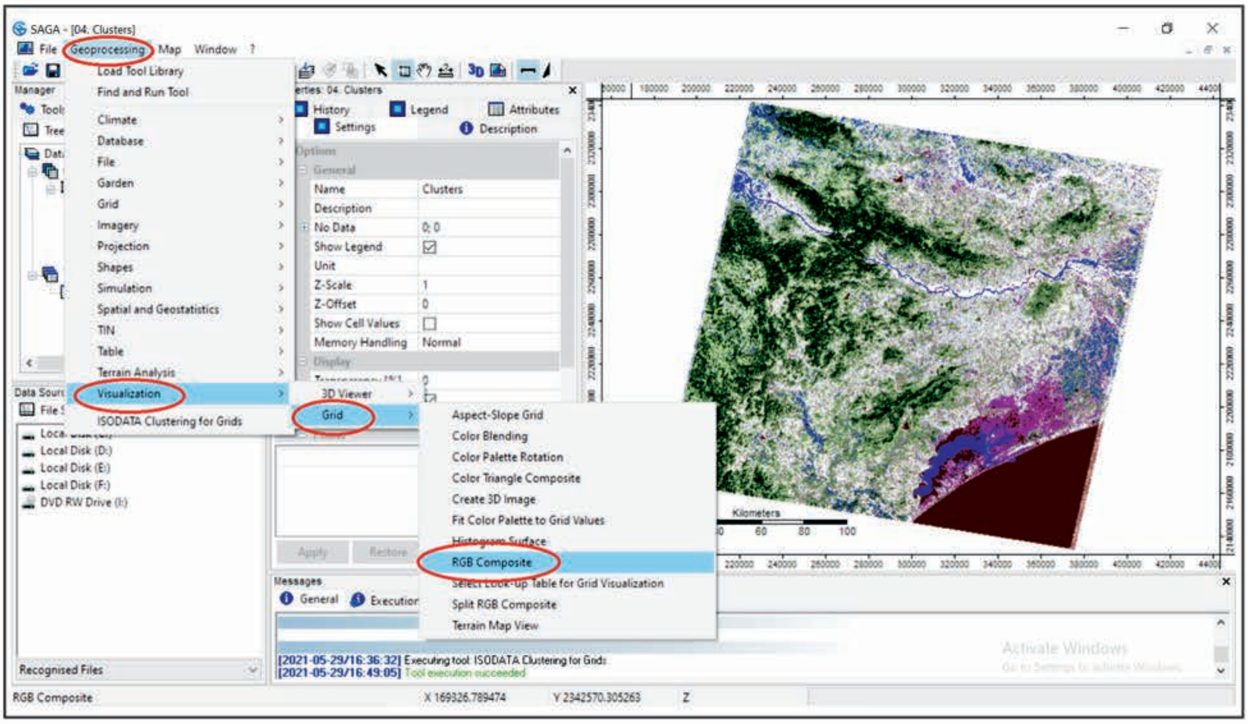
* Select the features as shown in the figure. Press Okay.



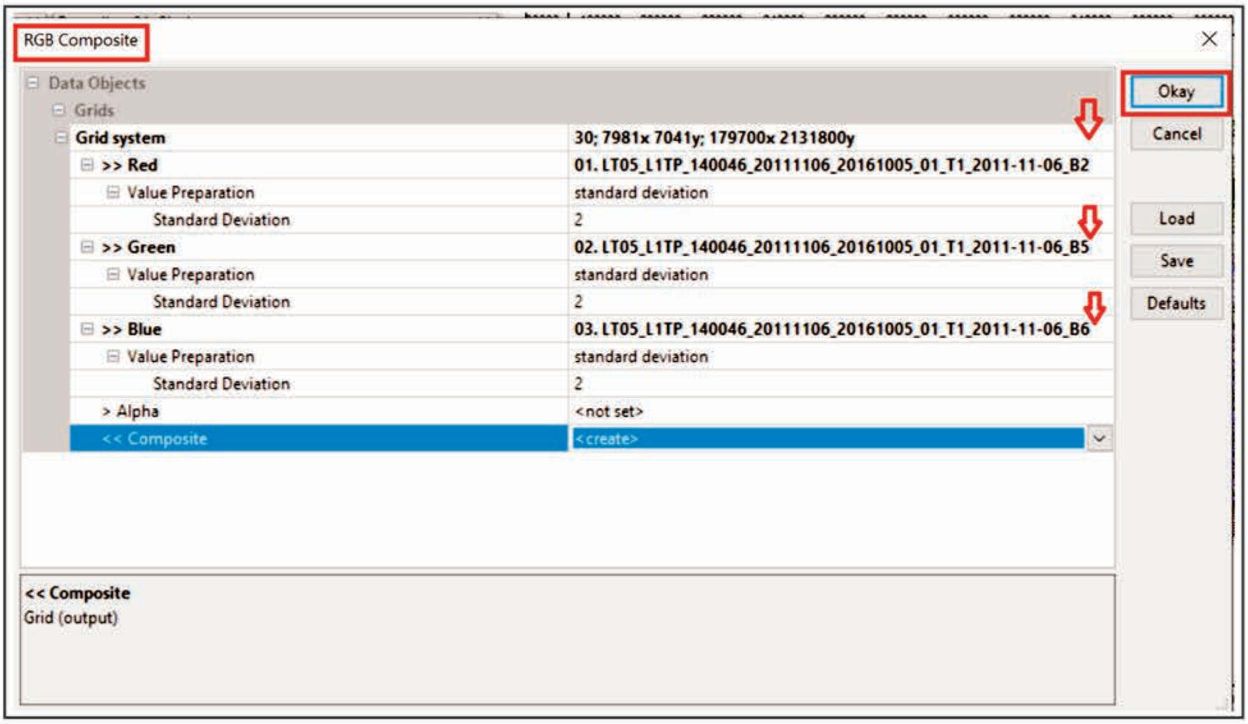
* A Cluster layer & ISODATA Cluster Statistics Table will appear in the left panel.



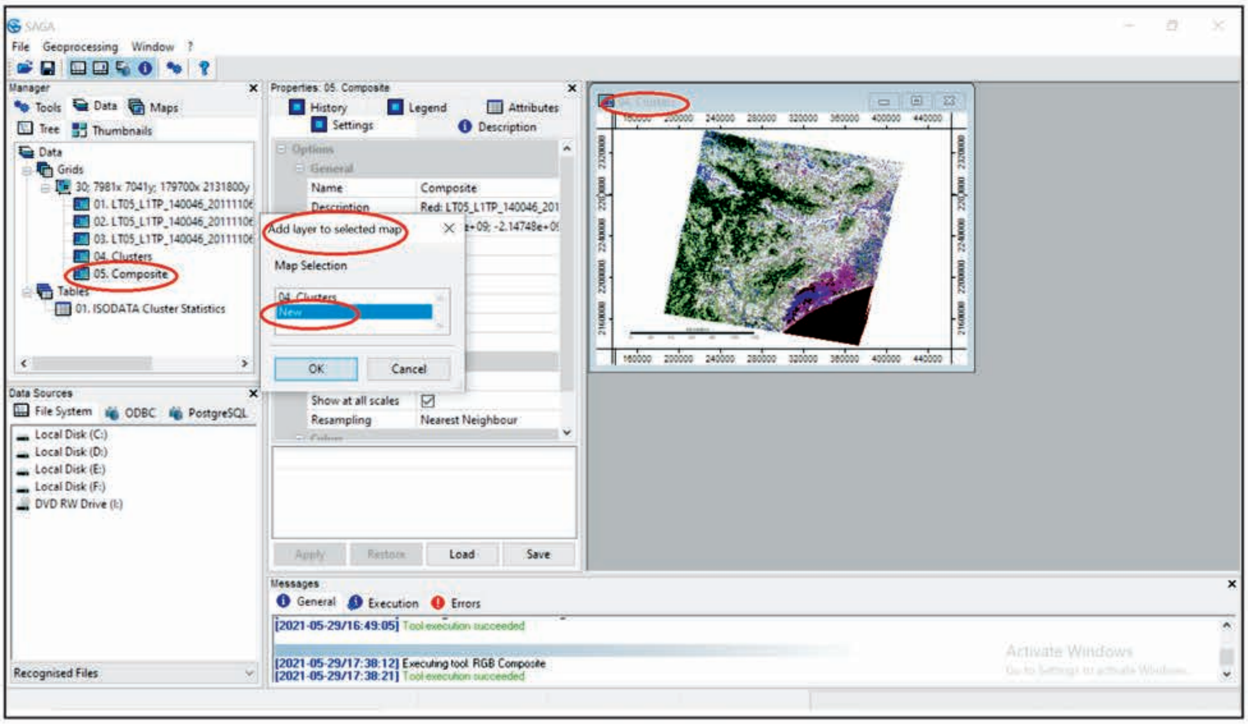
4. Make Composite layer :
Geoprocessing> Visualization> Grid> RGB Composite

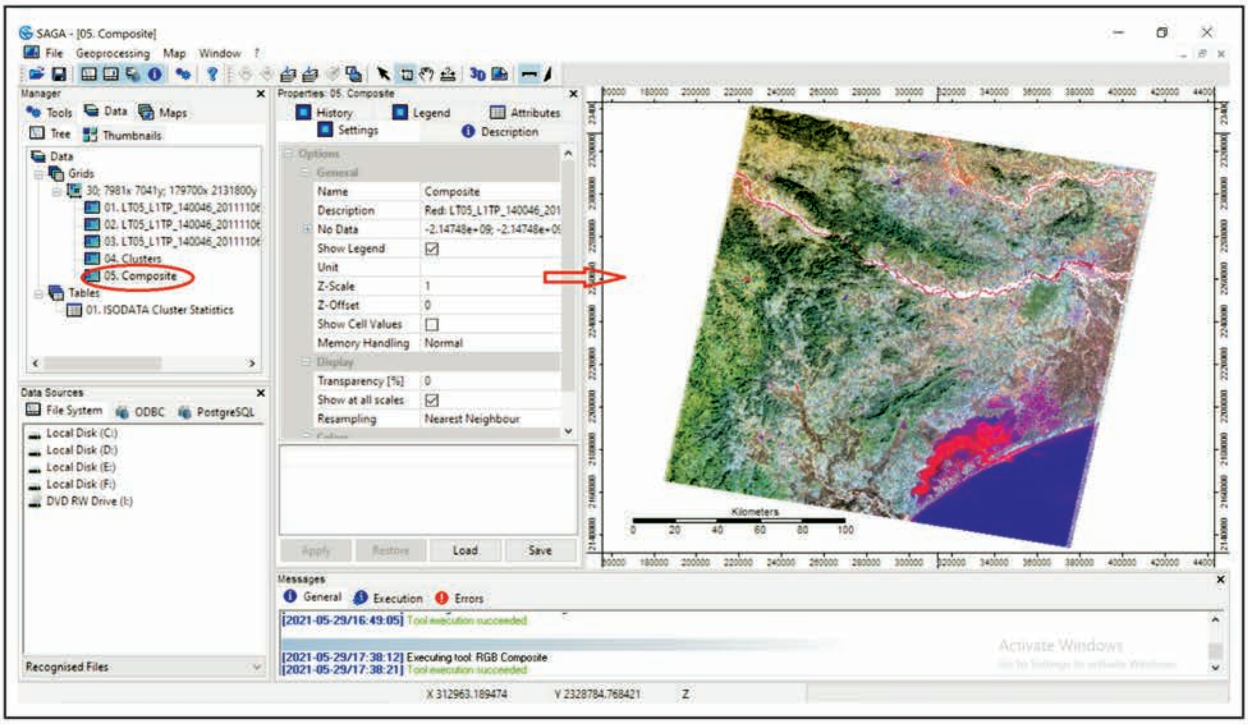


* Select the bands in RGB Composite. Press Okay.

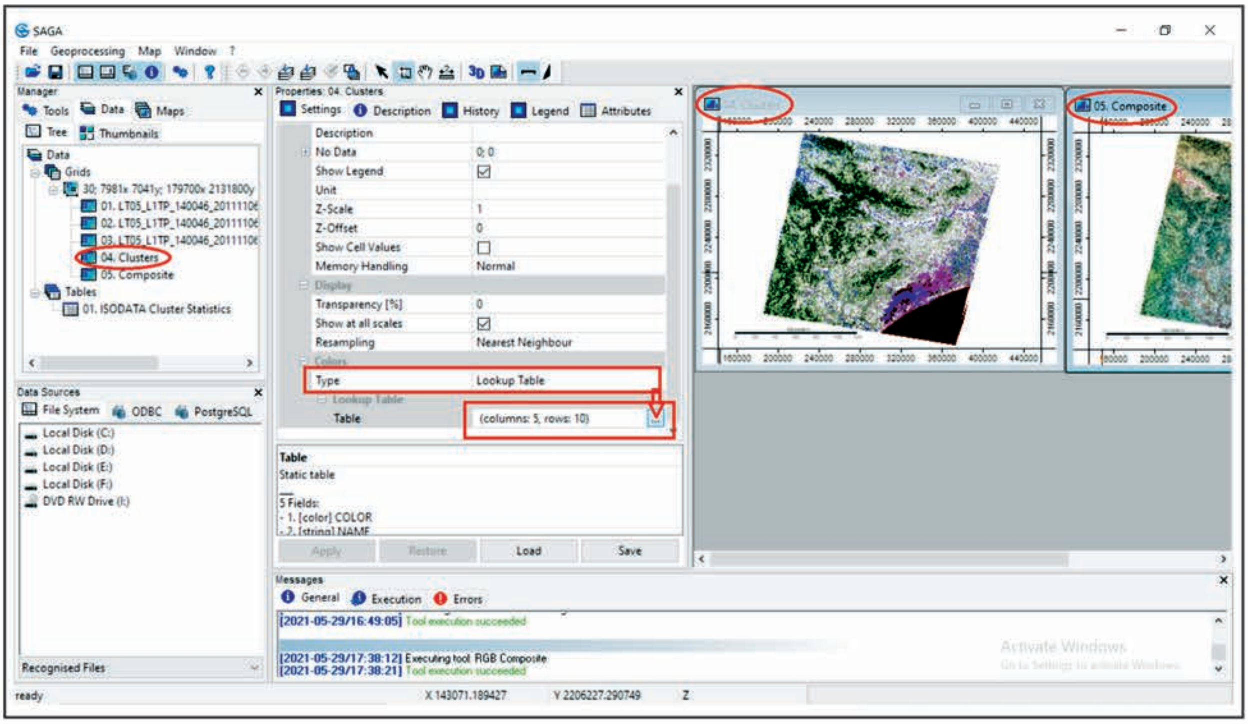


* The Composite layer will appear in the left panel.

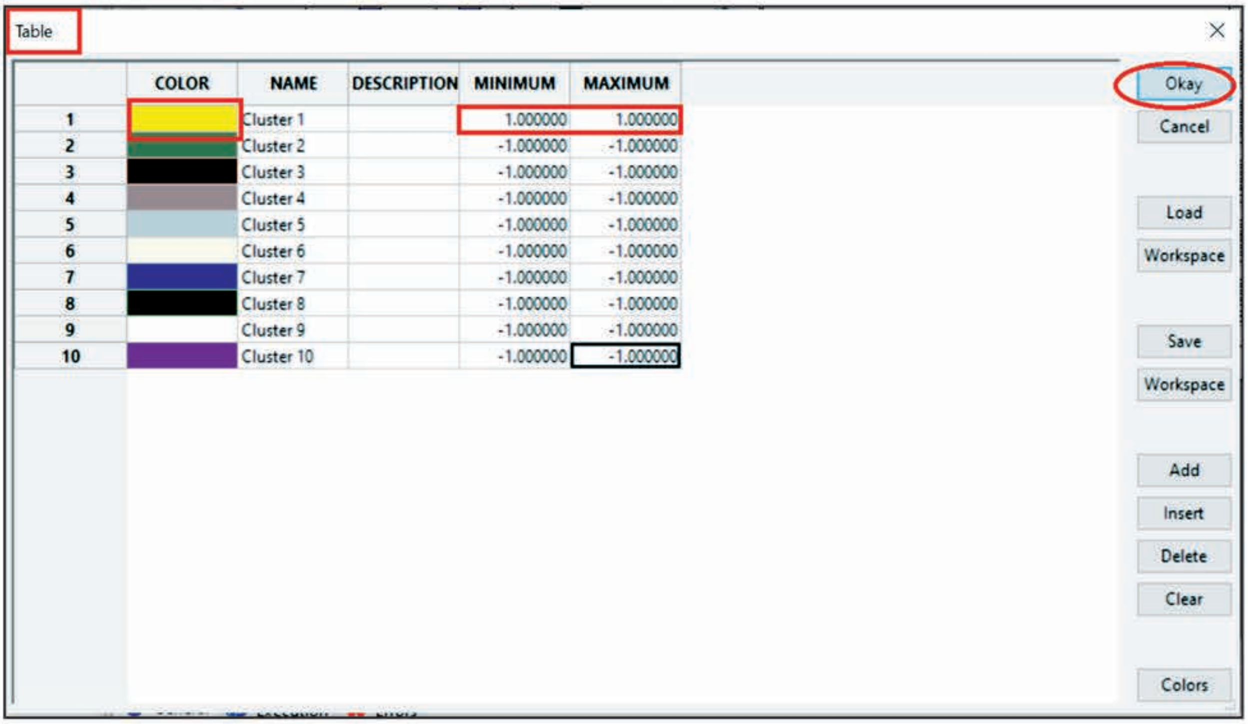




5. Right click the Clusters layer. In Properties, select the type as Lookup Table.

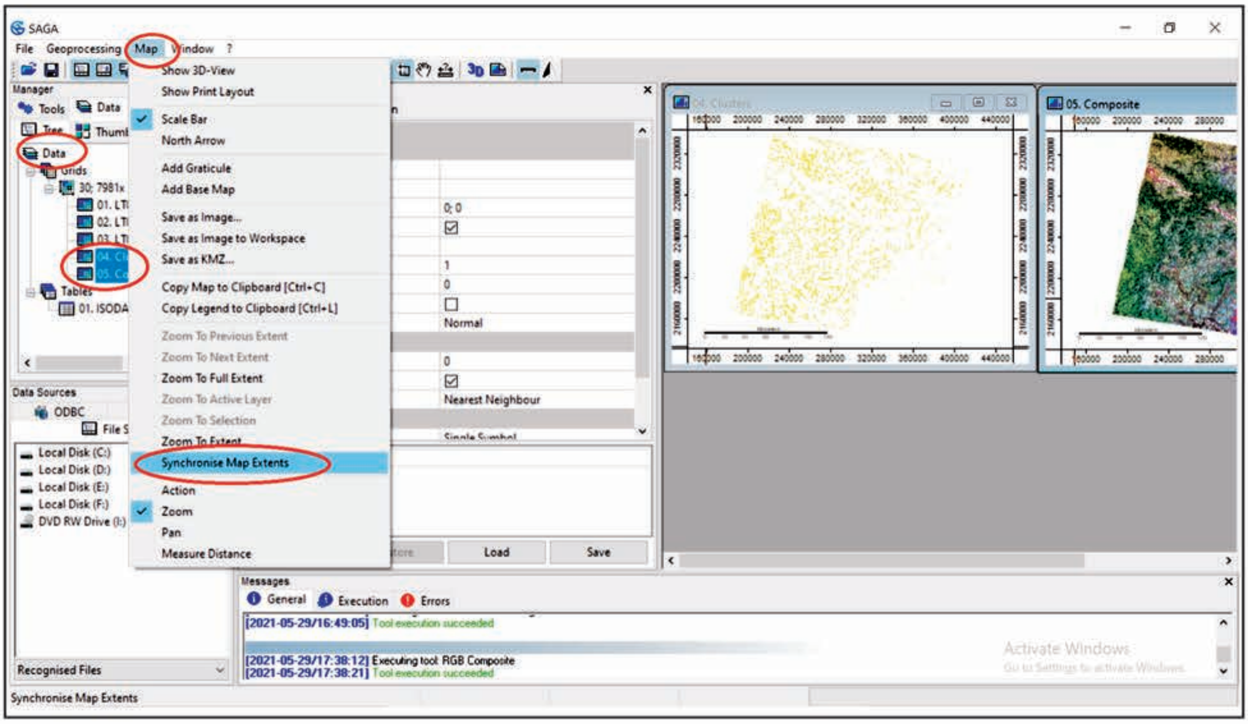


* In order to visualize the particular spectral class.
In Table, assign value "1" to the first cluster and "-1" to rest of the clusters, choose color and Press Okay>> apply>> start analyzing.

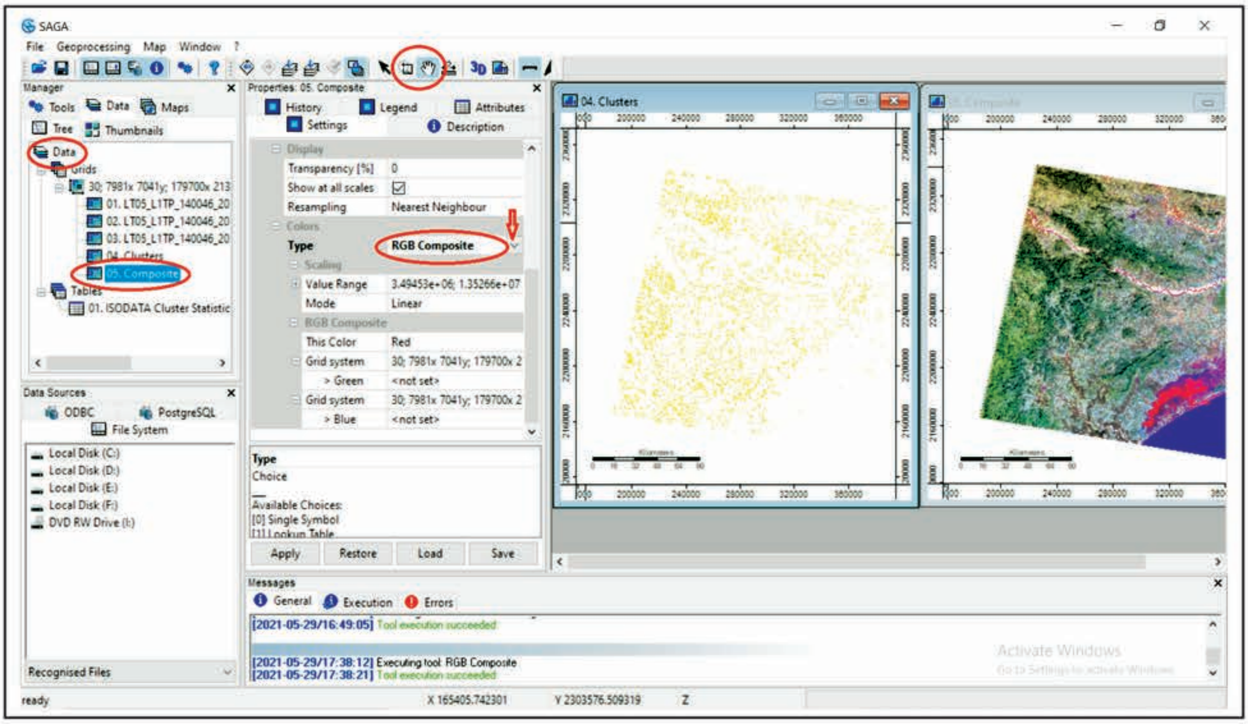


	COLOR	NAME	DESCRIPTION	MINIMUM	MAXIMUM
1		Cluster 1		1.000000	1.000000
2		Cluster 2		-1.000000	-1.000000
3		Cluster 3		-1.000000	-1.000000
4		Cluster 4		-1.000000	-1.000000
5		Cluster 5		-1.000000	-1.000000
6		Cluster 6		-1.000000	-1.000000
7		Cluster 7		-1.000000	-1.000000
8		Cluster 8		-1.000000	-1.000000
9		Cluster 9		-1.000000	-1.000000
10		Cluster 10		-1.000000	-1.000000

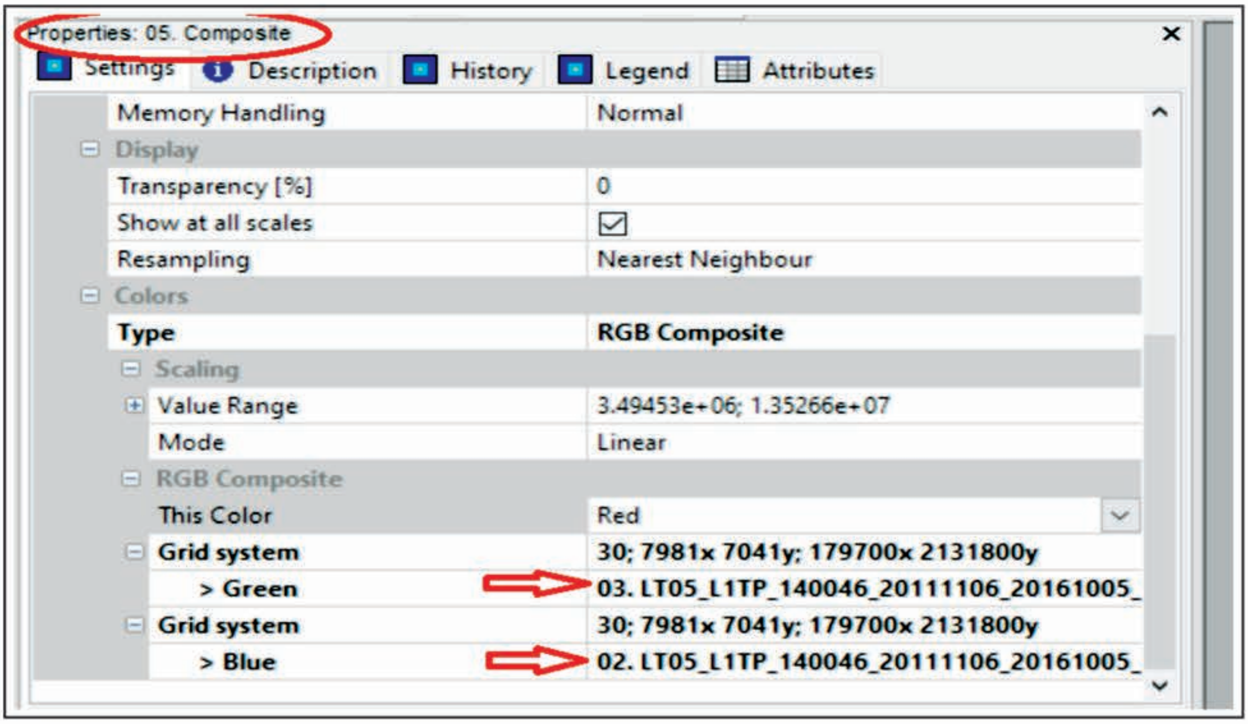
6. <u>Synchronisation of maps :</u> Select Cluster and Composite layers. Go to Map and click on Synchronise Map Extents.



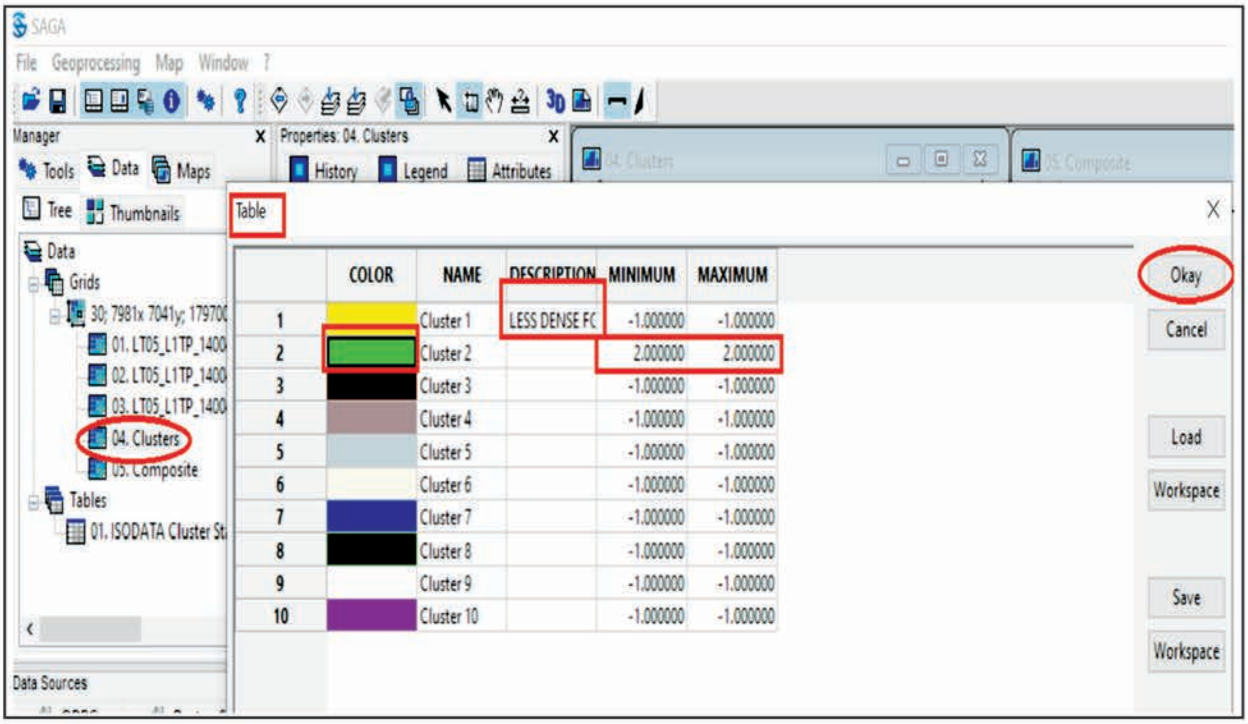
* Both the imageries will become synchronized. We can correlate the same features in two imageries and identify them.



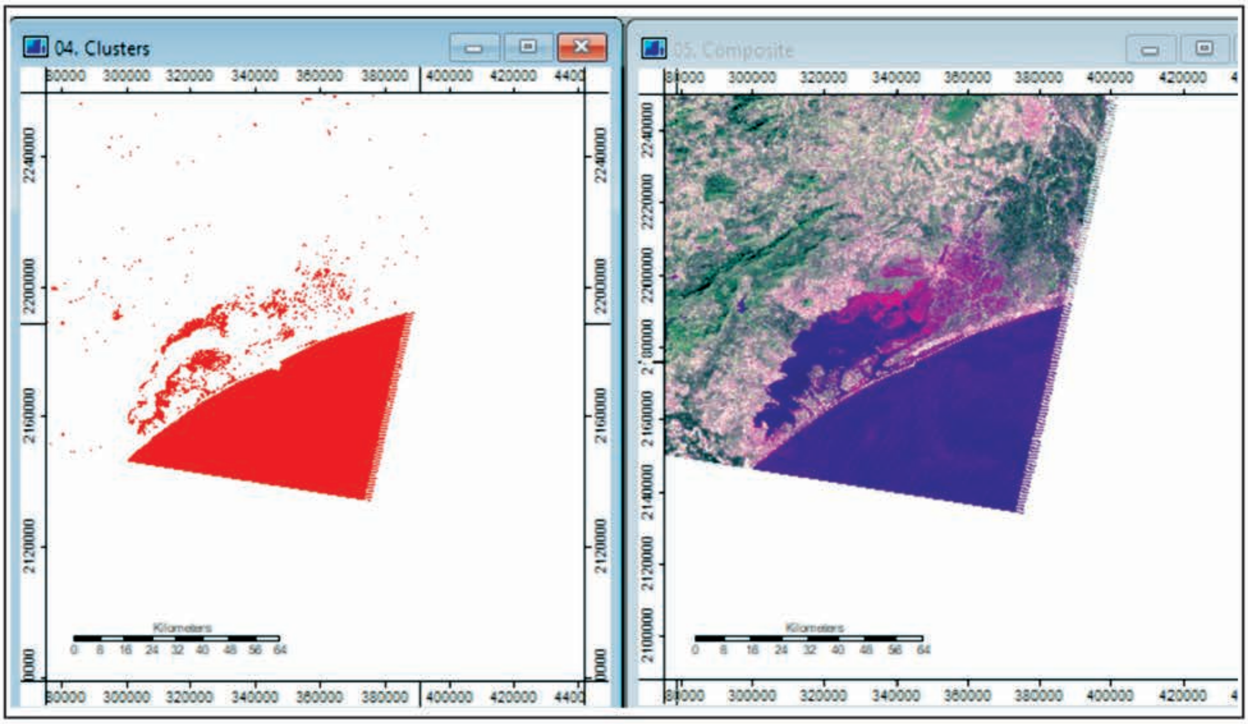
* Go to the Properties of Composite and select the bands as shown in the figure.

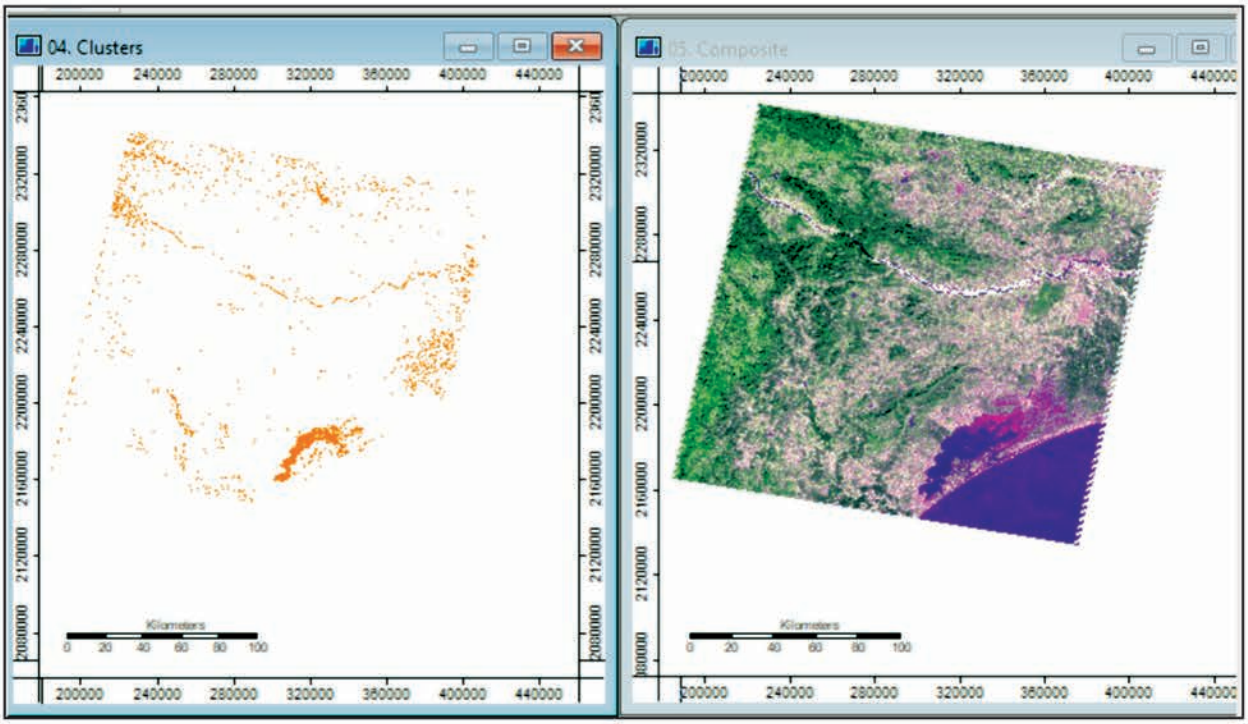


7. Write in Description about the Cluster as observed in imageries in the table. Select the 2nd cluster and assign it value "2" and rest remaining ones as "-1". Press Okay>> apply>> analyze the maps.

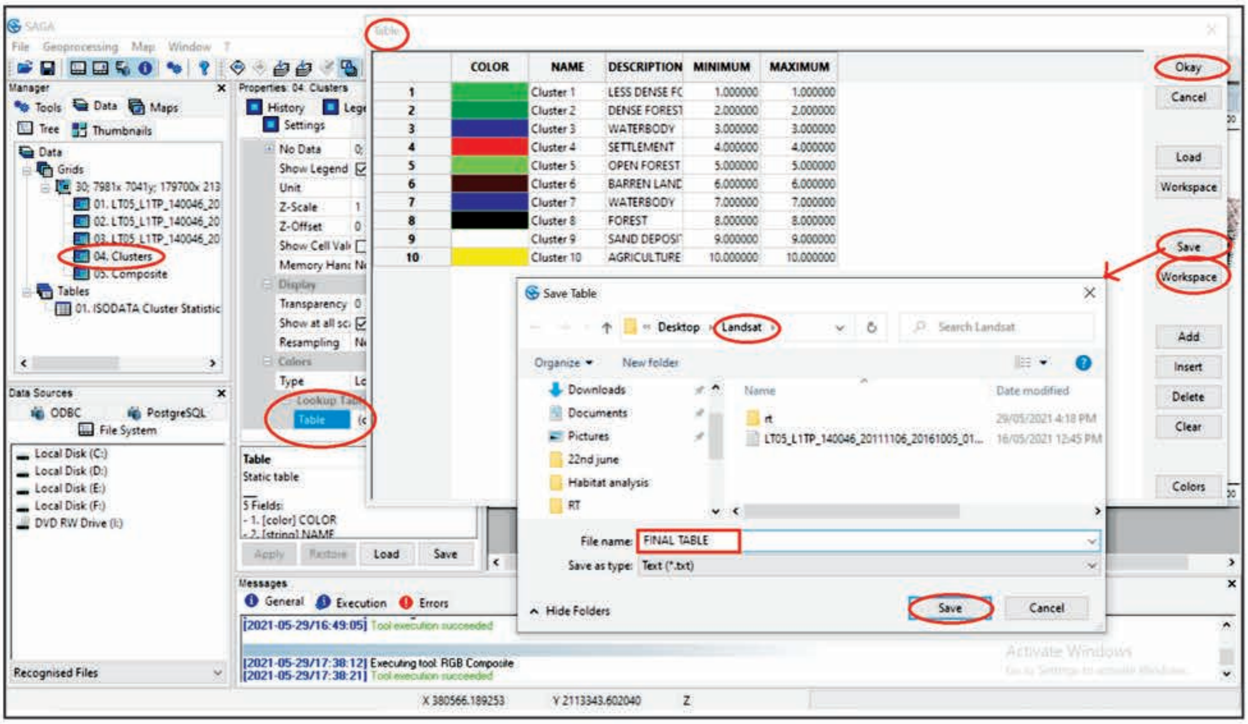


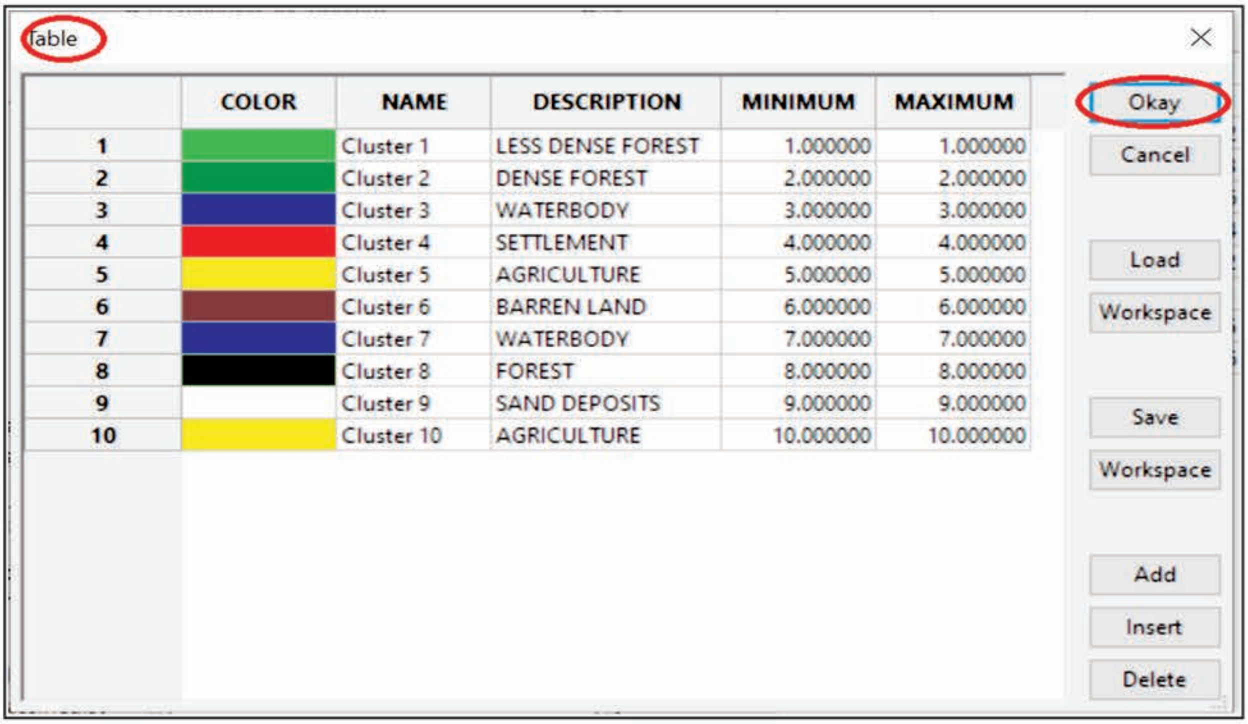
8. Repeat the steps and analyse other features/clusters. Name and tabulate them as shown in previous steps.





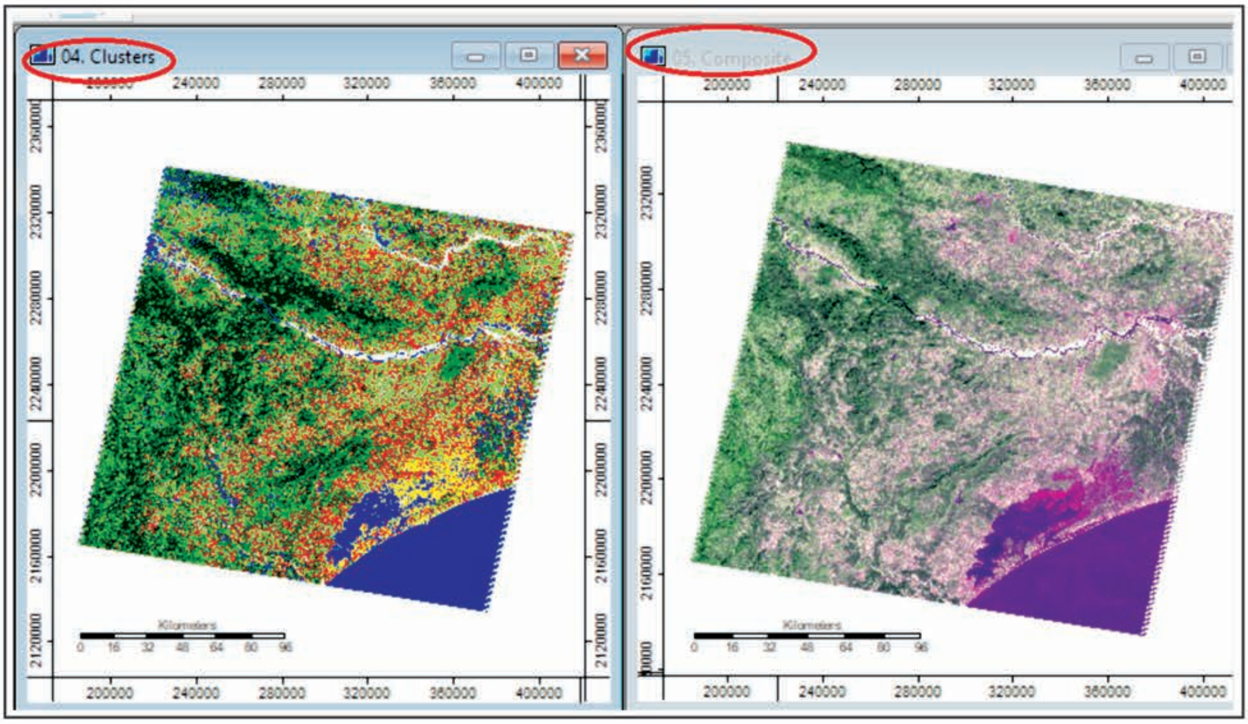
9. Save the Table as Final Table on working folder in desktop as well as on the Workspace.



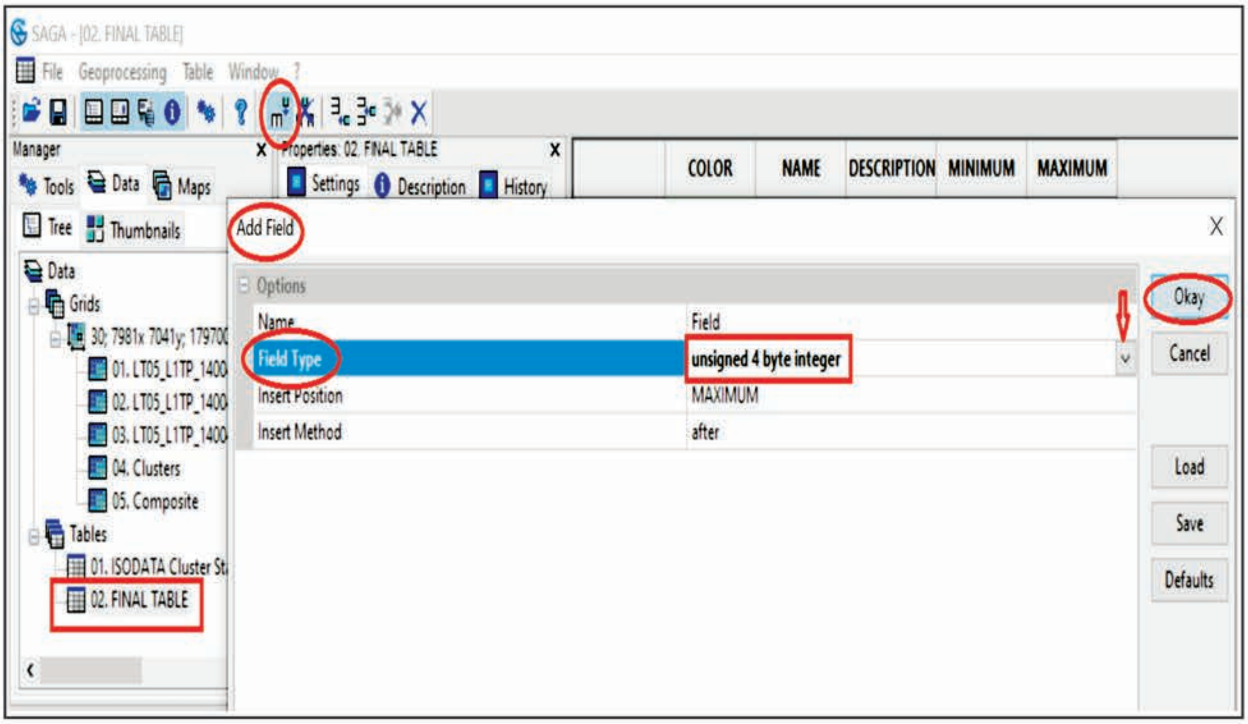


	COLOR	NAME	DESCRIPTION	MINIMUM	MAXIMUM
1		Cluster 1	LESS DENSE FOREST	1.000000	1.000000
2		Cluster 2	DENSE FOREST	2.000000	2.000000
3		Cluster 3	WATERBODY	3.000000	3.000000
4		Cluster 4	SETTLEMENT	4.000000	4.000000
5		Cluster 5	AGRICULTURE	5.000000	5.000000
6		Cluster 6	BARREN LAND	6.000000	6.000000
7		Cluster 7	WATERBODY	7.000000	7.000000
8		Cluster 8	FOREST	8.000000	8.000000
9		Cluster 9	SAND DEPOSITS	9.000000	9.000000
10		Cluster 10	AGRICULTURE	10.000000	10.000000

Final map will open with chosen colors representing clusters.



10. Select the Final Table. Select the Field Type as shown in the figure.



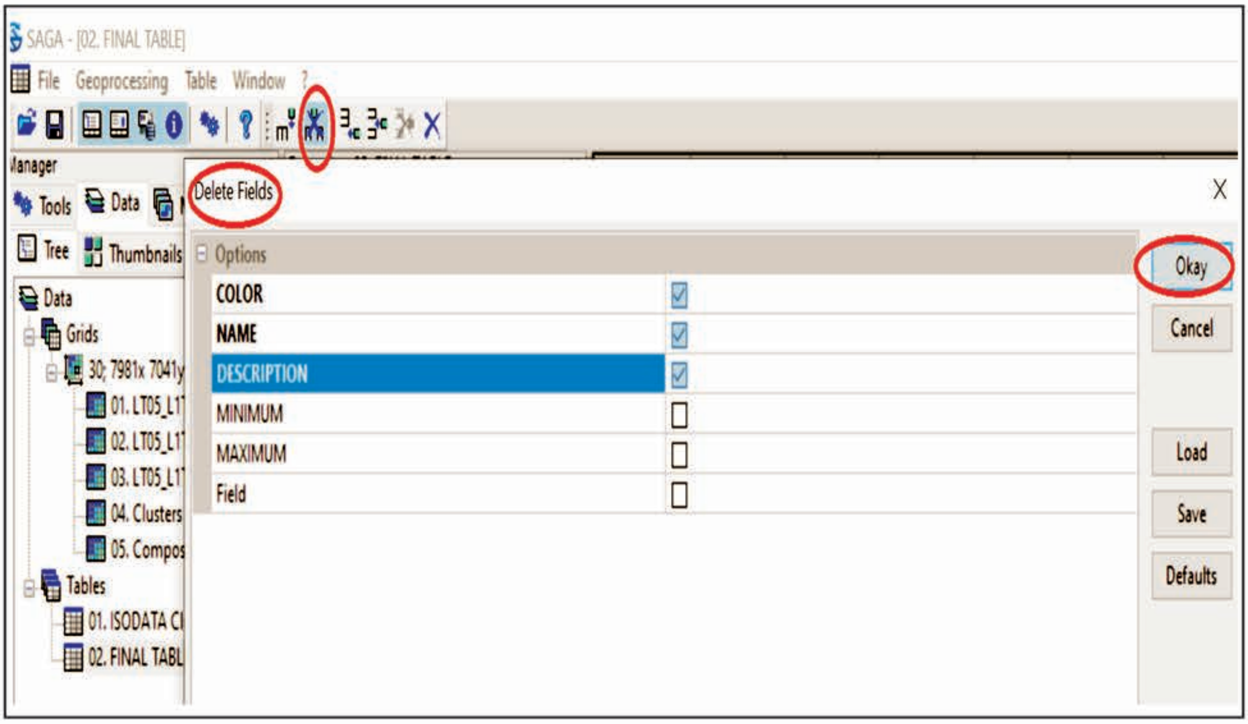
11. Make a Cluster Category Value Table and assign it to the following fields:

1	Forests
2	Water body
3	Settlements
4	Barren land
5	Sand deposits
6	Agricultural fields

	COLOR	NAME	DESCRIPTION	MINIMUM	MAXIMUM	Field
1		Cluster 1	LESS DENSE FC	1.000000	1.000000	1
2		Cluster 2	DENSE FOREST	2.000000	2.000000	1
3		Cluster 3	WATERBODY	3.000000	3.000000	2
4		Cluster 4	SETTLEMENT	4.000000	4.000000	3
5		Cluster 5	OPEN FOREST	5.000000	5.000000	1
6		Cluster 6	BARREN LAND	6.000000	6.000000	4
7		Cluster 7	WATERBODY	7.000000	7.000000	2
8		Cluster 8	FOREST	8.000000	8.000000	1
9		Cluster 9	SAND DEPOSIT	9.000000	9.000000	5
10		Cluster 10	AGRICULTURE	10.000000	10.000000	6

* Description can be changed as per the analysis of map.

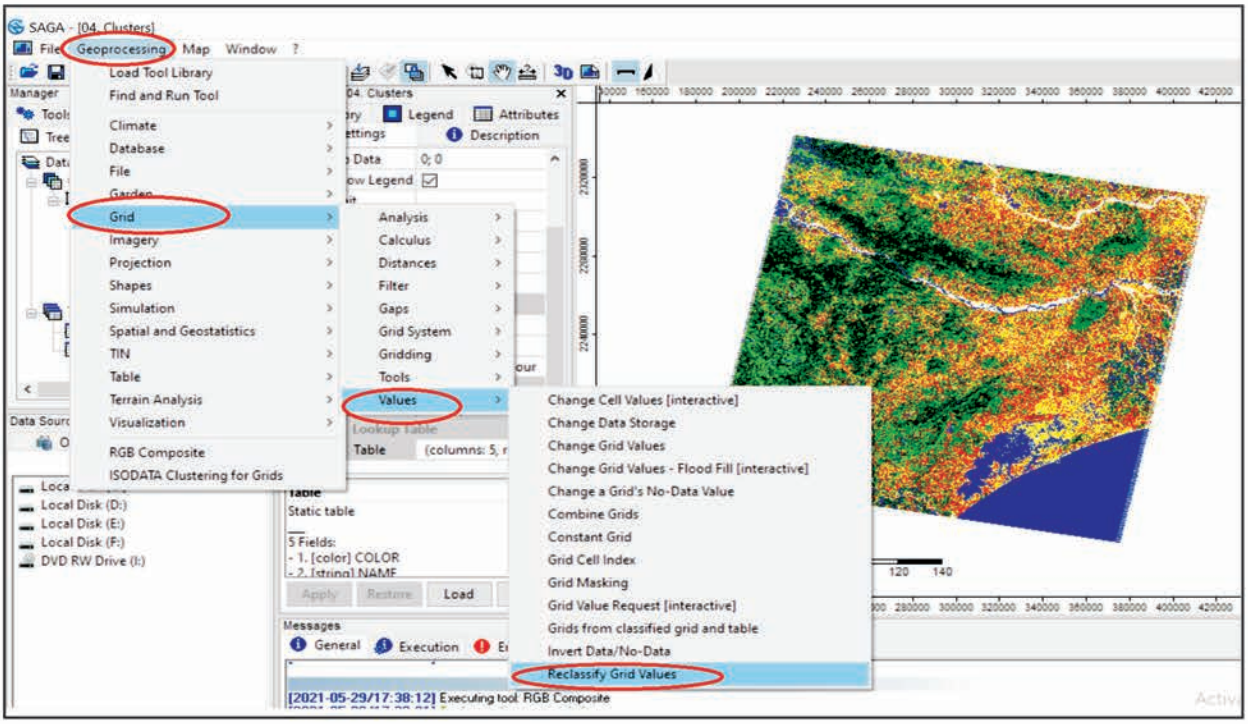
12. Final Table> Delete Fields> Okay.



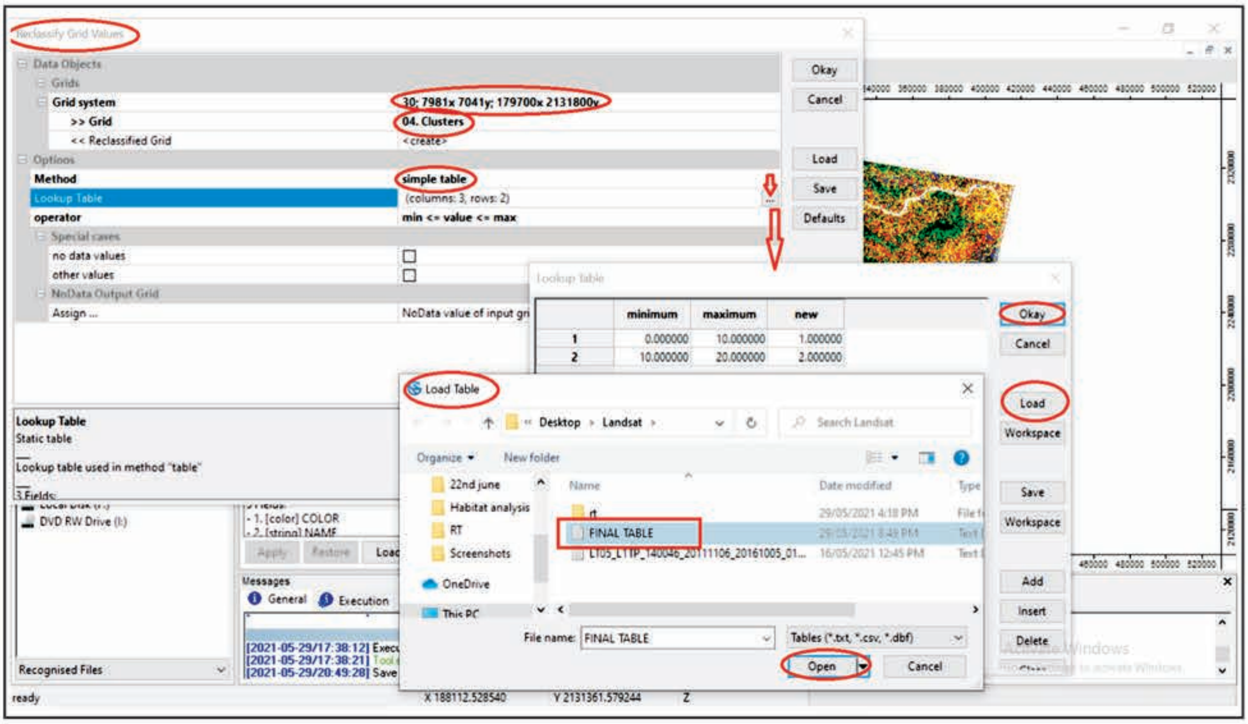
* After deleting the fields, the Final Table will look like this.

	MINIMUM	MAXIMUM	Field
1	1.000000	1.000000	1
2	2.000000	2.000000	1
3	3.000000	3.000000	2
4	4.000000	4.000000	3
5	5.000000	5.000000	6
6	6.000000	6.000000	4
7	7.000000	7.000000	2
8	8.000000	8.000000	1
9	9.000000	9.000000	5
10	10.000000	10.000000	6

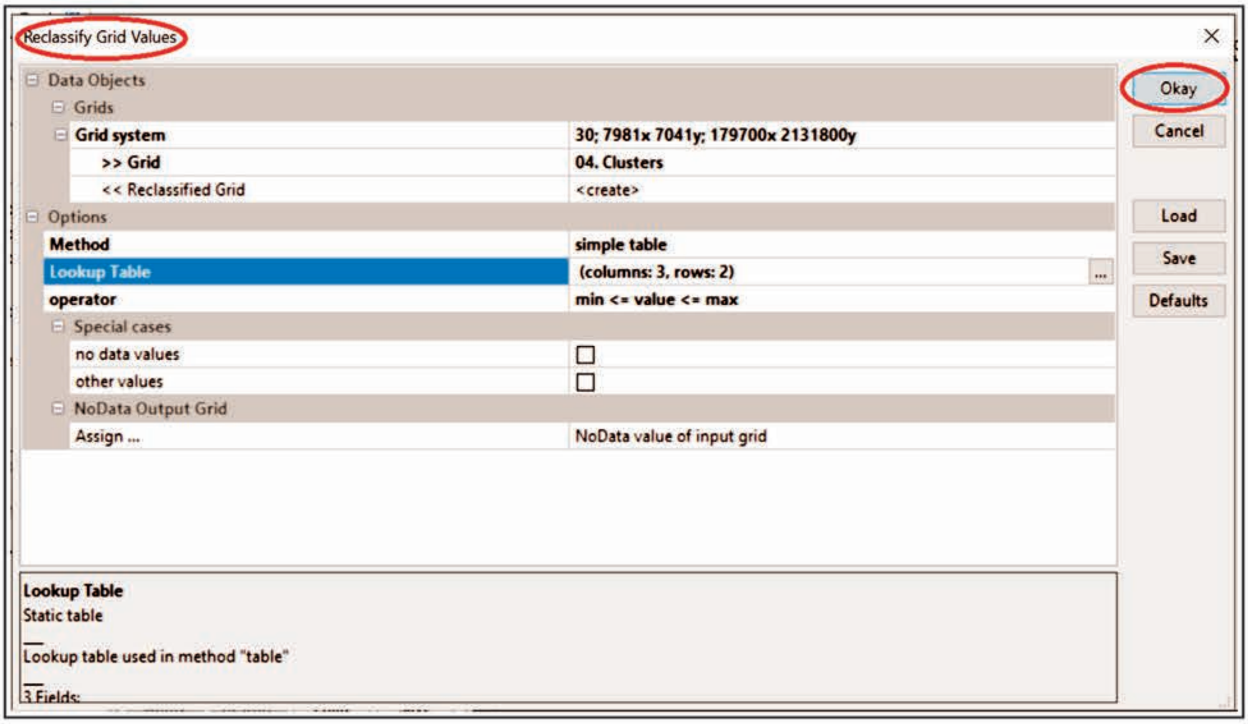
13. Reclassification: Geoprocessing> Grid> Values> Reclassify Grid Values.



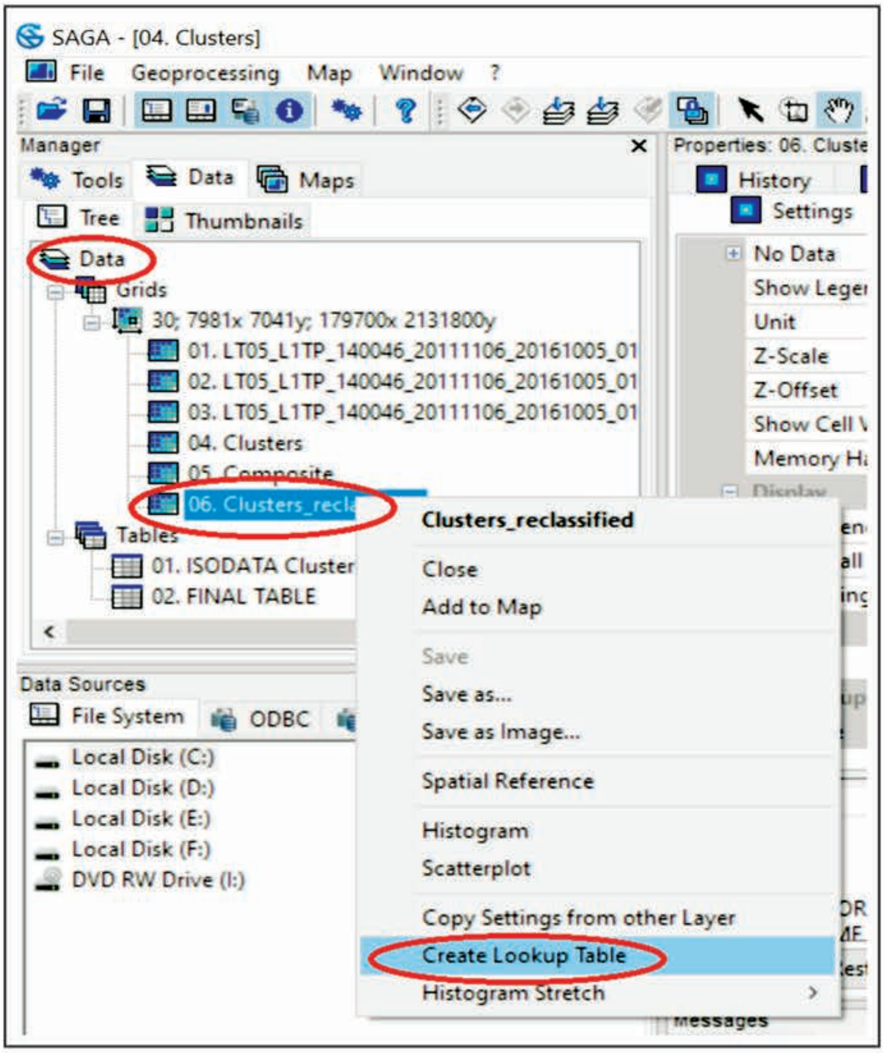
* Select the fields as shown in the figure.
Lookup table> Browse> Lookup Table> Load> Final table> Open> Okay.



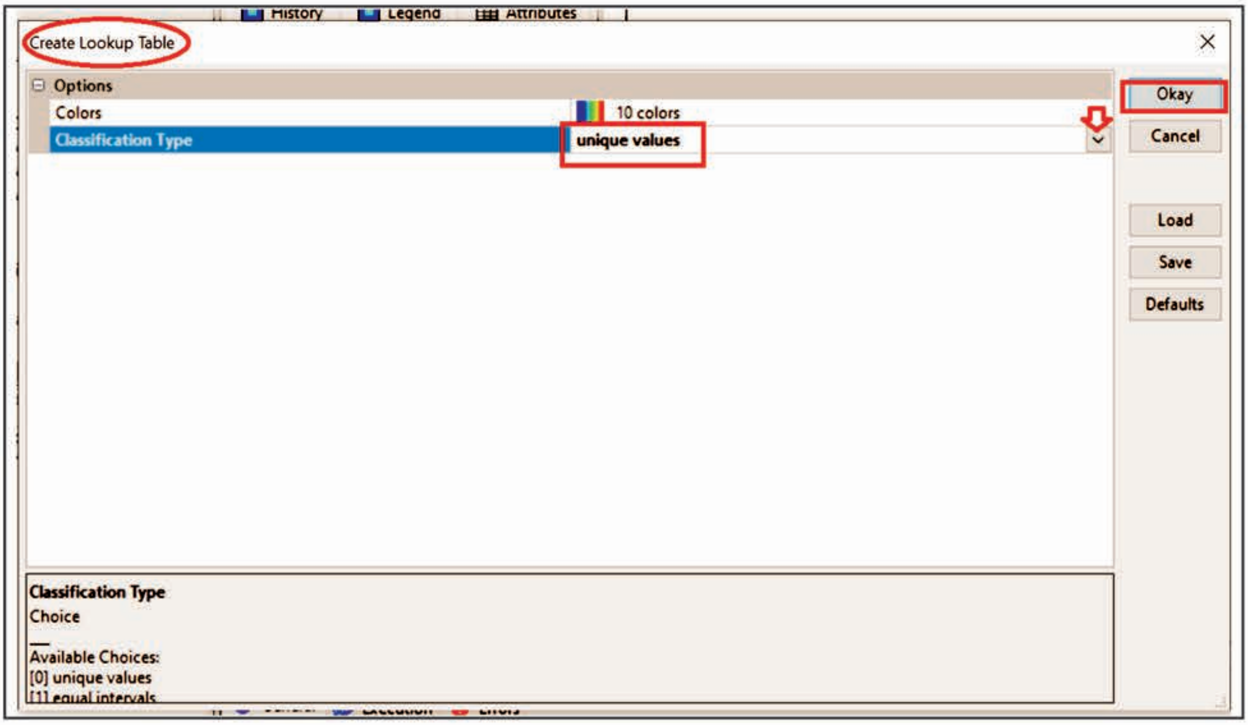
Select the features as shown in the figure. Press Okay.



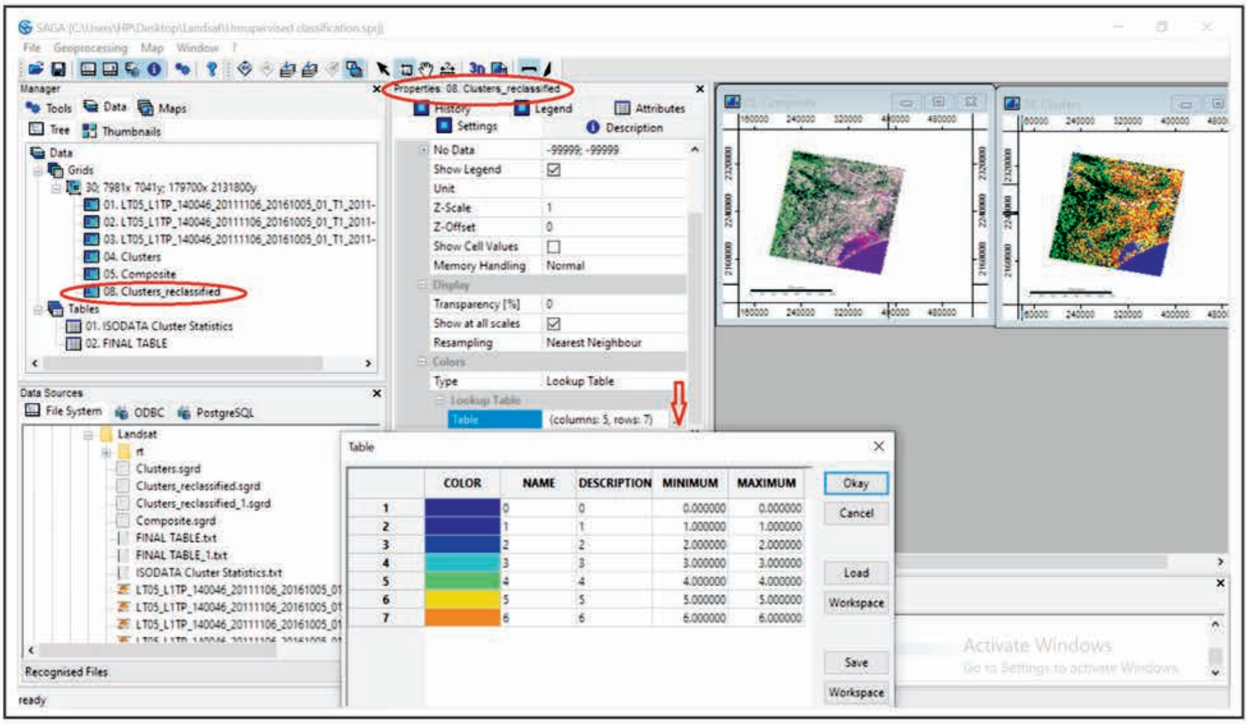
14. A Clusters reclassified layer will be added in left panel. Right click on it and select Create Lookup Table.



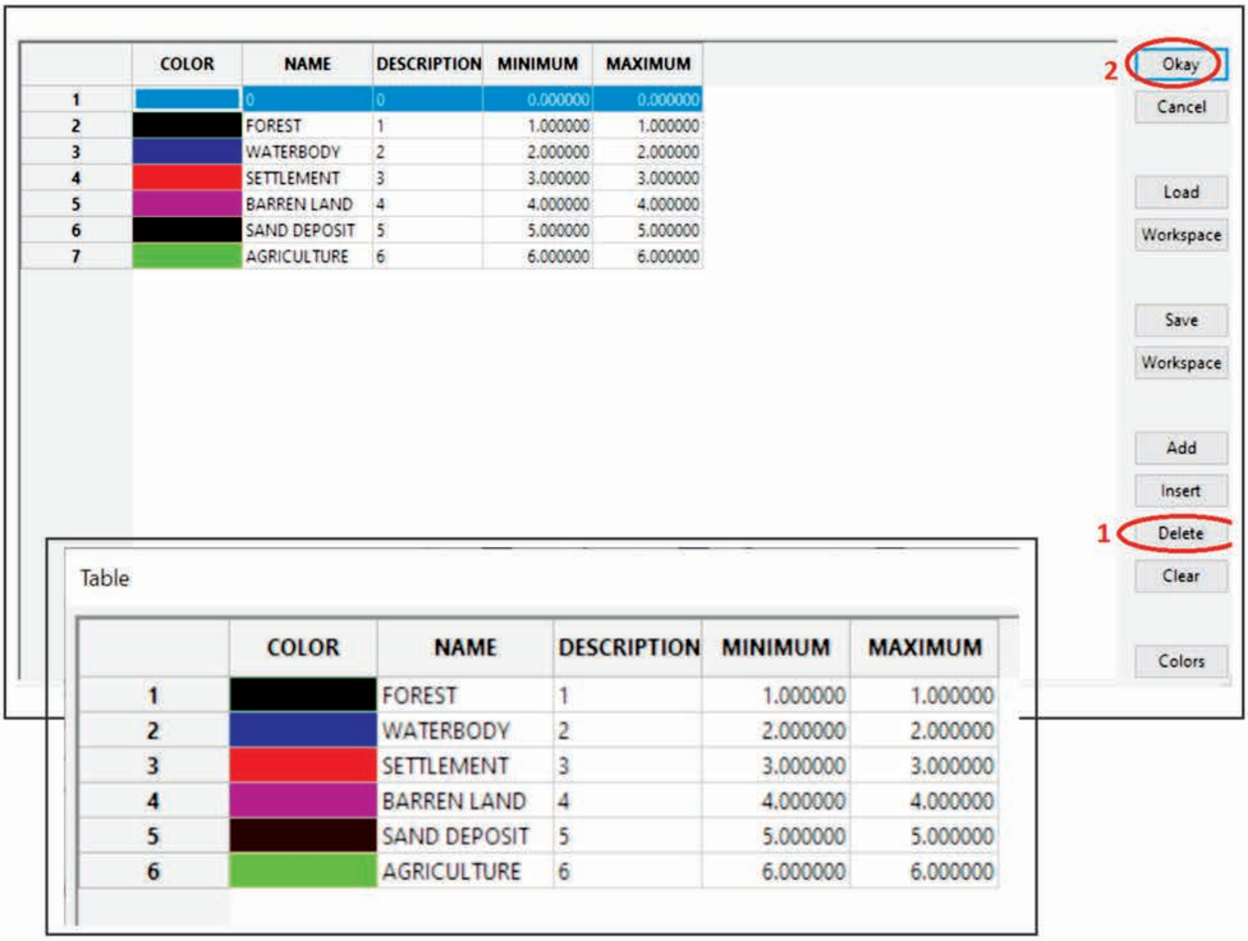
15. In Create Lookup Table, select the Classification Type a Unique Values. Press Okay.



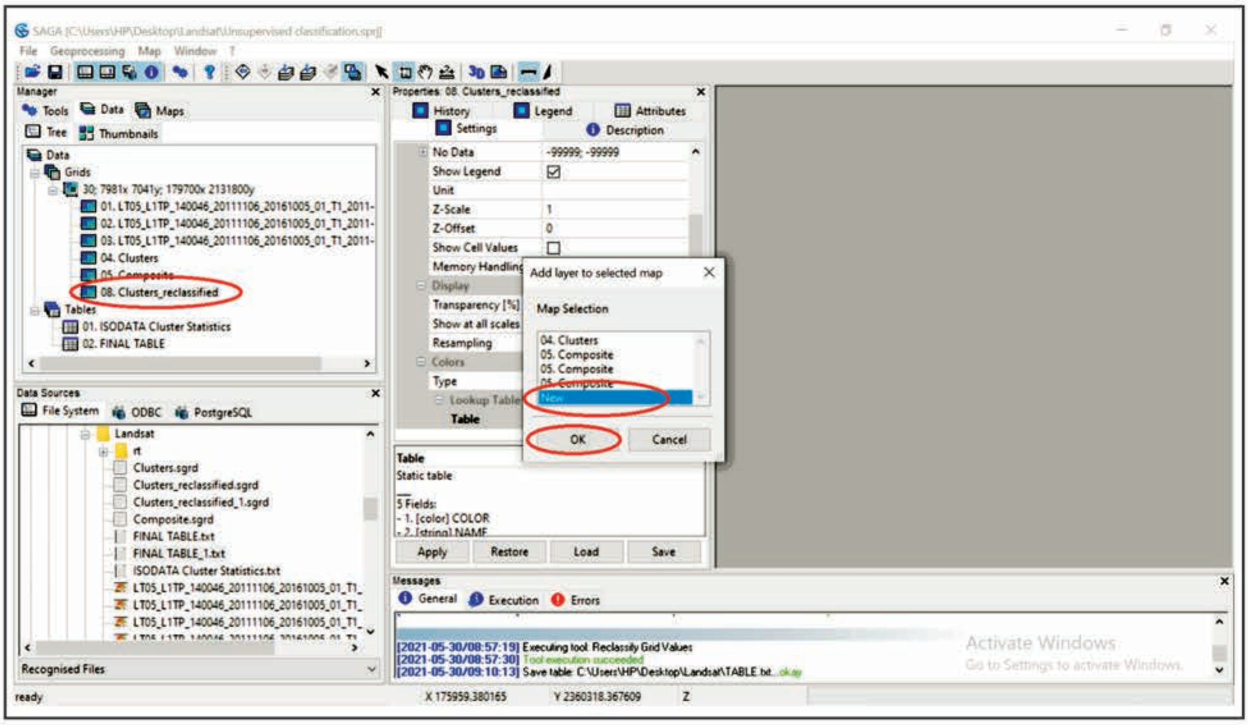
* Go to the properties of Clusters reclassified layer and select the features as shown in the figure.



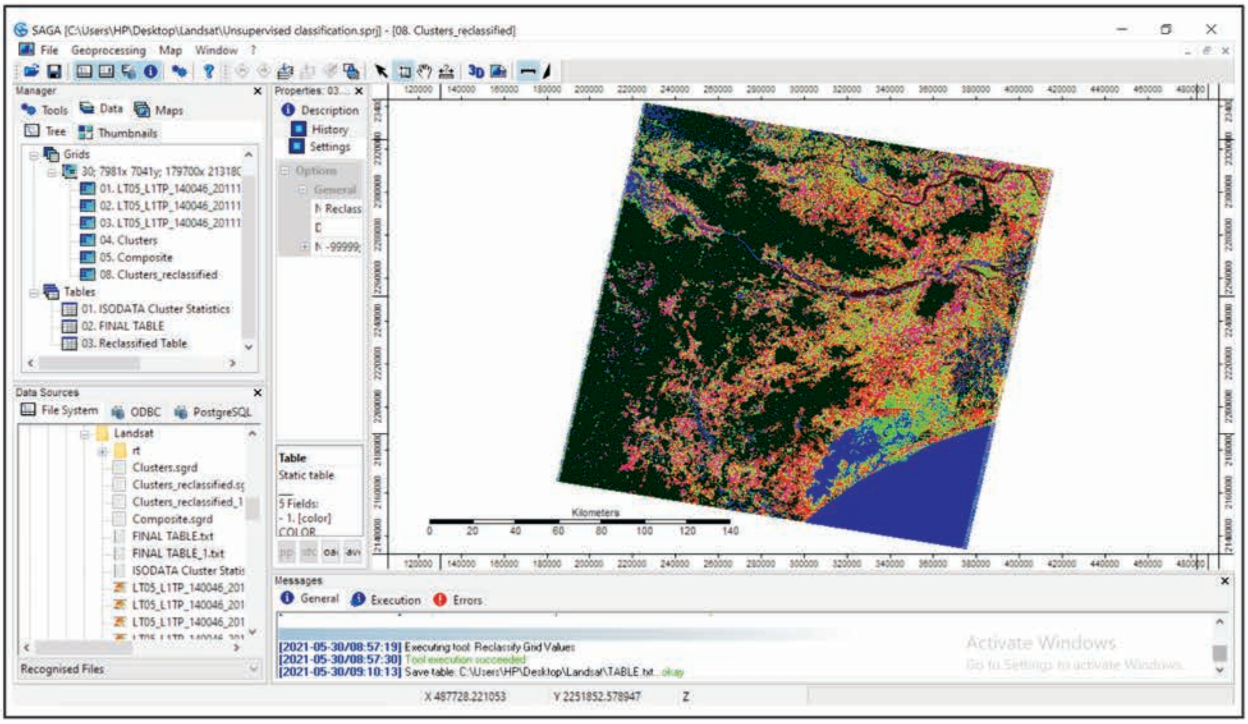
* Change the colors of the Clusters, name them as per Cluster Category Value Table. Delete the "0th" row. Press Okay.

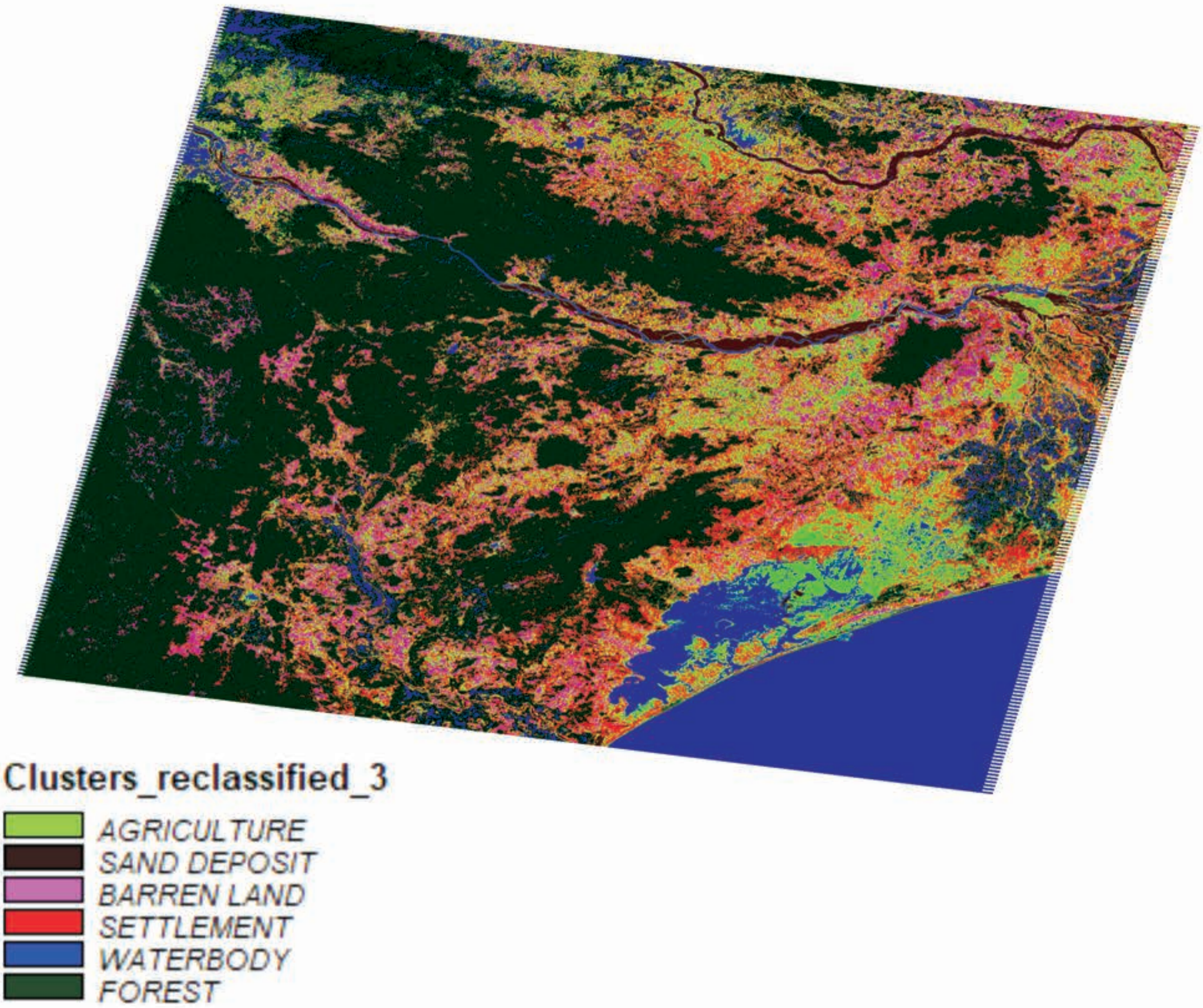


16. Select Cluster reclassified layer. A new Pop-up window "Add Layer to selected Map" will open>> Map Selection>> New>>OK.



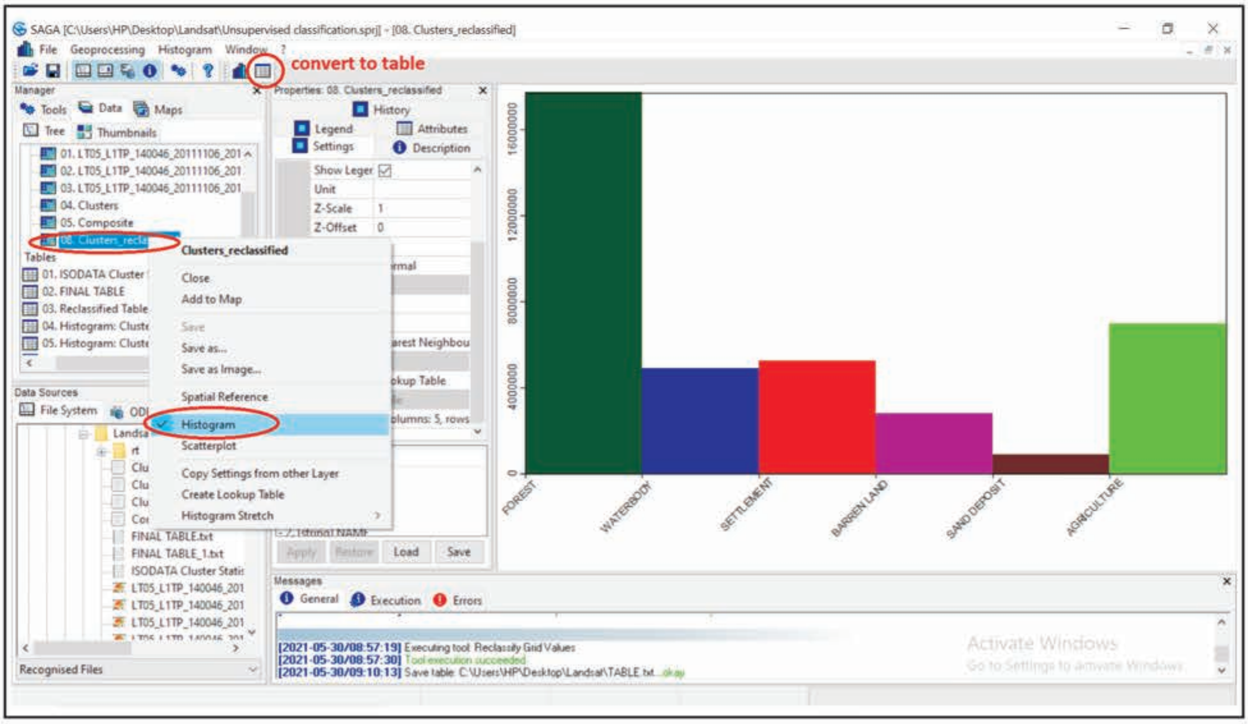
* The map will appear like this. Cluster reclassified layer >>Right click >> Save image.





17. Right click on Cluster reclassify layer>> Histogram.

A histogram will be generated.

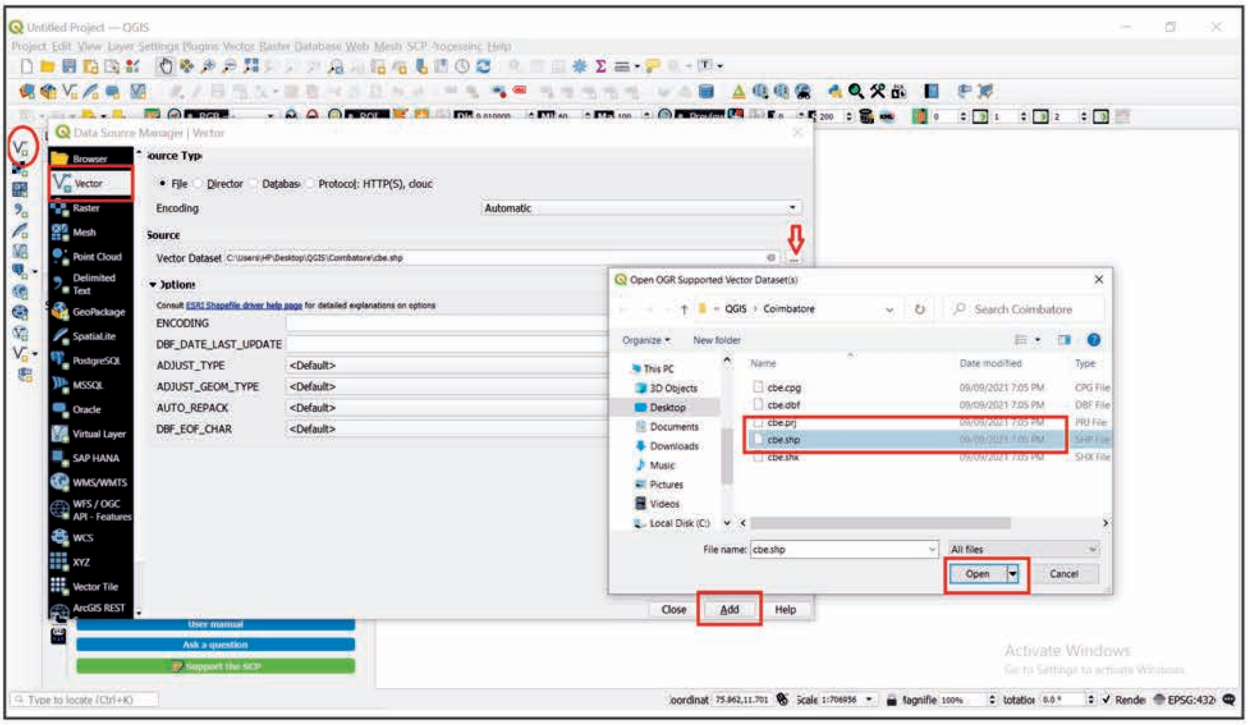


18. Click on Convert to Table. Final table with Area (In Square meter) for each category of land use will be generated.

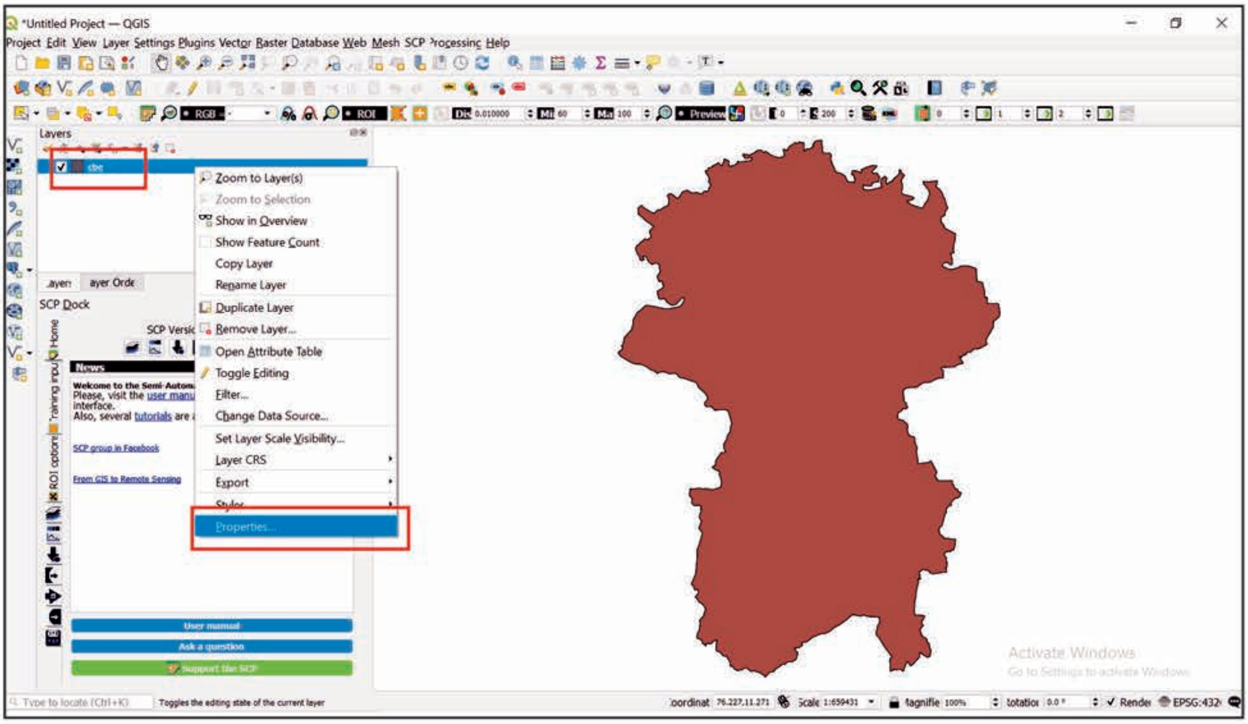
	CLASS	AREA	COUNT	CUMUL	NAME	MIN	CENTER	MAX
1	1	15940615500.000000	17711795	17711795	FOREST	1.000000	1.000000	1.000000
2	2	4403163600.000000	4892404	22604199	WATERBODY	2.000000	2.000000	2.000000
3	3	4736611800.000000	5262902	27867101	SETTLEMENT	3.000000	3.000000	3.000000
4	4	2534842800.000000	2816492	30683593	BARREN LAND	4.000000	4.000000	4.000000
5	5	812216700.000000	902463	31586056	SAND DEPOSIT	5.000000	5.000000	5.000000
6	6	6294058200.000000	6993398	38579454	AGRICULTURE	6.000000	6.000000	6.000000

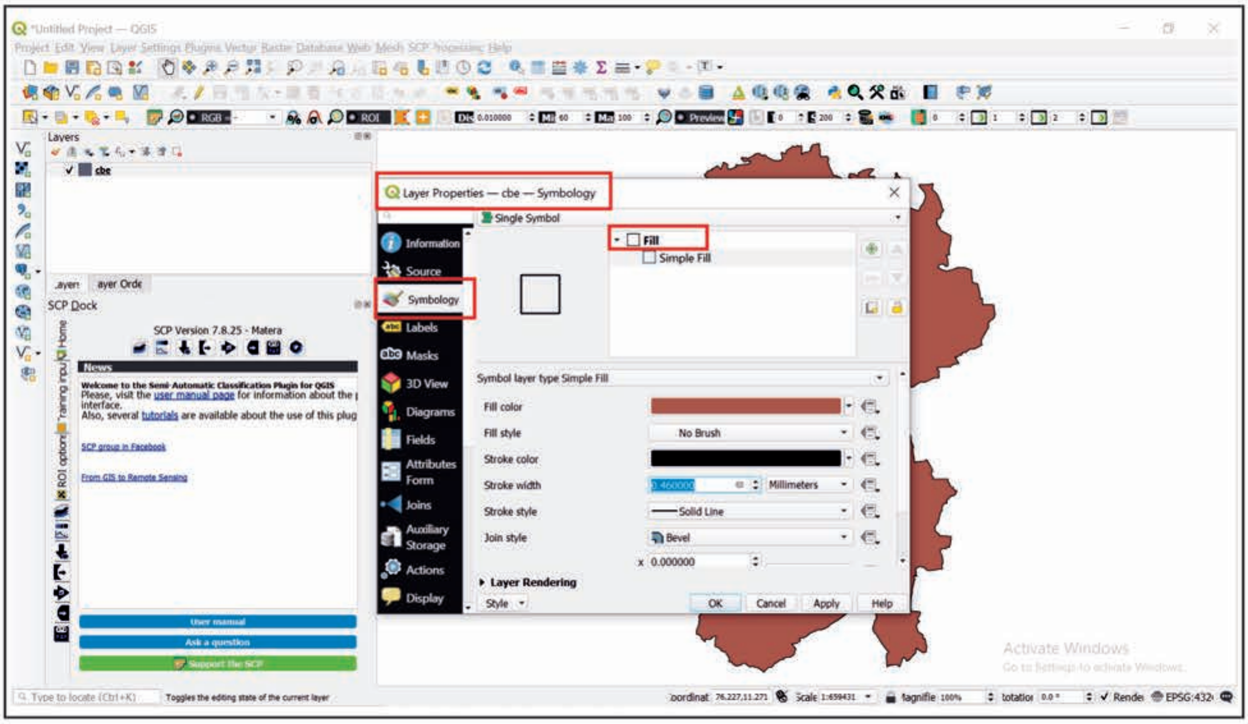
15. Creation of Grid in QGIS

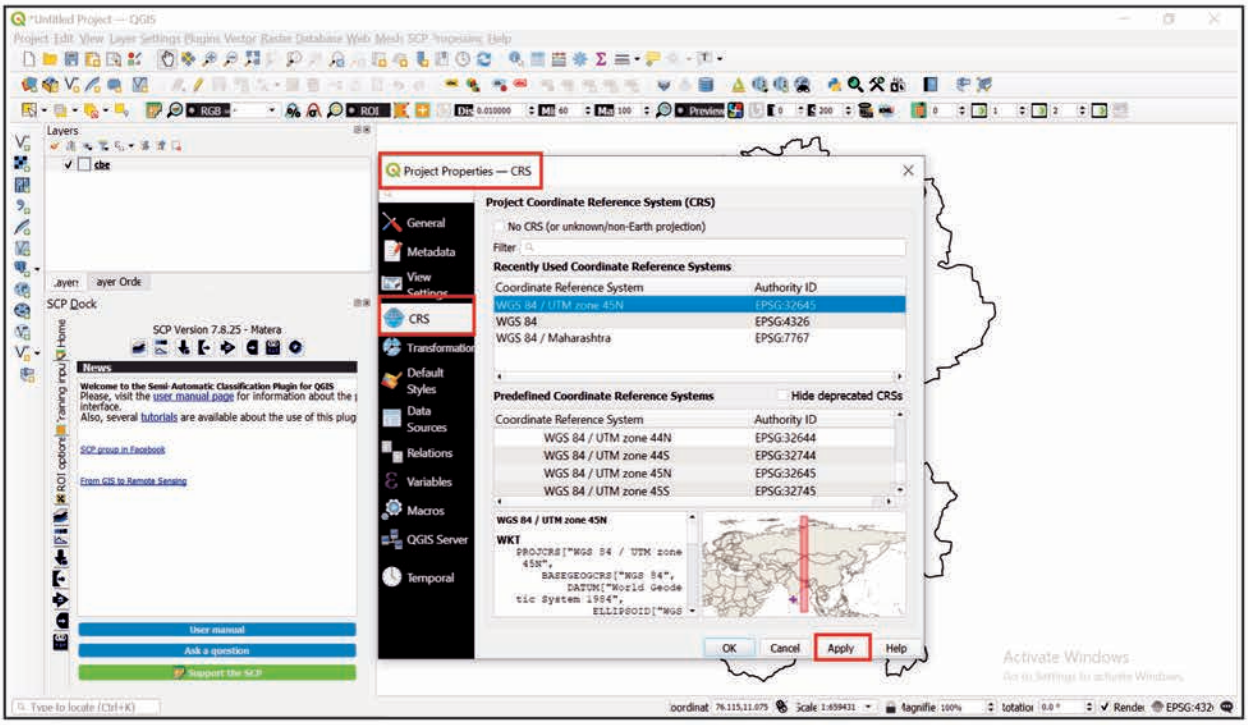
Step-1: Add shape file of the Coimbatore district.

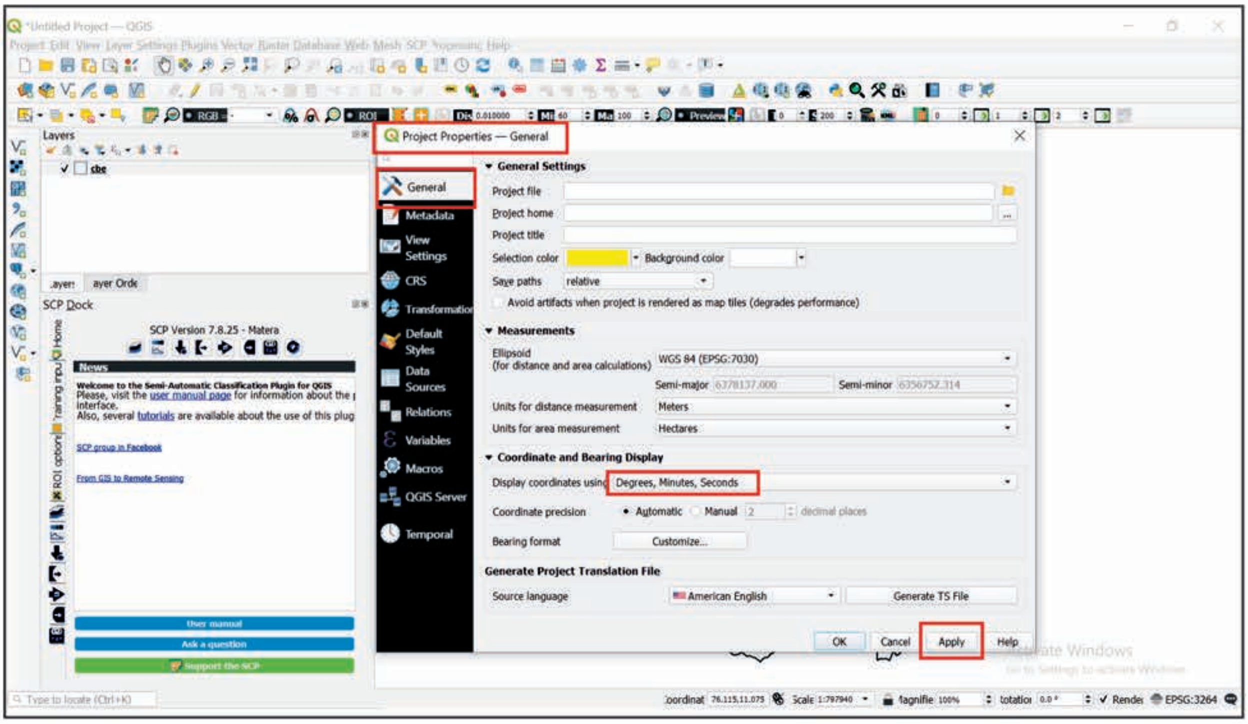


Step-2: Open Properties>> Change Symbology>>CRS (WGS 84 UTM Zone 45) >>General (Select Degree Minute Second)>> Apply Ok

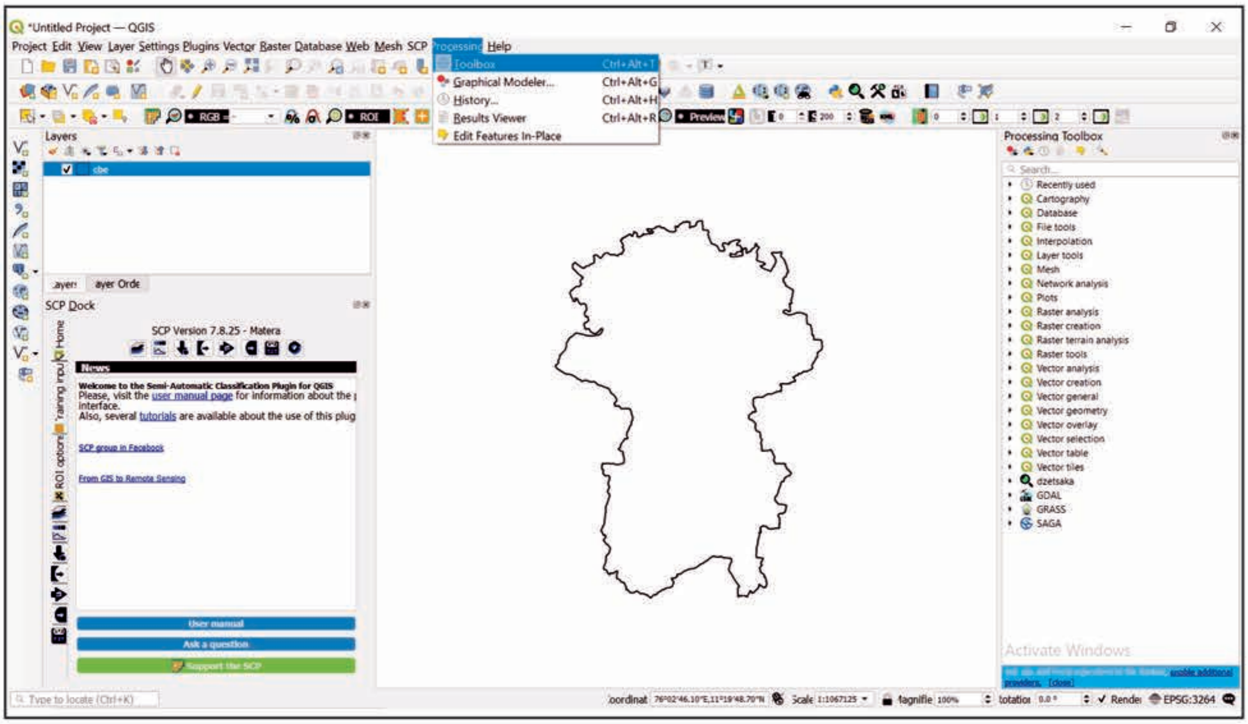


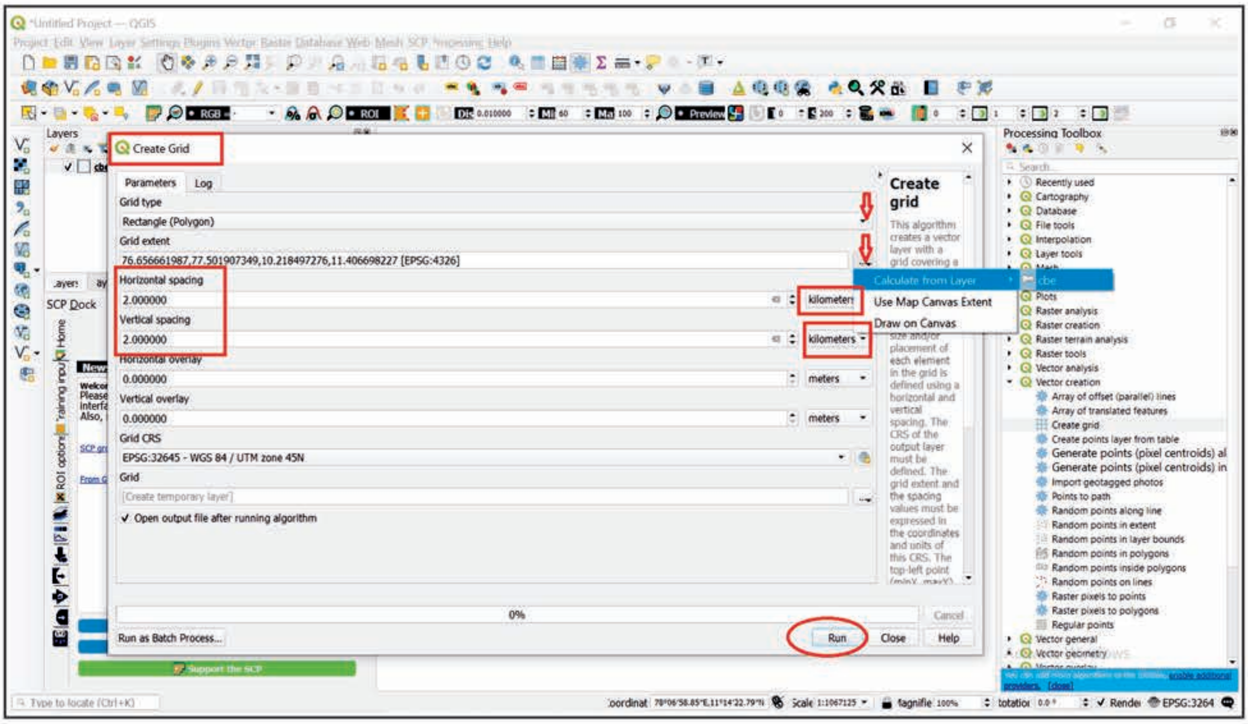

Layer Properties — cbe — Symbology
Single Symbol
Fill
Simple Fill
Information
Source
Symbology
Labels
Masks
3D View
Diagrams
Fields
Attributes Form
Joins
Auxiliary Storage
Actions
Display
Symbol layer type Simple Fill
Fill color
Fill style
No Brush
Stroke color
Stroke width
Millimeters
Stroke style
Solid Line
Join style
Bevel
Layer Rendering
Style
OK
Cancel
Apply
Help
SCP Dock
SCP Version 7.8.25 - Matera
News
User manual
Ask a question
Support the SCP


Project Properties — CRS
Project Coordinate Reference System (CRS)
No CRS (or unknown/non-Earth projection)
Filter
Recently Used Coordinate Reference Systems
Coordinate Reference System
Authority ID
WGS 84 / UTM zone 45N
EPSG:32645
WGS 84
EPSG:4326
WGS 84 / Maharashtra
EPSG:7767
Predefined Coordinate Reference Systems
Hide deprecated CRSs
WGS 84 / UTM zone 44N
EPSG:32644
WGS 84 / UTM zone 44S
EPSG:32744
WGS 84 / UTM zone 45N
EPSG:32645
WGS 84 / UTM zone 45S
EPSG:32745
General
Metadata
View Settings
CRS
Transformations
Default Styles
Data Sources
Relations
Variables
Macros
QGIS Server
Temporal
OK
Cancel
Apply
Help

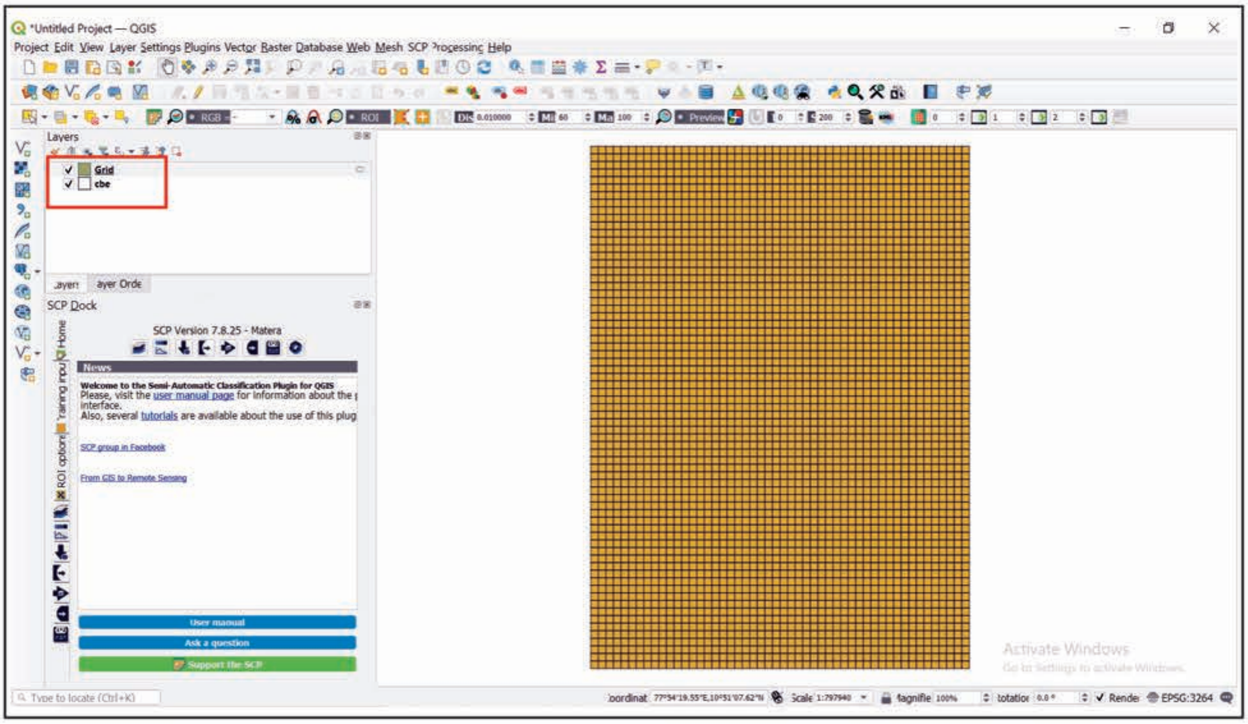


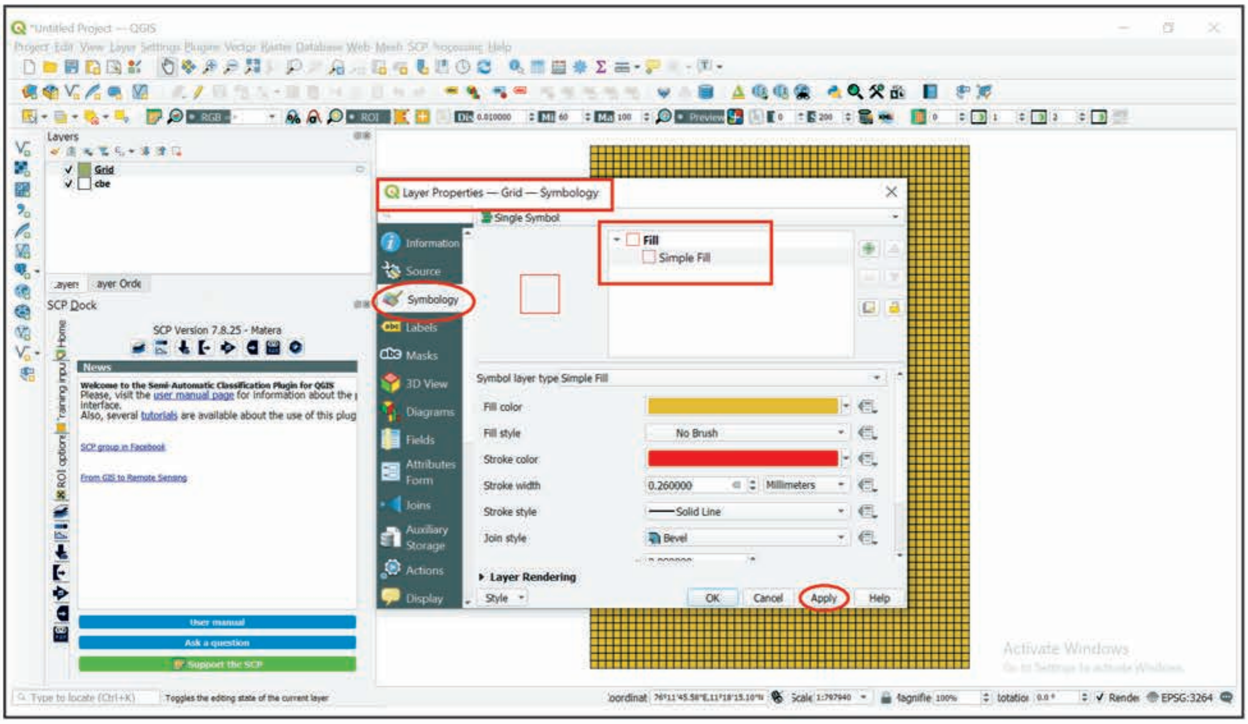
Step-3: Open Processing Toolbox>> Vector Creation >> Create Grid>> Grid Type (Rectangle Polygon)>> Grid Extent (From Layer)>> Change horizontal and vertical spacing 2*2 km>> Run



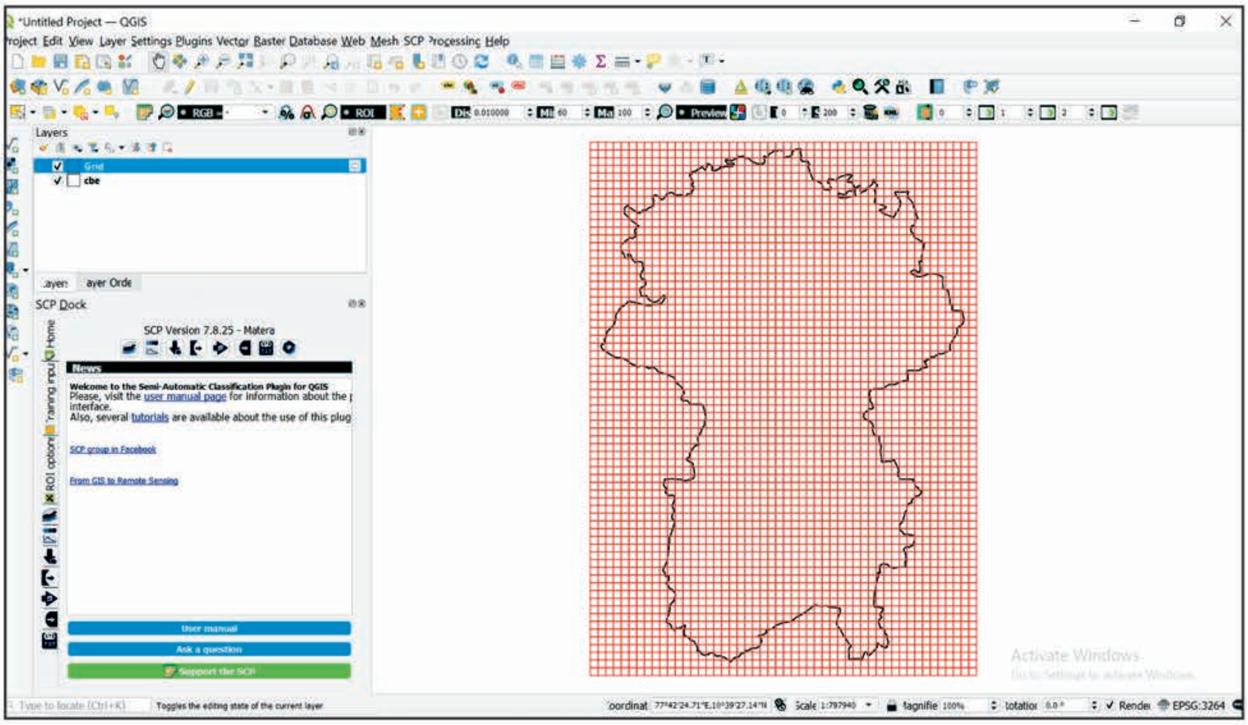


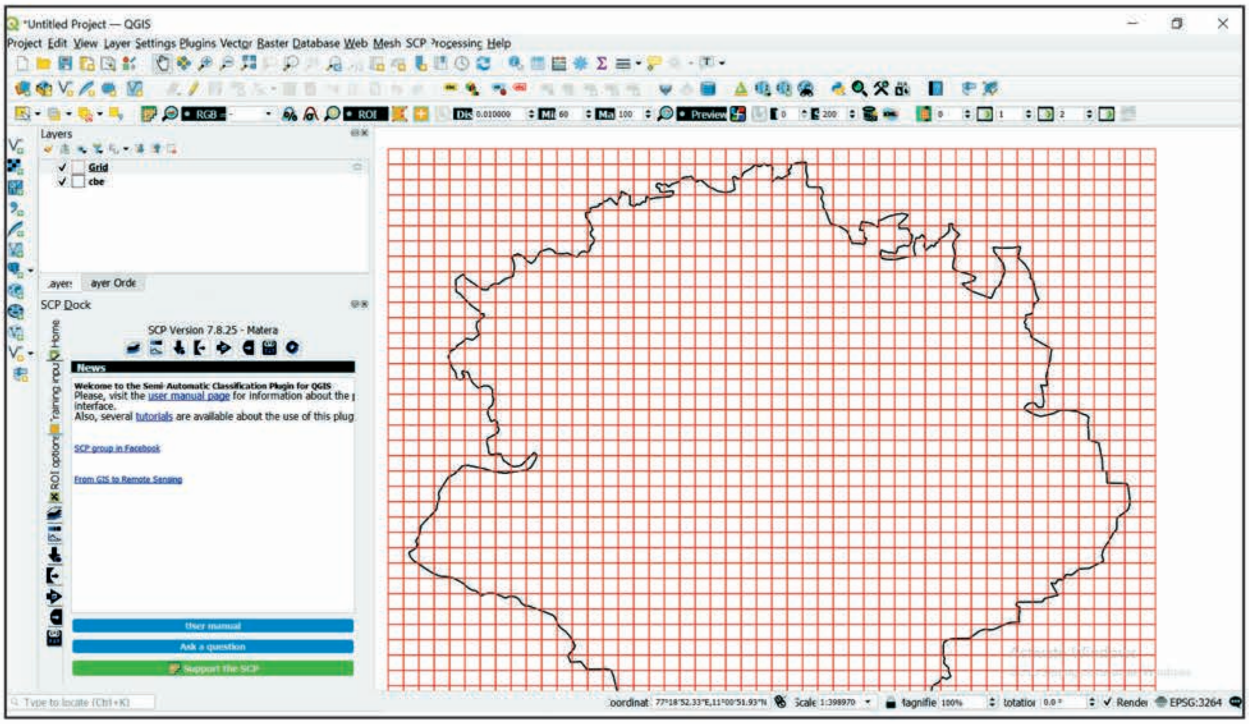
Step-4: Open properties and change the symbology as highlighted below.





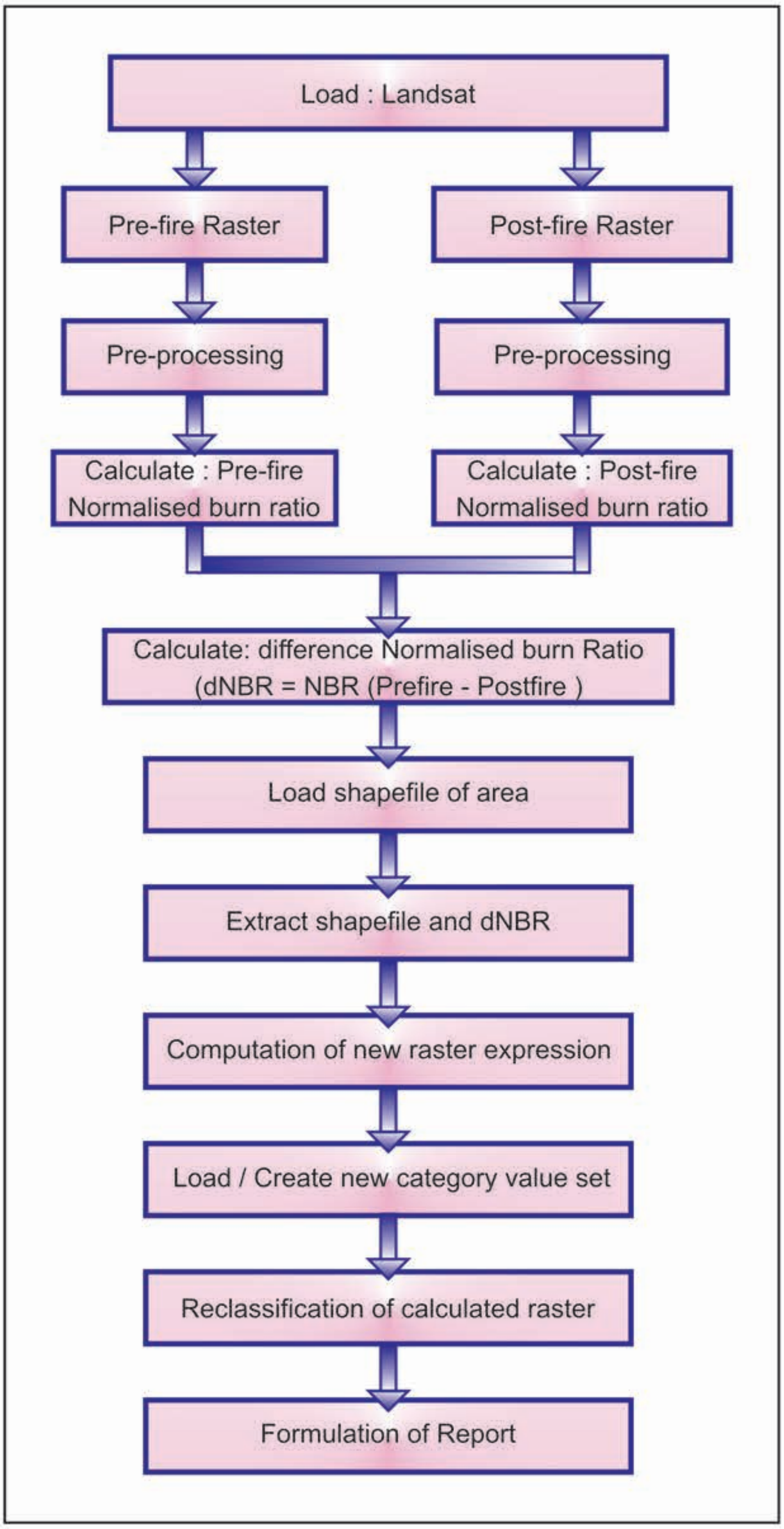
* Grid will be formed as per given dimensions i.e. 2*2 Km




*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Database Web Mesh SCP Processing Help
Layers
Grid
cbe
SCP Dock
SCP Version 7.8.25 - Matera
News
Welcome to the Semi-Automatic Classification Plugin for QGIS
Also, several tutorials are available about the use of this plug
SCP group in Facebook
From GIS to Remote Sensing
User manual
Ask a question
Support the SCP
EPSG:3264

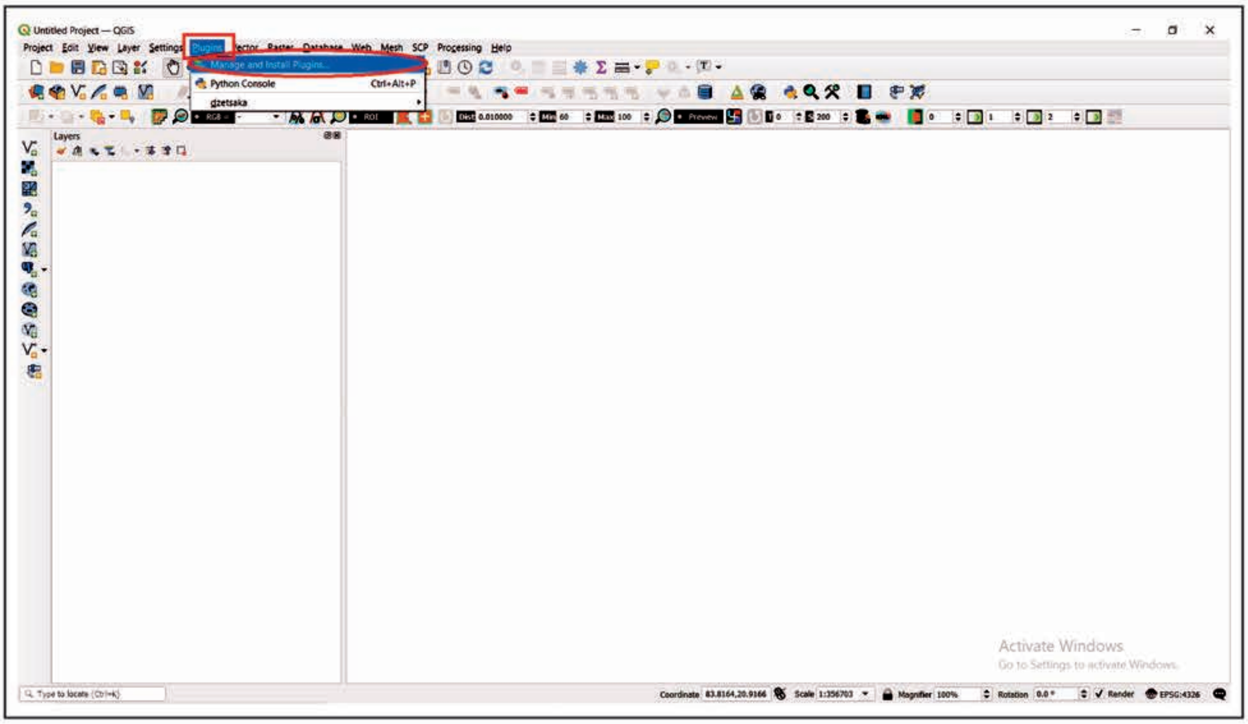
17. FIRE BURN SEVERITY

Forest fire is the main driver for forest degradation. It is imperative for the forest officer to know about the forest fire risk assessment and burn severity in order to plan for the upcoming fire season. The exercise intends to give idea about burnt severity and regeneration after fire in a particular area. This exercise involves the calculation of Normalized Burn Ratio which helps us in understanding the burnt area and the area of enhanced regeneration after the fire season. It also helps to make decisions on stationing and movement of fire protection squads, utilization of forest resources and planning for post fire season.

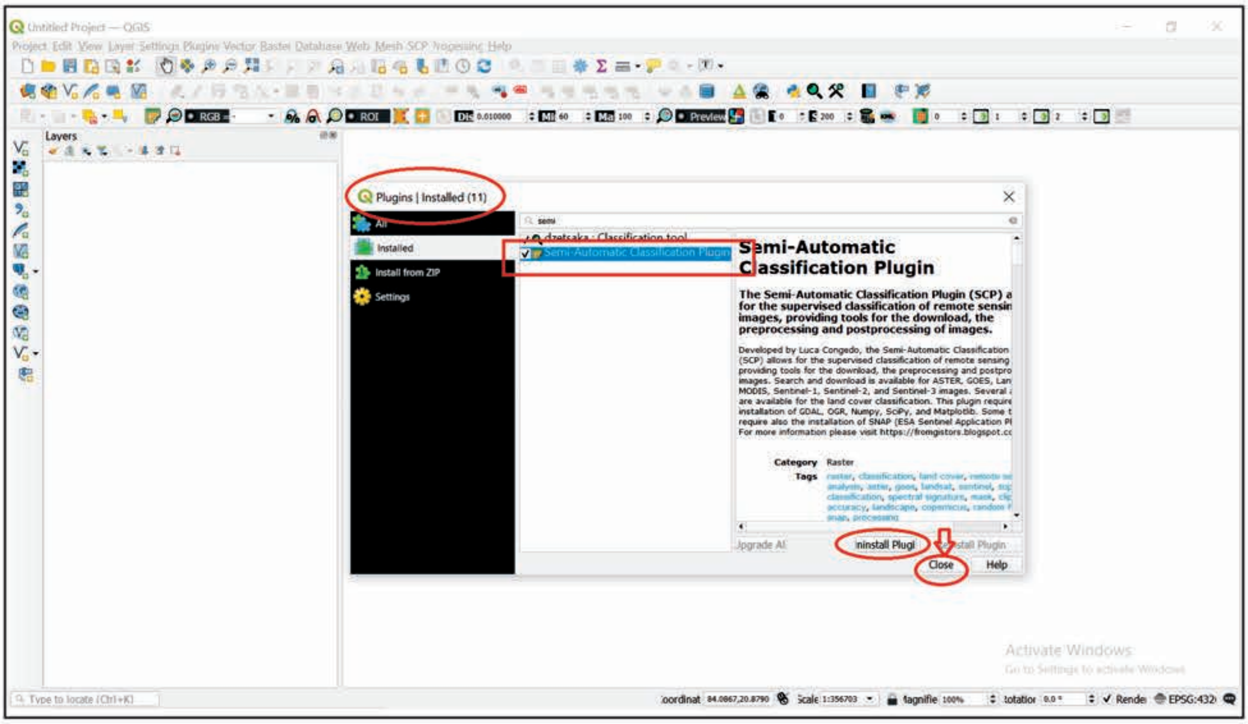


FIRE BURN SEVERITY ANALYSIS ON Q-GIS

Step 1. Open **Q-GIS**. Select **Plugins** and click on **Manage and Install Plugins**.

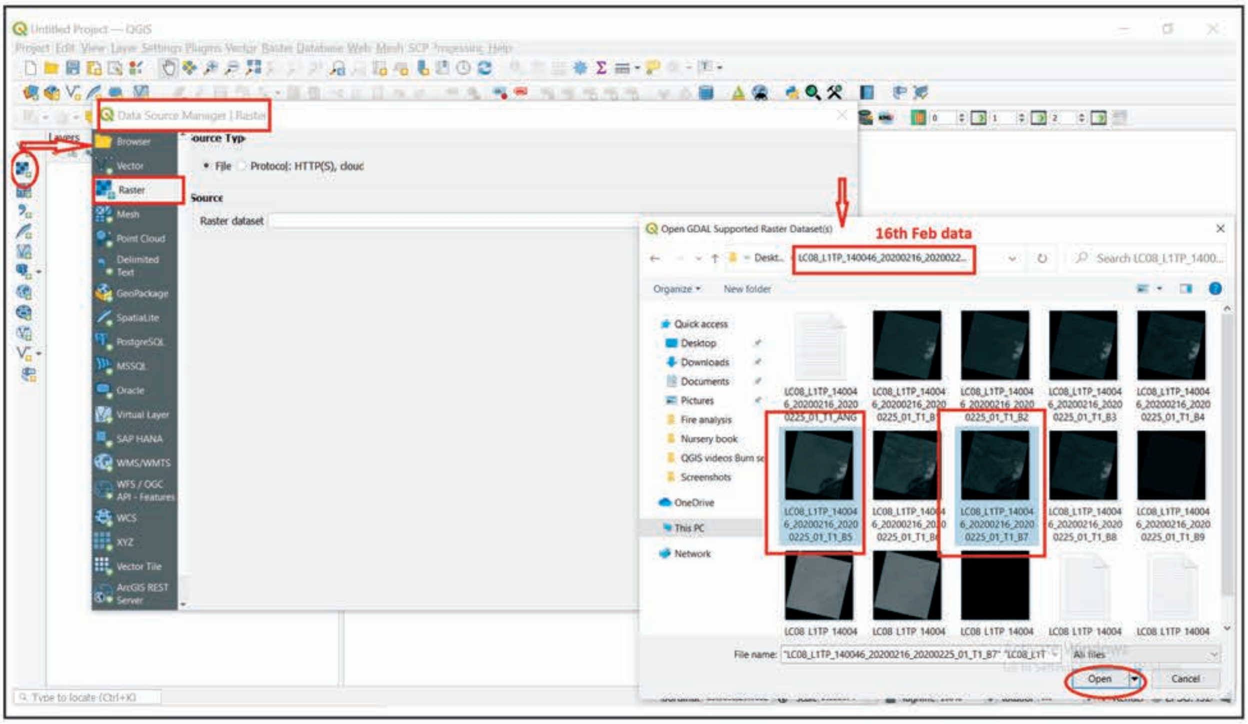


Step 2. Go to installed plugins, open **Semi-Automatic Classification (SCP) Plugin**. Close the window.

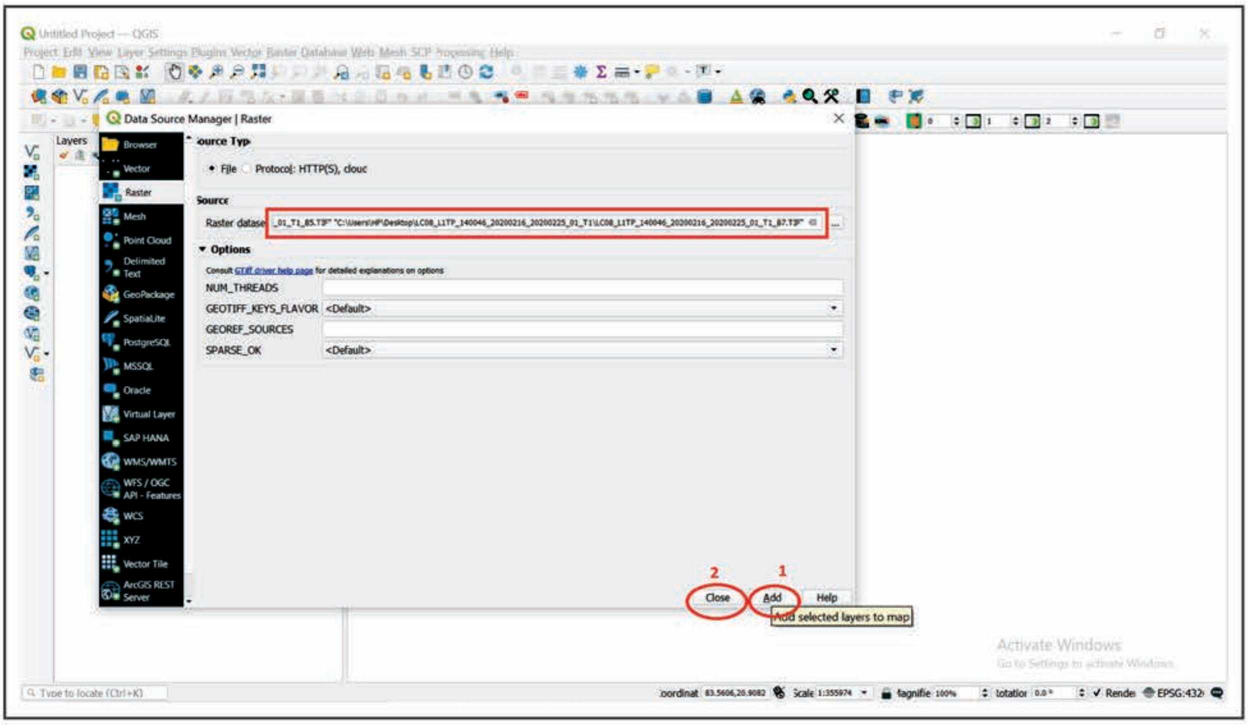


Step 3. Go to Manage Layers Toolbar and click on **Add Raster Layer**. A Data Source Manager Raster window will open; click on Raster and select the source Pre-fire Raster Files (Band 5 and Band 7).

· Click on open.

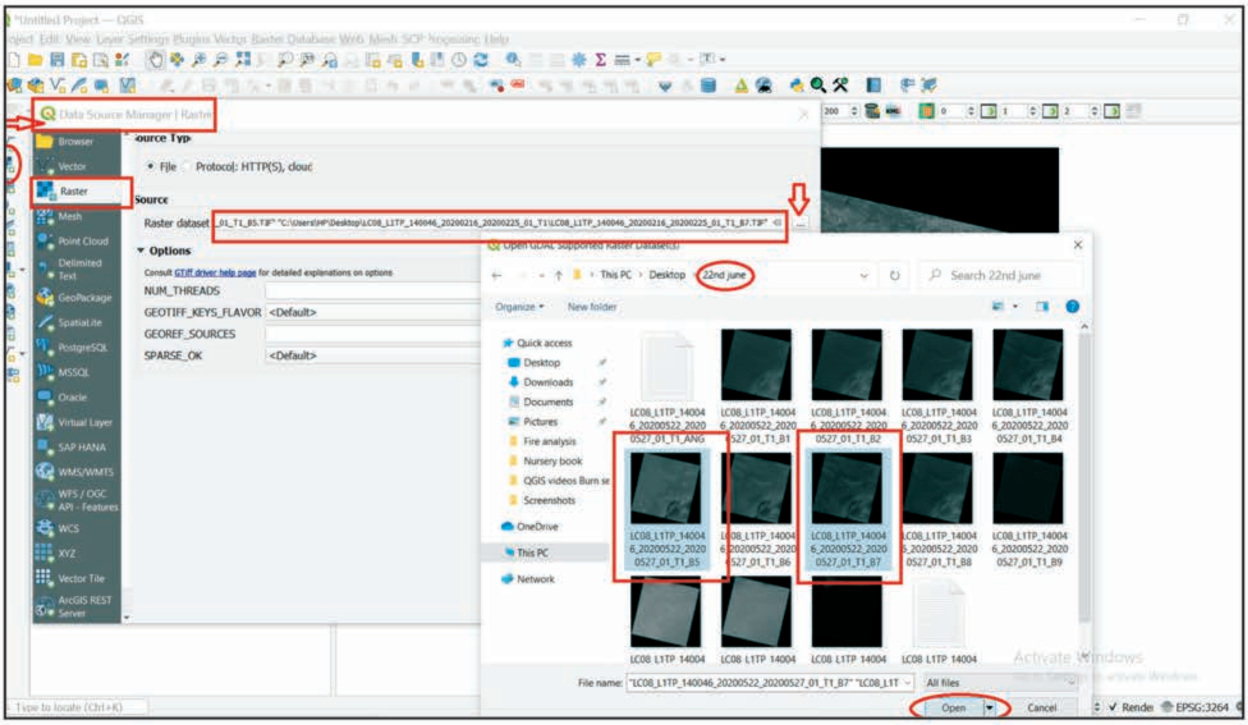


Step 4. The selected Pre-fire raster files will appear in **Raster Dataset Source**. Click on **Add and Close** the window.

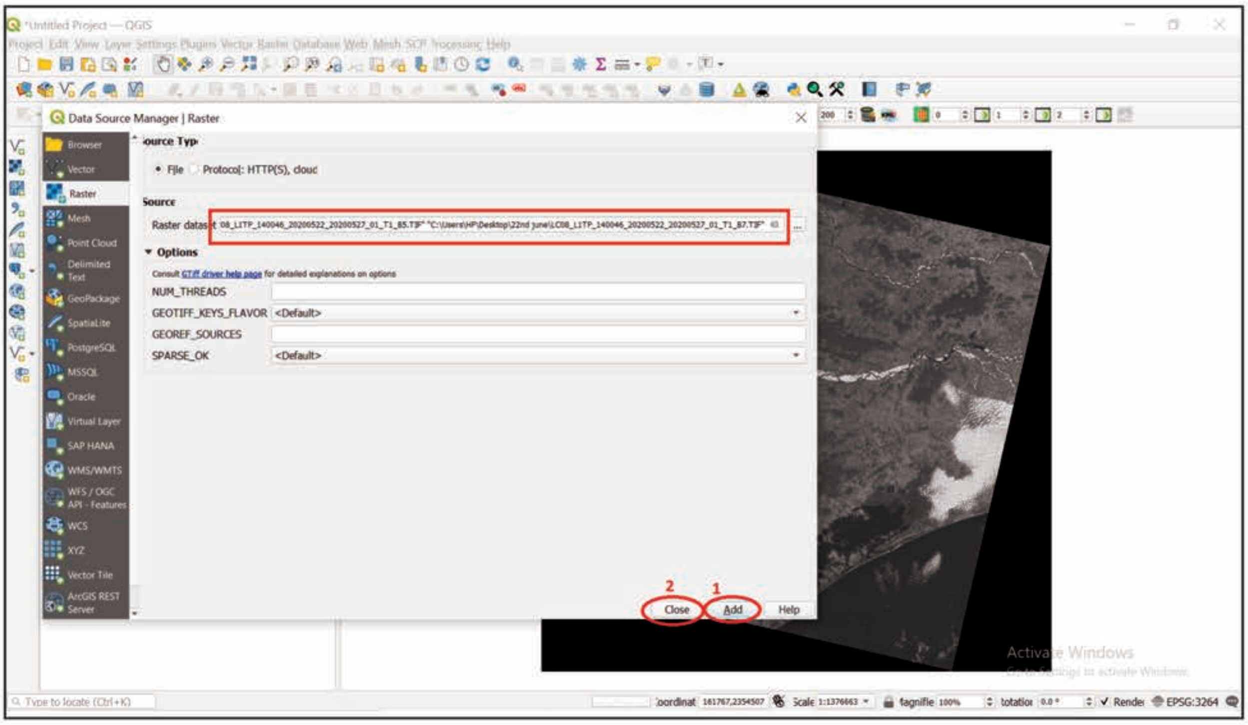


Step 5. Go to Layers in Menu Tool Bar and click on Add Raster Layer. A Data Source Manager Raster window will open; click on Raster and select the source Post-fire Raster Files (Band 5 and Band 7).

- Click on Open.

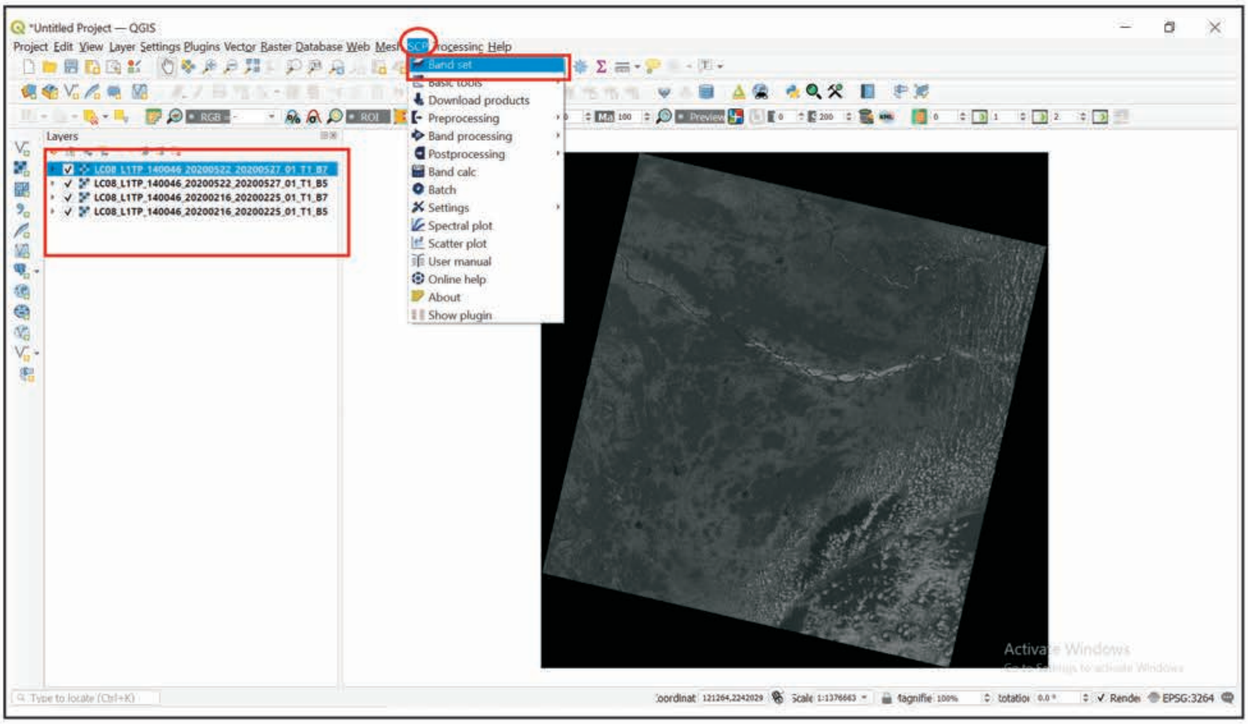


Step 6. Browse and select the raster files. Click on **Add and Close** the window.



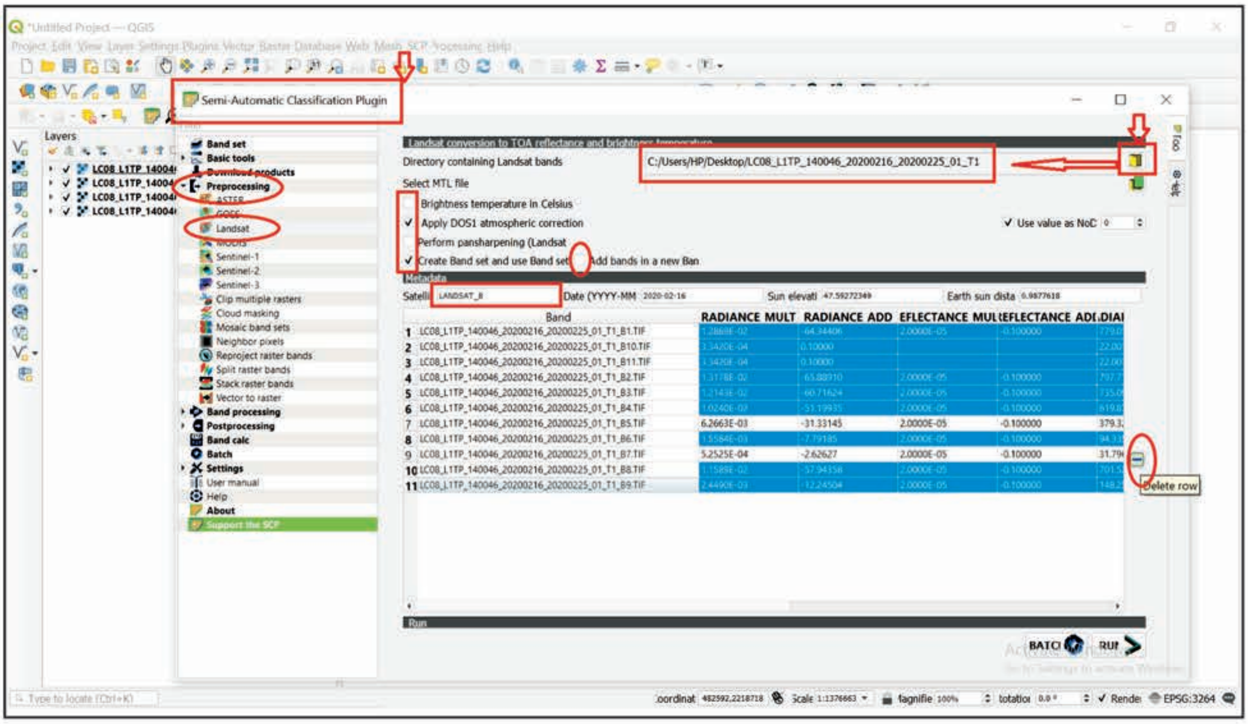
Step 7. The added four layers (two Pre-fire and two Post-fire) will appear on the Layers panel.

- Click on **SCP** and **select Bandset**.



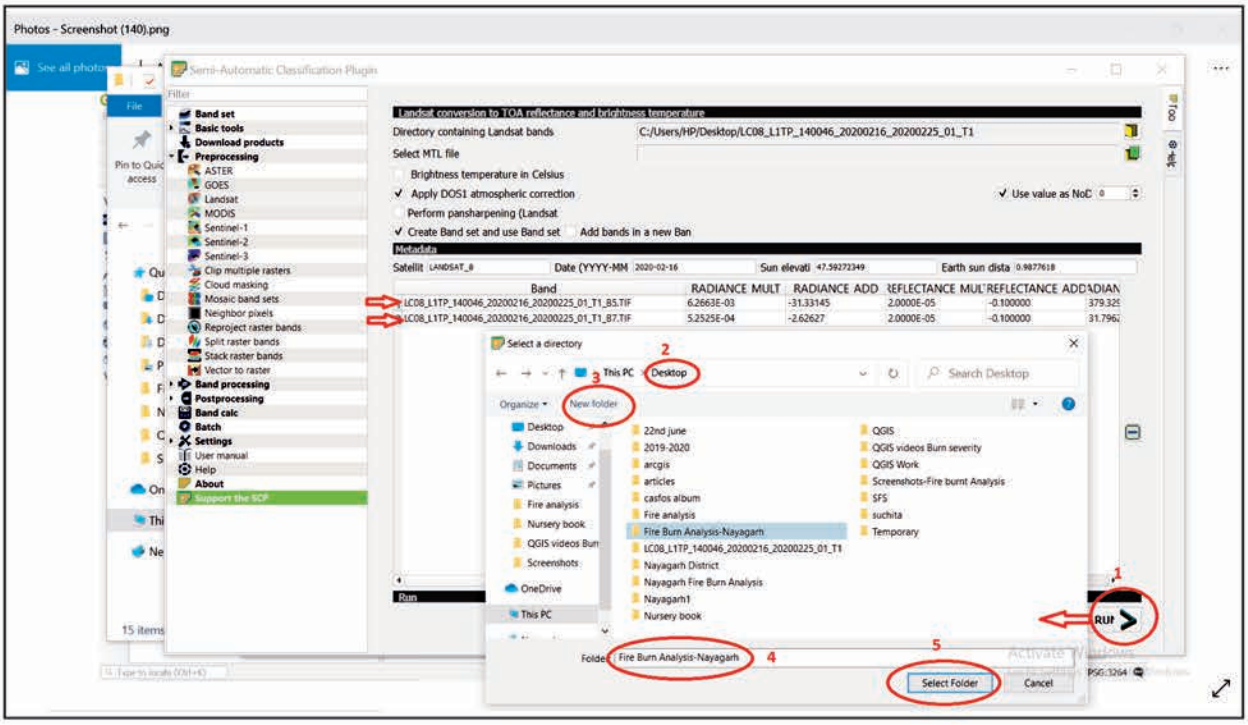
Step 8. **Semi-Automatic Classification Plugin >> Preprocessing >>Landsat.**

- Add **Pre-fire directory** in **Directory containing Lands at bands**.
- Check and uncheck the options as shown in the figure.
- In **Metadata**, delete all the rows, except those containing **Band 5 and 7** by clicking on **Delete Rows (-)**.

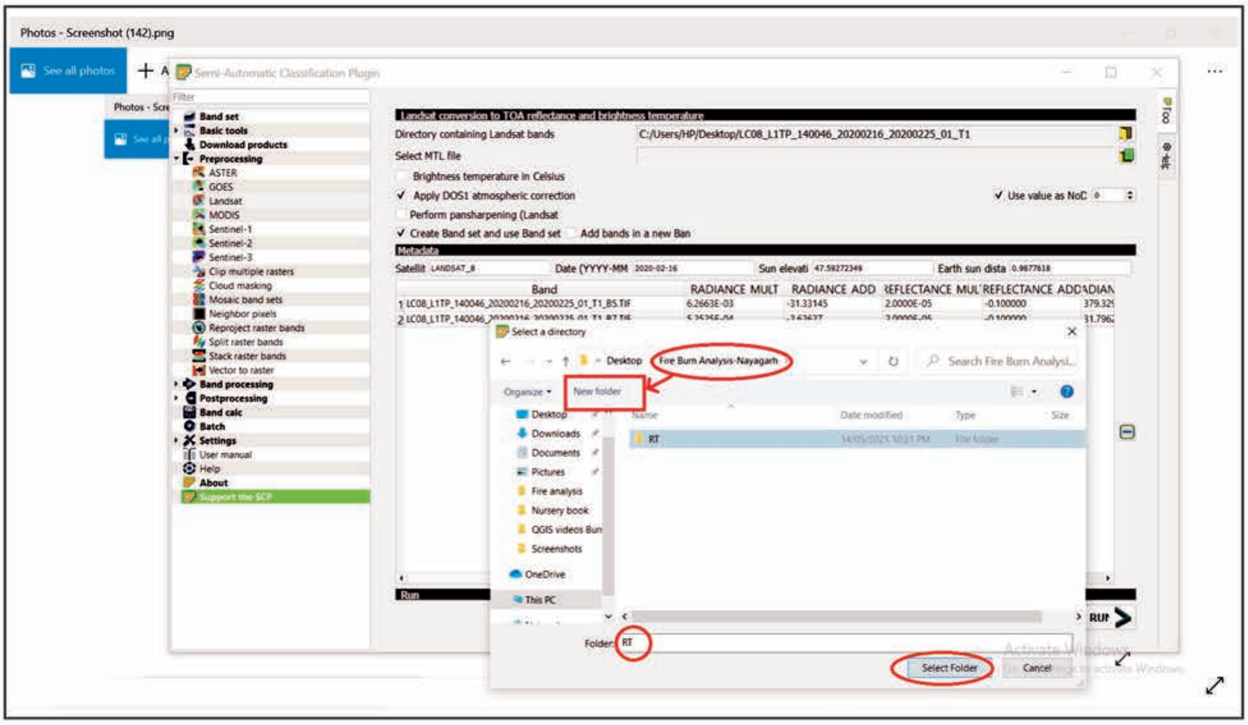


Step 9. **Run** the Program.

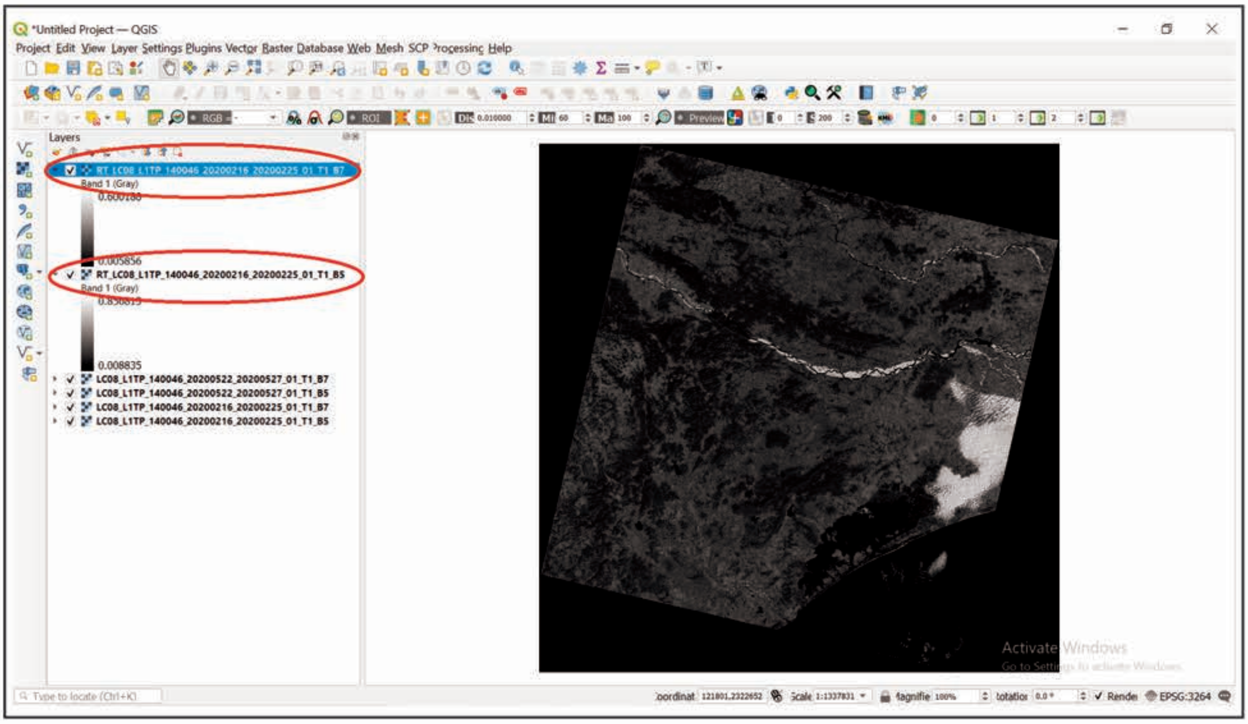
- Create a new Folder 'Fire Burn Analysis' on Desktop by following the sequential steps as shown in figure below.



Step 10. In the Folder made in previous step, create a new folder "RT" to store the pre-processed images. Select the folder.

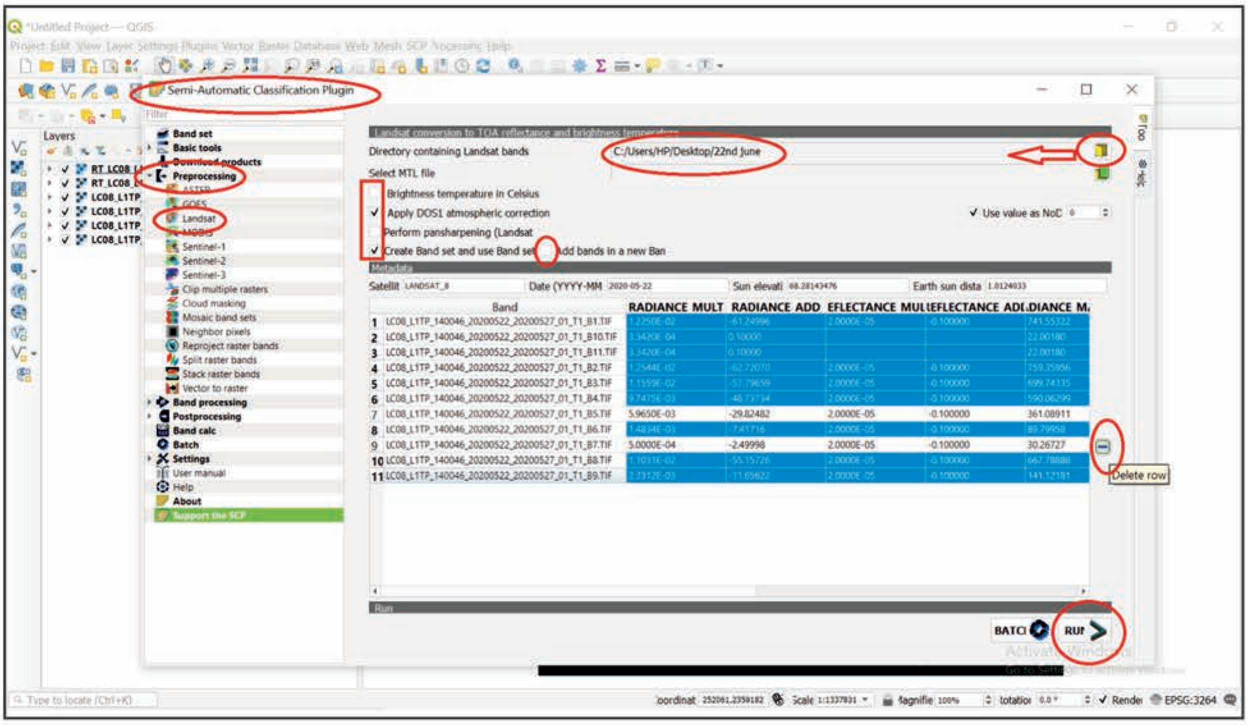


Step 11. The selected Pre-fire "RT" bands will appear.

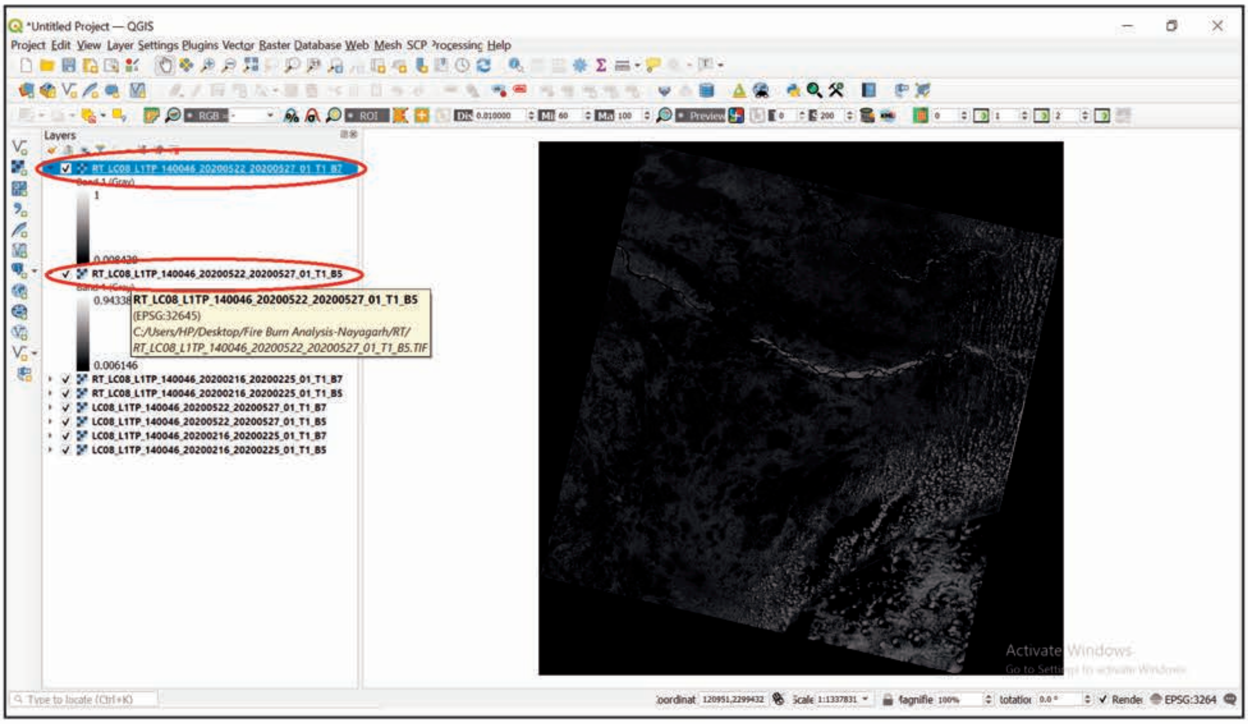


Step 12. **Semi-Automatic Classification Plugin >> Preprocessing >>Landsat.**

- Add **Post-fire directory** in **Directory containing Landsat bands**.
- Mark and unmark the options as shown in the figure.
- In **Metadata**, delete all the rows, except those containing **Band 5 and 7** by clicking on **Delete Rows (-)**.

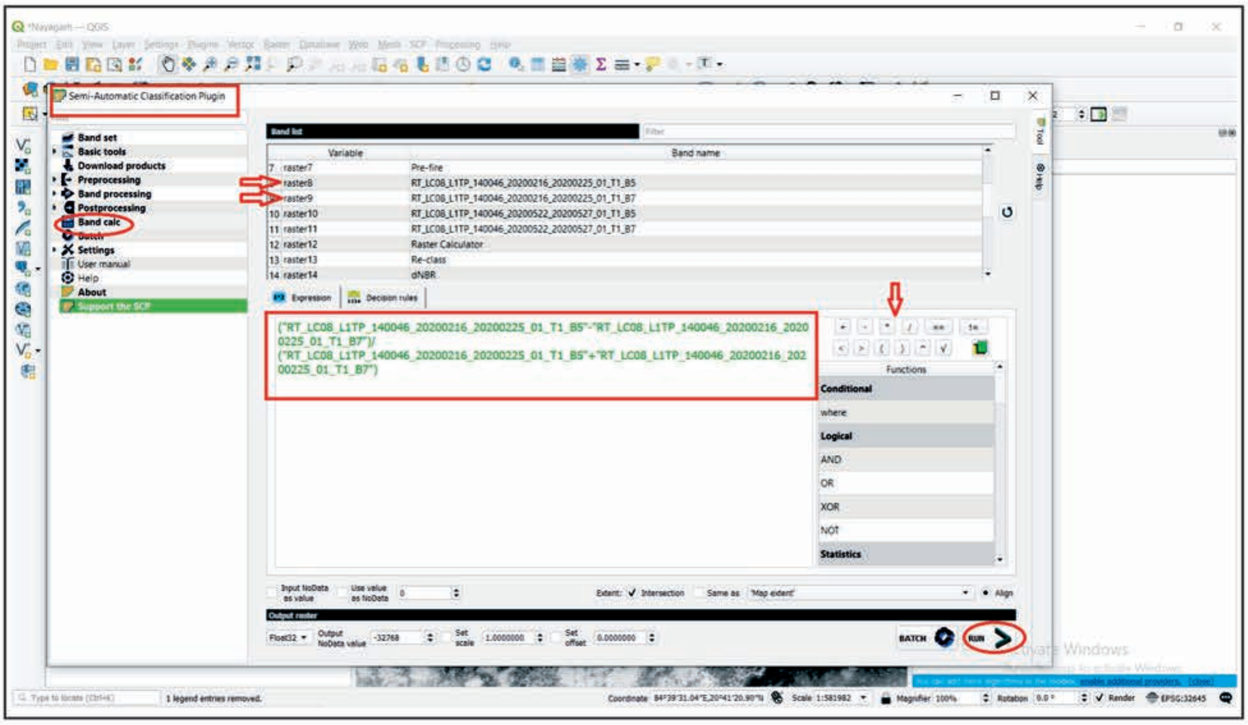


Step 13. The selected Post-fire "RT" bands will appear.



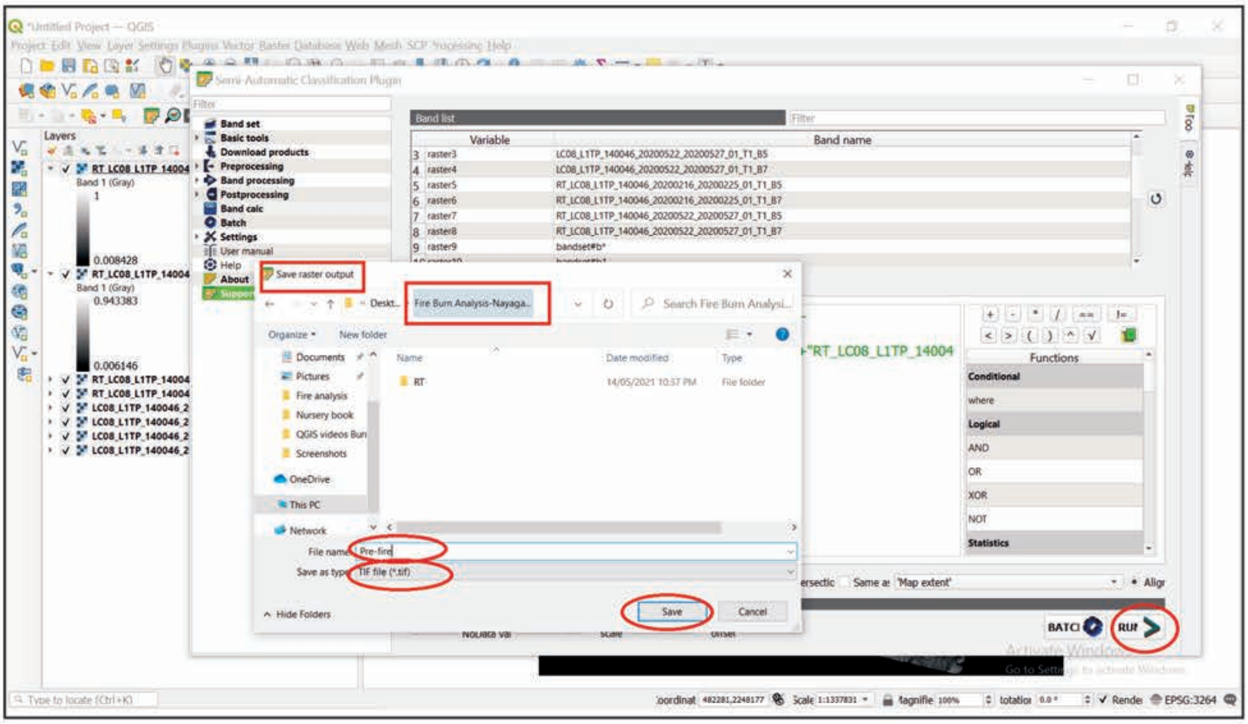
Step 14. Open Semi-Automatic Classification Plugin and Click on **Rast calc**.

- Select the "RT" Pre-Fire bands among all the bands.
- In order to calculate NBR for pre fire images Type the expression **("B5-B7")/("B5+B7")** by using the functions as shown in figure.

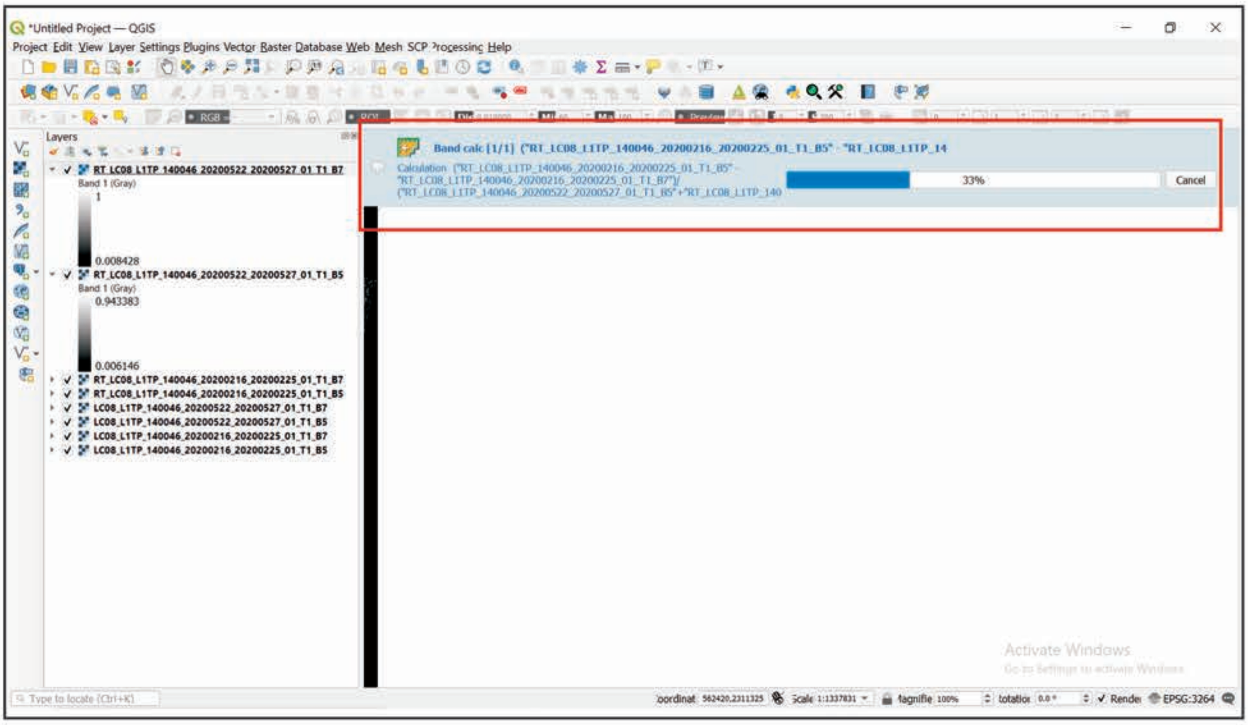


Step 15. **Run the Process**.

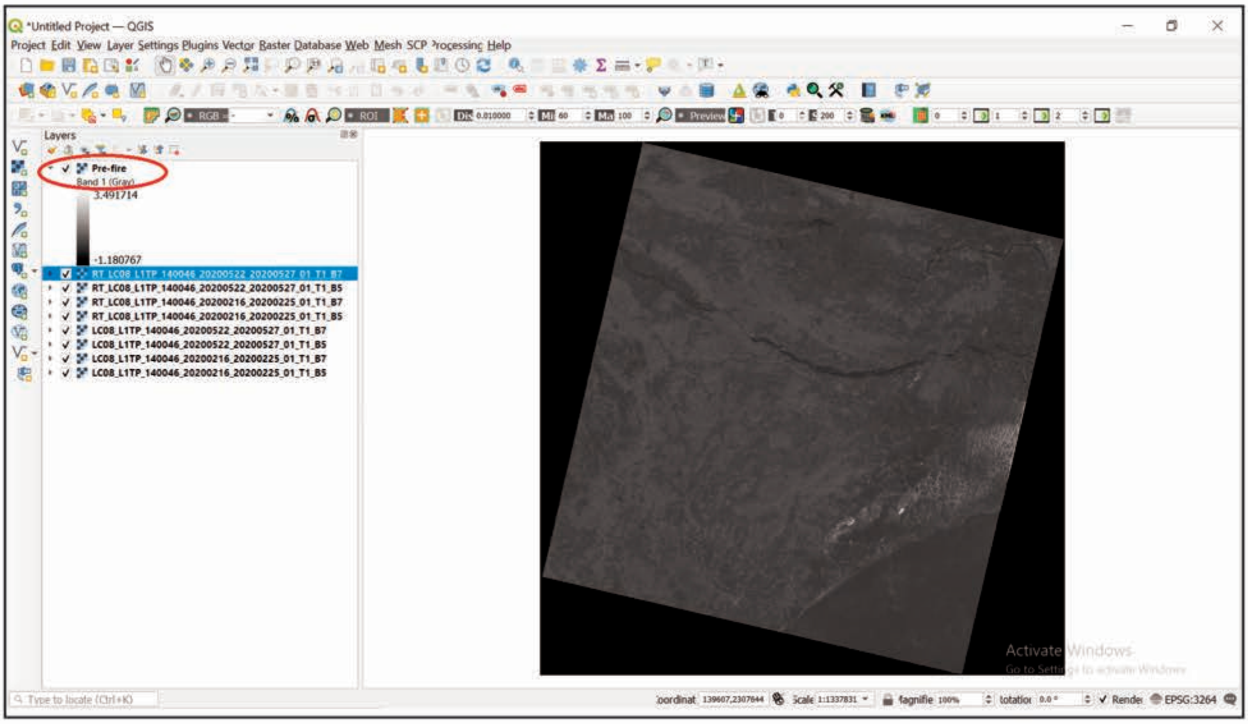
· Save the file name as Pre-Fire in format ***.tiff** in the working folder.



Step 16. The **Band Calc** will carry out the requisite calculations.

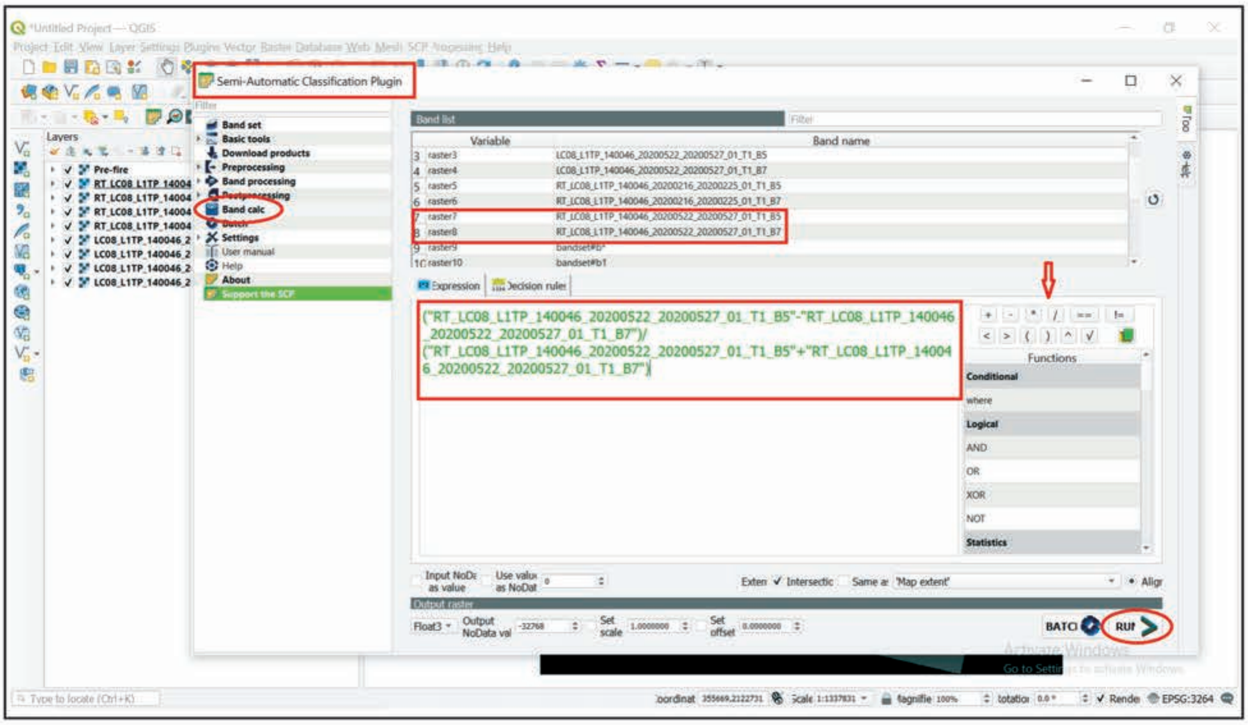


Step 17. The **Pre-Fire layer** will appear.



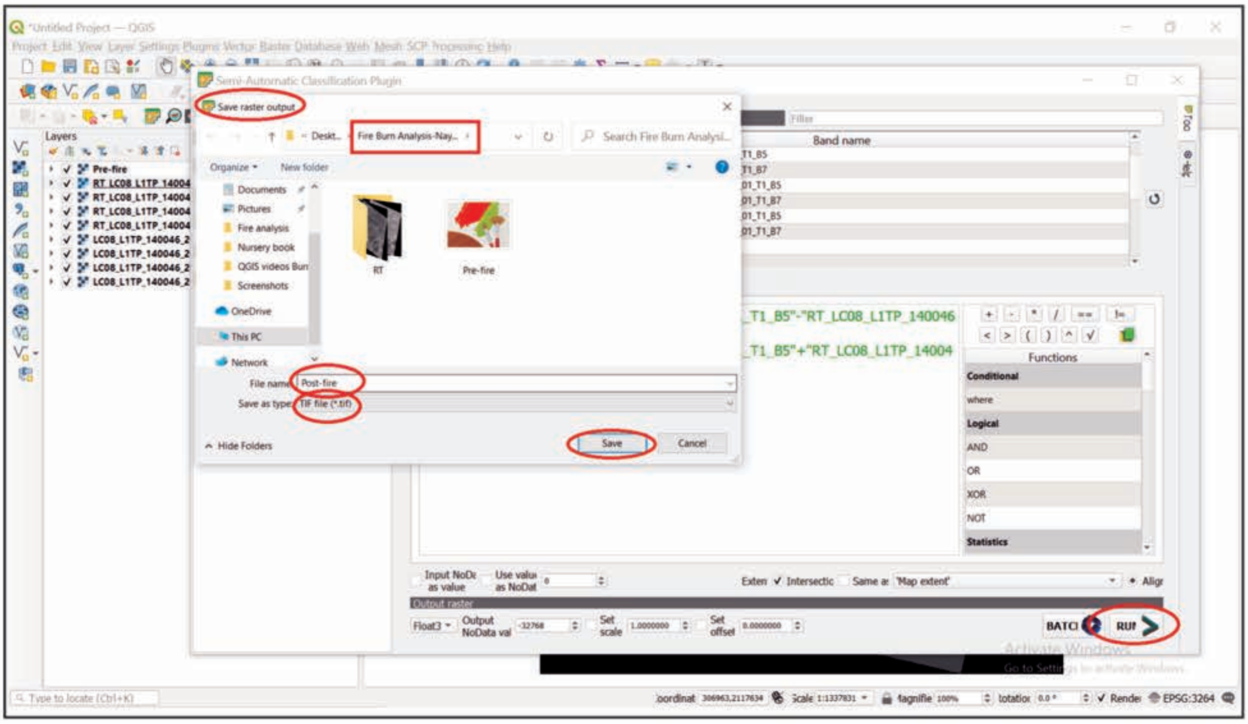
Step 18. Open Semi-Automatic Classification Plugin and Click on **Rast calc.**

- Select "RT" Post-Fire bands among all the bands.
- In order to calculate NBR for post fire images,
  Type the expression **("B5-B7")/("B5+B7")** by using the functions as shown in figure.

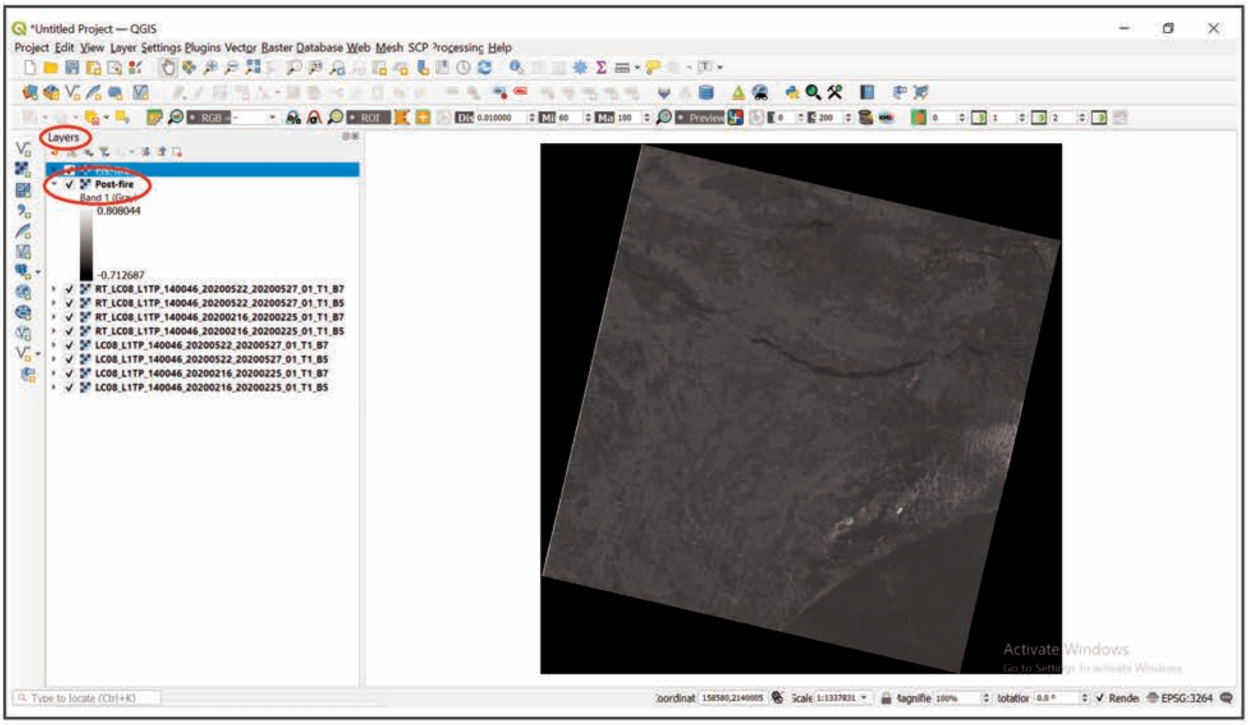


Step 19. **Run the Program**.

Save the file name as Post-Fire in format ***.tiff** in the working folder.

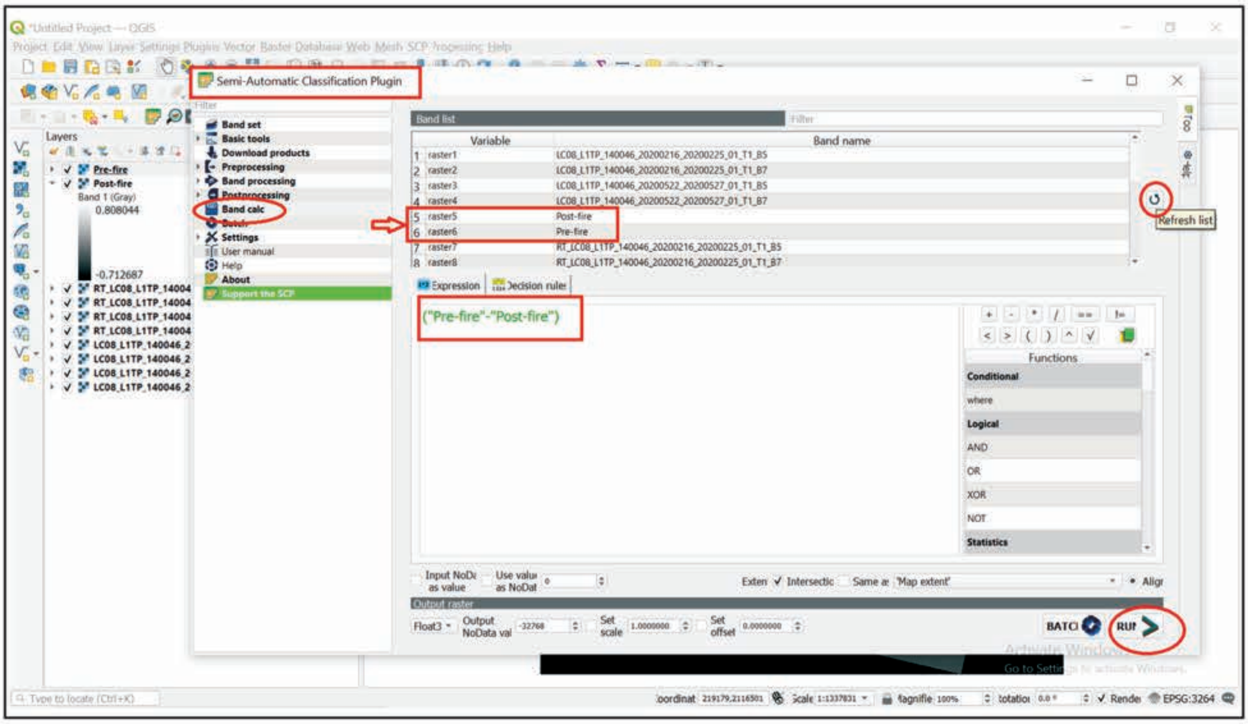


Step 20. The **Post-Fire layer** will appear.

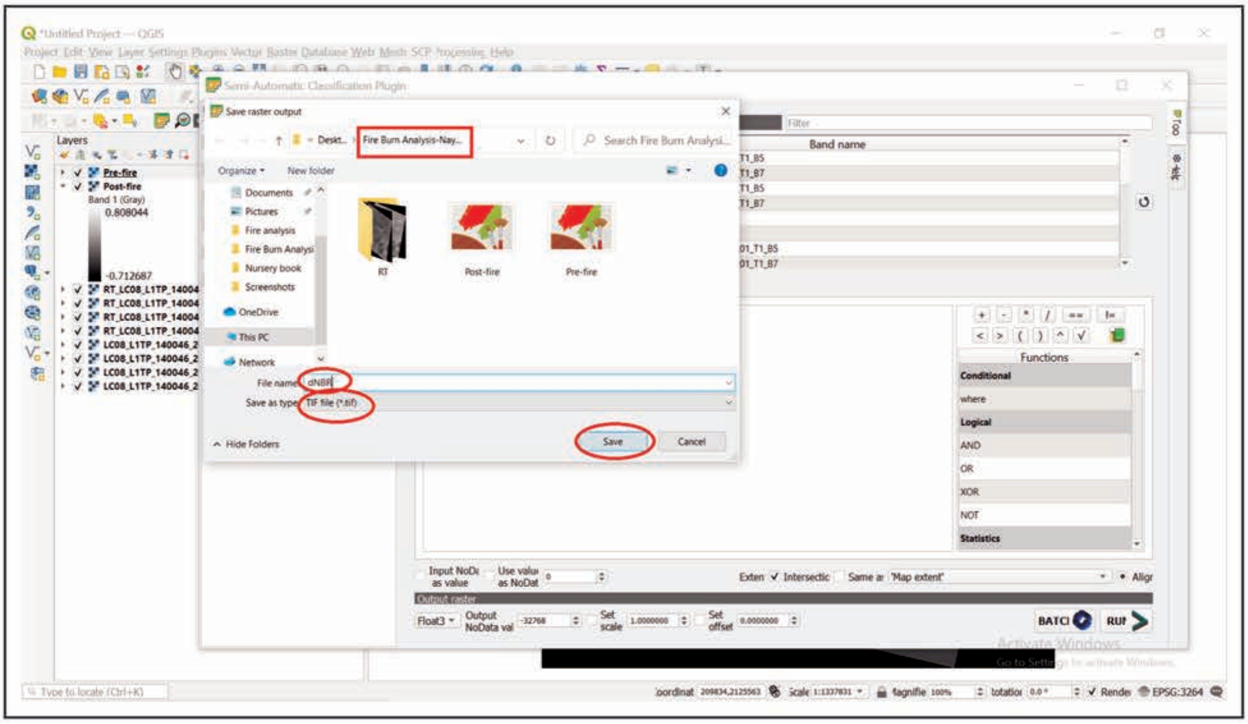


Step 21. **Calculation of dNBR.**

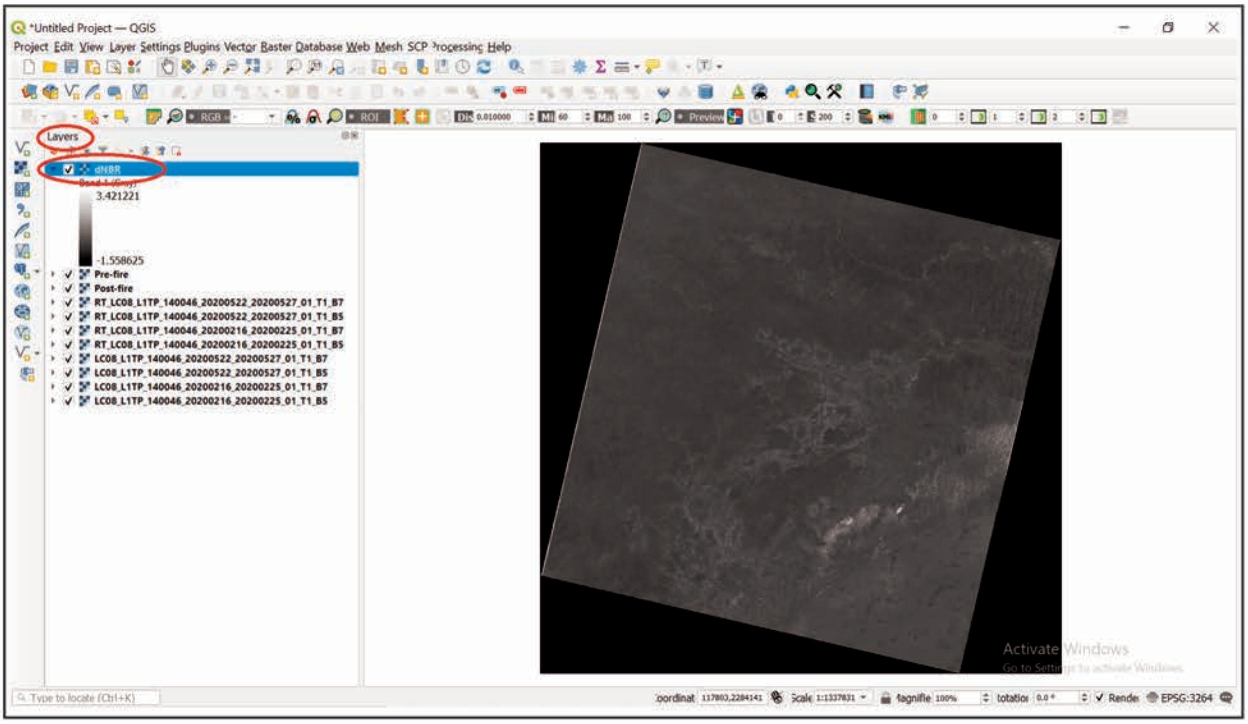
- Open **Semi-Automatic Classification Plugin**.
- Select **Band calc**.
- Click the **Refresh List icon** to refresh the list; **Pre and Post Fire bands** will appear in the list.
- Type the expression **("Pre-fire"-"Post-fire").**
- **Run** the process.



Step 22. Save the File name as dNBR in format ***.tiff** in working folder on desktop.

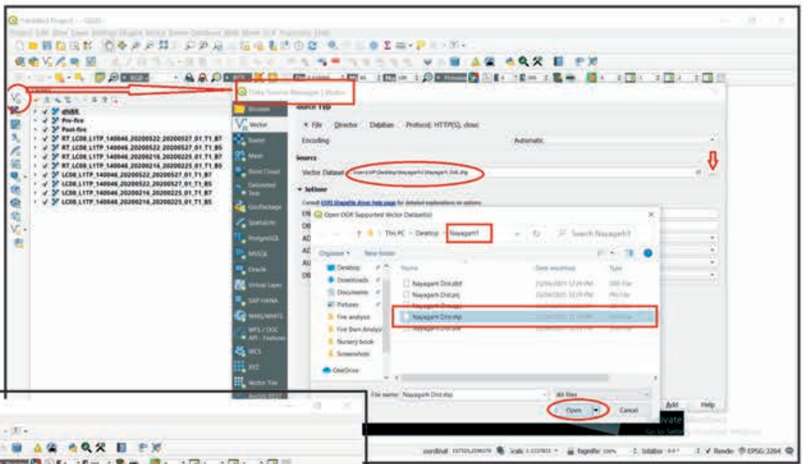


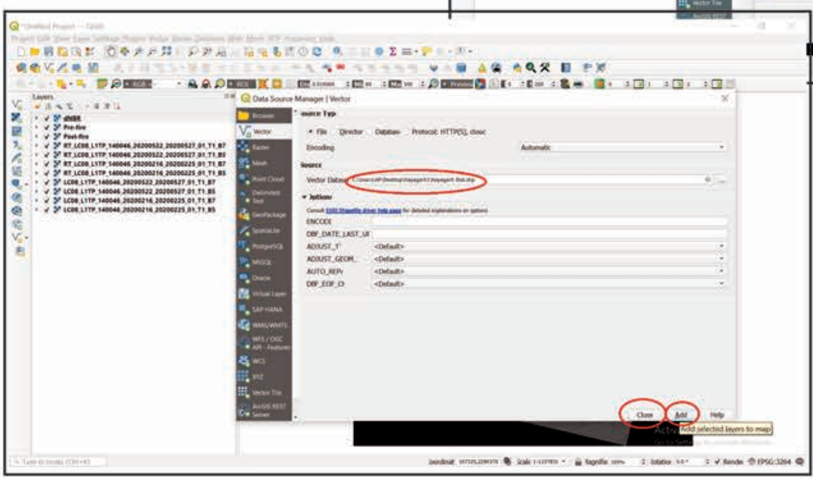
Step 23. The **dNBR layer** will appear in the layer panel.



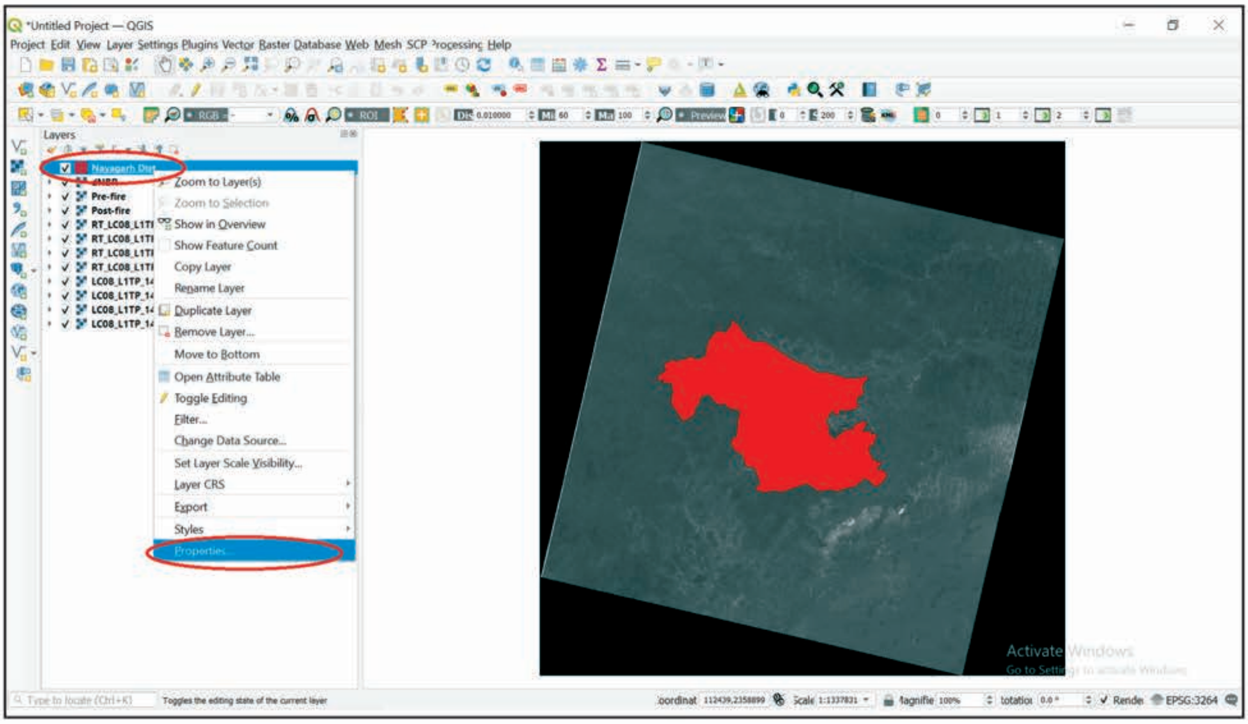
Step 24. Go to **Manage Layers Toolbar** and select **Add Vector Layer**.

- Select the corresponding shape file.
- Open it.
- Add the shapefile.

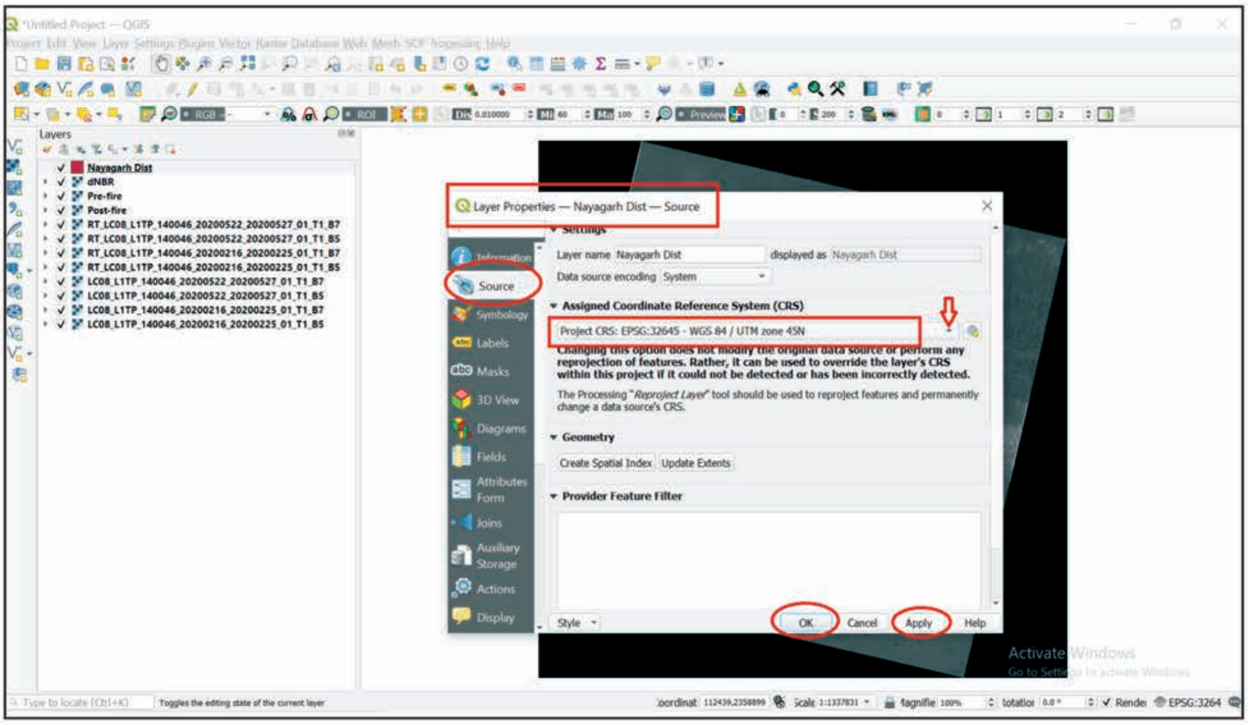




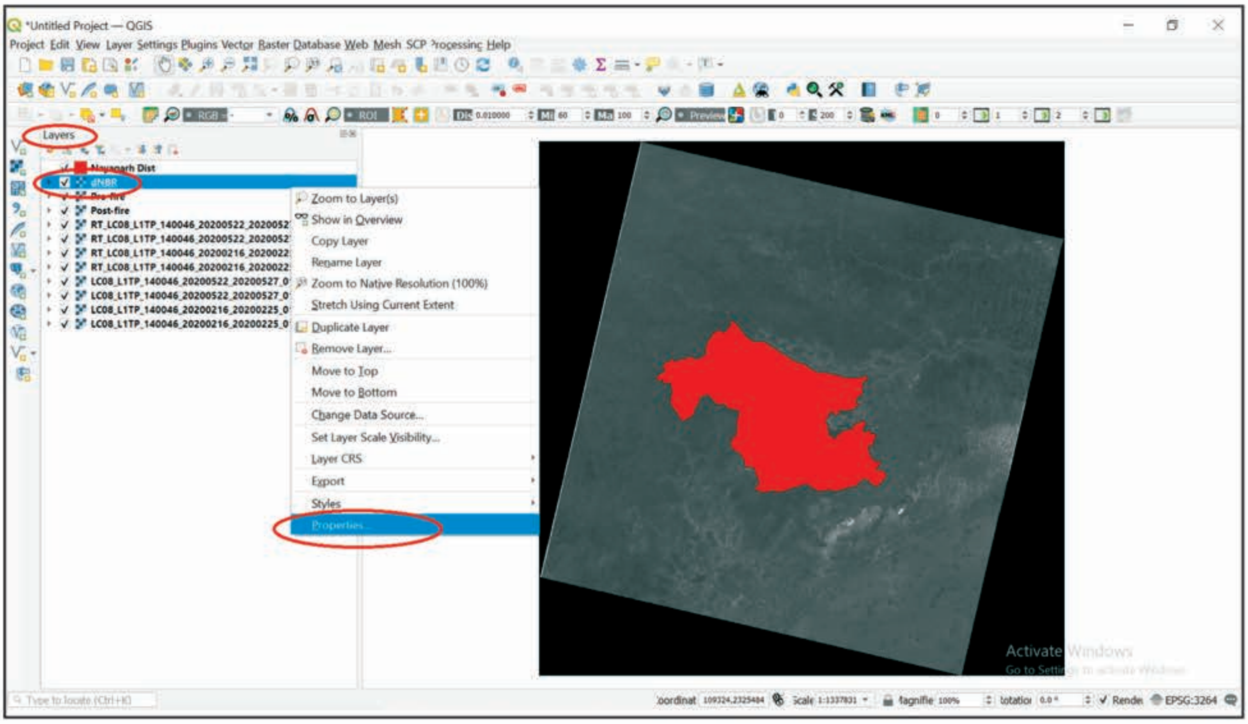
Step 25. Go to the **properties** of added Shapefile.



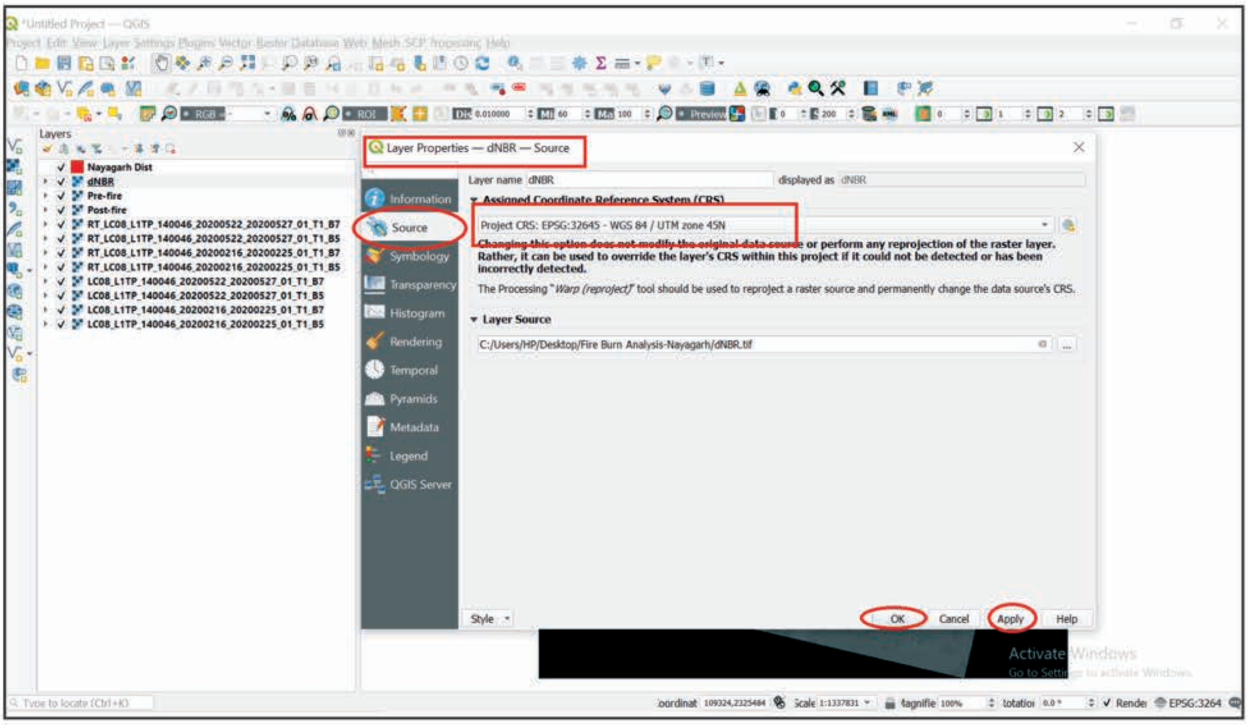
Step 26. In the Layer Properties, select **Source**.
- Change the **CRS** as shown in the figure below.
- Click **Apply** and **OK**.



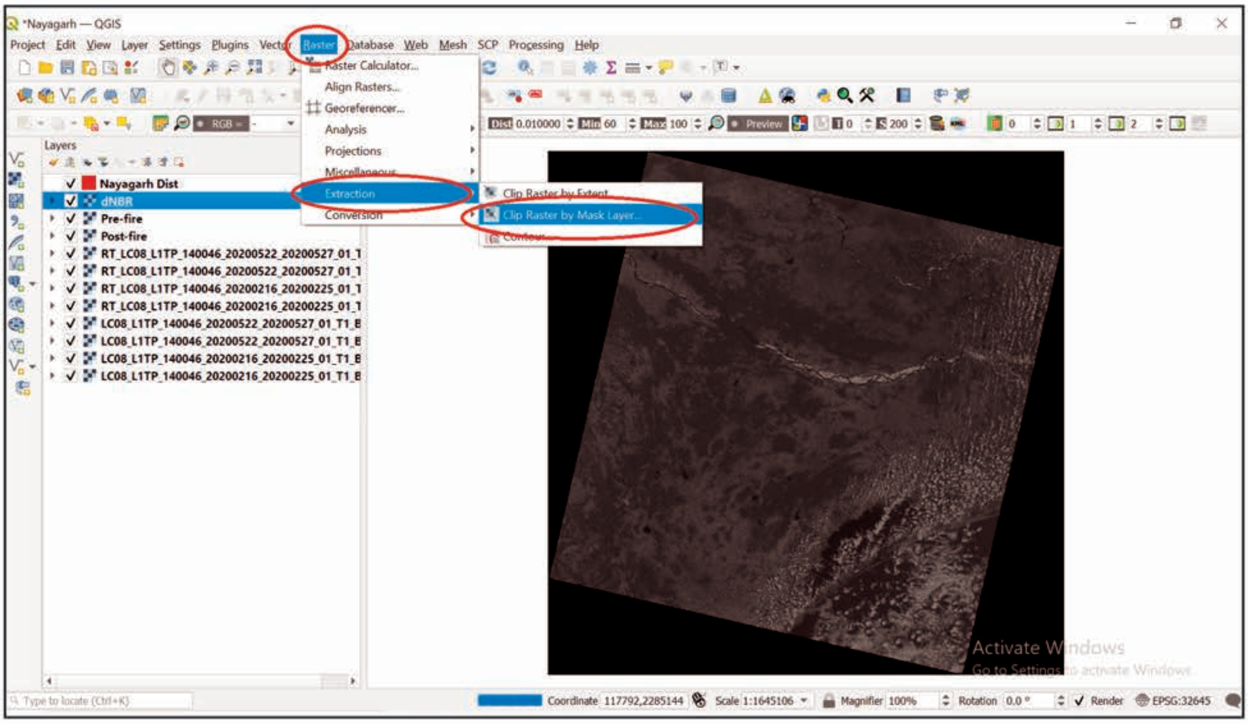
Step 27. Go to the **Properties** of **dNBR layer**.



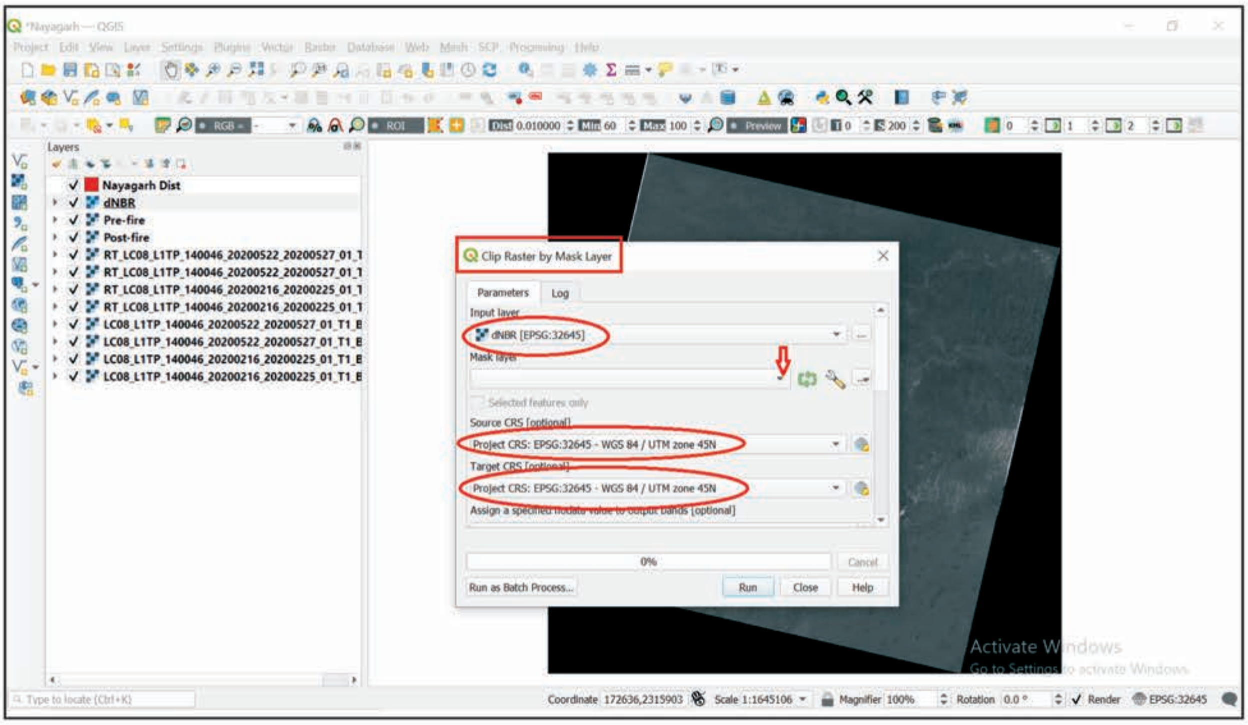
Step 28. In the Layer Properties, select **Source**.
- Change the **CRS** as shown in the figure below.
- Click **Apply** and **OK**.

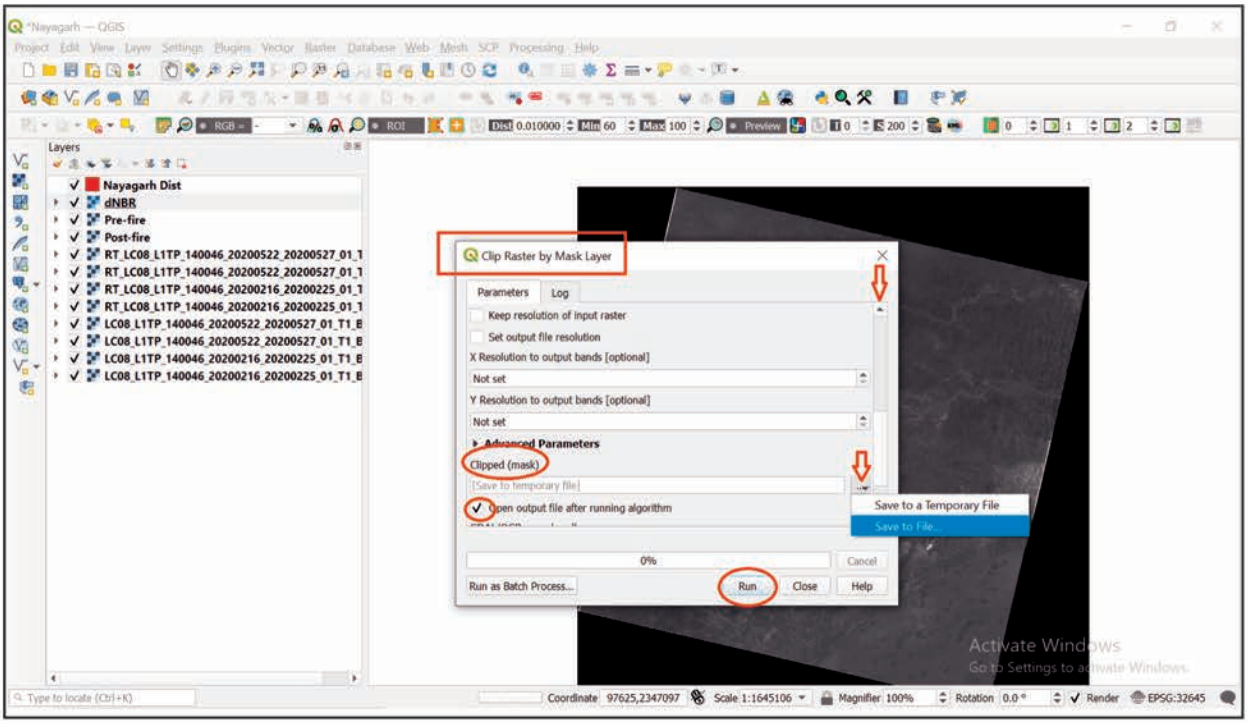


Step 29. **Clipping** : **Raster-> Extraction-> Clip Raster by Mask Layer**.

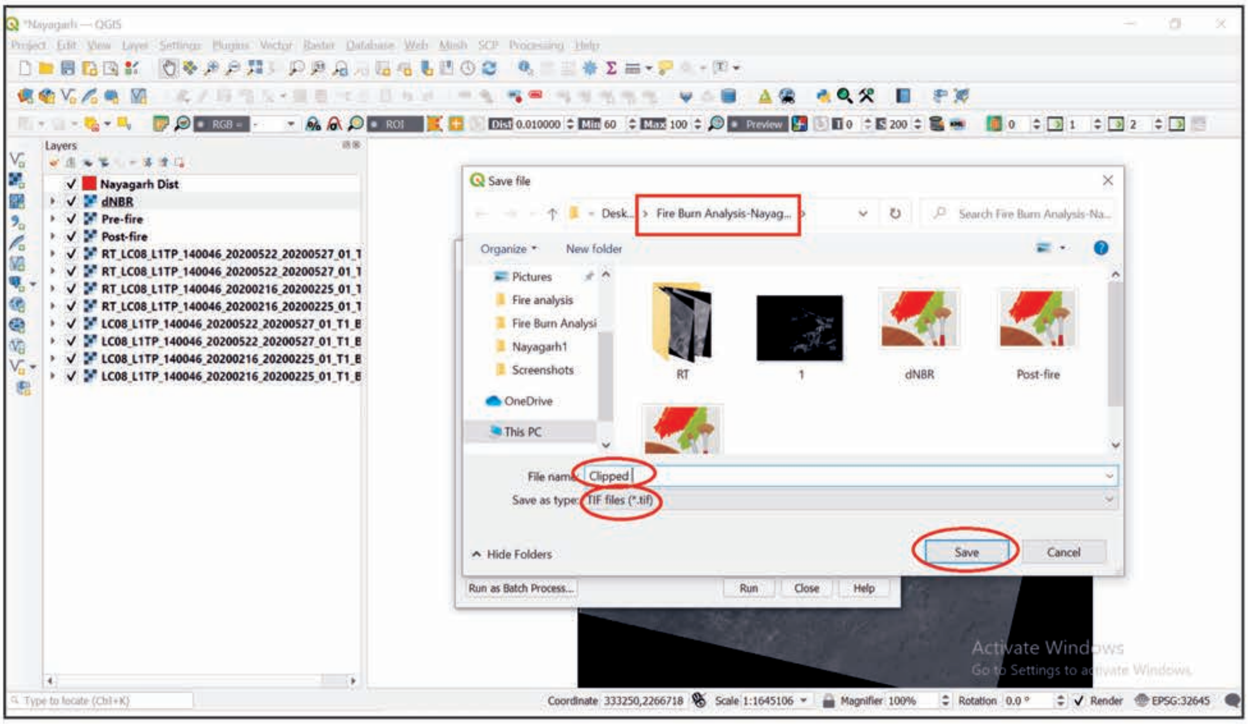


Step 30. In the **Clip Raster by Mask Layer** window, make the changes as shown in the figure.

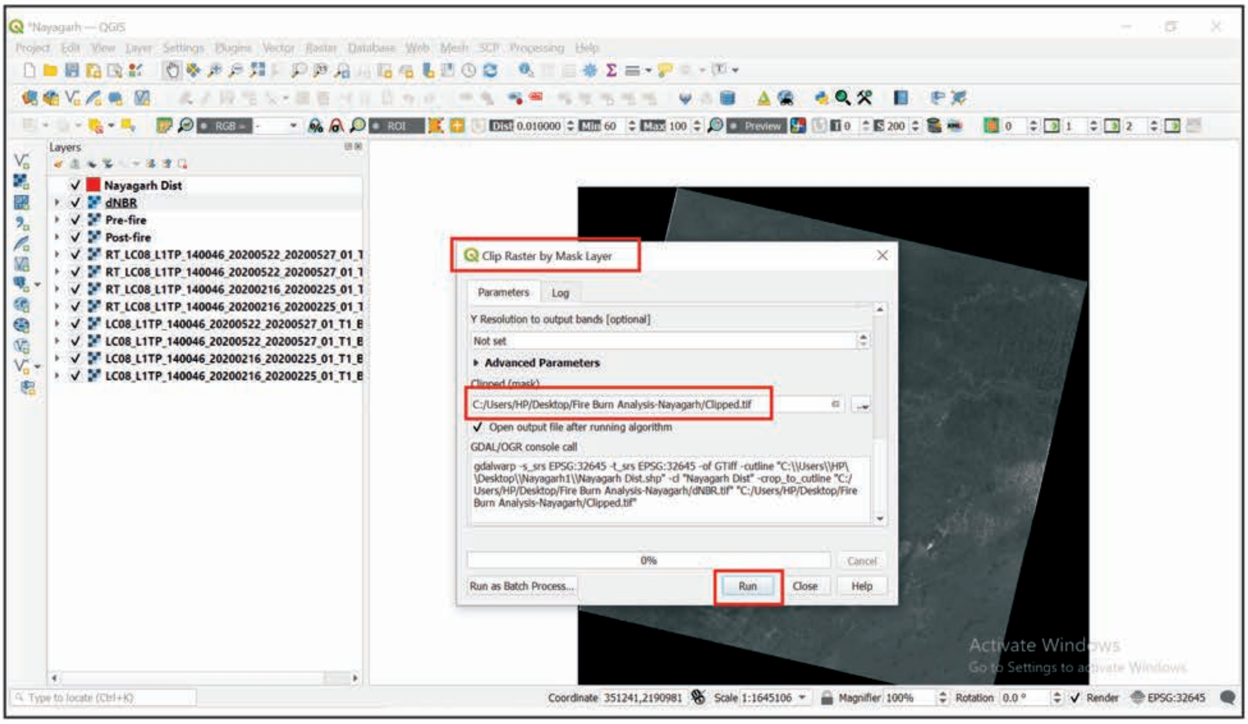




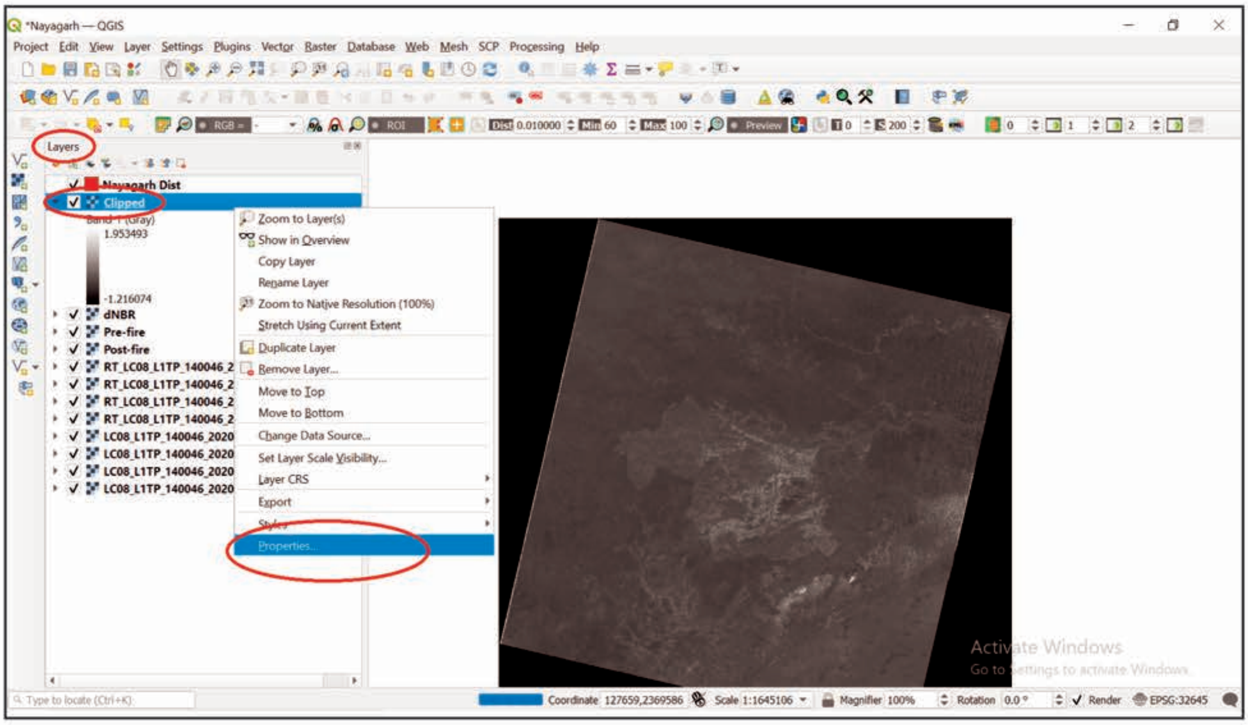
·Save the file name as **Clipped** in format ***.tiff** in working folder on desktop.



· Run the Clipped layer.

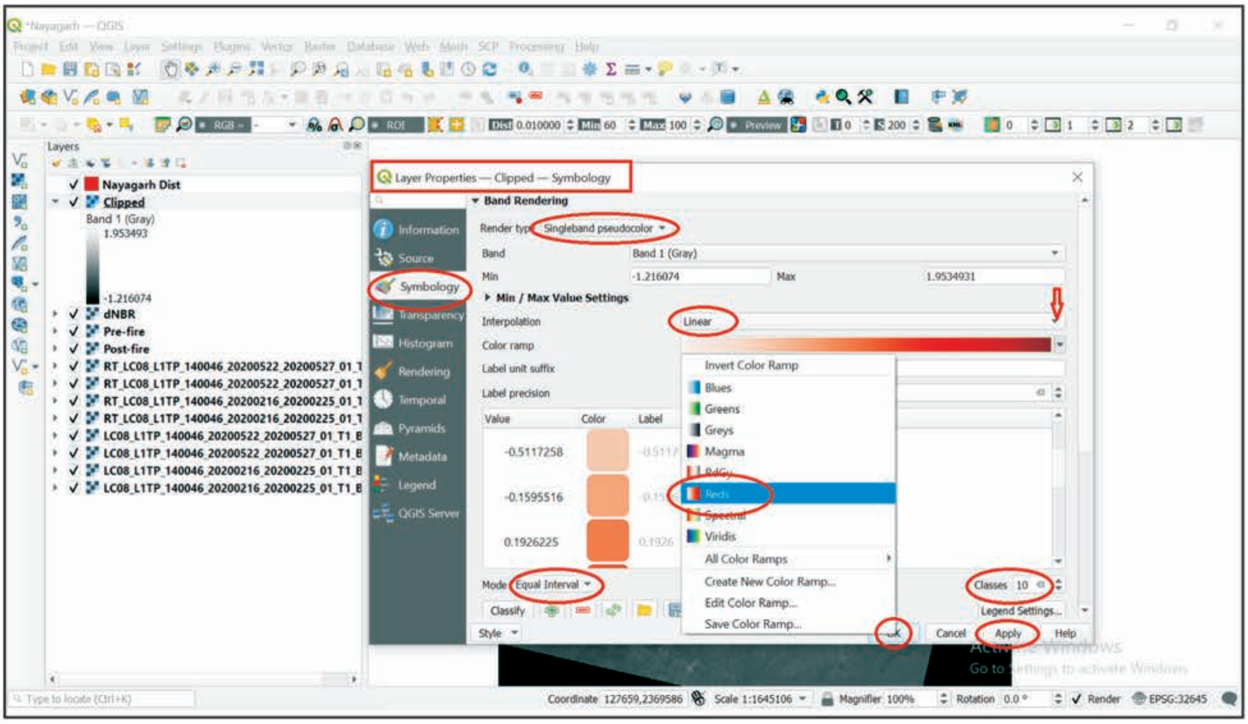


· Changing color of clipped image. Select **Clipped layer >> Properties.**

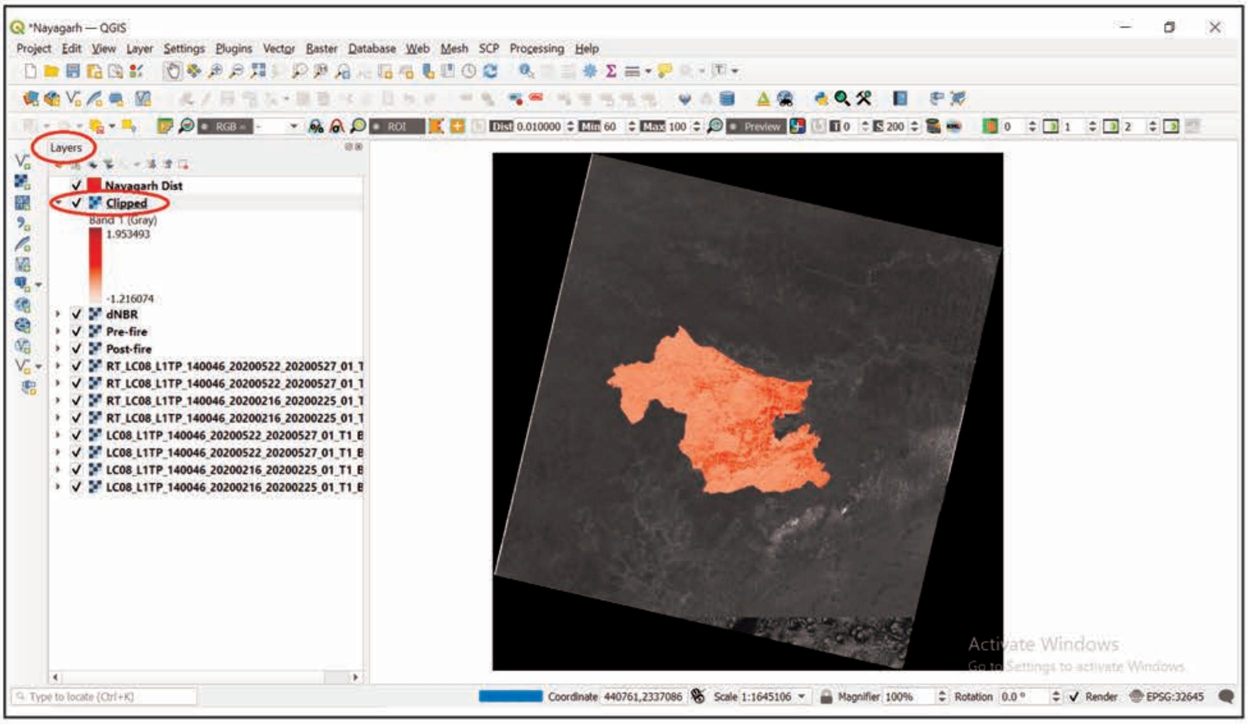


· Right click on Clipped layer. Go to Properties>>Layer Properties.

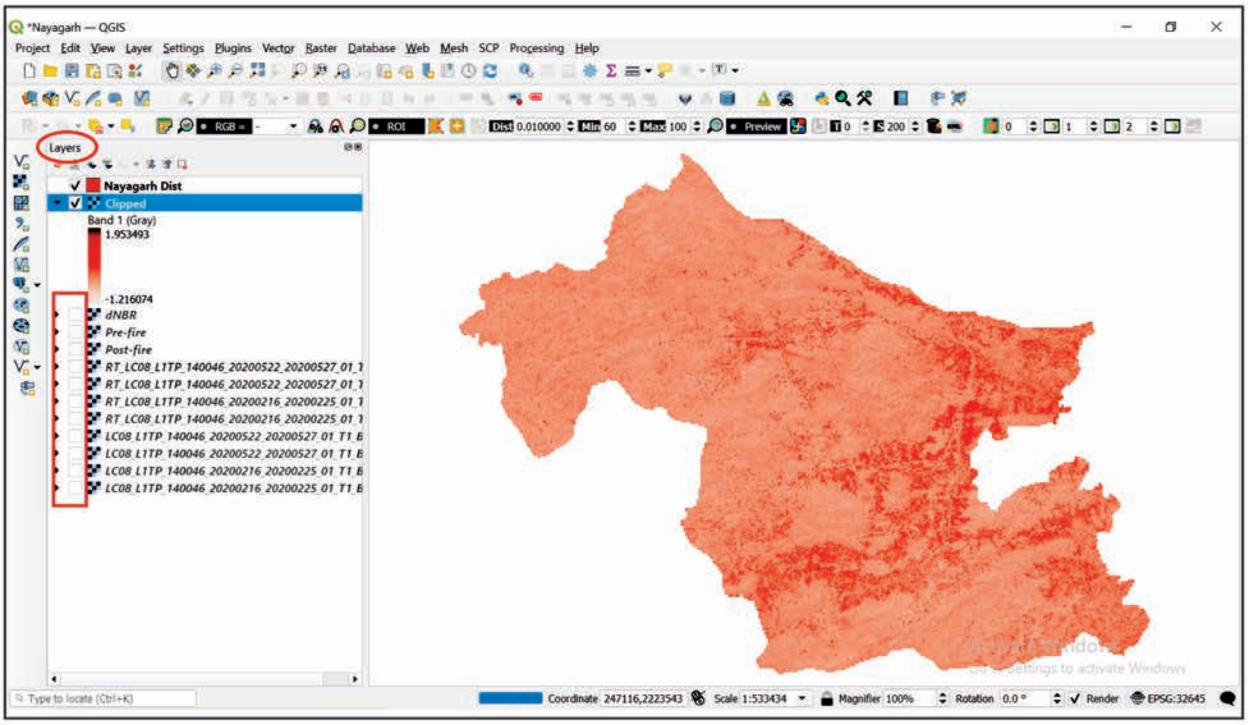
Follow the following steps.



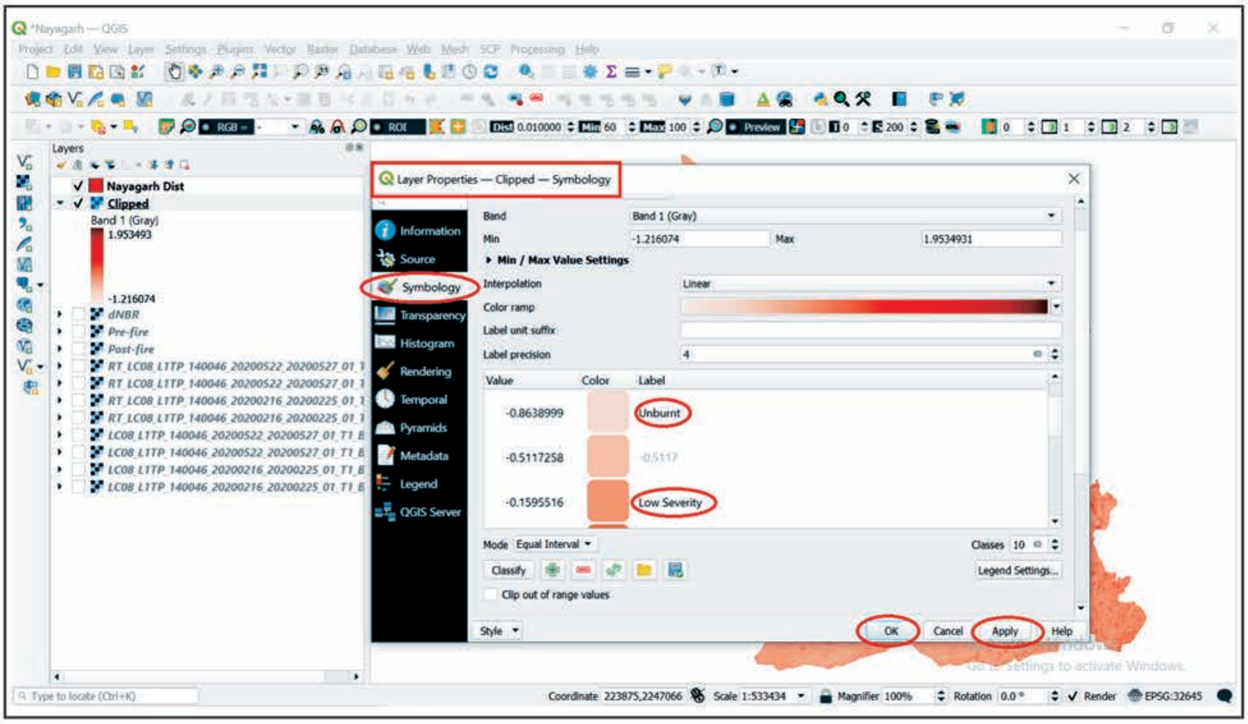
· The color of clipped layer appears as below.



Step 31. In **Layers** panel, uncheck the layers as shown below.



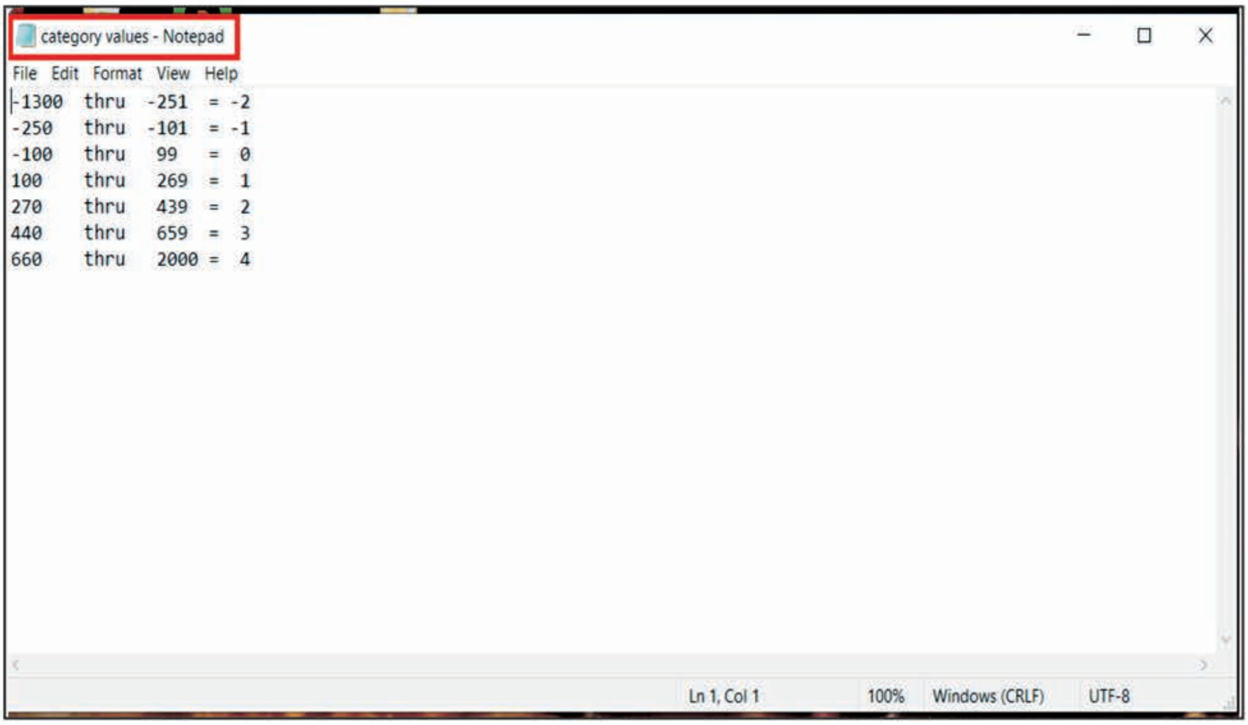
· Set the **Labels** in **Symbology** as shown below.



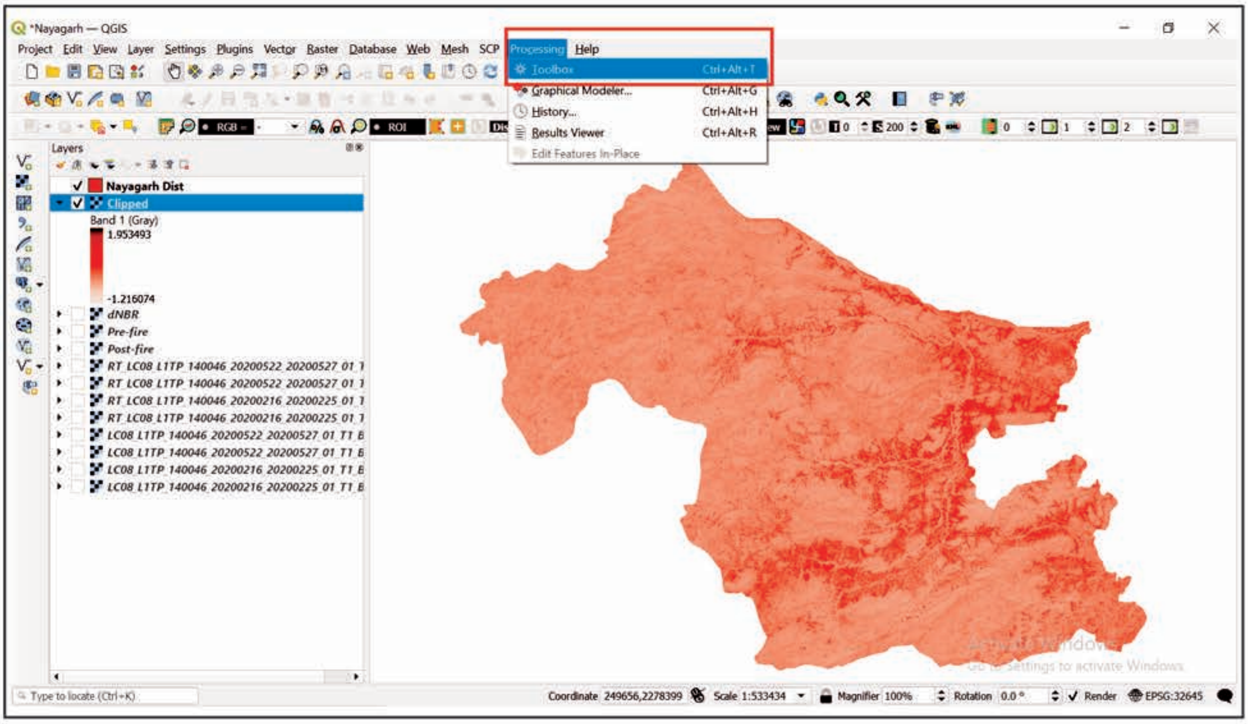
Note:- There are 10 classes which need to be labeled .It can be done in the following way.

Value	1	2	3	4	5	6	7	8	9	10
Label		Unburnt		Low Severity		Moderately low severity		Moderately High Severity		High Severity

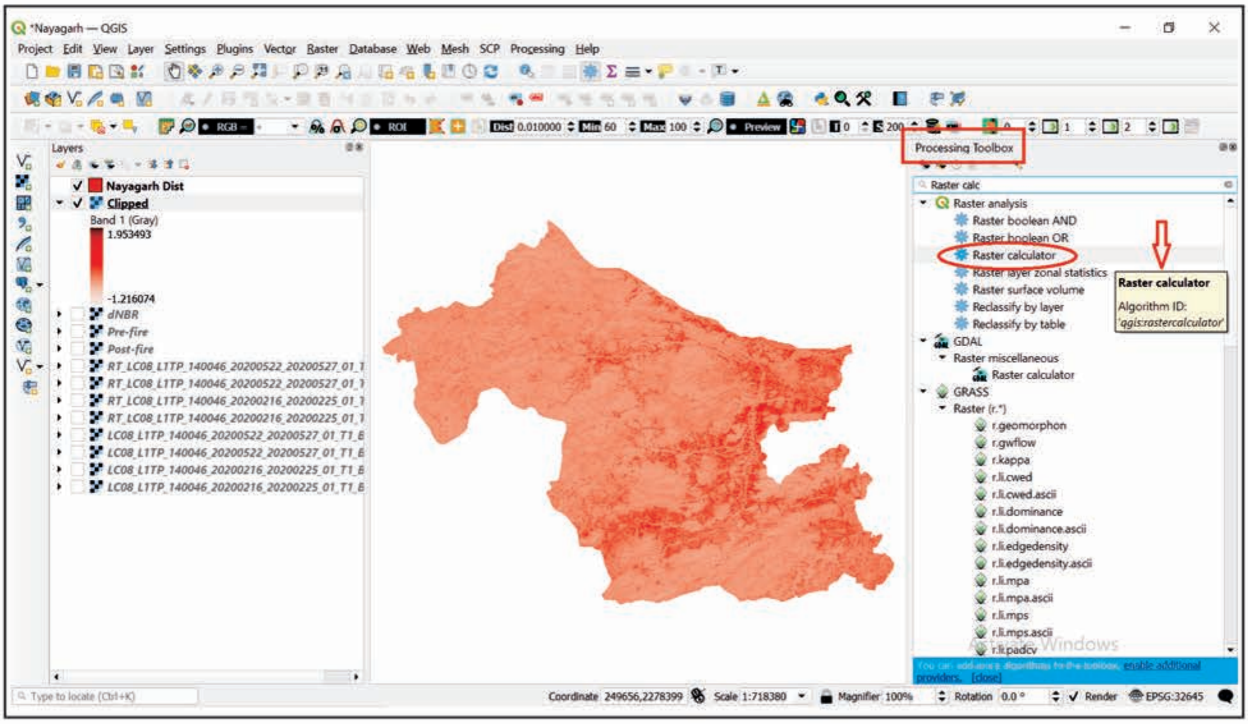
Step 32. In notepad, set the **category values** as shown below.



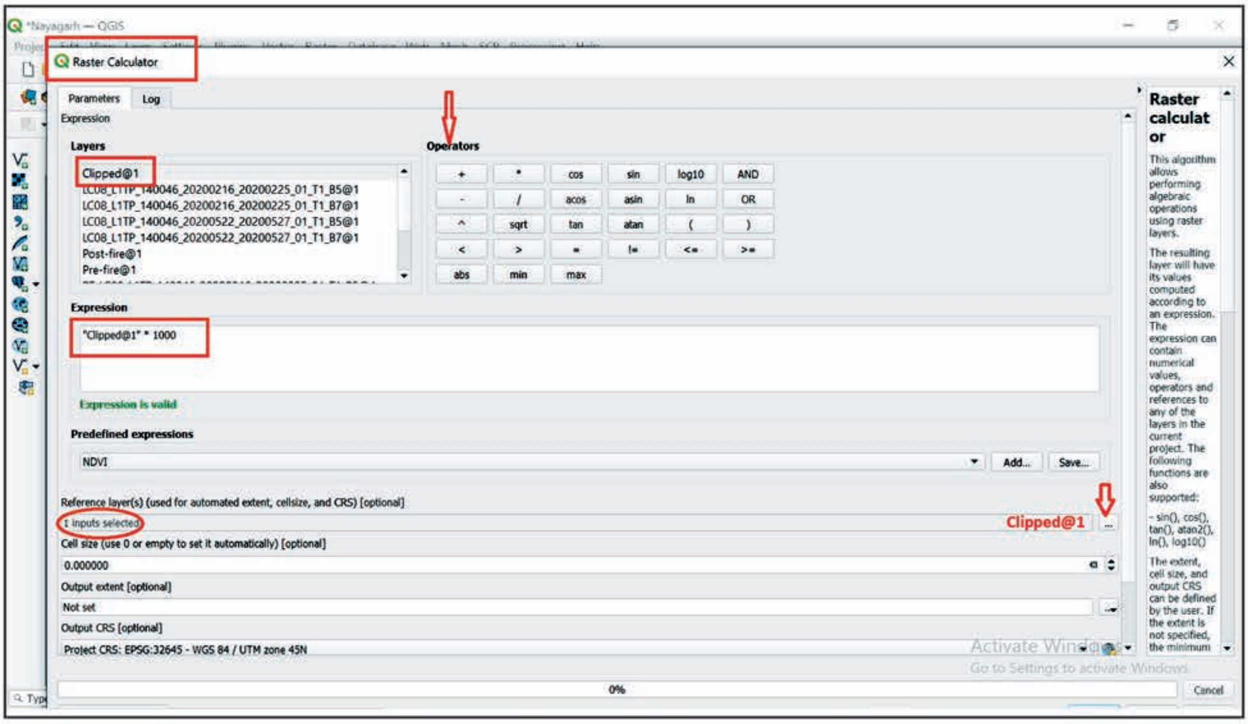
Step 33. Open Processing Toolbox and Click on **Raster calculator.**



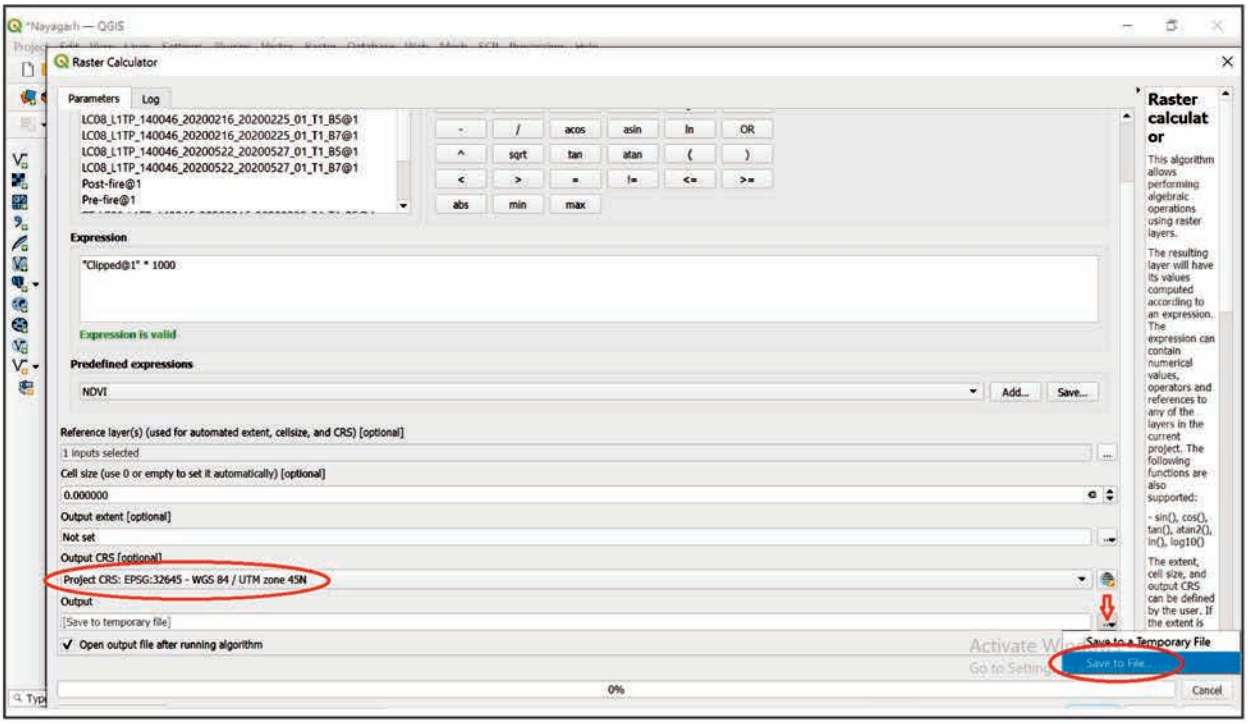
· Processing toolbox >> **Raster Calculator.**



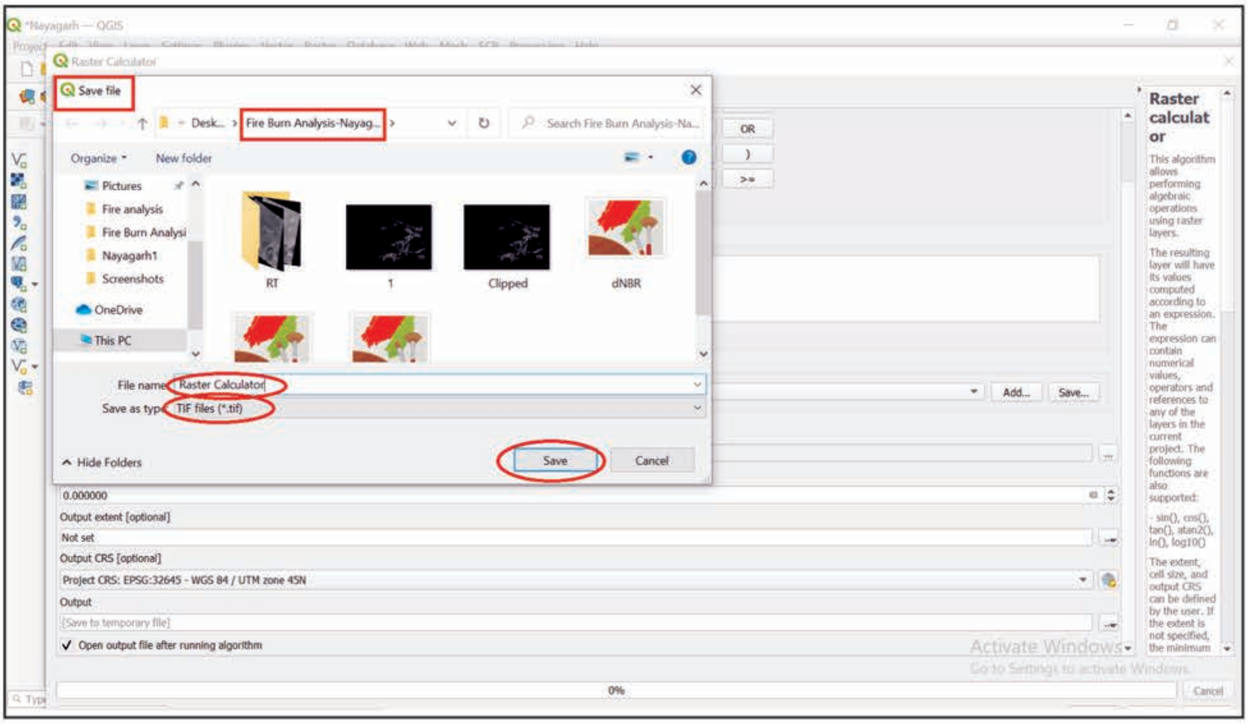
· In **Raster calculator** window, enter the input values as shown below.



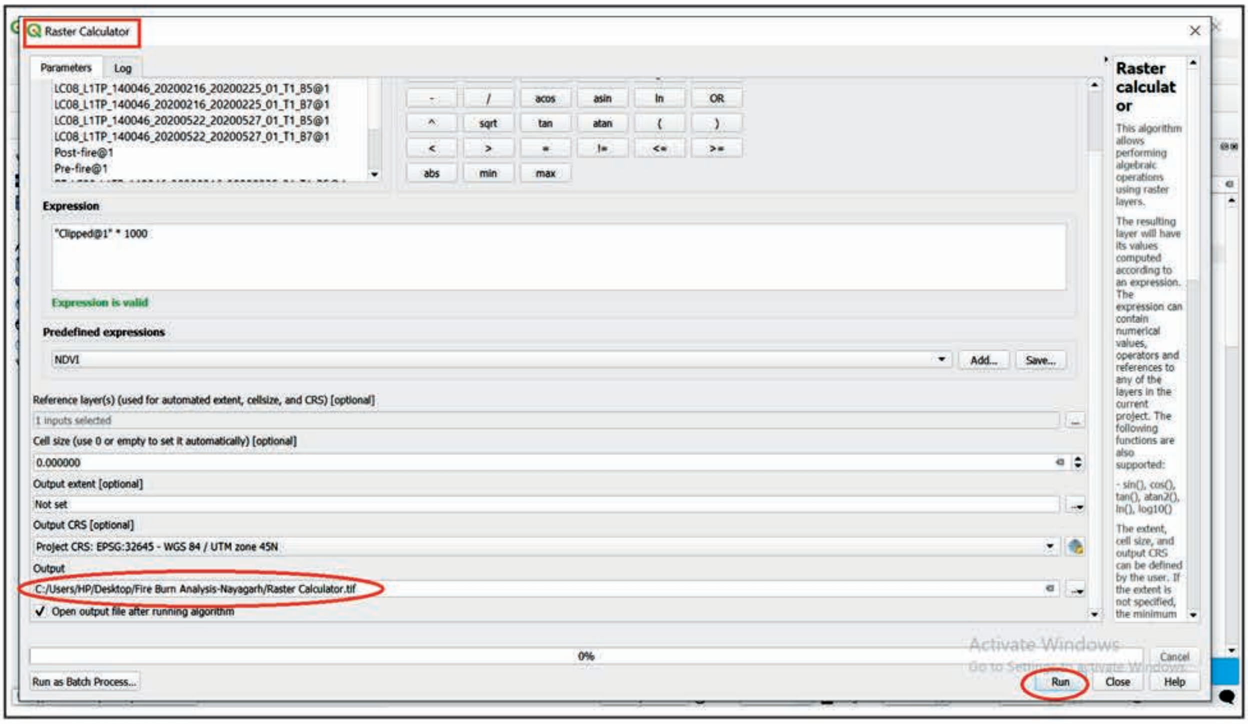
- Set the **output CRS** as below >> **Save to File**.



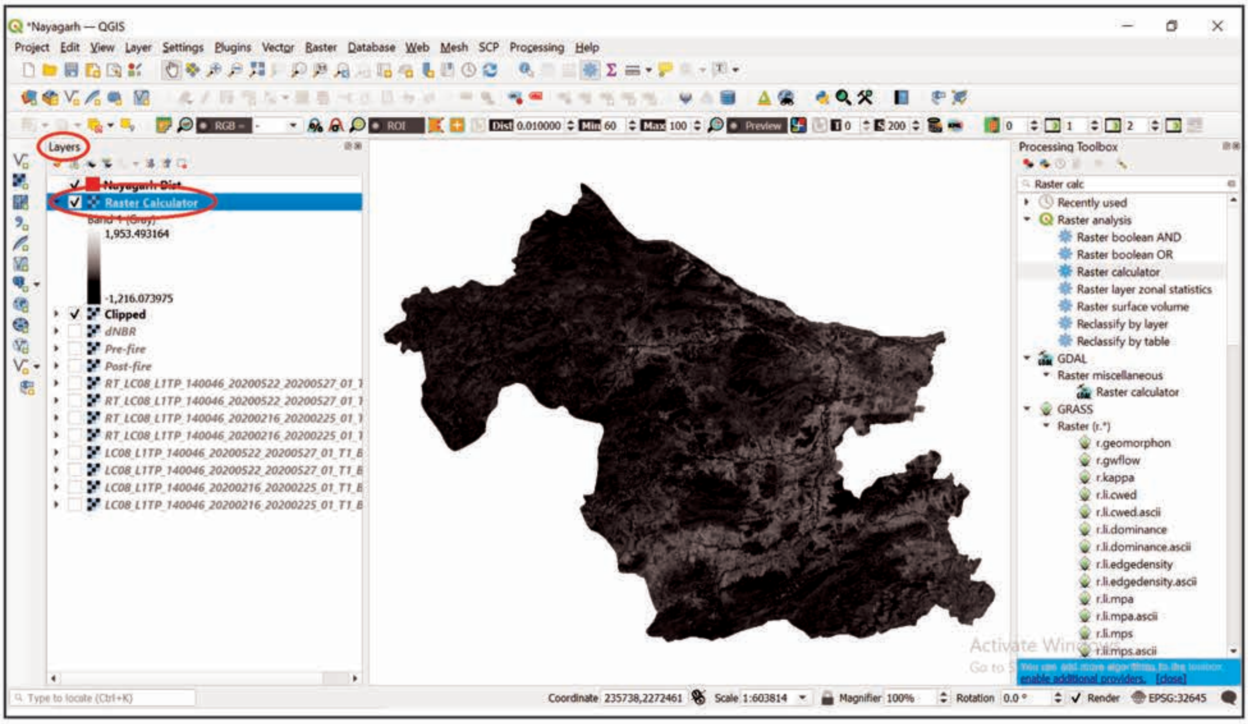
- Save File >> Folder (Fire burnt Analysis-Nayagarh) >> File Name (Raster Calculator)



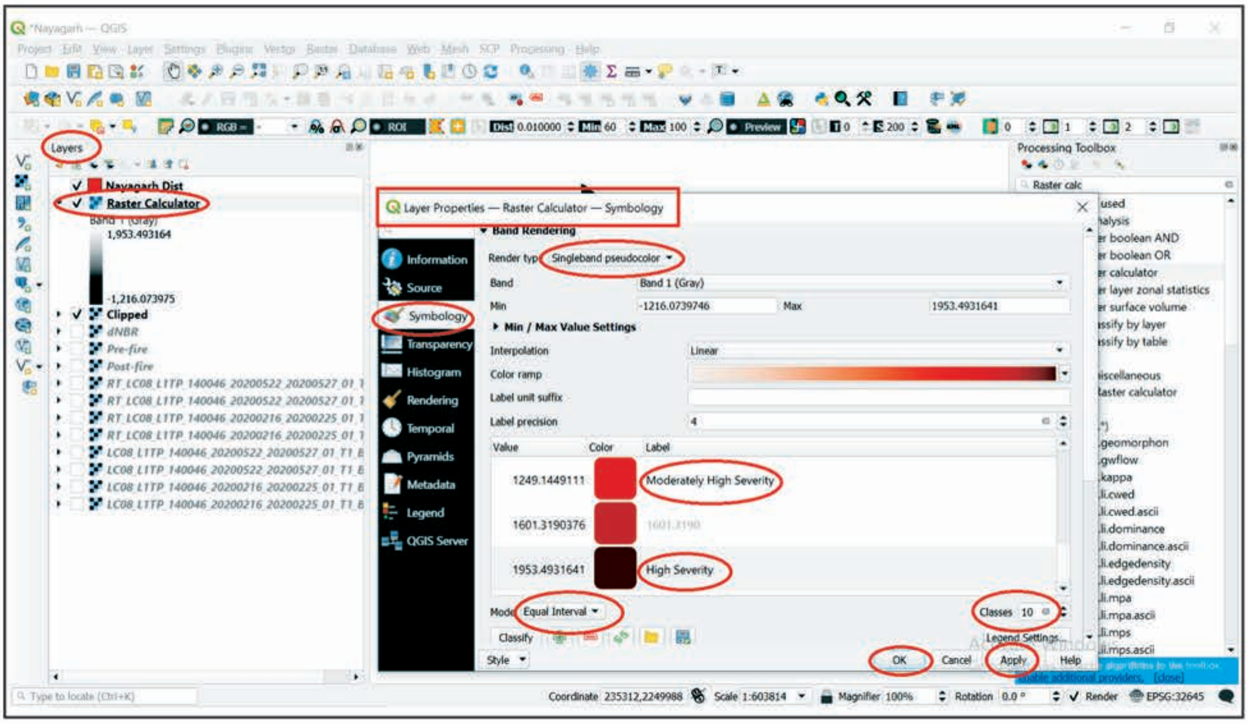
· Click on **RUN** button.



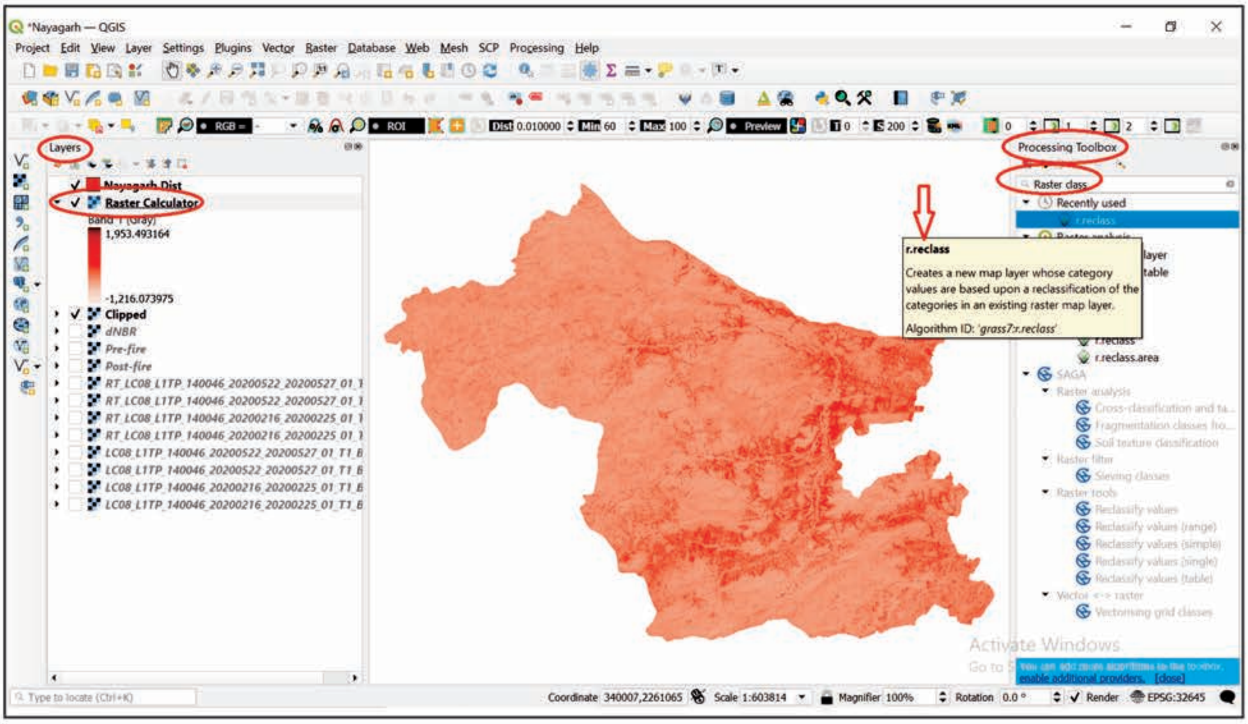
· The **Raster Calculator** layer appears as below.



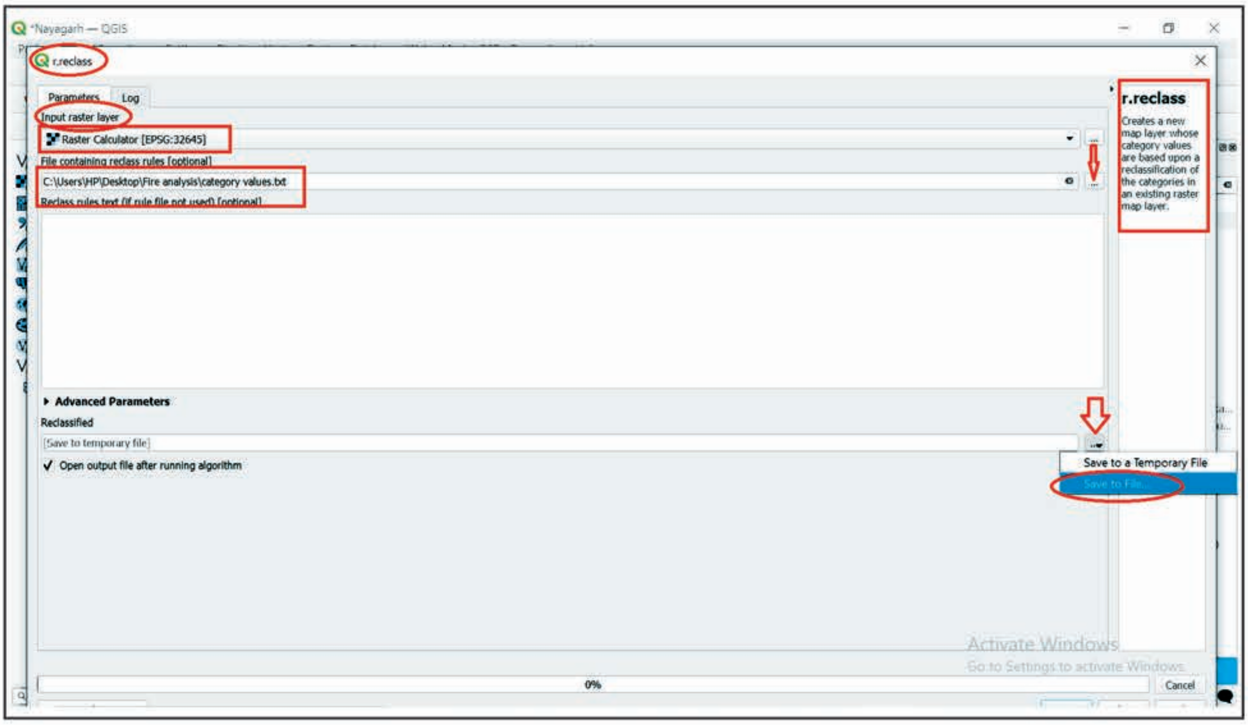
· Changing color in **Symbology** in Raster Calculator layer as below.



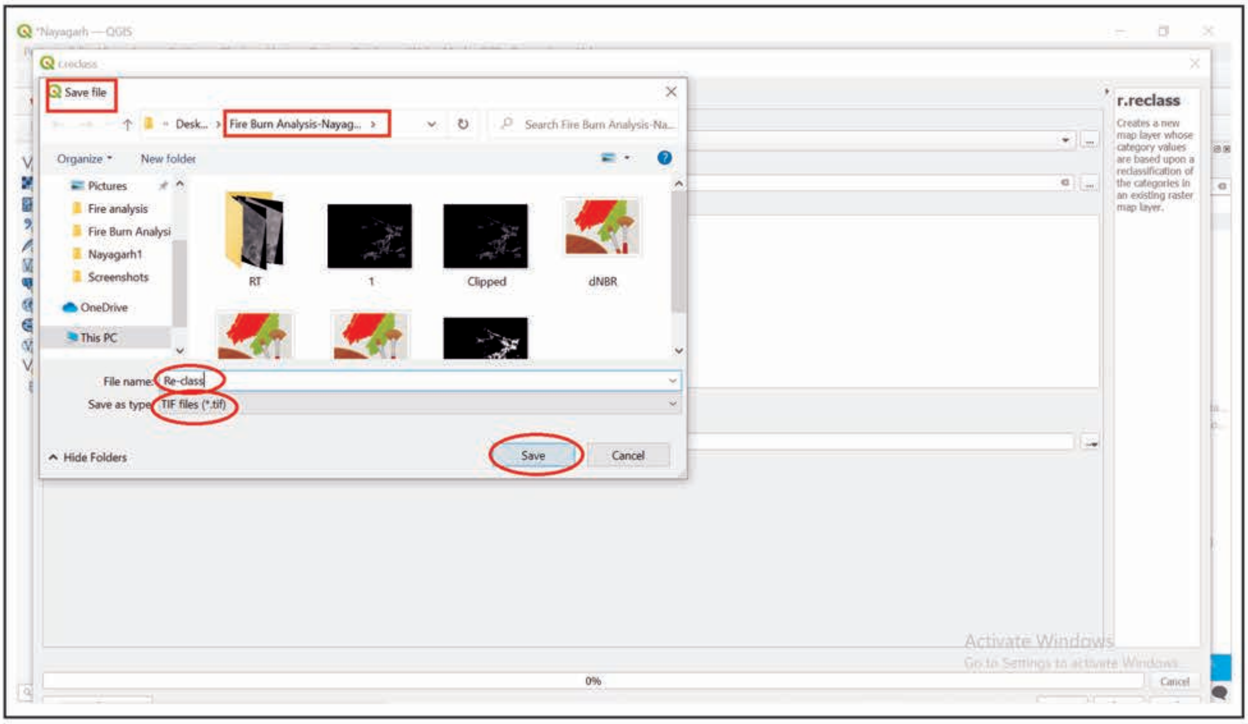
Step 34. **Re-classification : Go to Processing Toolbox >> r.reclass**



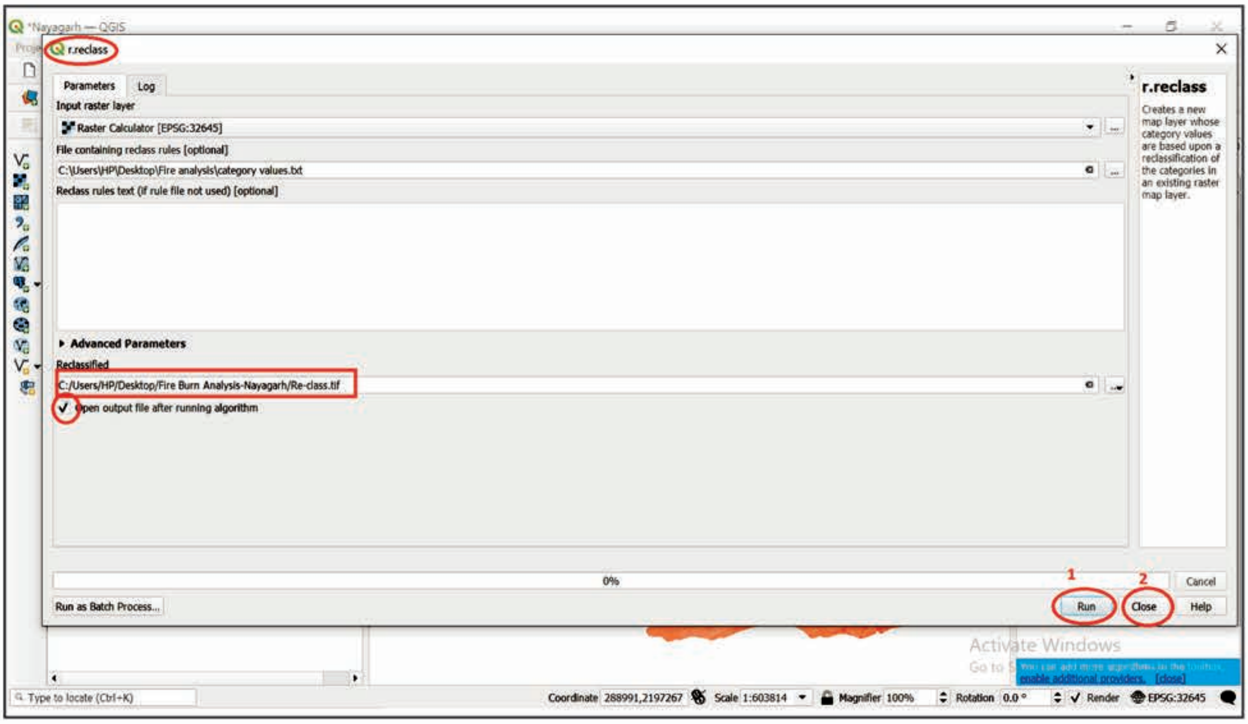
· In **r.reclass** window, the **reclass file** can be added or the expression can be directly entered in the Raster rules in the field given, enter parameters as shown below.



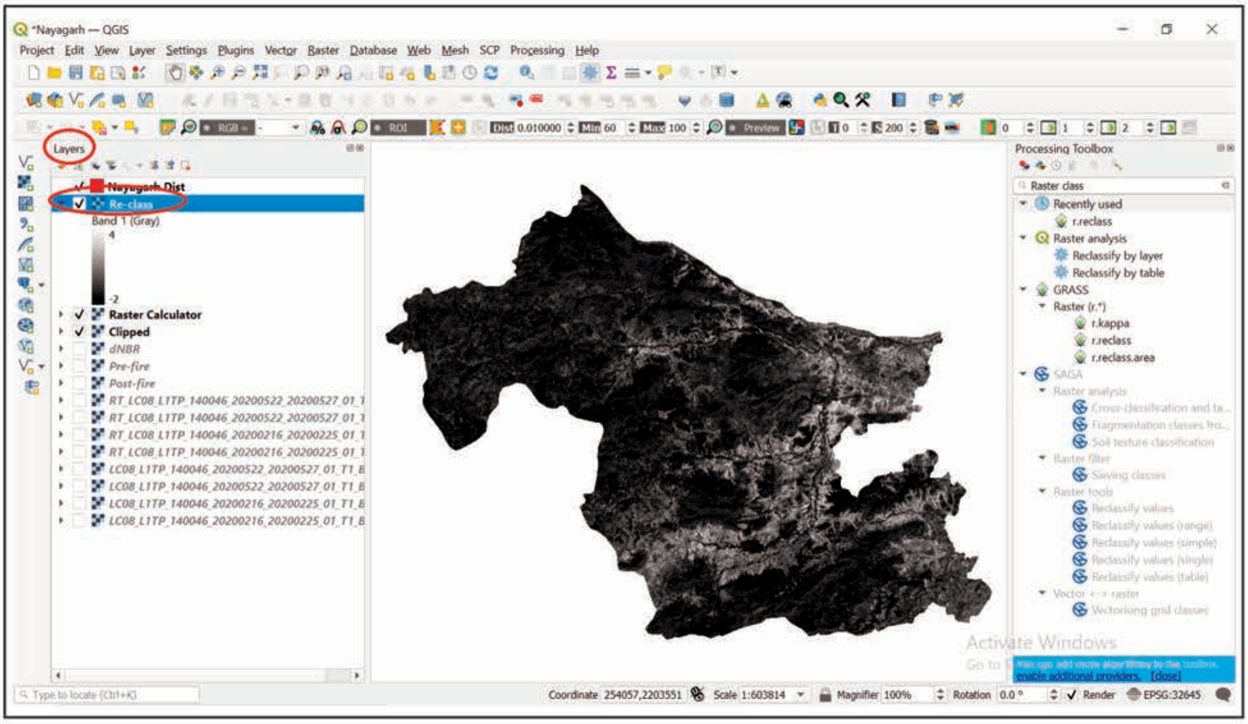
* Save the file in specified folder as shown below.



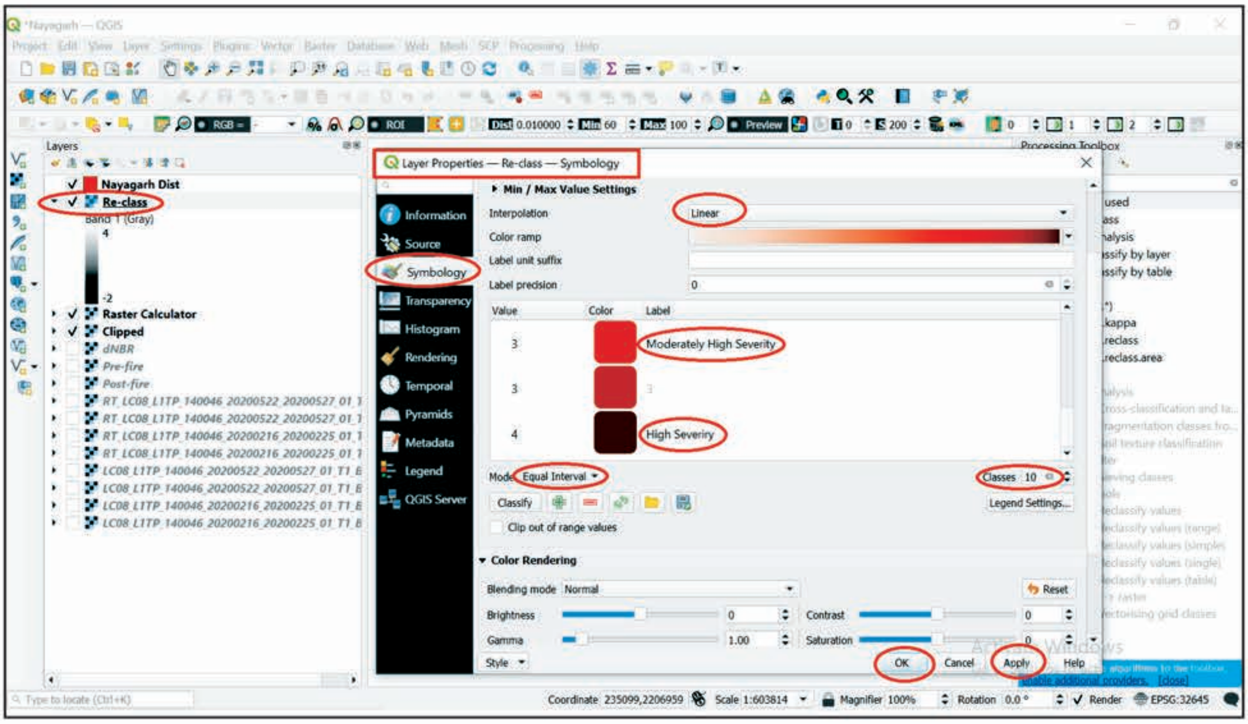
· Click on **Run**. After the algorithm runs successfully, Close the r.reclass window.



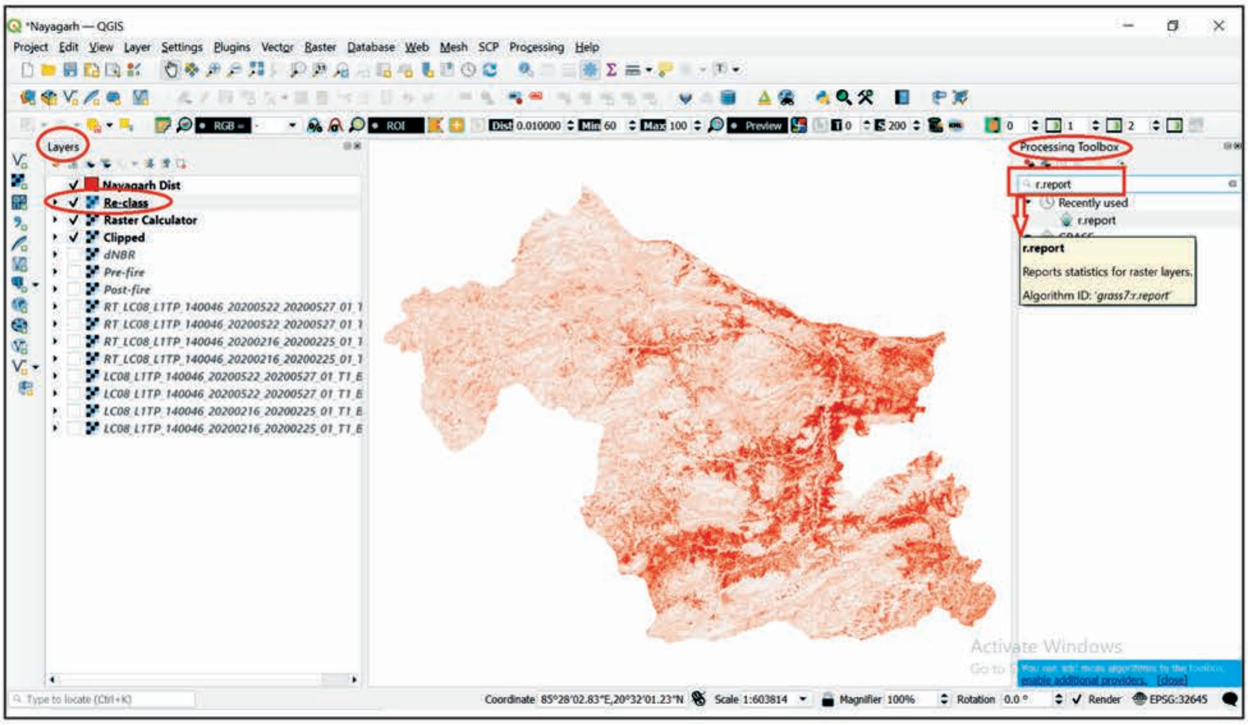
· In **r.reclass**, layer appears and image opens as shown below.



· Change Color and do labelling in **Symbology** of reclassified layer as shown below.

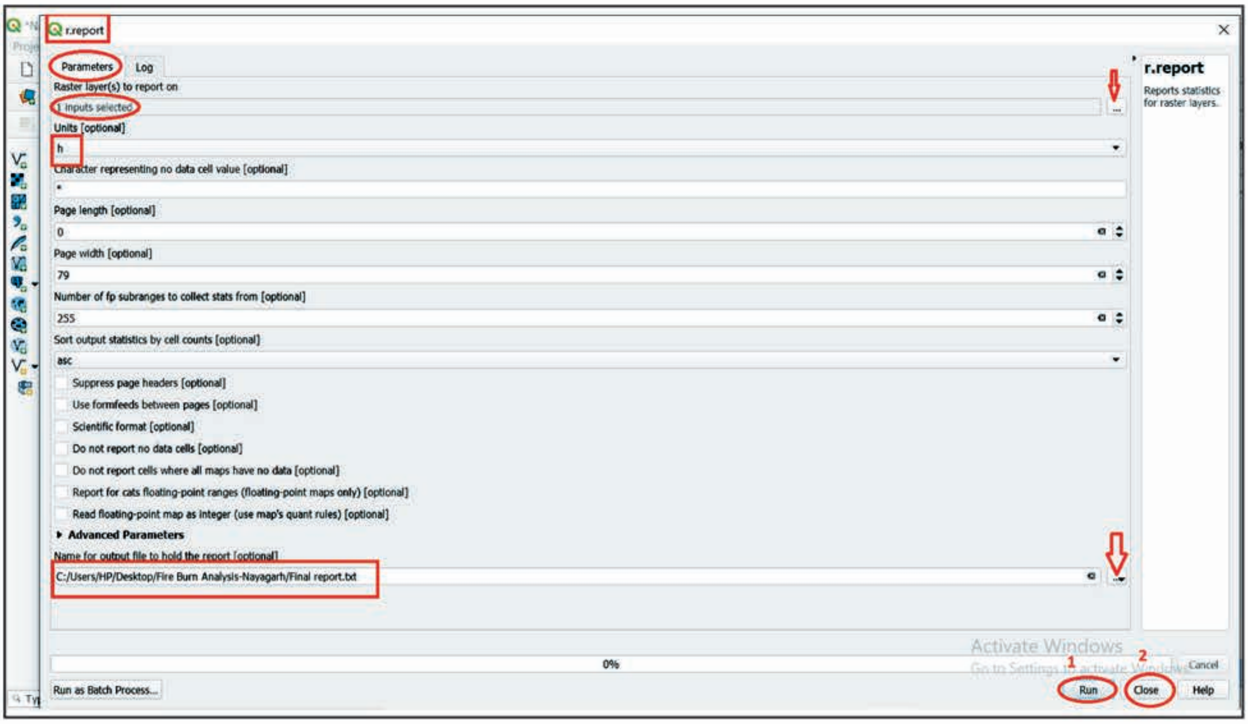


· The re-classified image appears as below. Go to **Processing Toolbox >> r.report**.

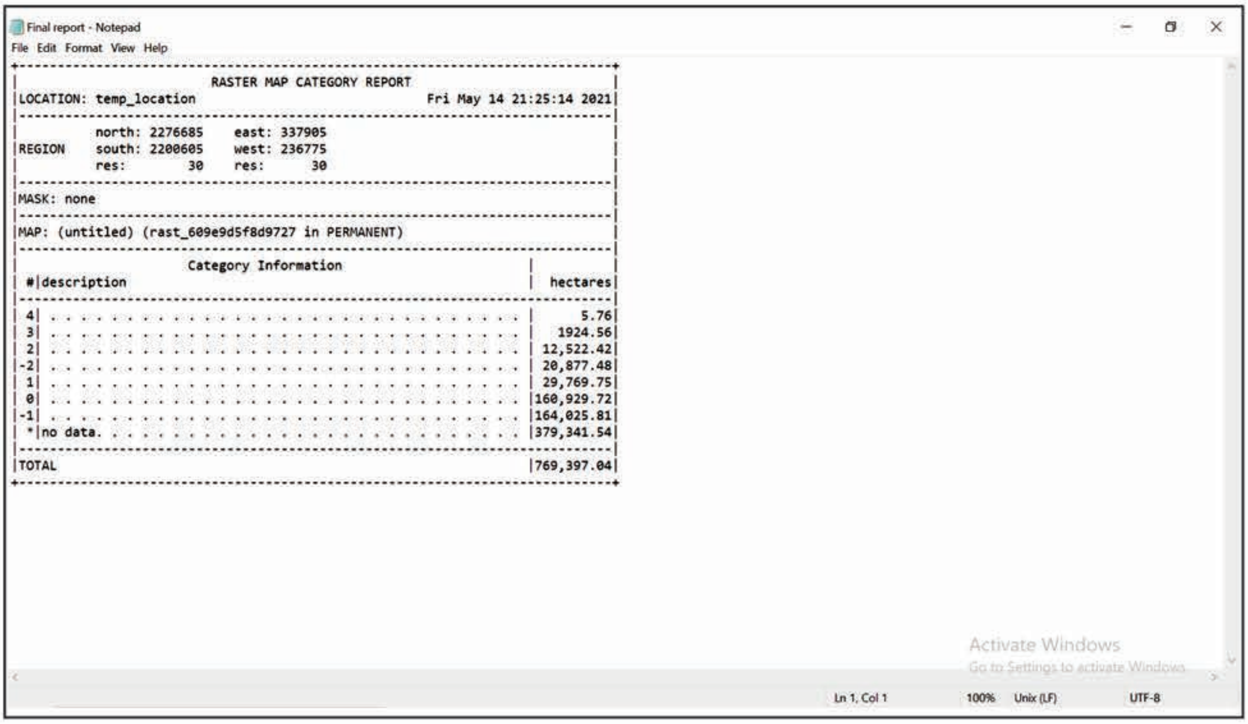


- In **r.report** window, enter parameters as shown below.

  Click on **Run** button. **Close** the window after completion of successful completion of Run.

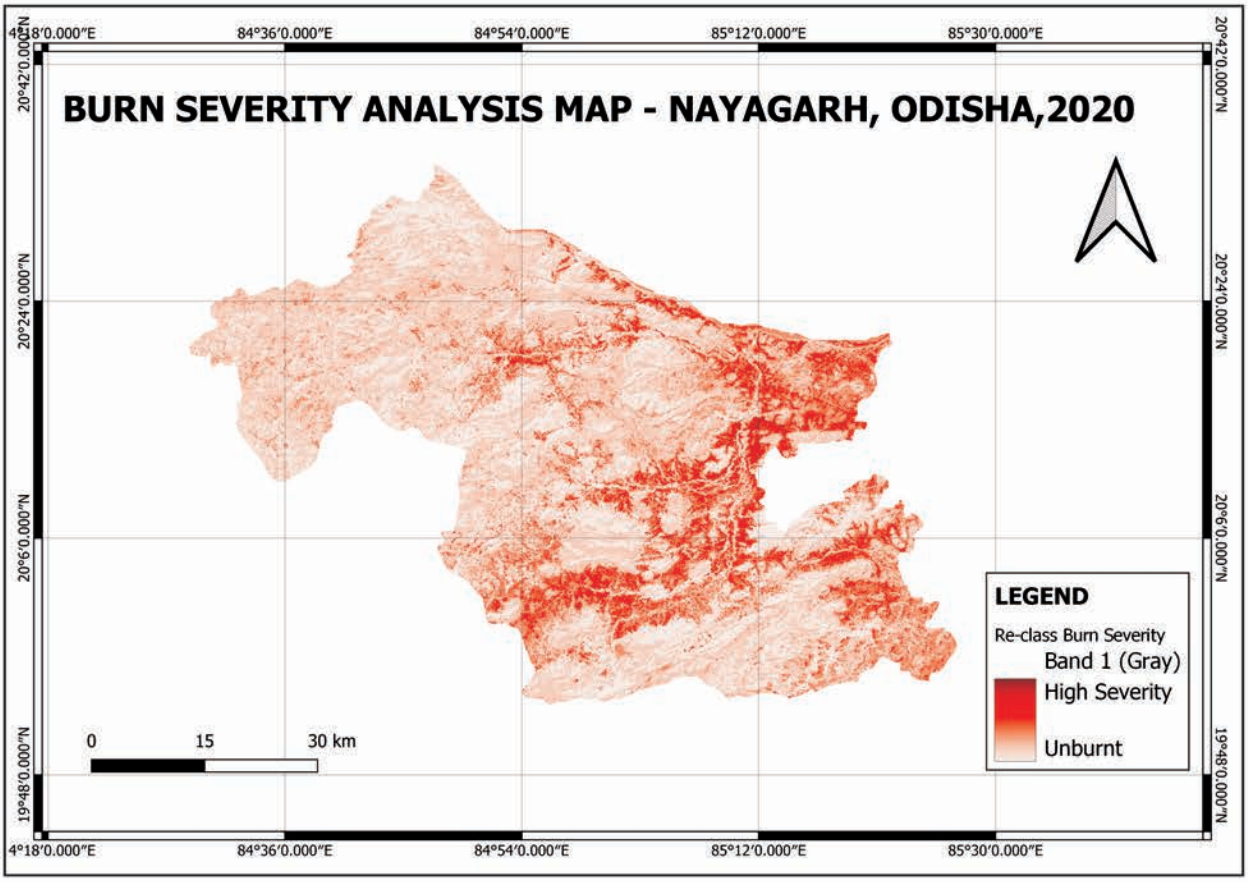


- The final generated report is as below. The raster report is generated for all the classes as set.


Final report - Notepad

```
+-----------------------------------------------------------------------------+
|                         RASTER MAP CATEGORY REPORT                          |
|LOCATION: temp_location                             Fri May 14 21:25:14 2021|
|-----------------------------------------------------------------------------|
|          north: 2276685    east: 337905                                     |
|REGION    south: 2200605    west: 236775                                     |
|          res:        30    res:       30                                     |
|-----------------------------------------------------------------------------|
|MASK: none                                                                   |
|-----------------------------------------------------------------------------|
|MAP: (untitled) (rast_609e9d5f8d9727 in PERMANENT)                          |
|-----------------------------------------------------------------------------|
|                     Category Information                       |           |
| #|description                                                  |  hectares|
|-----------------------------------------------------------------------------|
| 4| . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . |      5.76|
| 3| . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . |   1924.56|
| 2| . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 12,522.42|
|-2| . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 20,877.48|
| 1| . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 29,769.75|
| 0| . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . |160,929.72|
|-1| . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . |164,025.81|
| *|no data. . . . . . . . . . . . . . . . . . . . . . . . . . . . |379,341.54|
|-----------------------------------------------------------------------------|
|TOTAL                                                           |769,397.04|
+-----------------------------------------------------------------------------+
```

Step 35. The map of Burn Severity Analysis is as shown below.



18. Forest Canopy Fragmentation in QGIS

Forest Canopy Fragmentation analysis is gives us clear idea about different changes in forest due to massive urbanization, mining and industrialization. It is done by calculating the different indices as advance vegetation index (AVI), Bare Soil Index (BSI), Shadow Index (SI), Forest canopy Density (FCD) with the help of Landsat8 satellite imagery. In this exercise dense forest cover affects measured as comparable change in the area with its environment which provides a quantity and can be applied by policy makers in planning of protection of forest.

Open SCP, band Set and Select meta data file and save as RT.

↓

Add Raster Layer of Lansdat Band 2-7.

↓

Select SCP Band set of selected bands.

↓

Add vector layer of Region of Interest (ROI).

↓

Clip multiple rasters of Landsat8 (OLI) and save as clip in folder.

↓

Open Raster Calculator and apply the formulae of Advance Vegetation Index (AVI), Bare Soil Index (BSI) and Canopy shadow Index (CSI). And save in layer panel.

↓

Remove all earlier layers and Rename the RT as B2- B7.

↓

To calculate Vegetation Density go to Plugin select PCA for Change detection (PCA4CD), Select Input A as AVI and B as BSI and compute principal component. Select change detection layer and save PCA as AVI PCA.

↓

Go to Symbology and select the ramp of different colors.

↓

Open Raster Calculator and apply formulae of Forest Canopy Density (FCD). Rescale the FCD in 0-100 scale from rescale raster.

↓

Scale the shadow index in rescale raster on 0-100 scale and save it as Scaled Shadow Index (SSI).

↓

Add AVI PCA Raster layer.

Step 1:

1. **Select 'Layer' and 'Add layer' click "Add Raster layer"**
2. **Browse the Raster file.**
3. **Click 'Add' the file.**

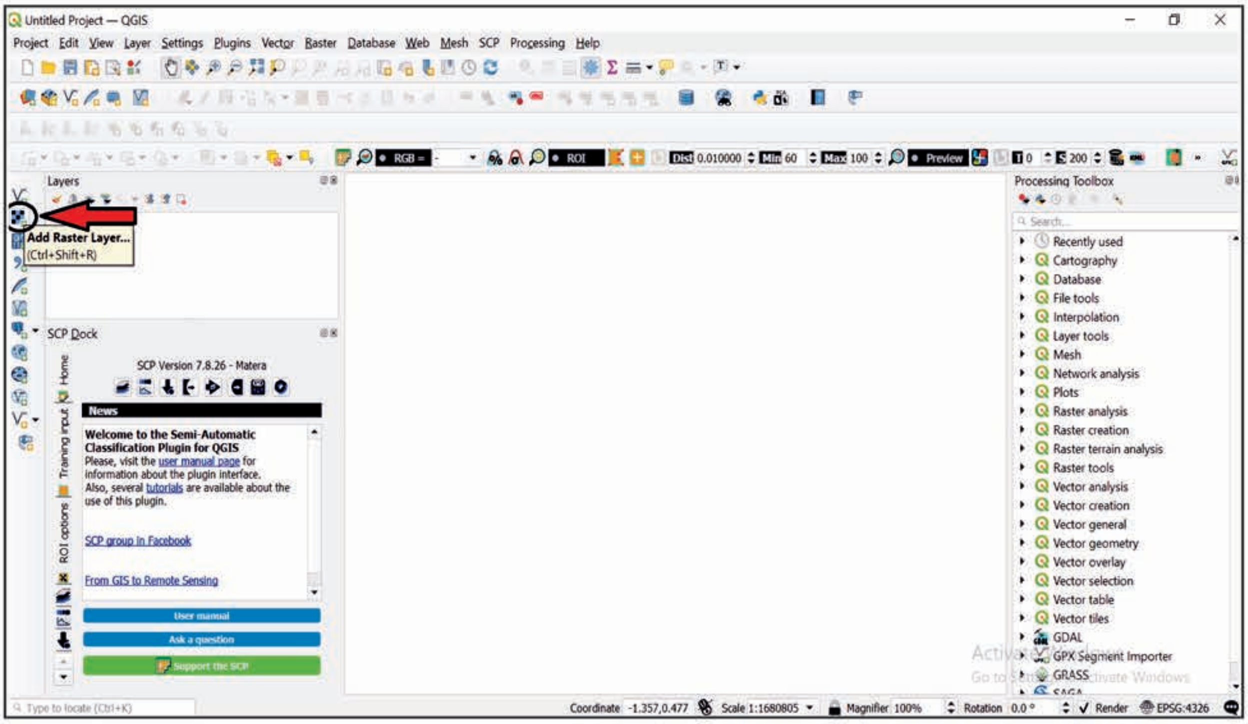


Fig.1. Click Add Raster layer

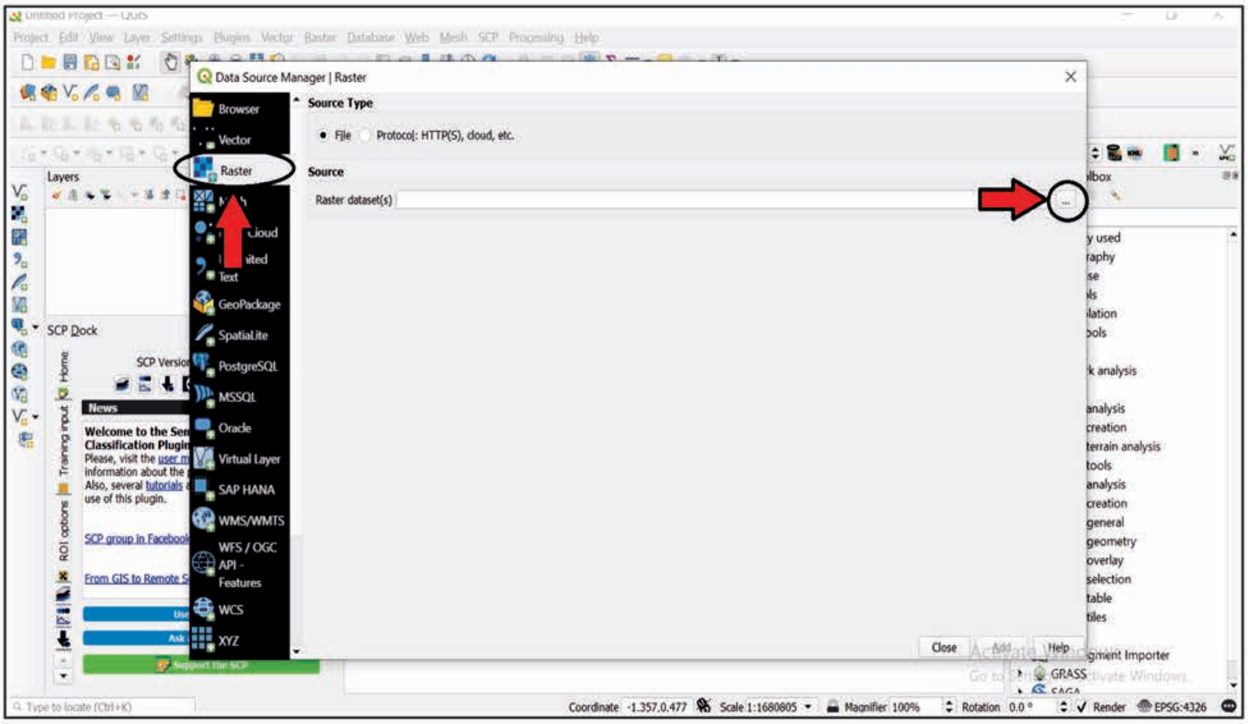


Fig.2. Select the Raster dataset(s)

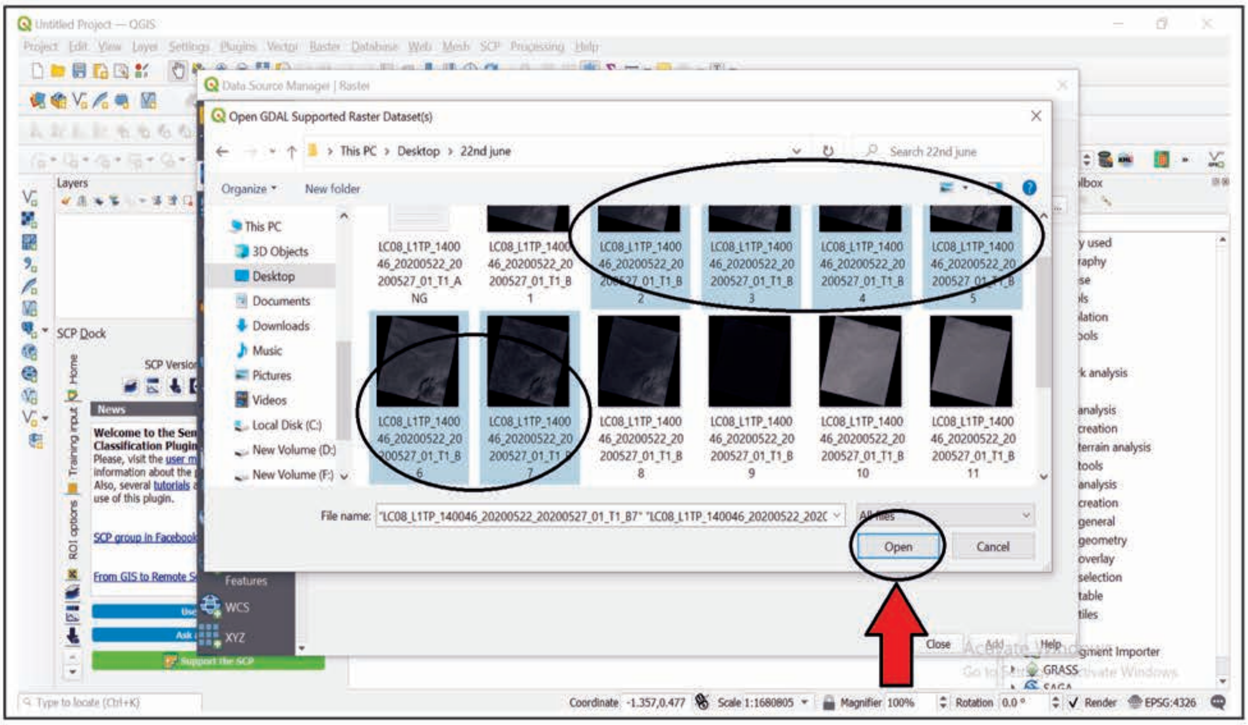


Fig.3.Select the Raster file (Band 2-7)

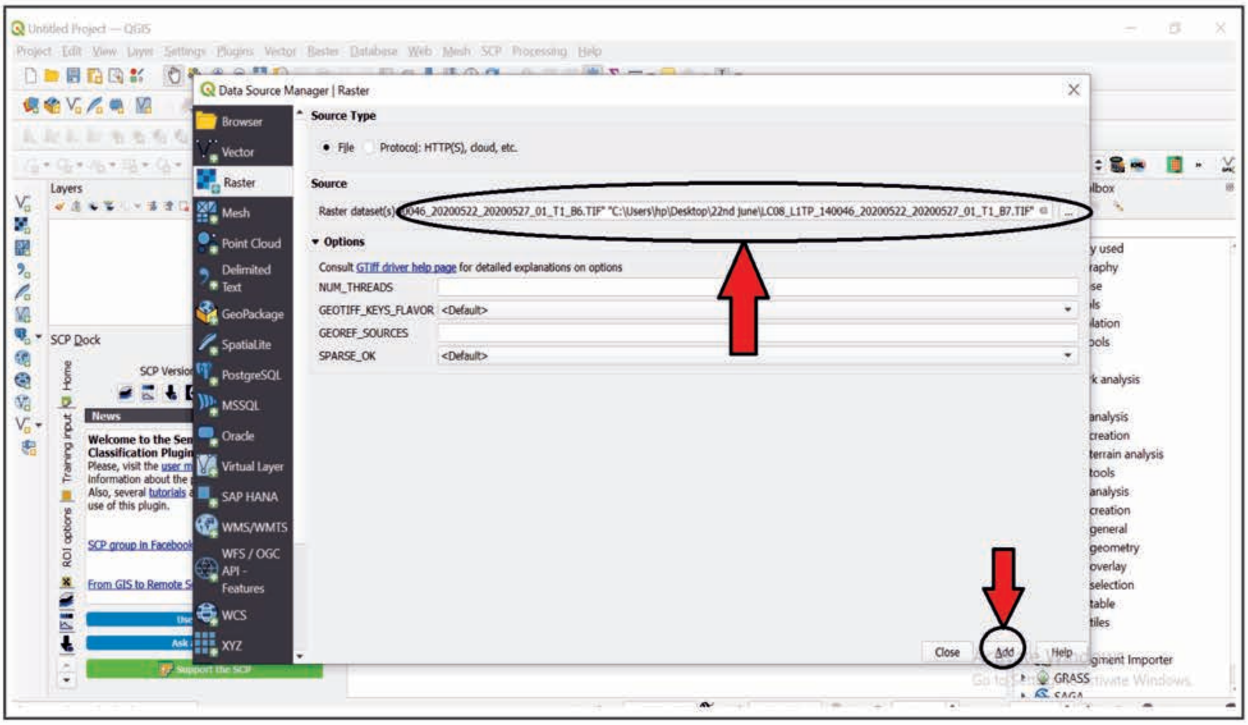


Fig.4. Click the Add button

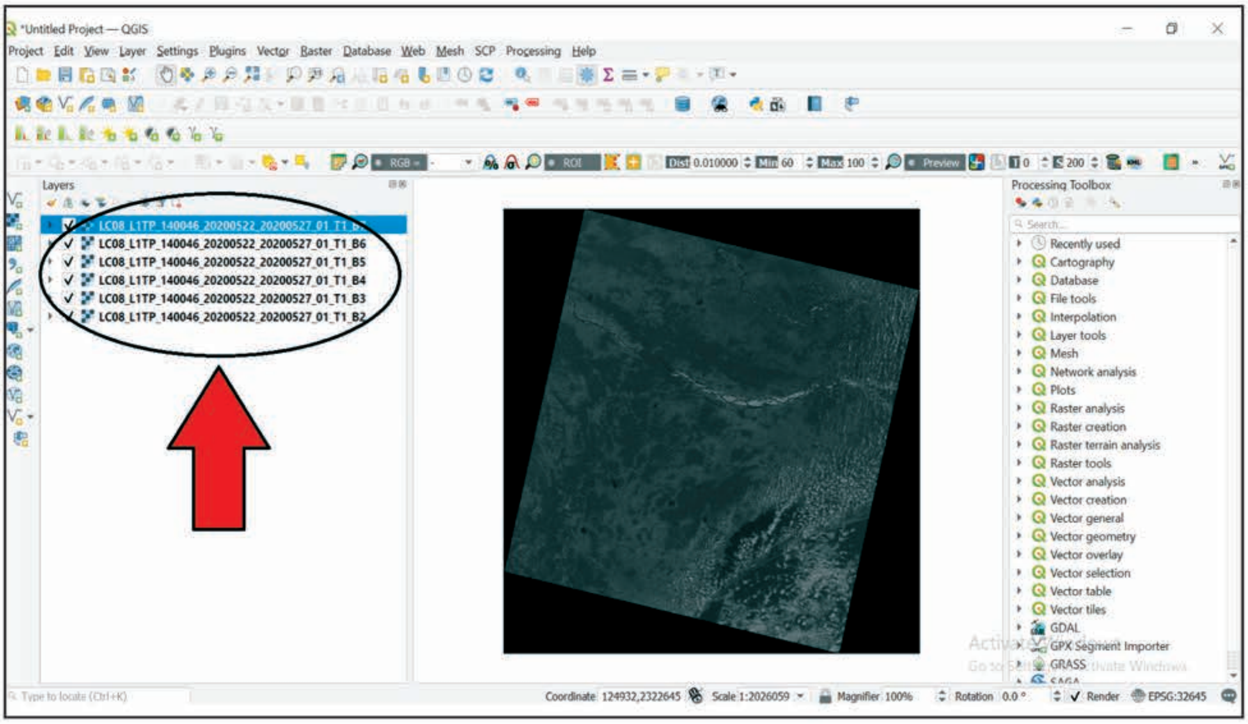


Fig.5. Raster file Added

Step 2:

1. Select 'SCP' click "Band set"
2. Set the Band values.

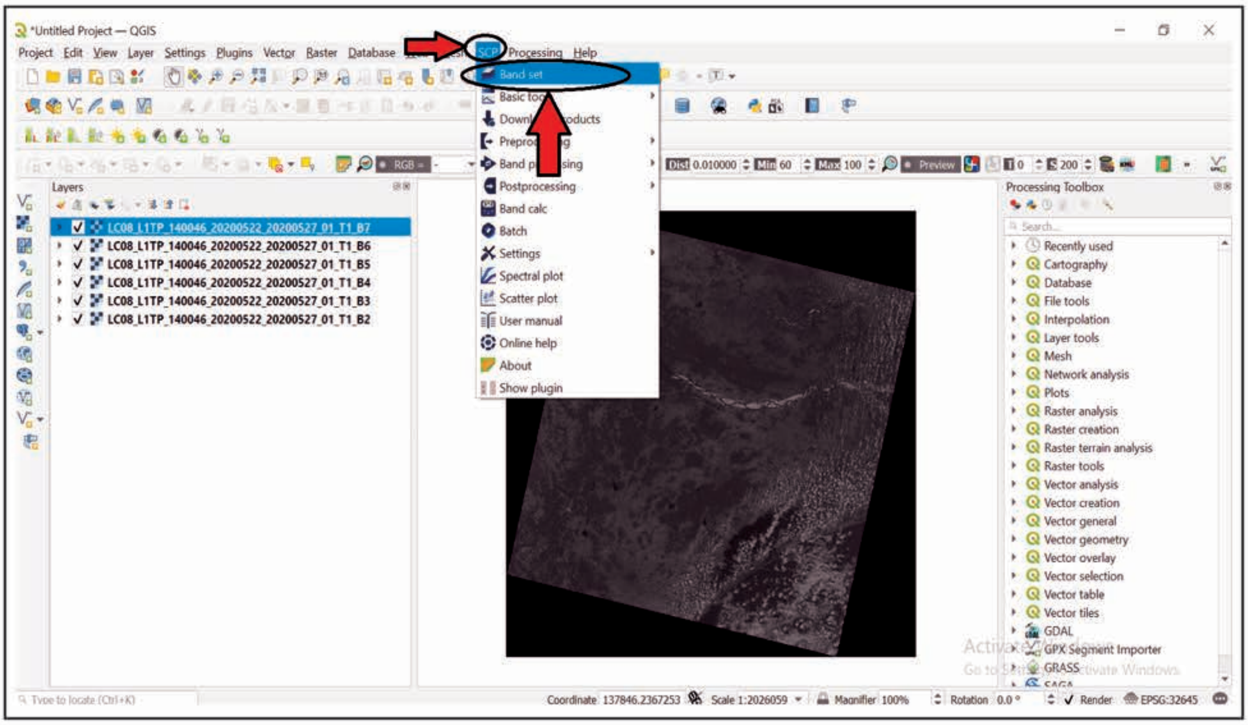


Fig.6. Select Bandset tool

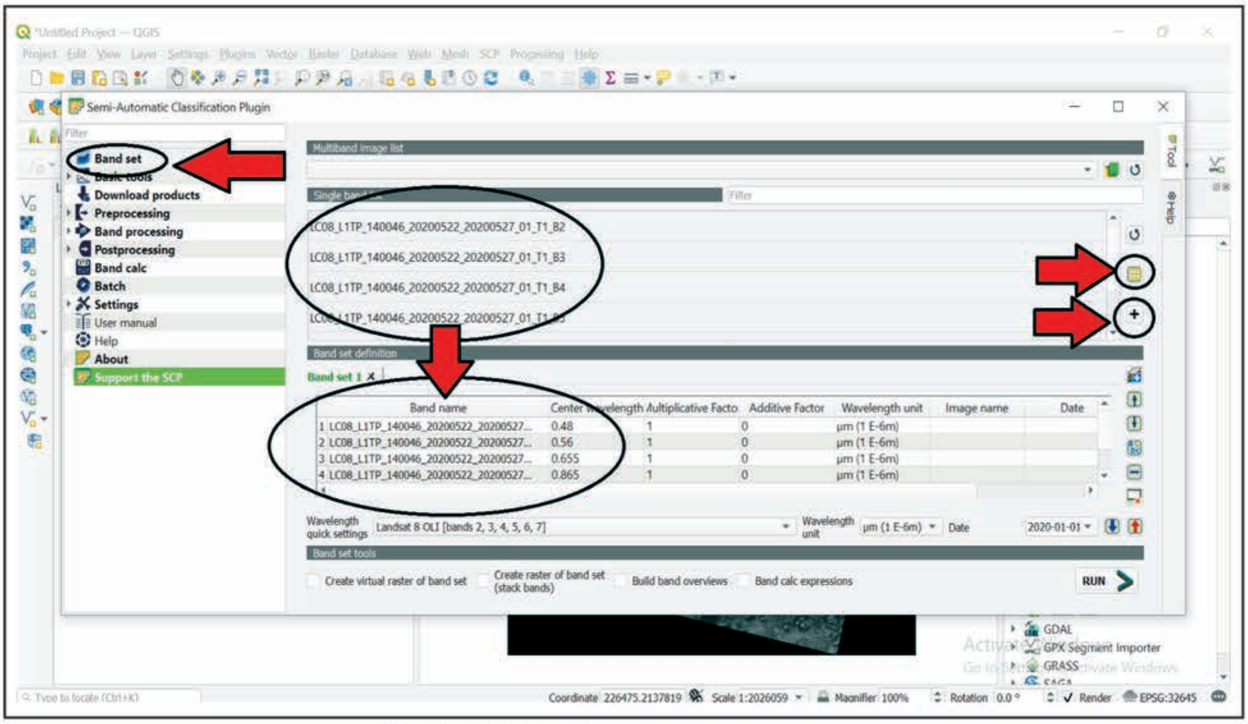


Fig.7. Set the Band value

Step 2:

1. Select 'Layer' and 'Add layer' click "Add Vector layer"
2. Browse the Vector file (Nayagarh District).
3. Click 'Add' the file.

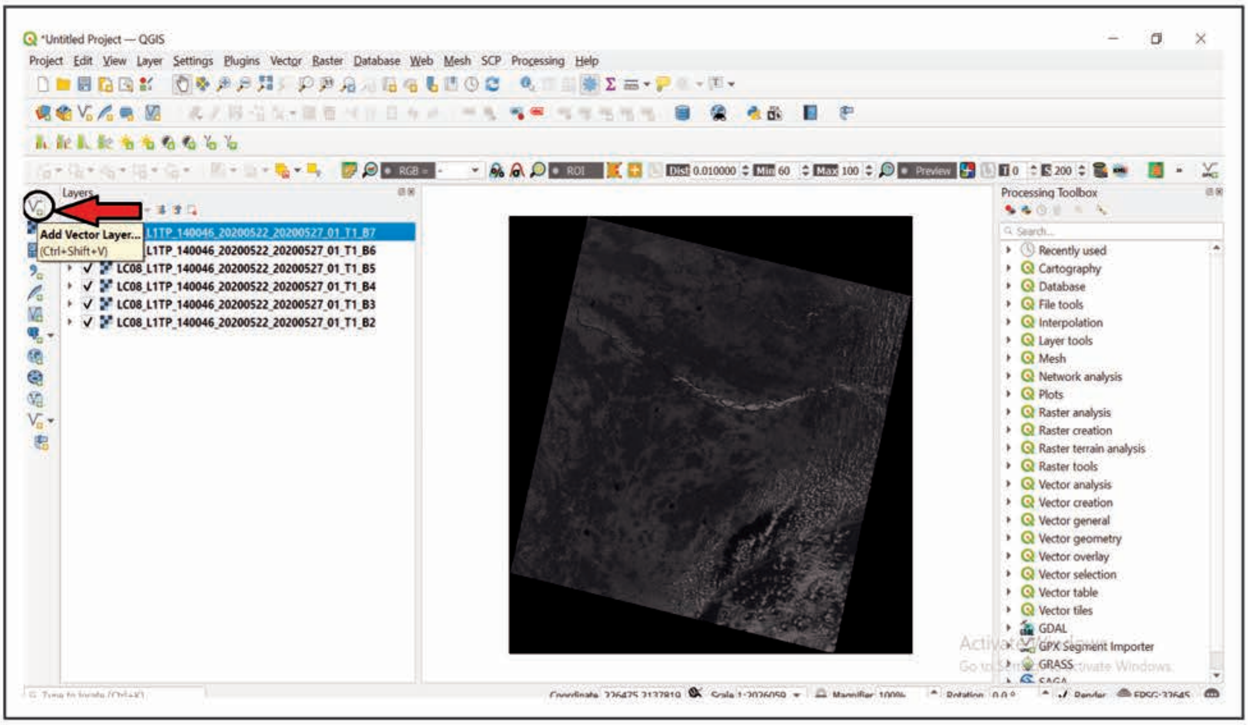


Fig.8. Click Add Vector layer tool

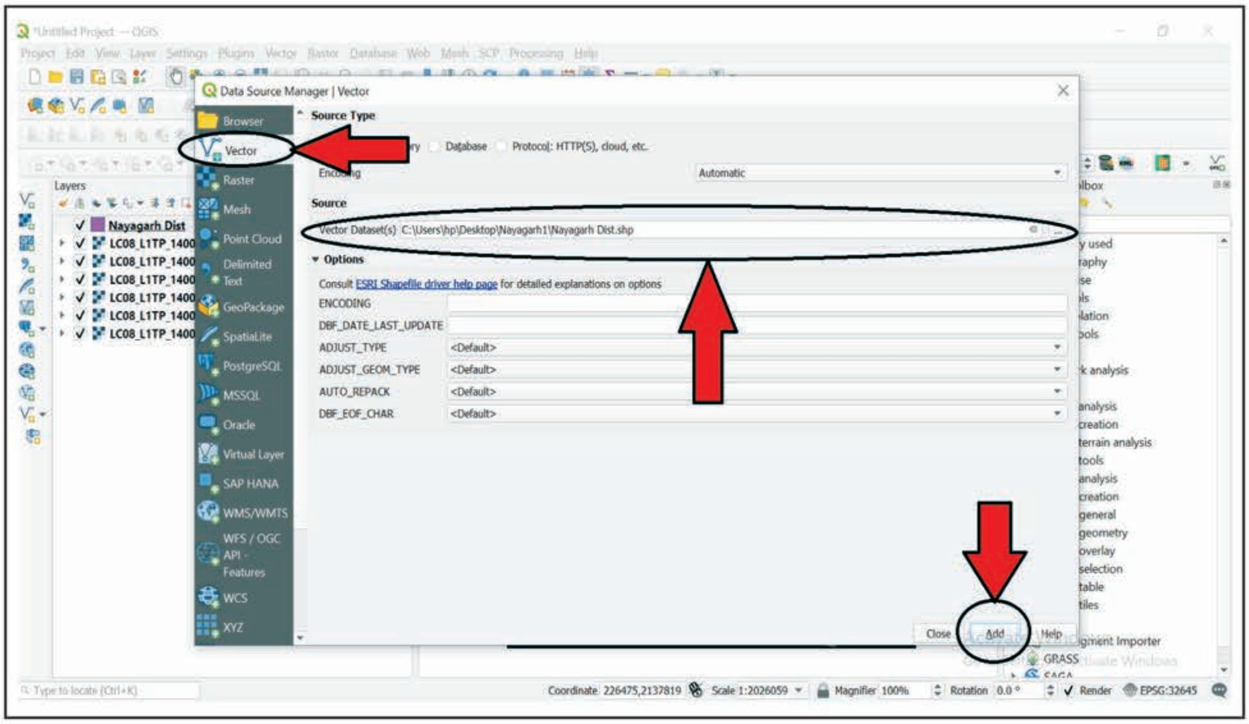


Fig.9. AddNayagarh district Vector Layer

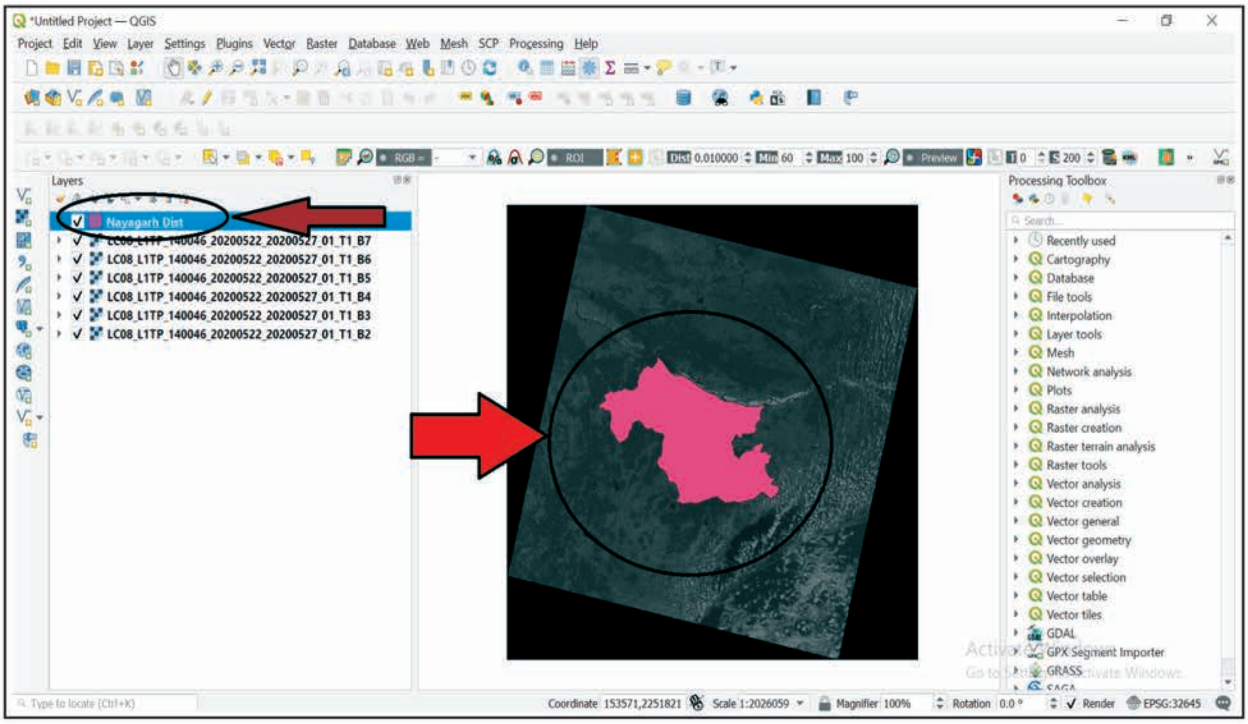


Fig.10. Nayagarh district vector file added

Step 3:

1. Select 'SCP' click "Band set"
2. Select 'Preprocessing' click "Clip Multiple Rasters"
3. Click Nayagarh district image for cliping.
4. Click Run tool.

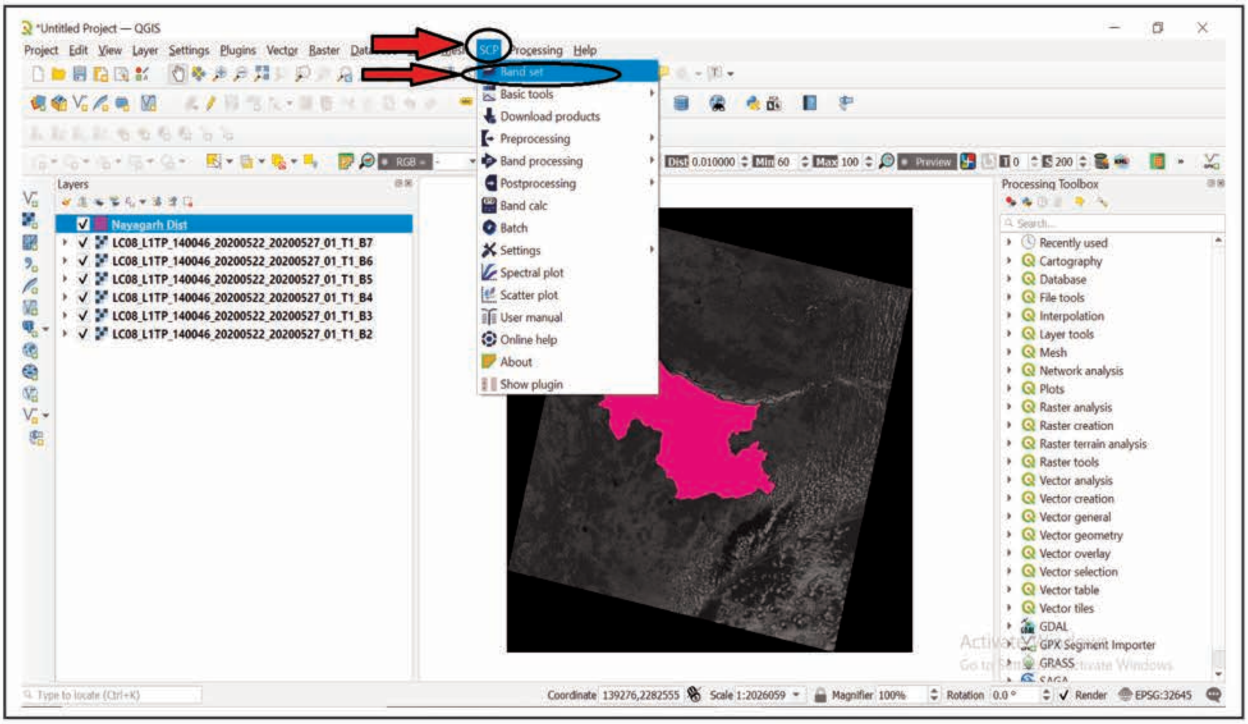


Fig.11.Select SCP and Bandset tool

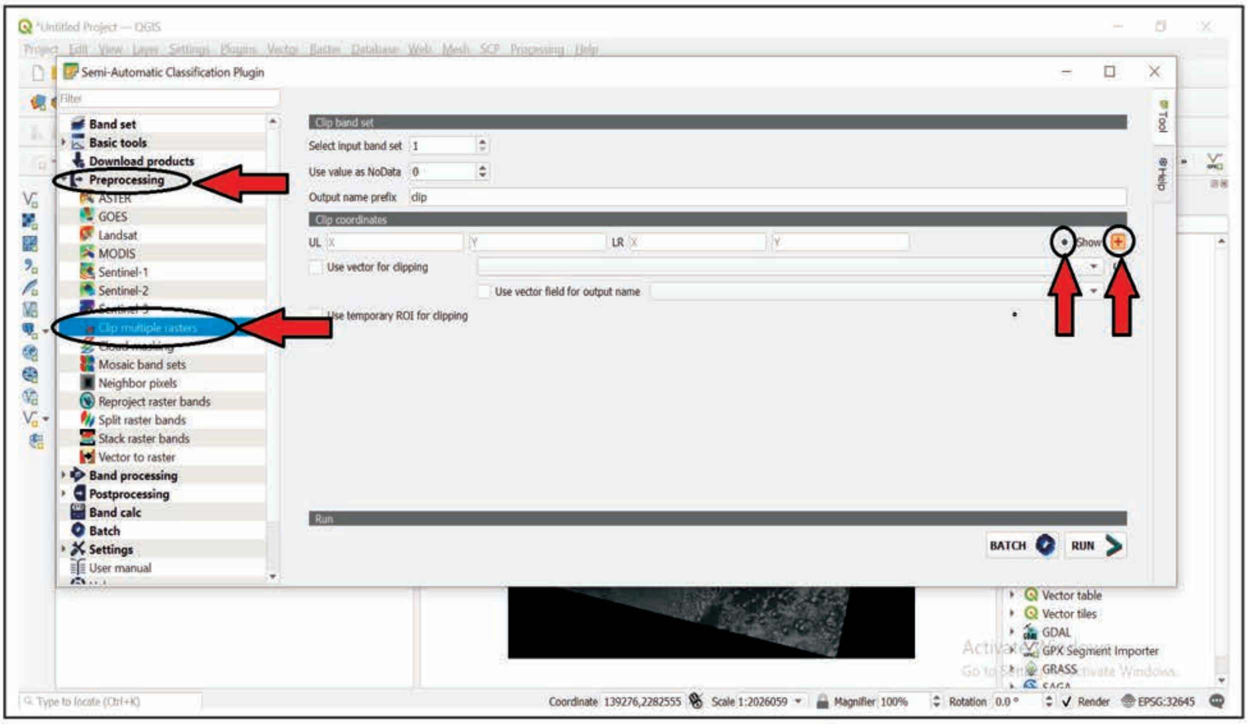


Fig.12.Select preprocessing and click Clip multiple raster

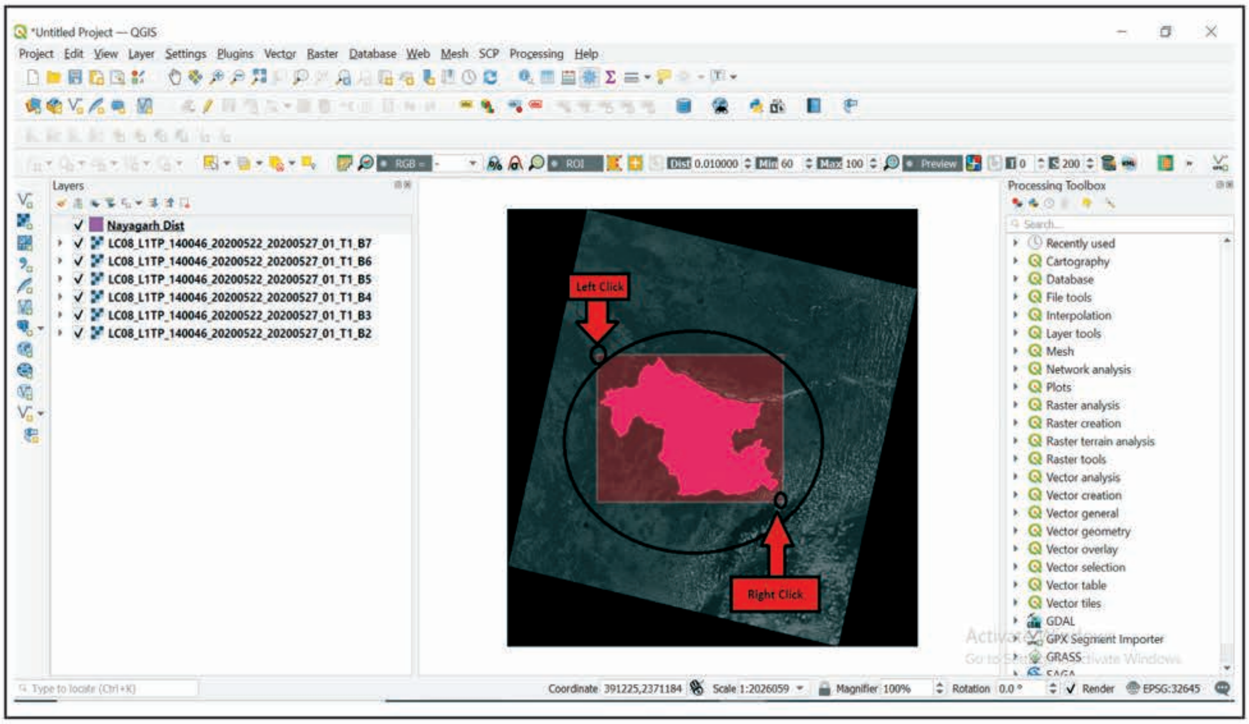


Fig.13. Click the Raster layer for clipping

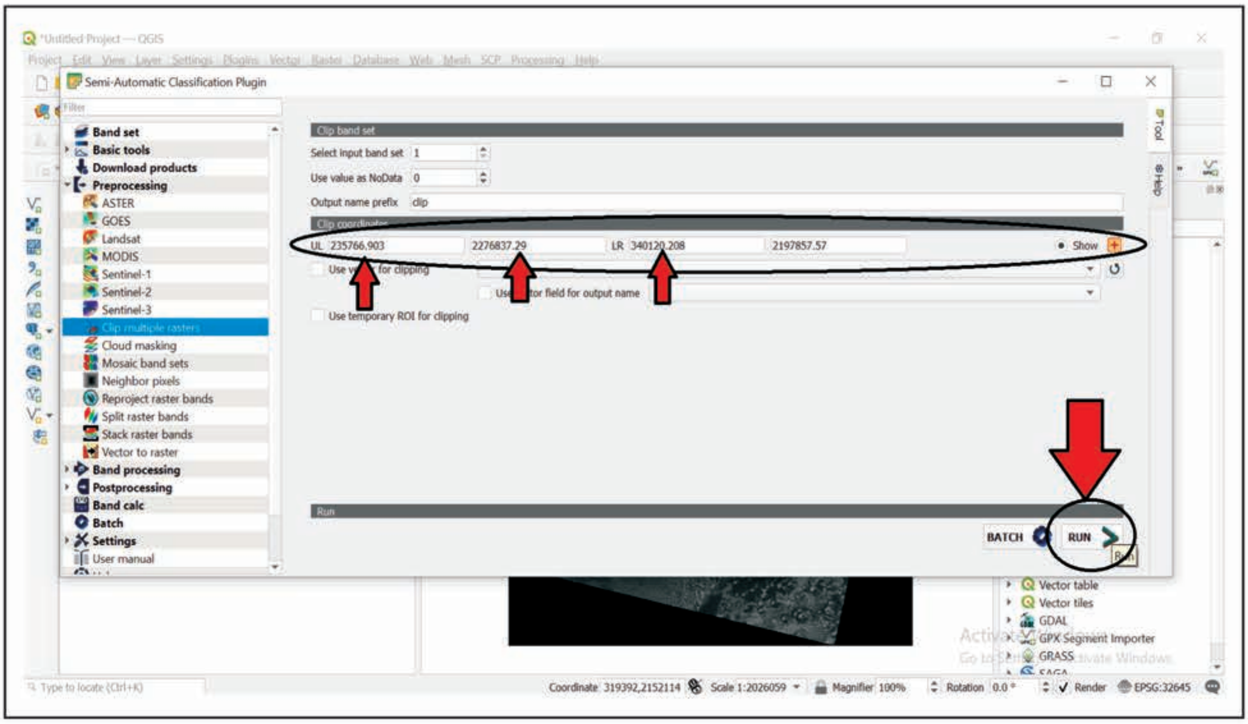


Fig.14. Click the Run tool

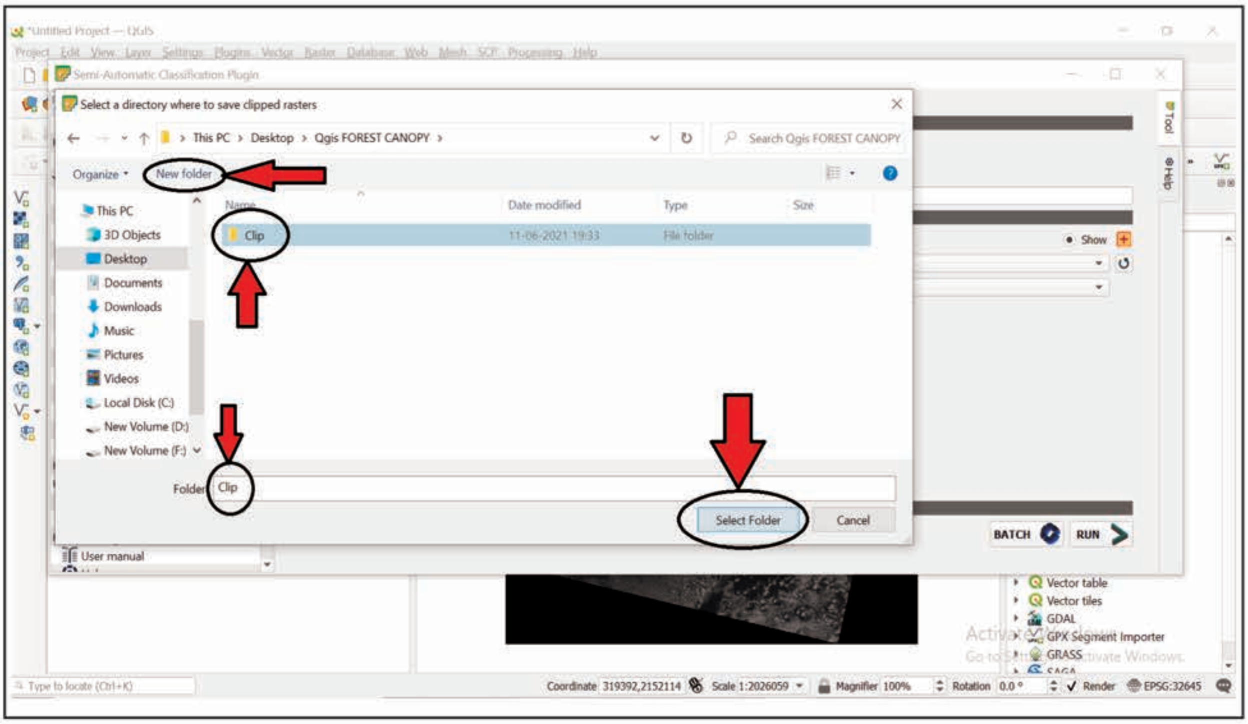


Fig.15. Create the folder(Clip) and select it

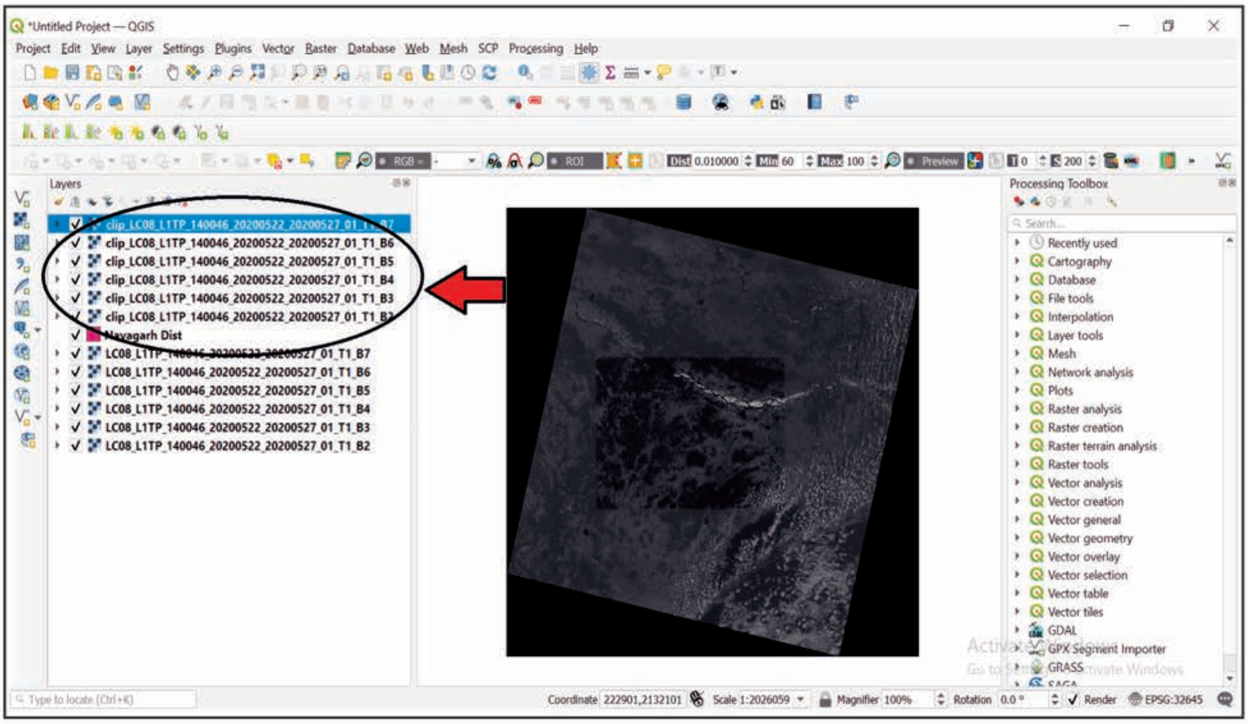


Fig.16. Clipped image created

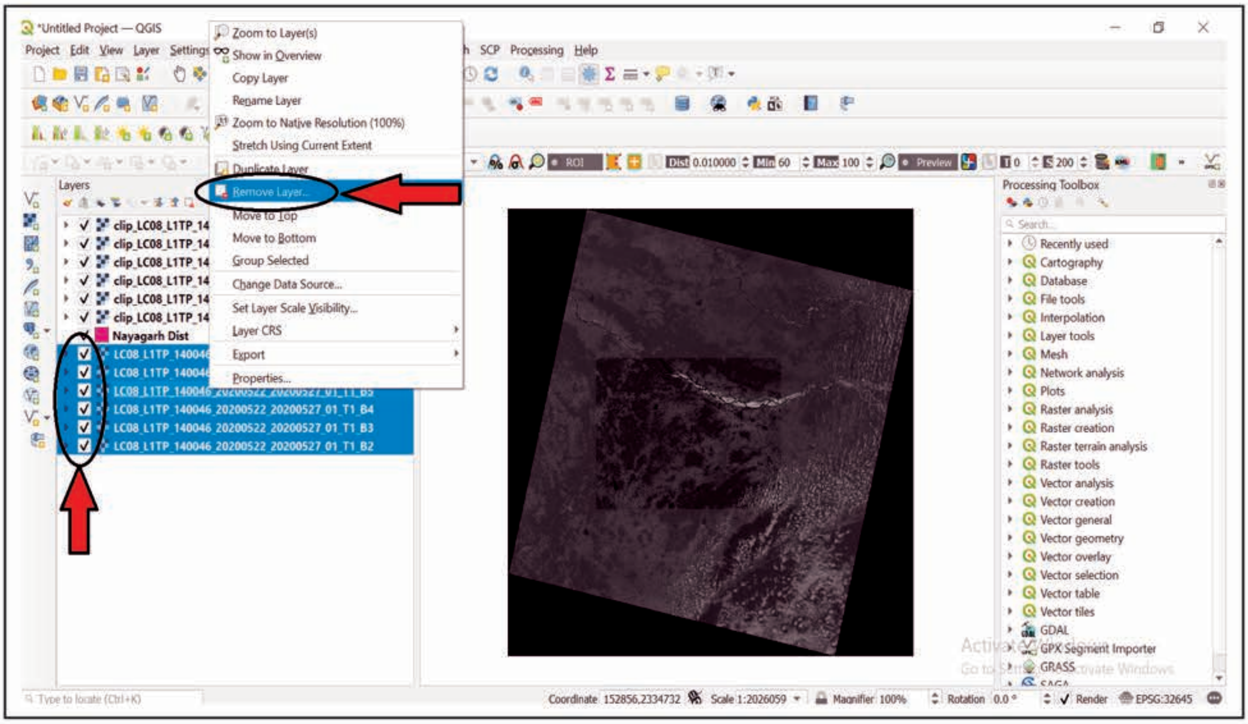


Fig.17. Remove the old Raster layers

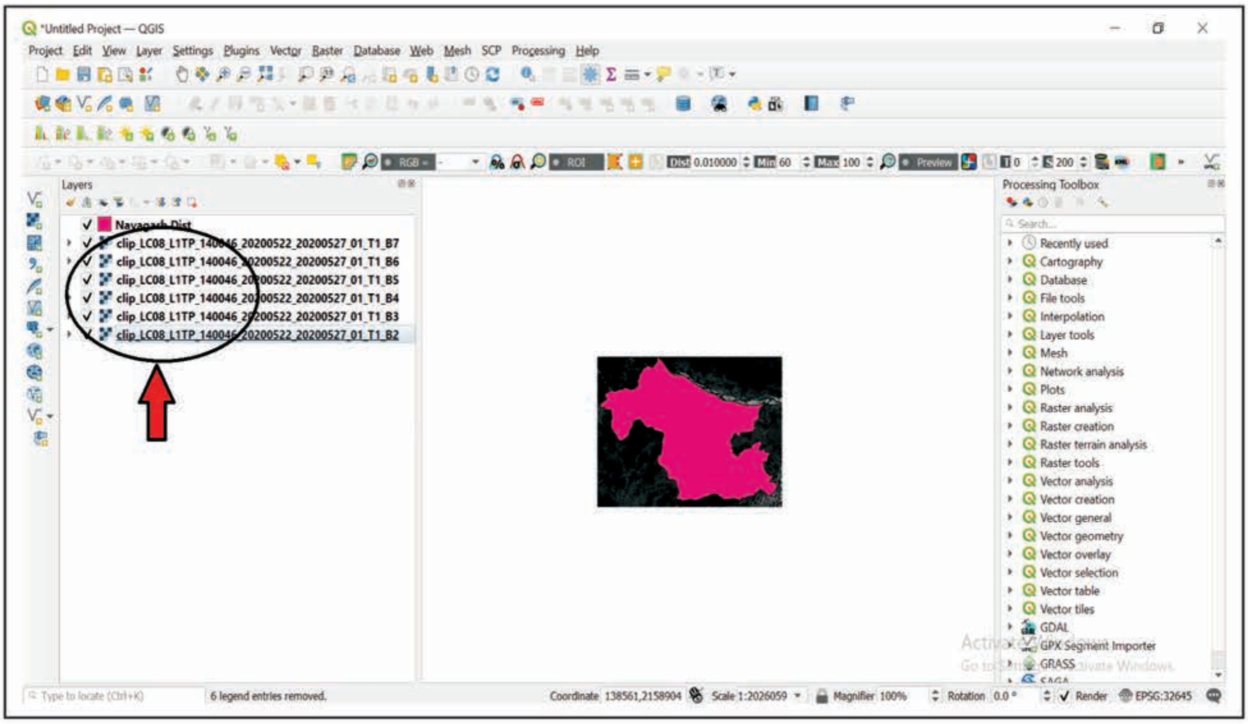


Fig.17.Image clipped

Step 3:

1. Select 'SCP' click "Band set"
2. Select 'Preprocessing' click "Landset"
3. Click Nayagarh district image for clipping.

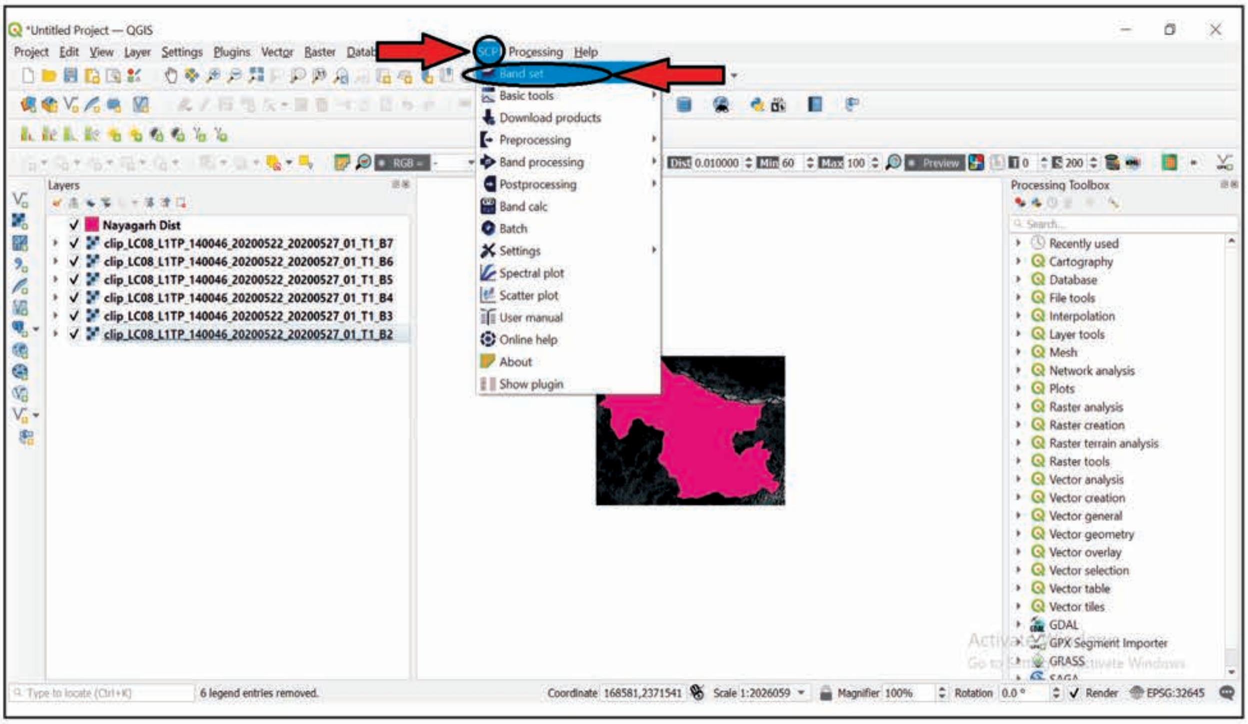


Fig.18. Select SCP Click Bandset

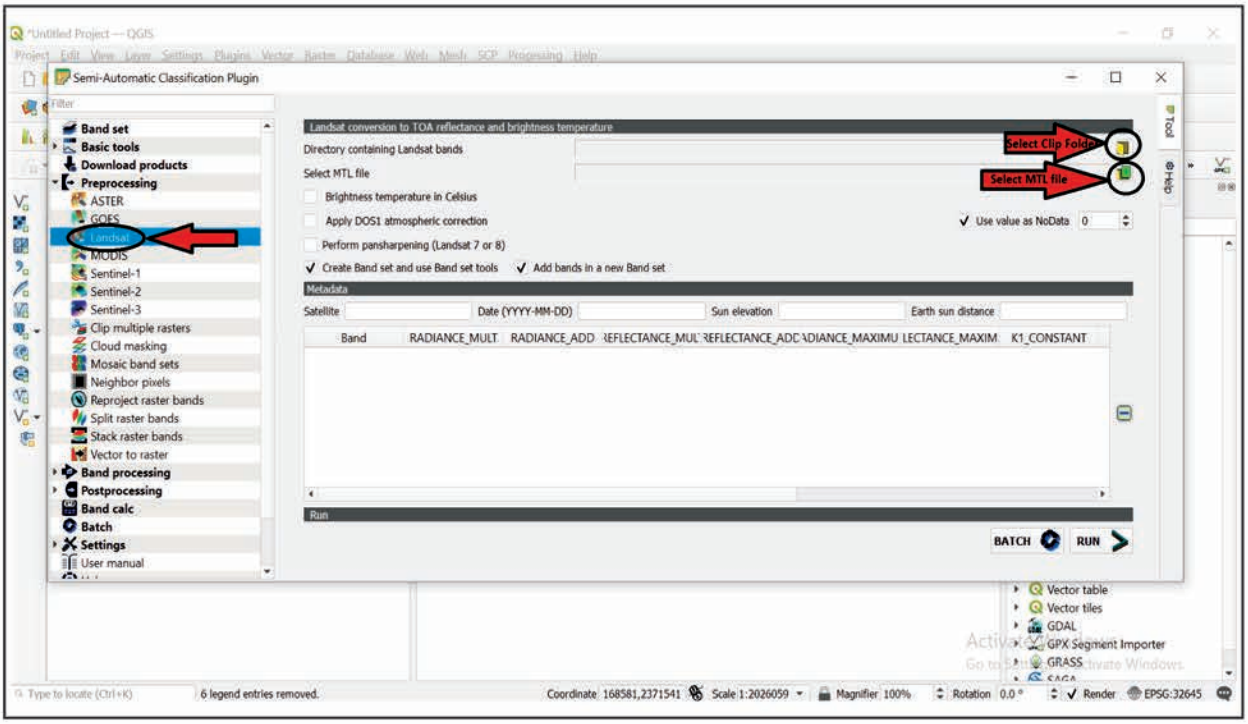


Fig.19. Click the Landset tool and upload the landset bands and MTL file

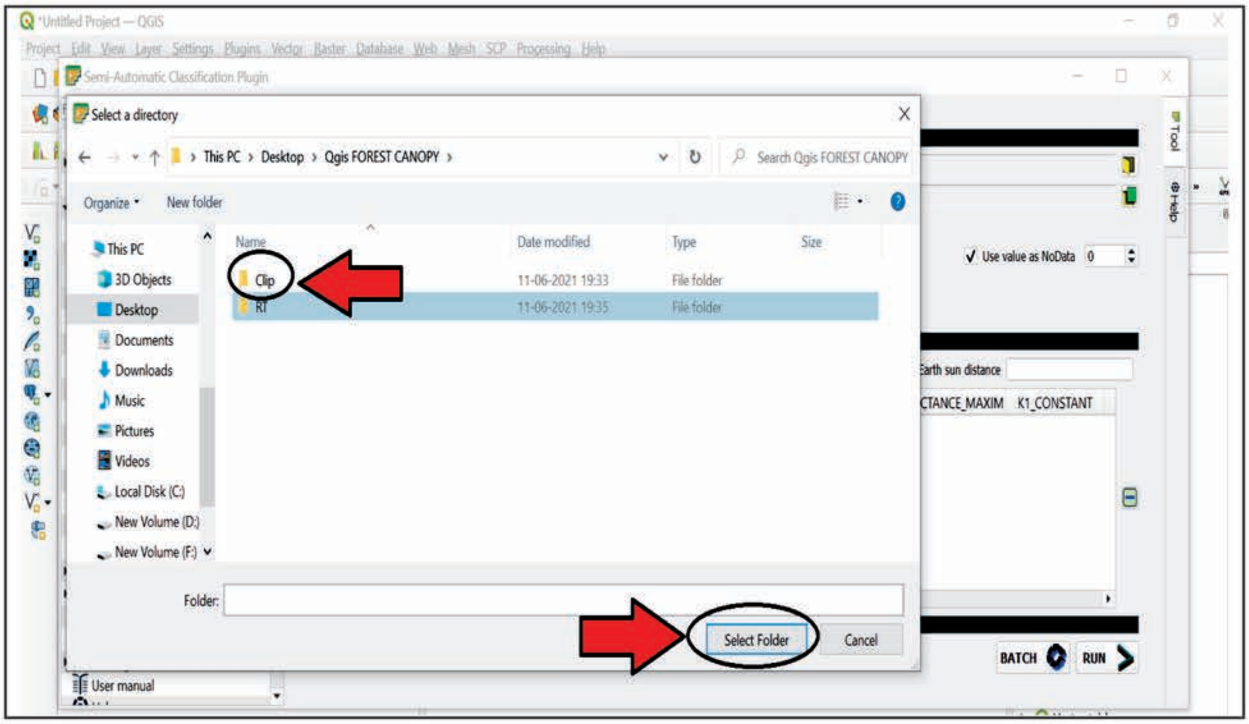


Fig.20. Select the Clip folder

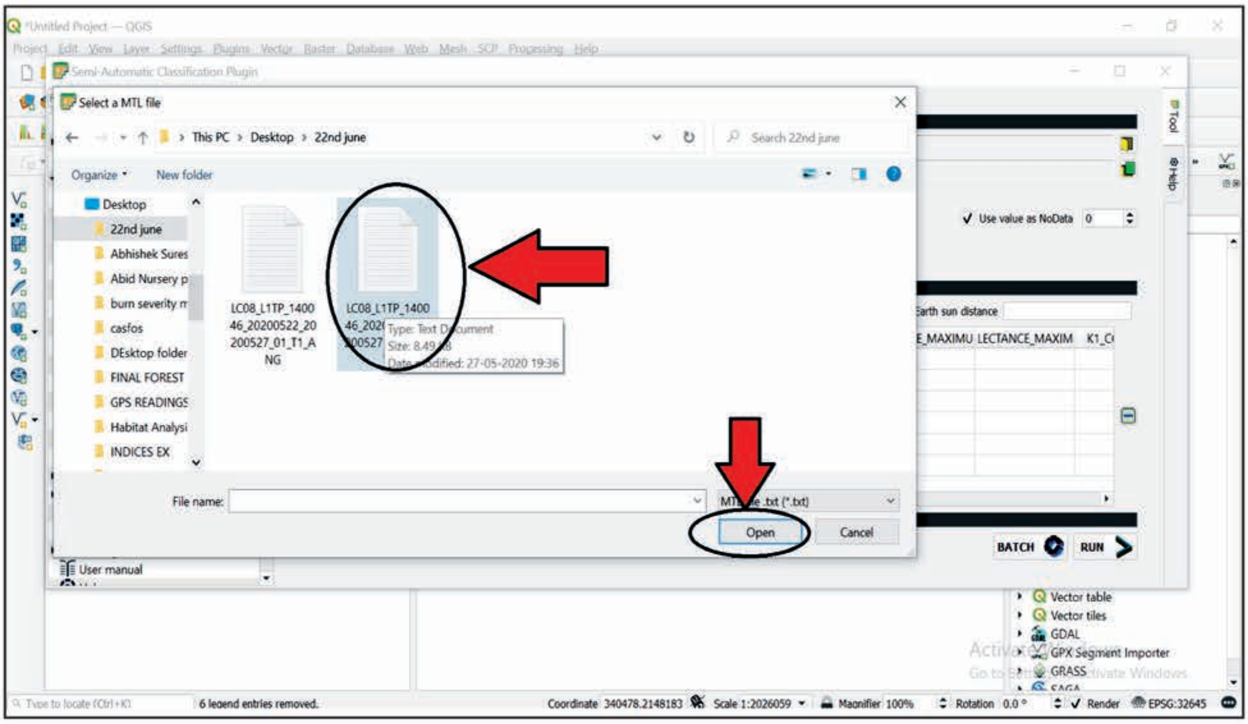


Fig.21. Select the MTL file

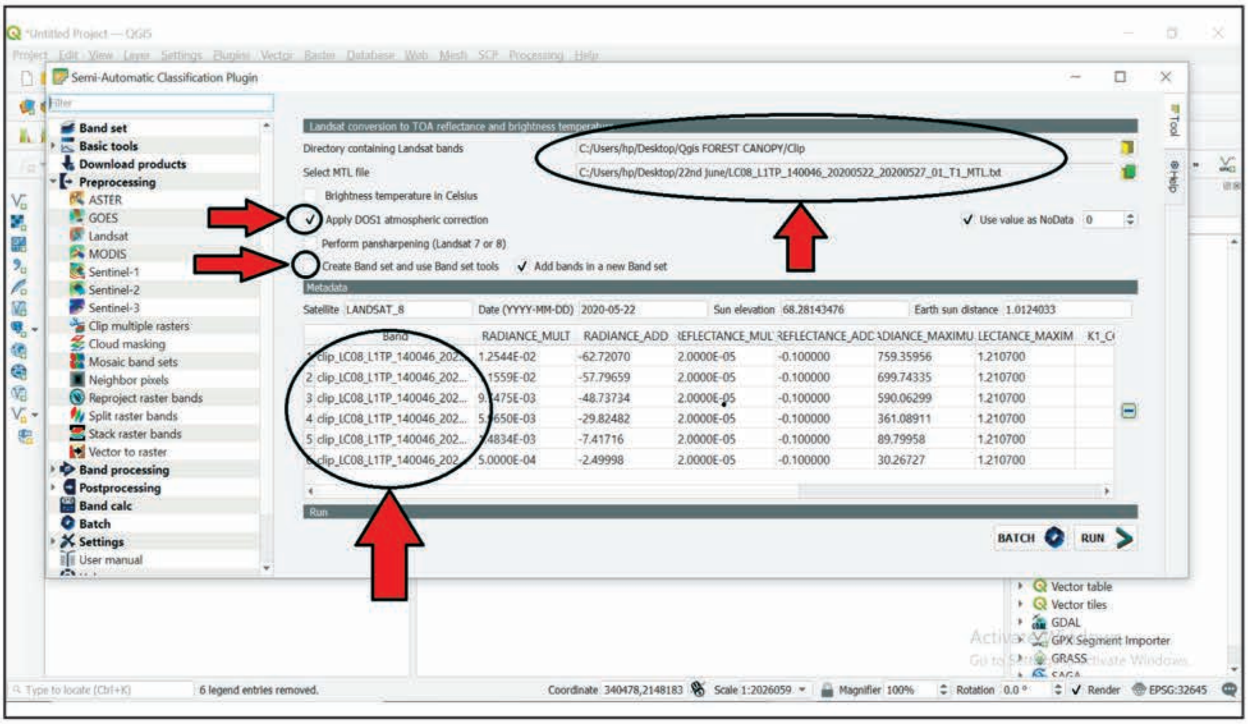


Fig.22. Run the Algorithm

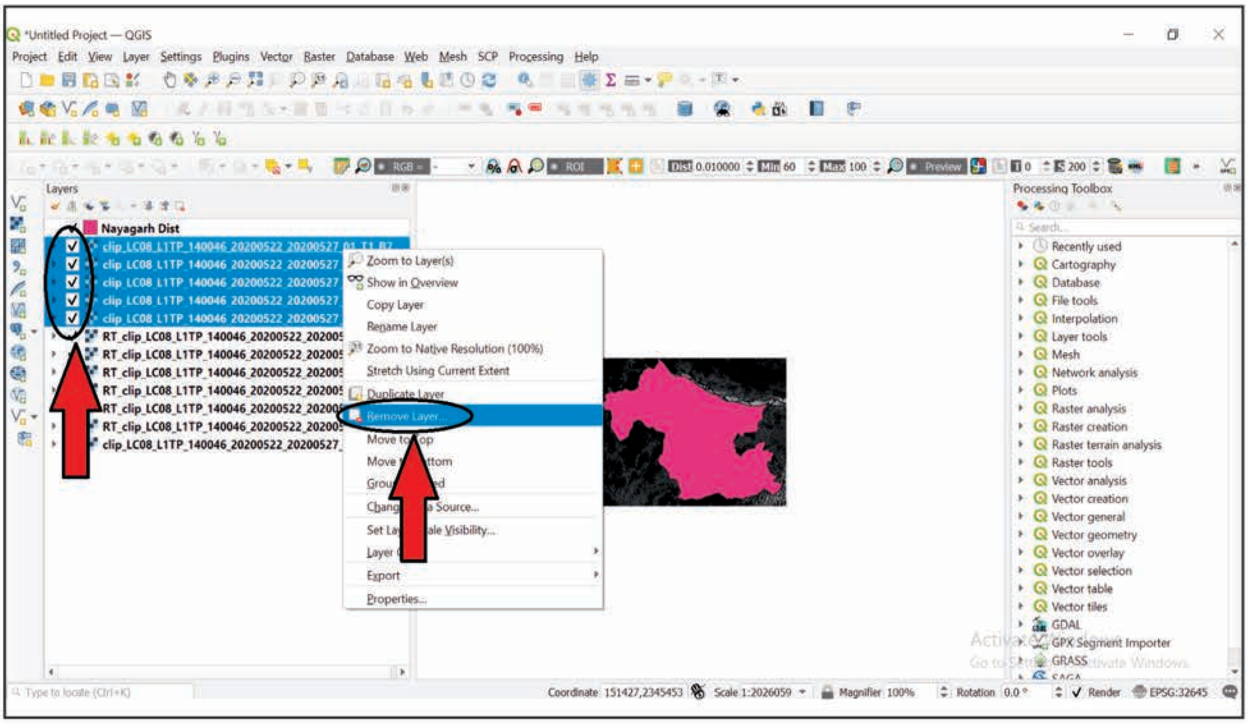


Fig.23. Remove the Clip Band layers

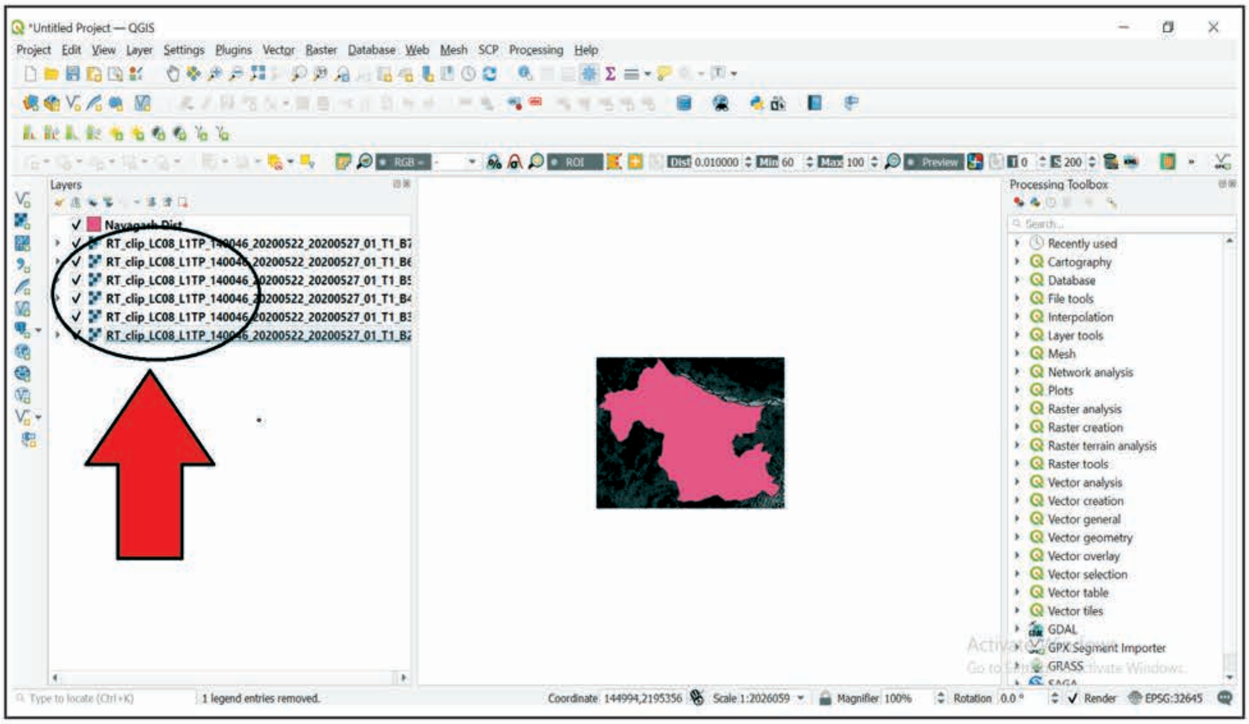


Fig.24. After delete the clip layer

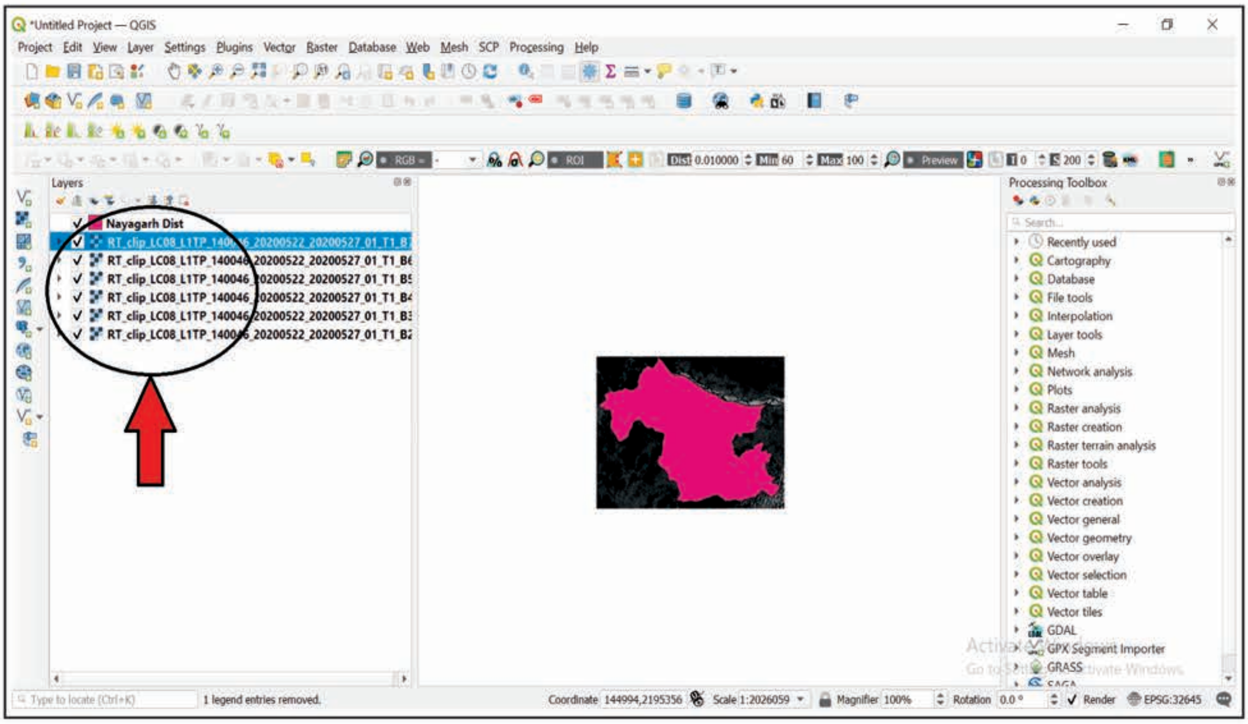


Fig.25

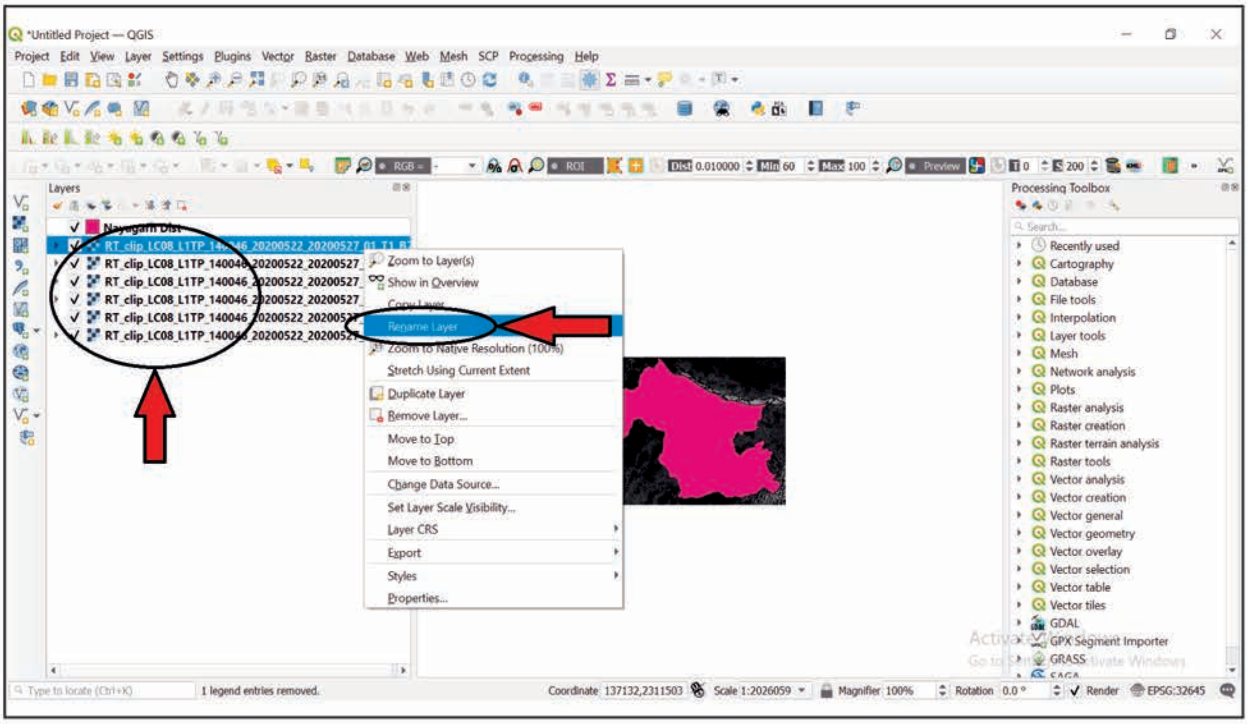


Fig.26. Rename RT Layer

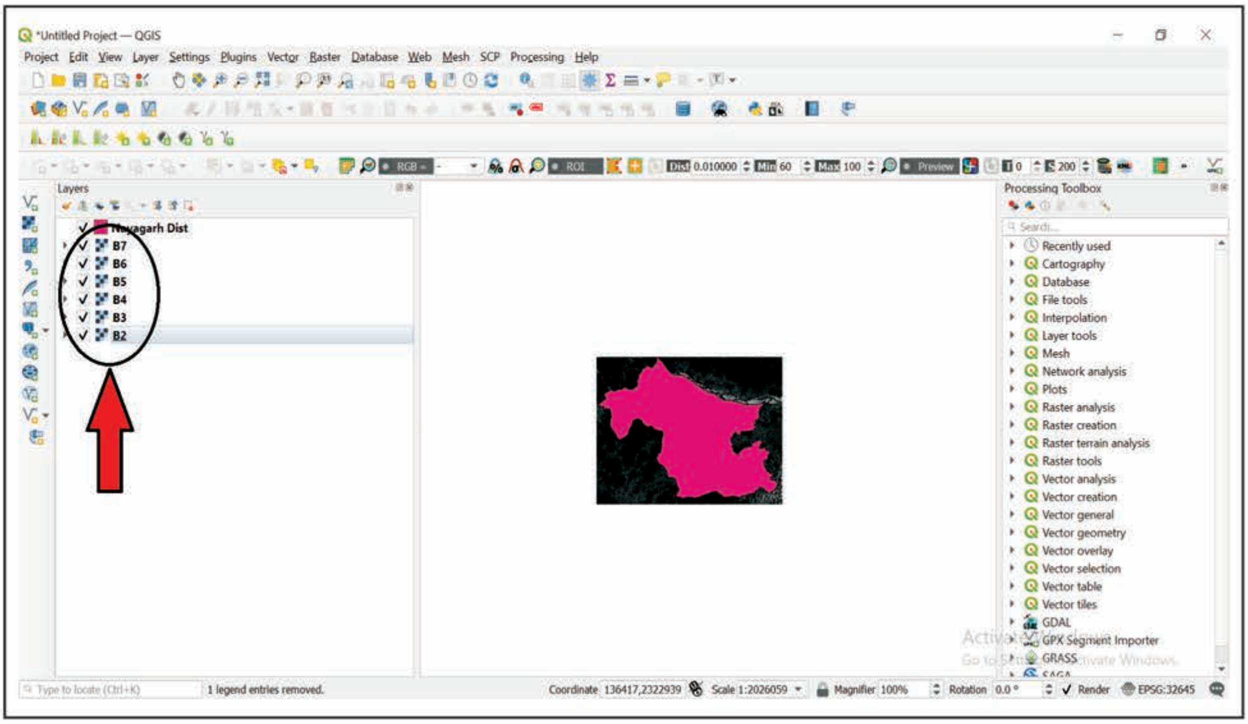


Fig.27. Renamed as B2-B7

Advance Vegetation Index: NDVI Is used to identify the high and low vegetation area. It is unable to high-light delicately balanced amount in cover relation between mass and size, thats why it has been getting better by using power degree of infra-redresponse. The calculated index has been termed as an AVI. It has been worked out using an equation.

AVI= ((B5 * (1-B4) * (B5-B4)) ^ (1/3)

Step 5:

1. Open 'Raster Calculator'.
2. Create 'AVI' image.

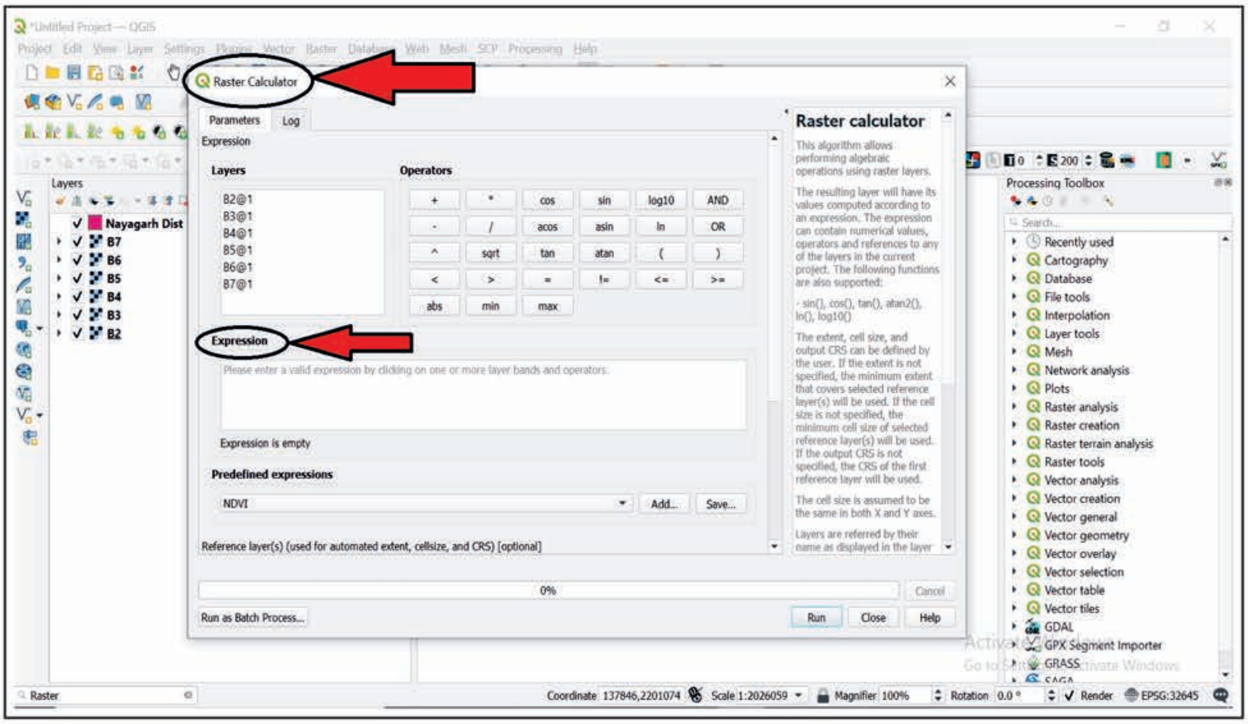


Fig.27. Open Raster Calculator

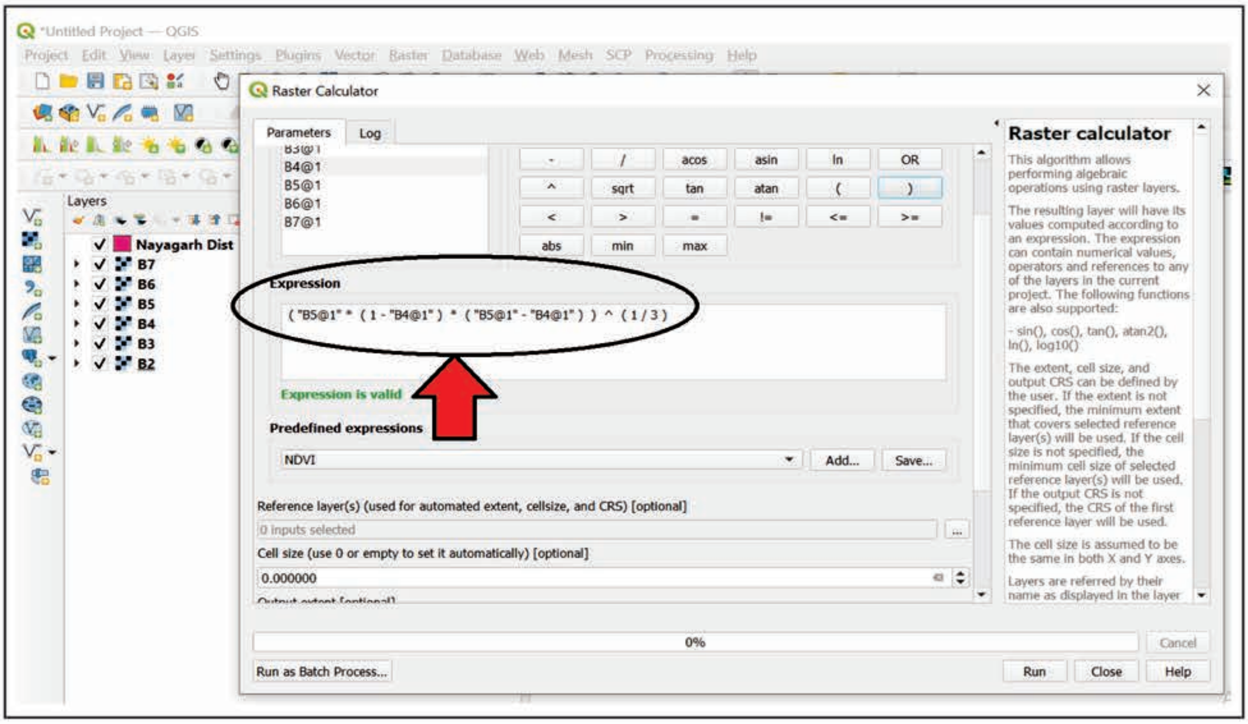


Fig.28. Use the formula

AVI= ((B5 * (1-B4) * (B5-B4)) ^ (1/3)

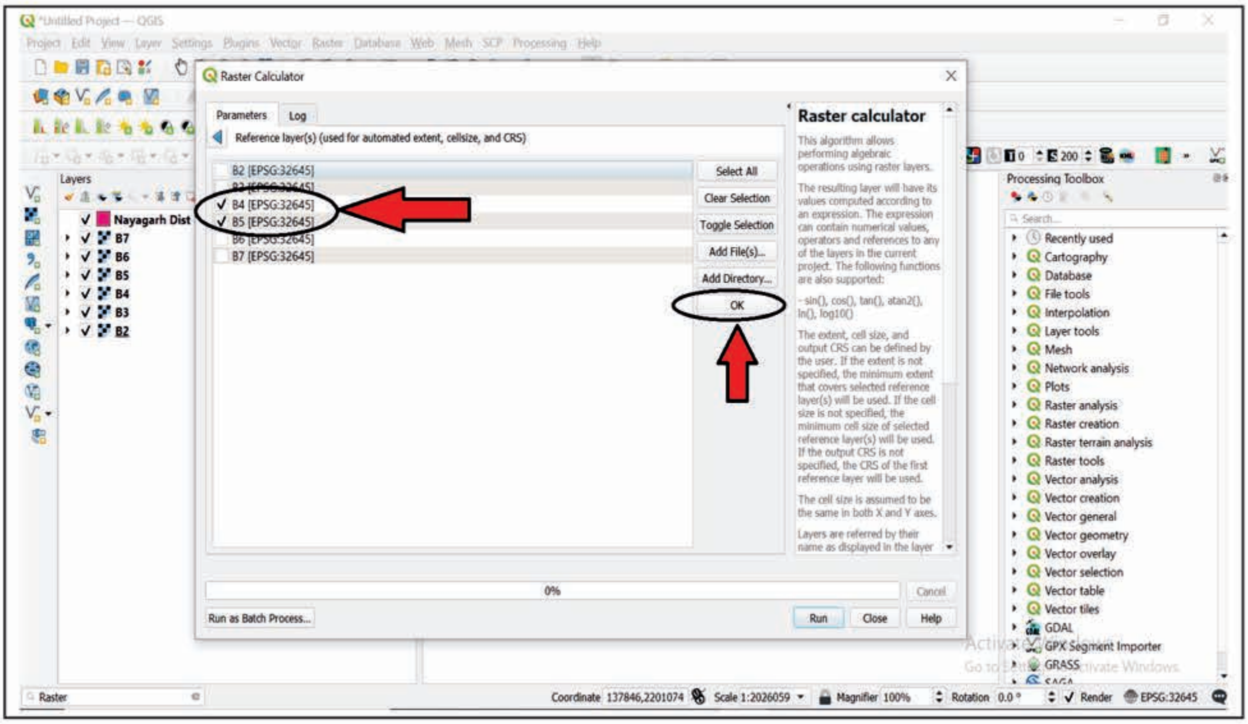


Fig.29. Tick the B4 and B5 layer

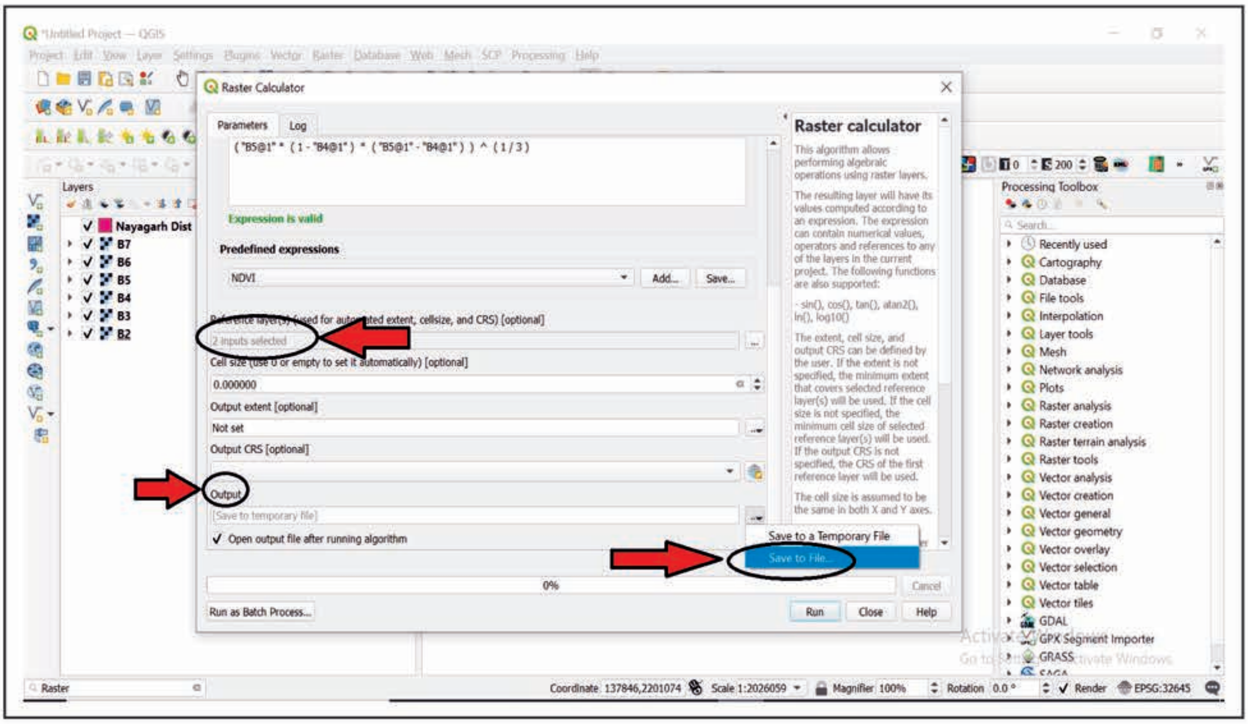


Fig.30. Click the save to file tool

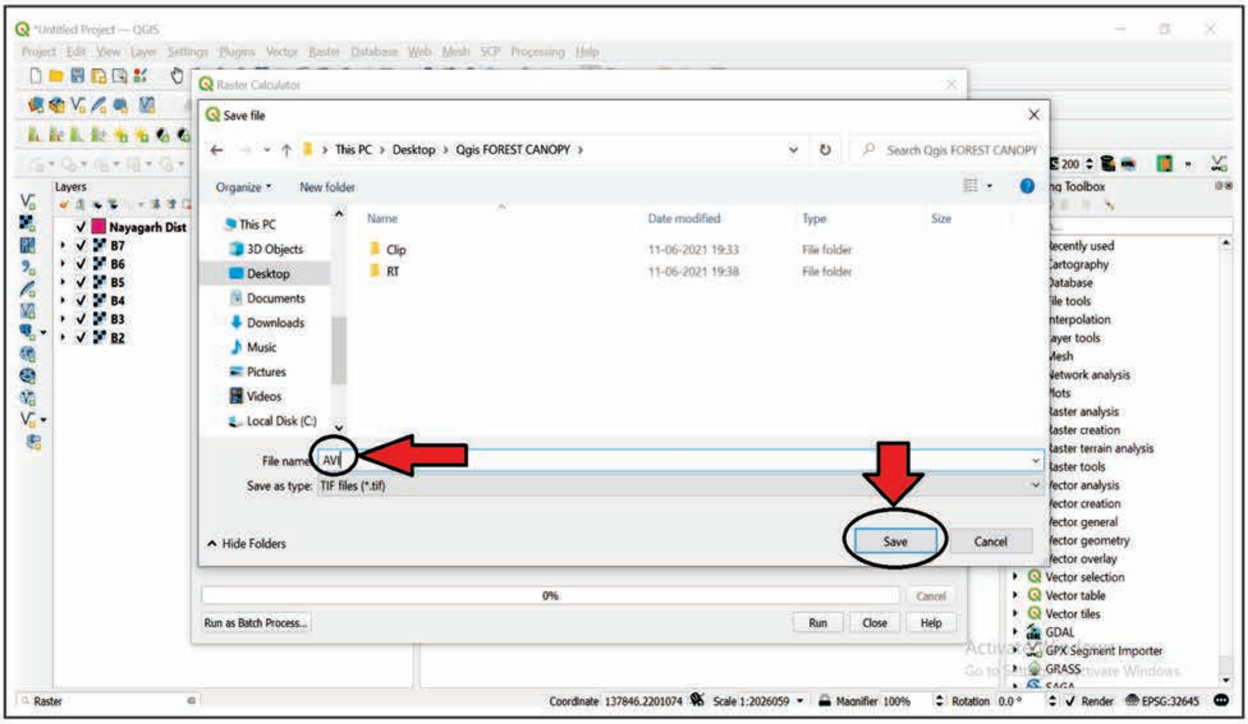


Fig.31. Create the AVI file and save the file

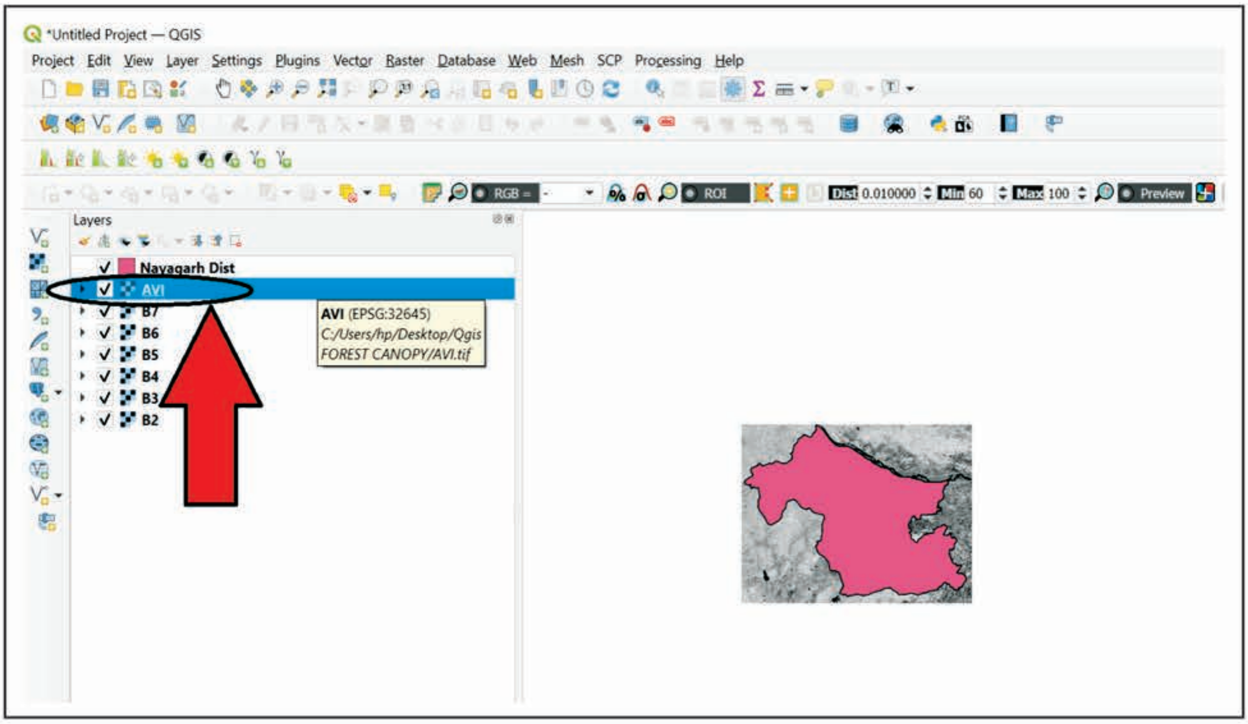


Fig.32. AVI file created

Bare Soil Index: This index helps us to give clear idea of vegetation from the surrounding.

BSI= ((B6+B4)- (B5+B2))/ ((B6+B4)+ (B5+B2))

Canopy Shadow Index (SI): this index works out with a shadow pattern affecting the spectral response when the crown arrangement in any forest. It shows a low SI in the case of young even aged as compared to matured natural forest.

CSI= ((1-B2) * (1-B3) * (1-B4)) ^ (1/3)

Vegetation Density: this is determined by yield through Principle Component Analysis (PCA) Between AVI and BSI as these two parameters have a high correlation of negative.

Step 5:

1. Open 'Raster Calculator'.
2. Create 'BSI' image.

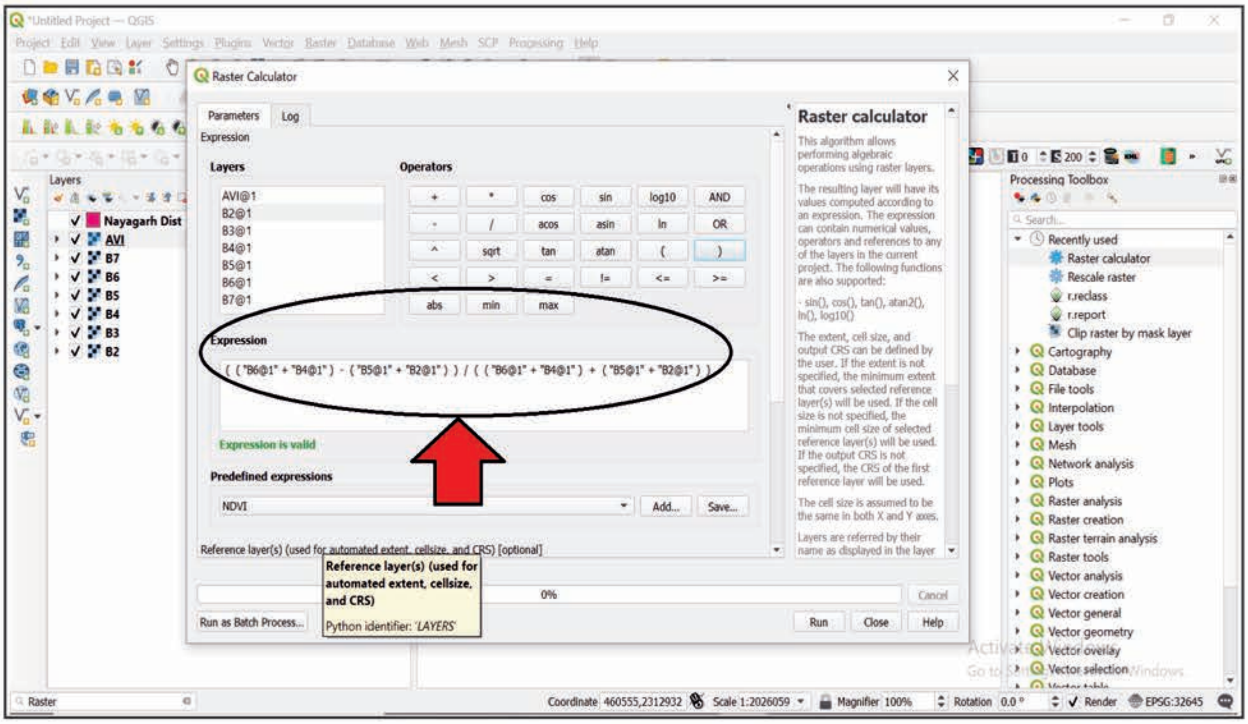


Fig.33. Use the formula

BSI= ((B6+B4)- (B5+B2))/ ((B6+B4)+ (B5+B2))

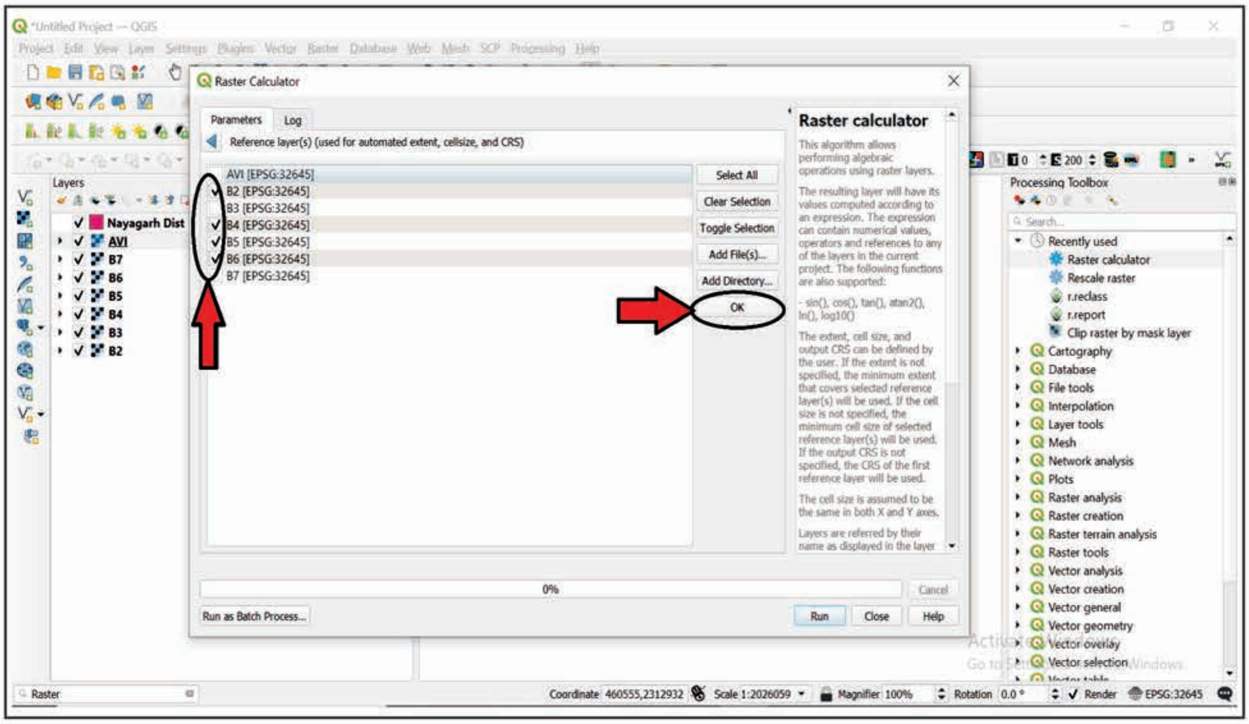


Fig.34. Tick the B2, B4, B5, B6 and click ok

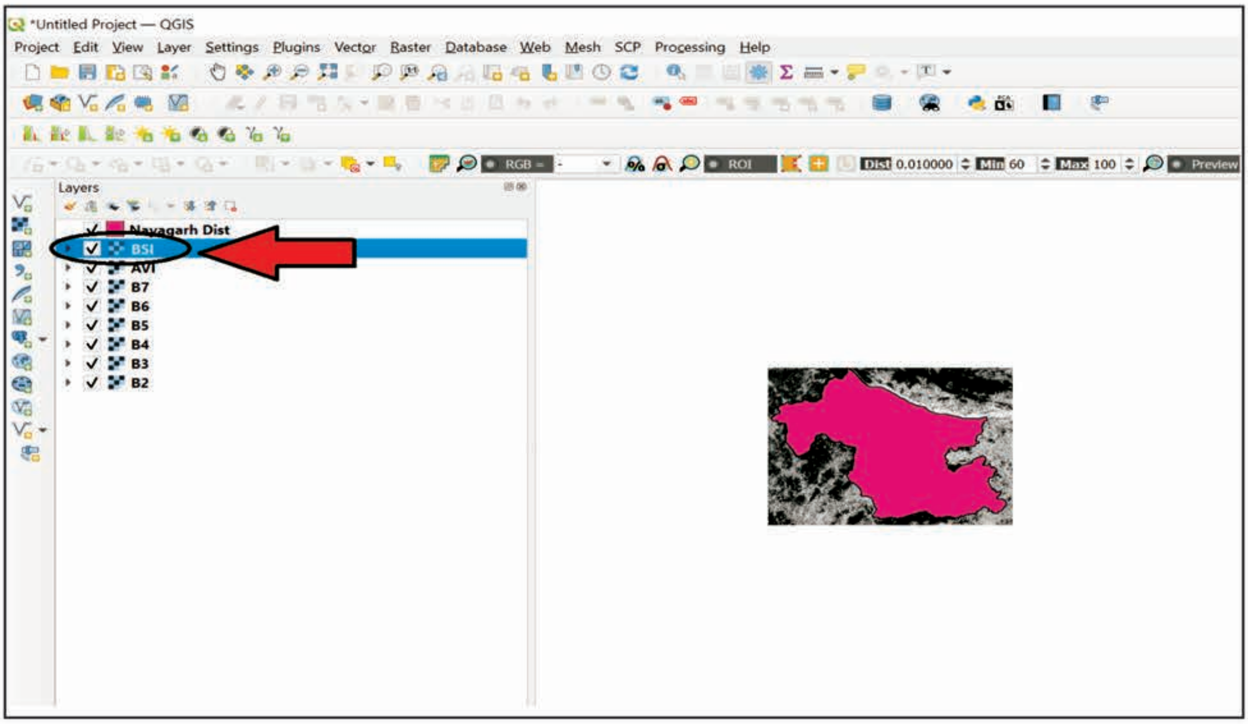


Fig.35. Barred soil Index image created

Step 5:

1. Open 'Raster Calculator'.
2. Create 'CSI' image.

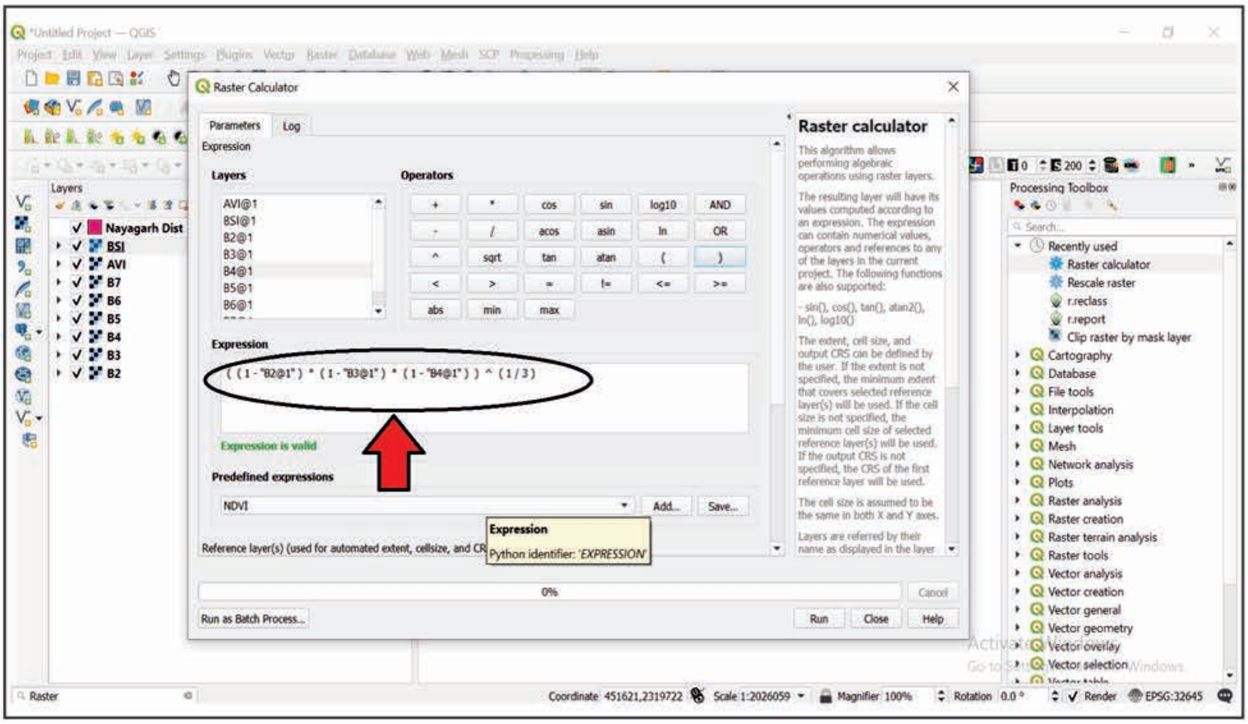


Fig.36. Use the CSI formula

CSI= ((1-B2) * (1-B3) * (1-B4)) ^ (1/3)

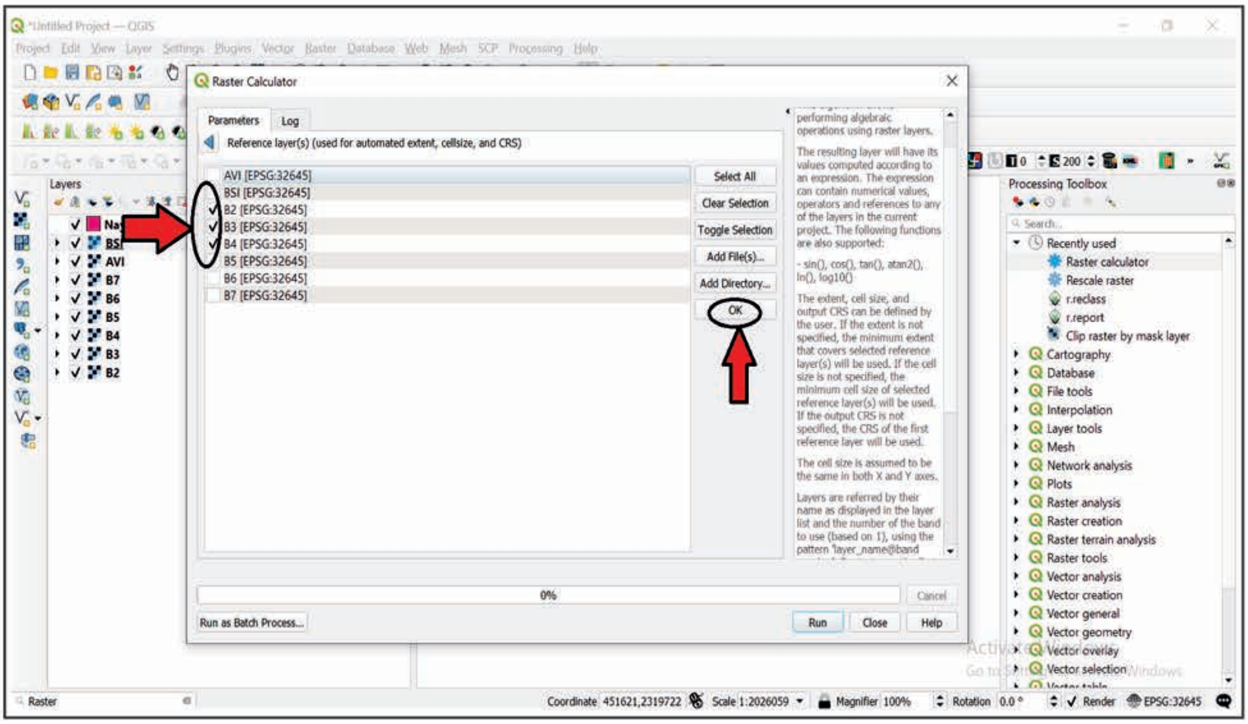


Fig.37. Tick the B2, B3, B4 band layer and click ok

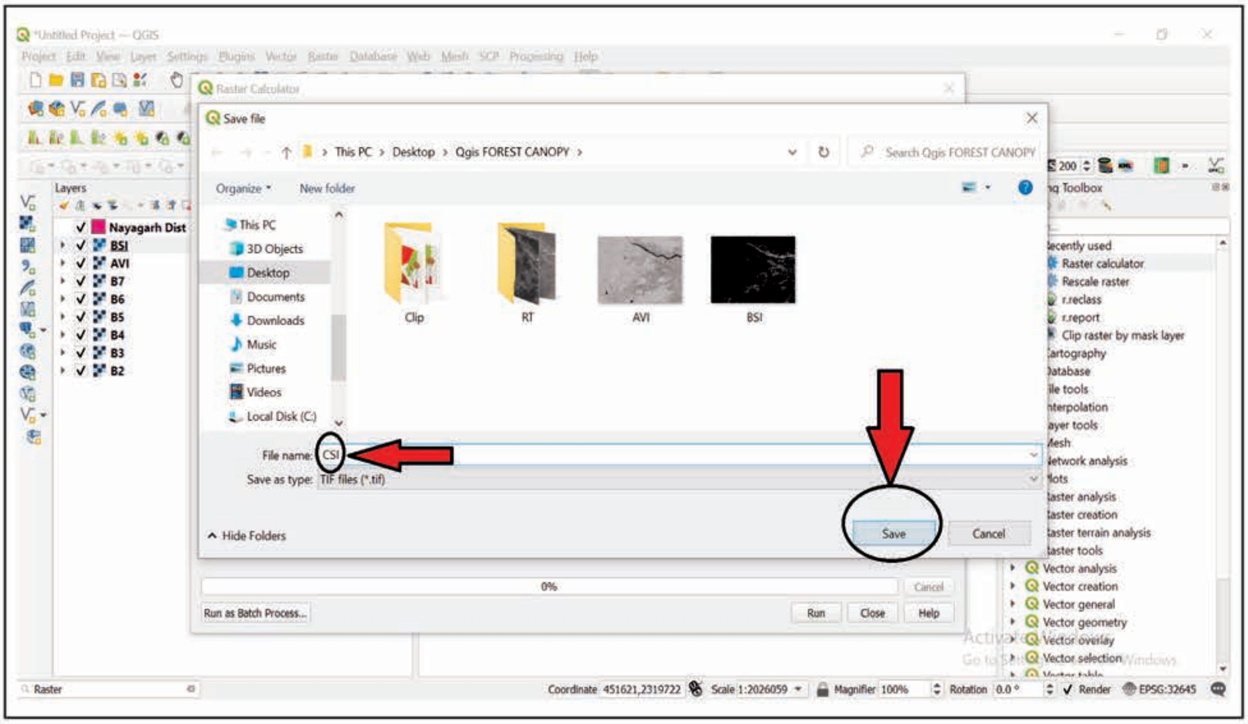


Fig.38. Create the CSI folder and save

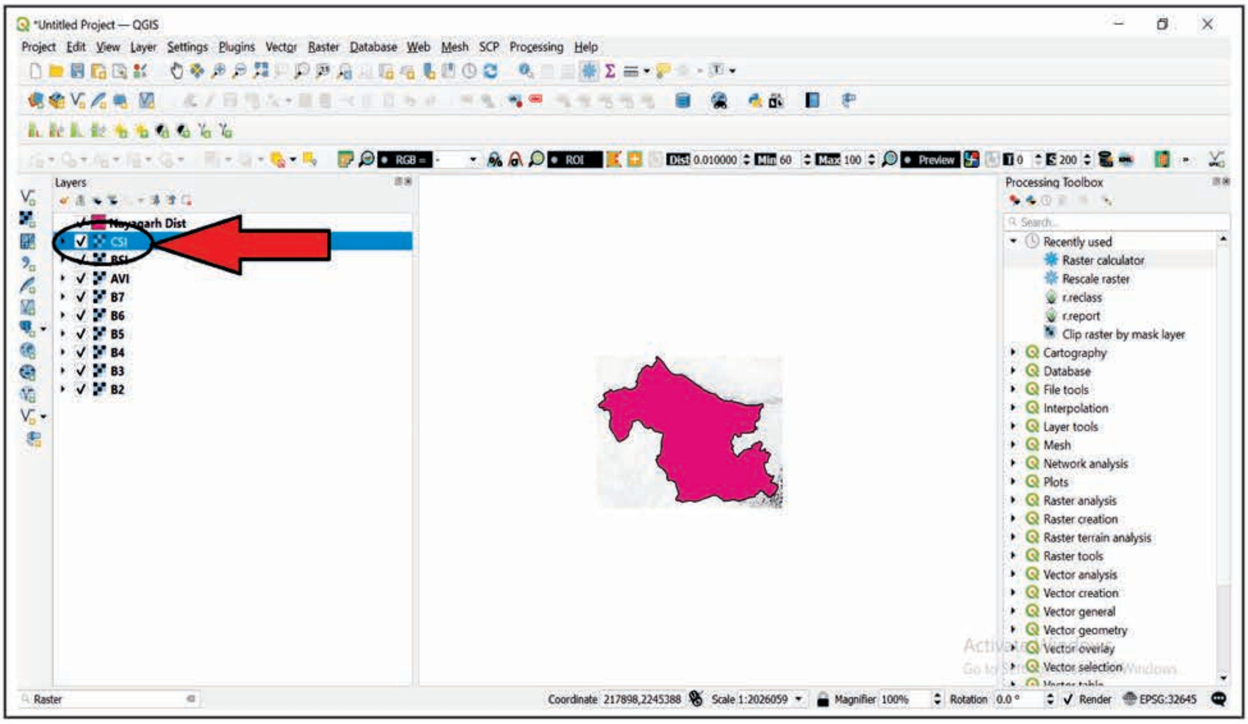


Fig.39. CSI image created

PCA for Change Detection (PCA4CD) : The PCA4CD is a QGIS Plugin to build the change detection layer using the principle component method. It works by dimensionality reducing the properties of the layers.

Step 5:

1. Open 'Plugins' and select 'PCA4CD-PCA for change detection' click 'PCA4CD'
2. Create 'AVI PCA' image.

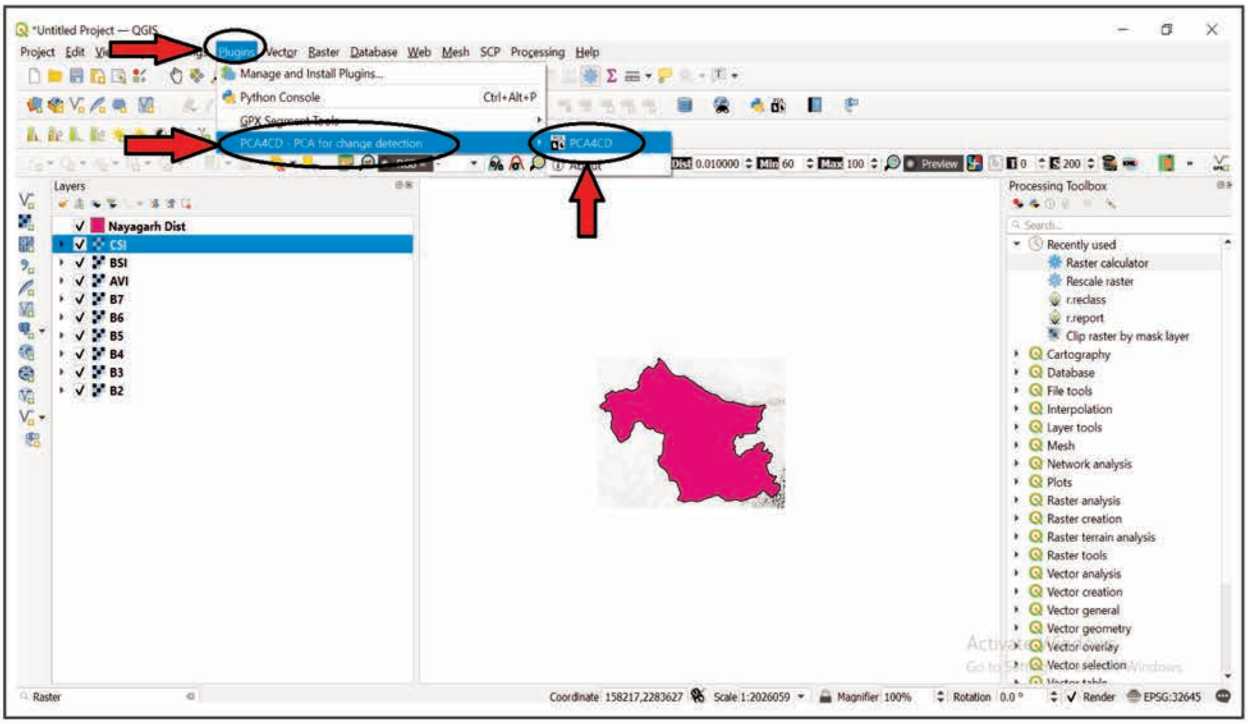


Fig.40. Open 'Plugins' and select 'PCA4CD-PCA for change detection' click 'PCA4CD'

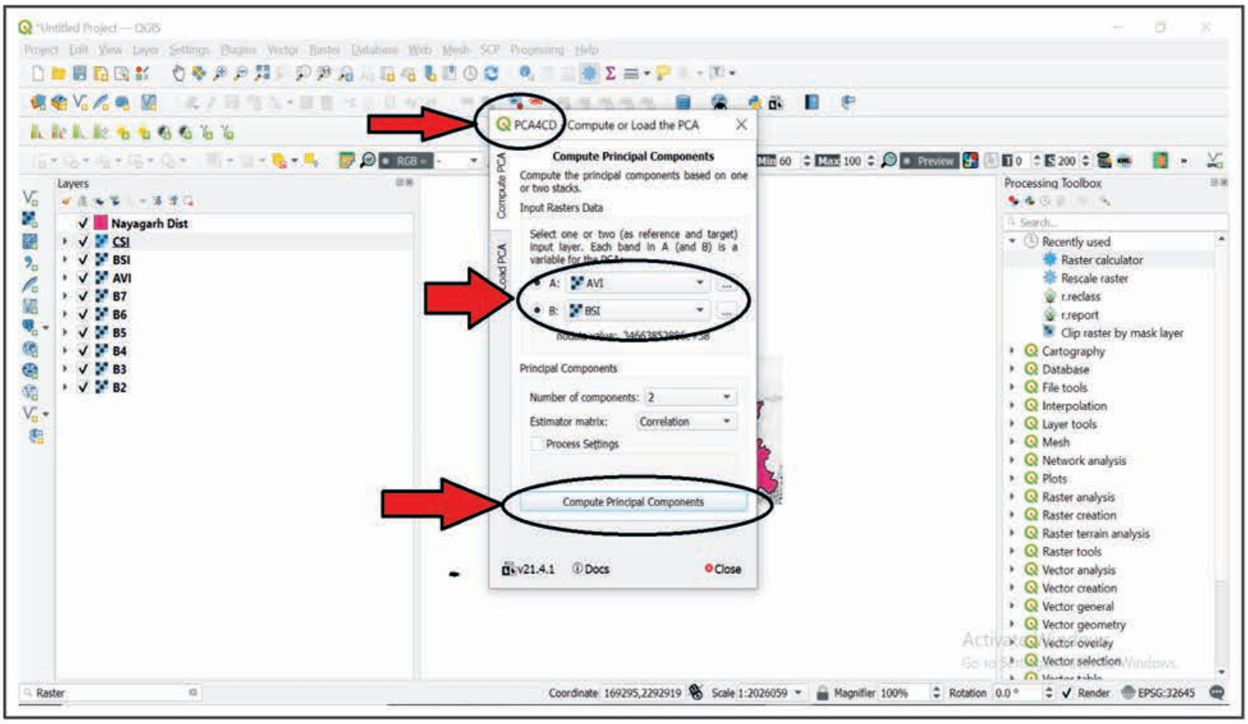


Fig.41. Upload the A and B Input Raster Data and compute principal components

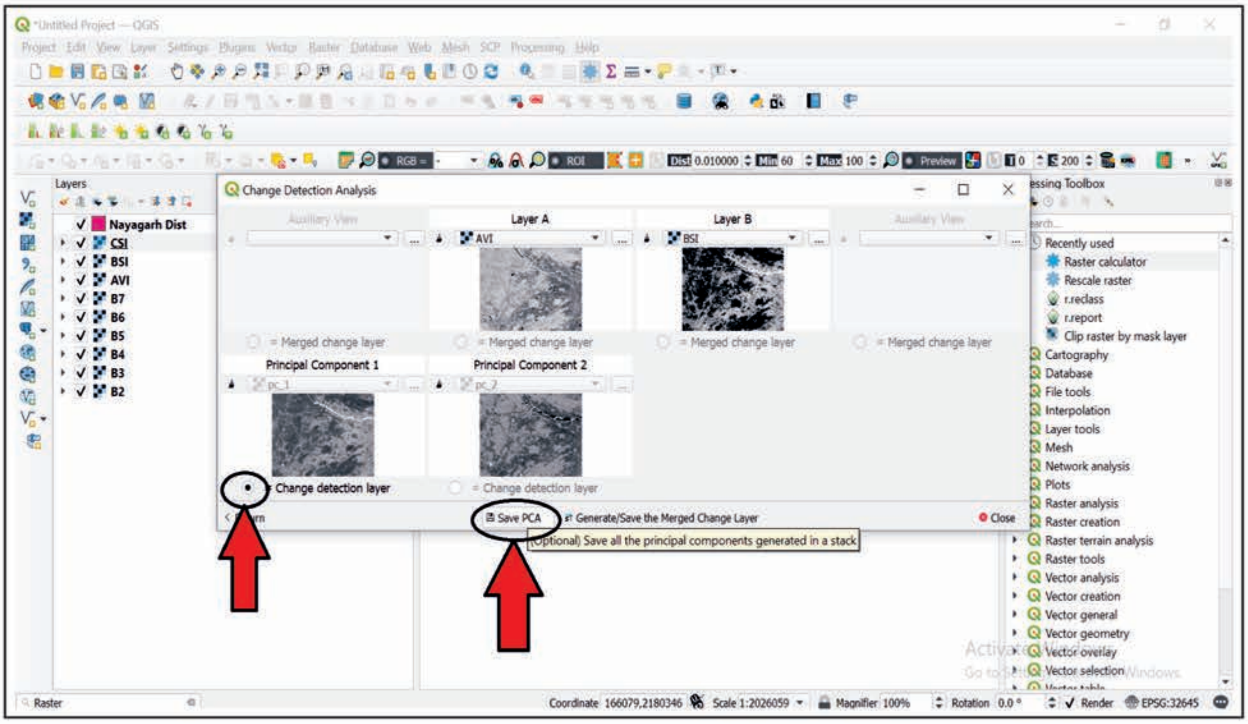


Fig.42. Click change detection layer and save PCA

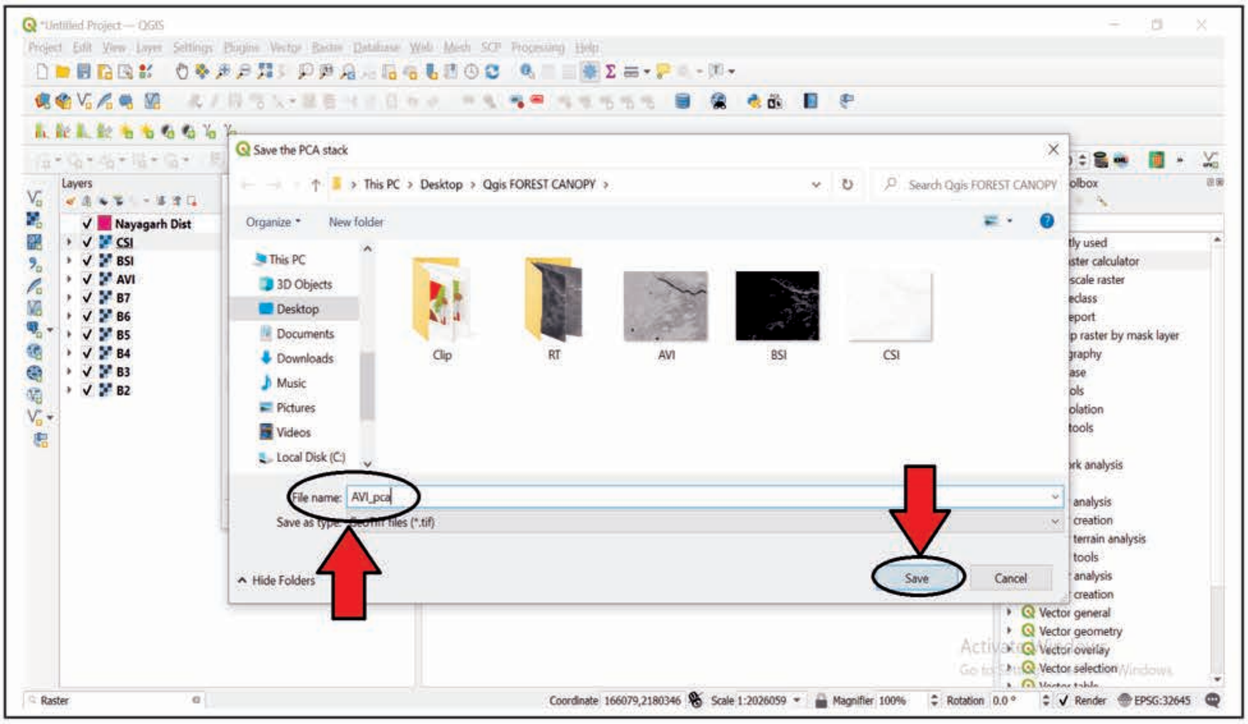


Fig.43. Type the file name as a AVI_pca and save

Step 1:

1. Select 'Layer' and 'Add layer' click "Add Raster layer"
2. Browse the Raster file (AVI_Pca).
3. Click 'Add' the file.

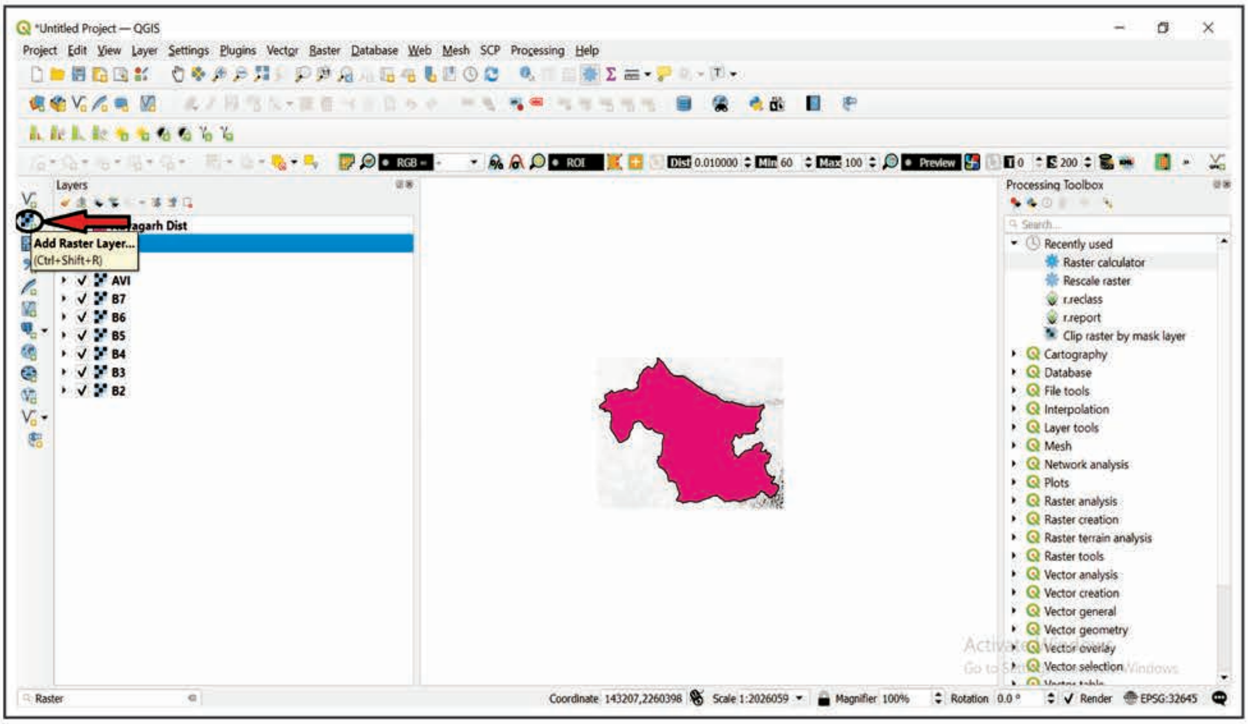


Fig.44. Click Add Raster Layer tool

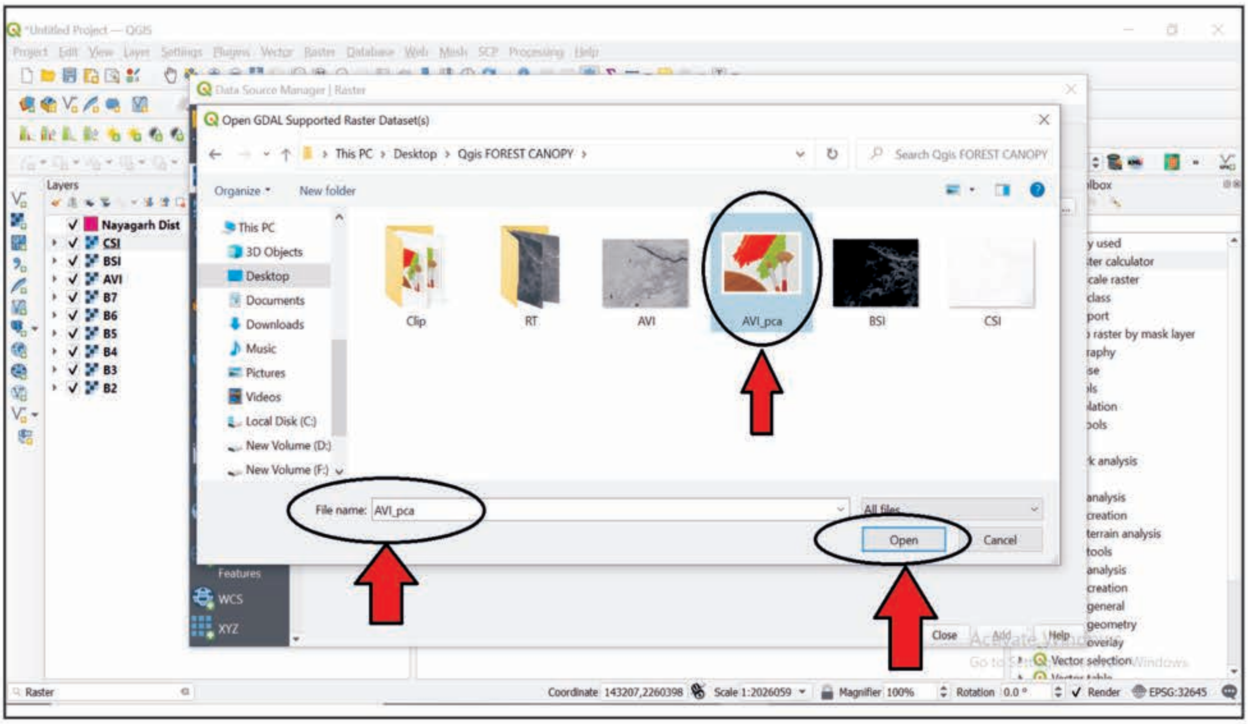


Fig.45. Add AVI_pca file

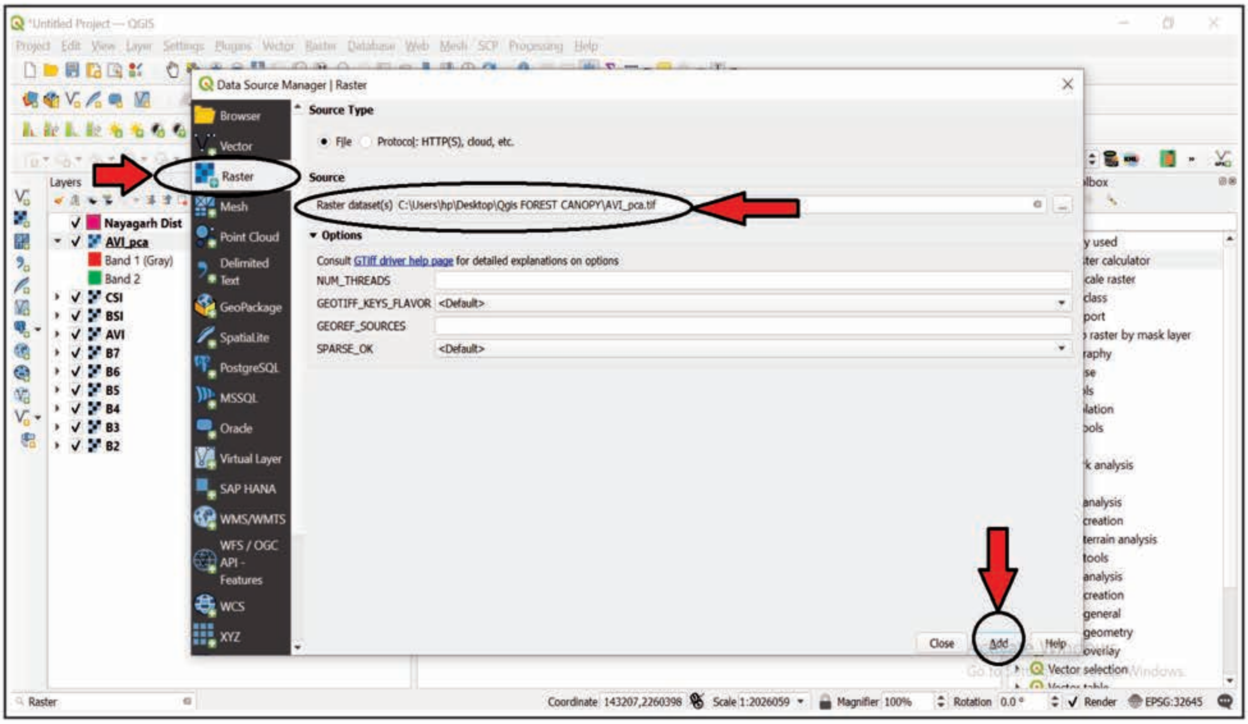


Fig.46. Click Add the Raster layer

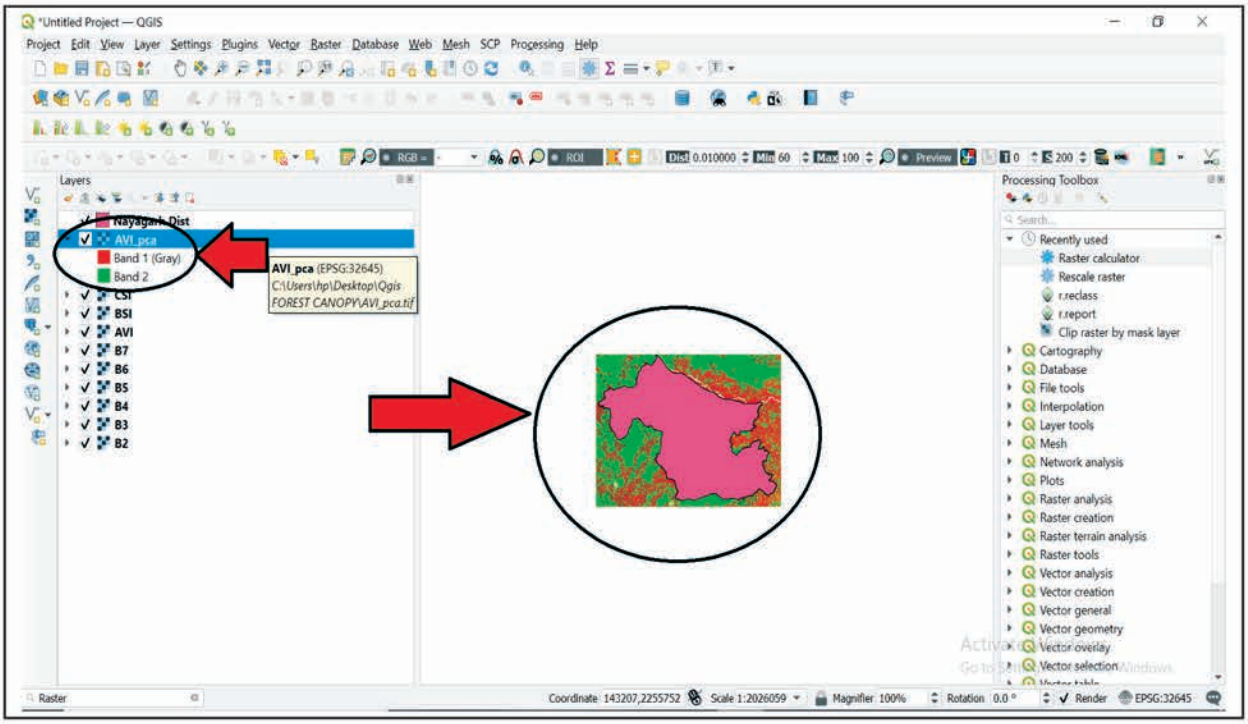


Fig.47. AVI_Pca Image uploaded

Scaled Shadow Index:(SSI) in this Shadow Index rescaled in 0-100 by using rescale raster. SSI 100% represents the highest possible shadow whereas 0% represents the opposite. It is calculated by using the linear transformation if SI.

Step 1:

1. Select " Rescale Raster" tool.
2. Create Rescale Layer and rename it as a SSI.

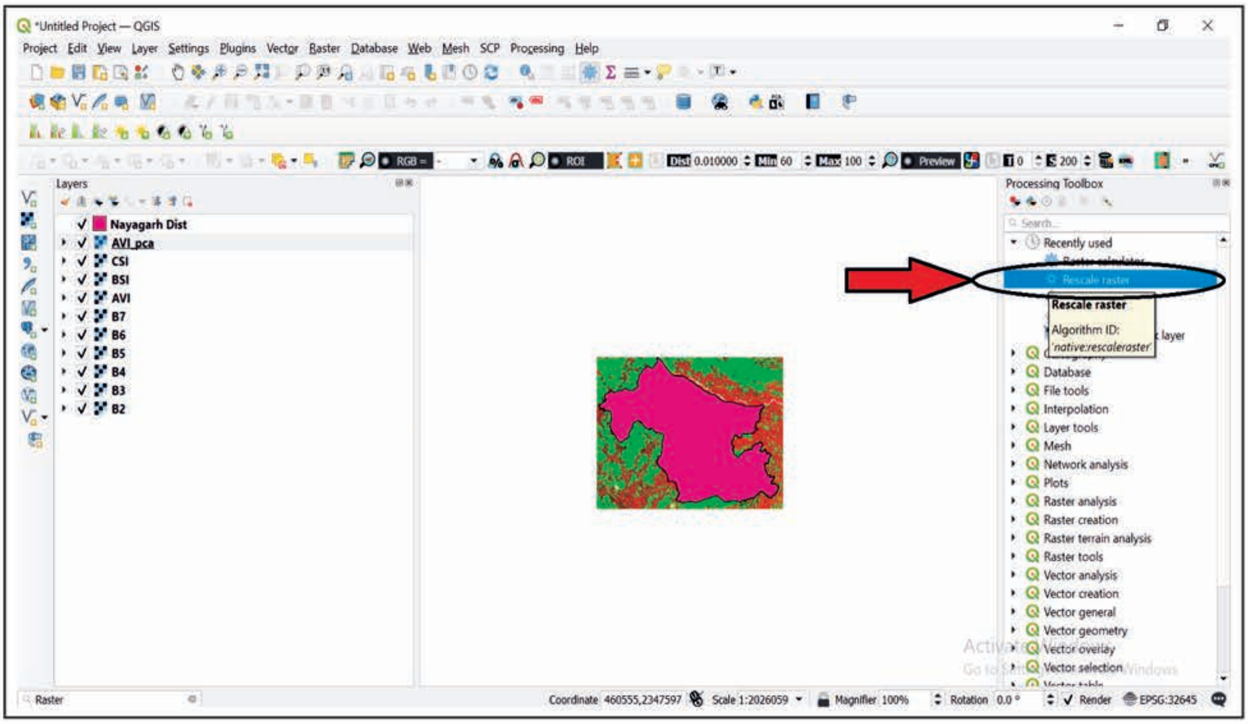


Fig.48. Select the Rescale Raster tool

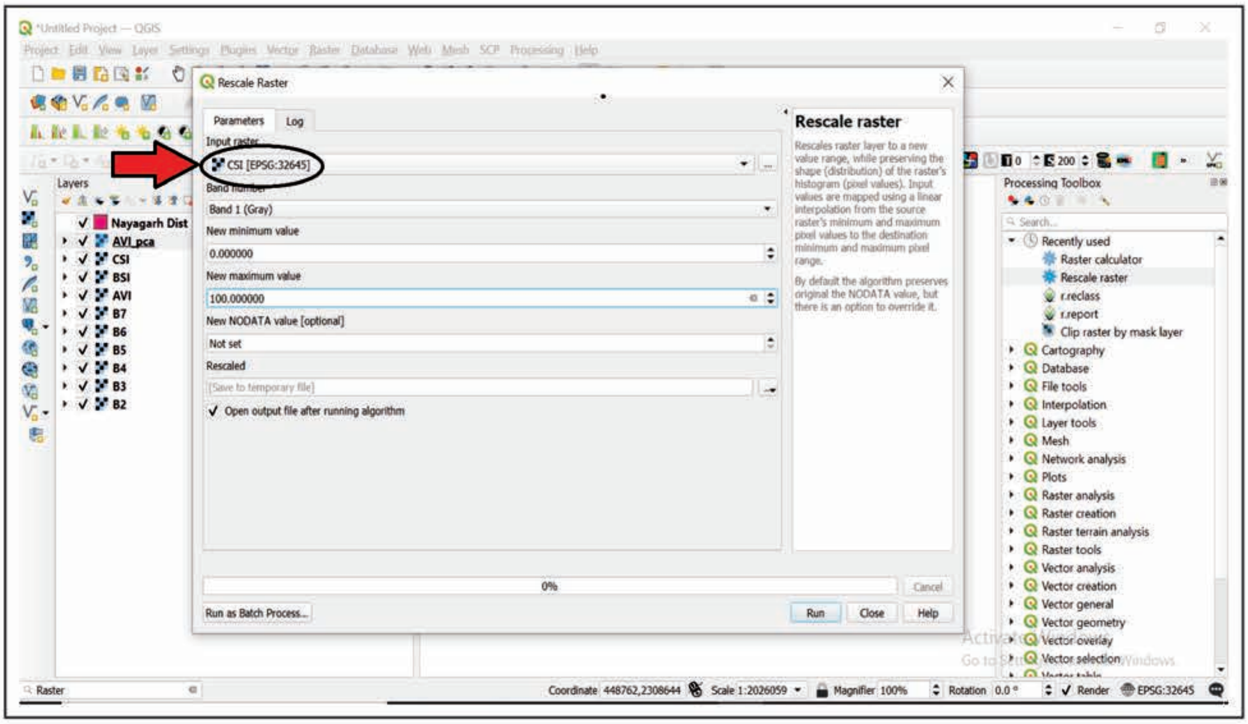


Fig.49. Change the Band Minimum and Maximum Value (0-100)

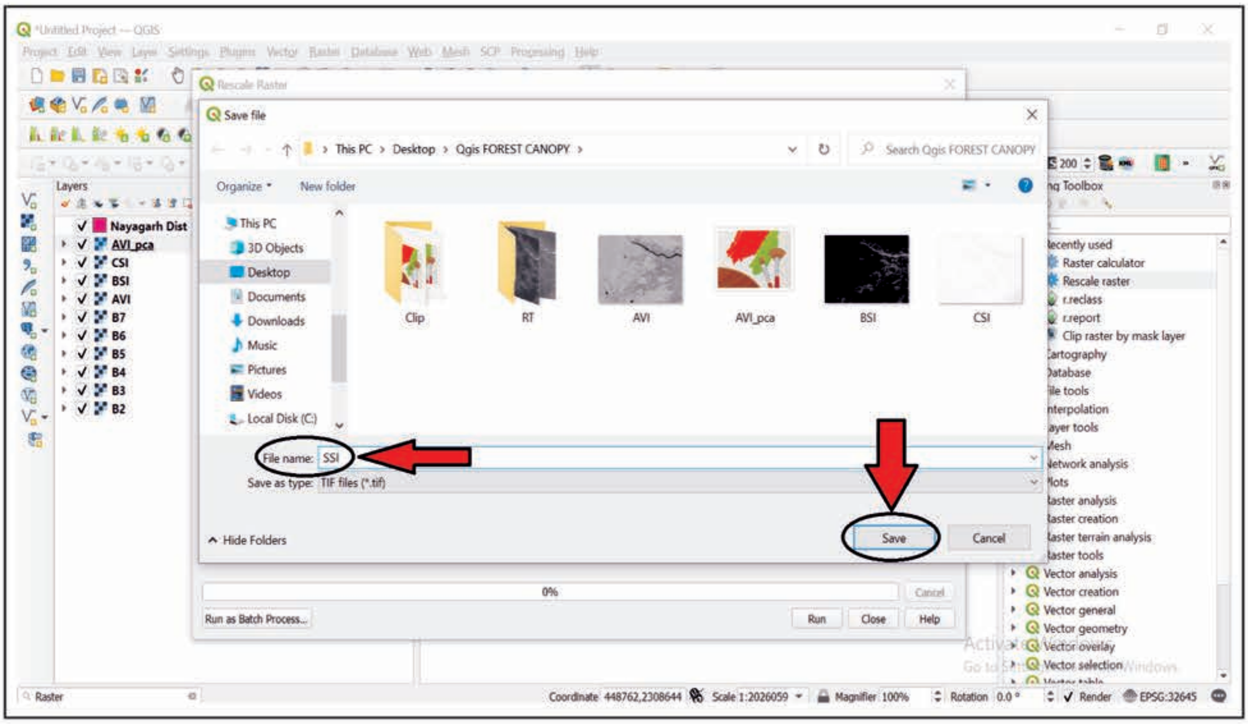


Fig.50. Create the SSI file and save the file

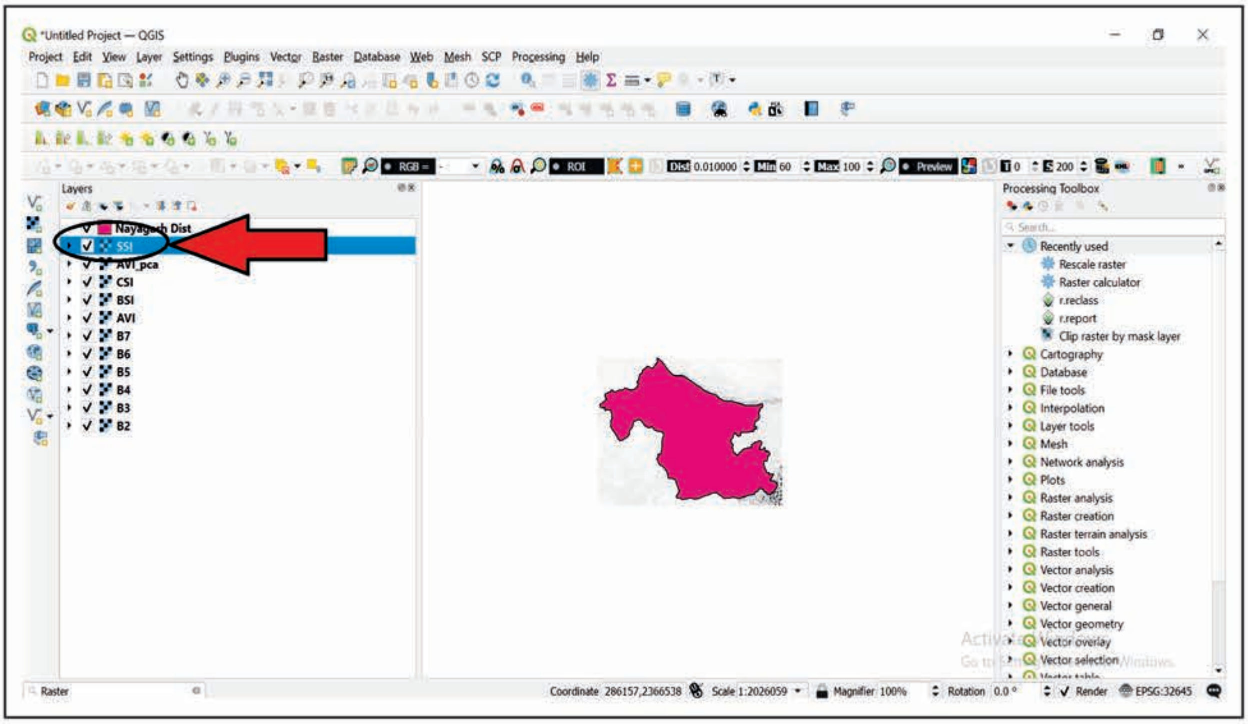


Fig.51. SSI image created

Forest Canopy Density (FCD): It is synthesis by using AVIPCA and SSI and also both indices are scaled and unit of each produces forest canopy density.

FCD= ((AVIPCA@2 * SSI)+1)*1/2-1

Step 1:

1. Select 'Raster calculator'.
2. Create the Forest canopy density By using the formula.
3. Run the algorithm.

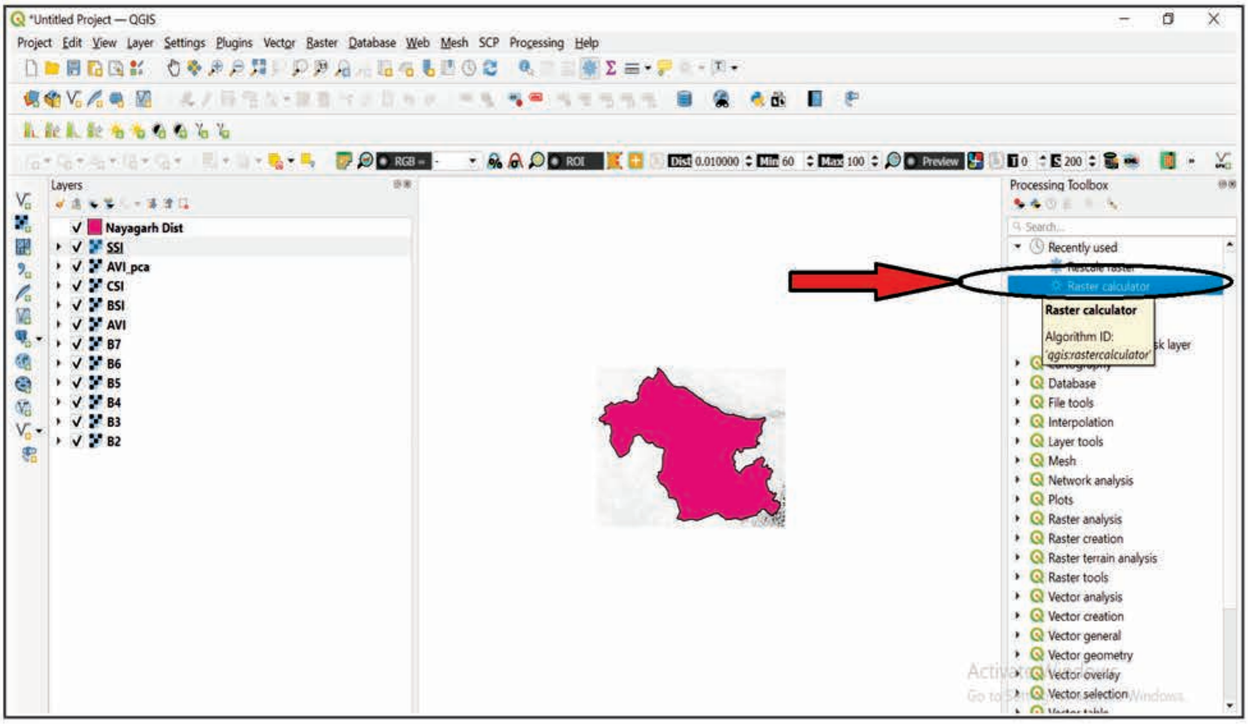


Fig.52. Select the Raster calculator tool

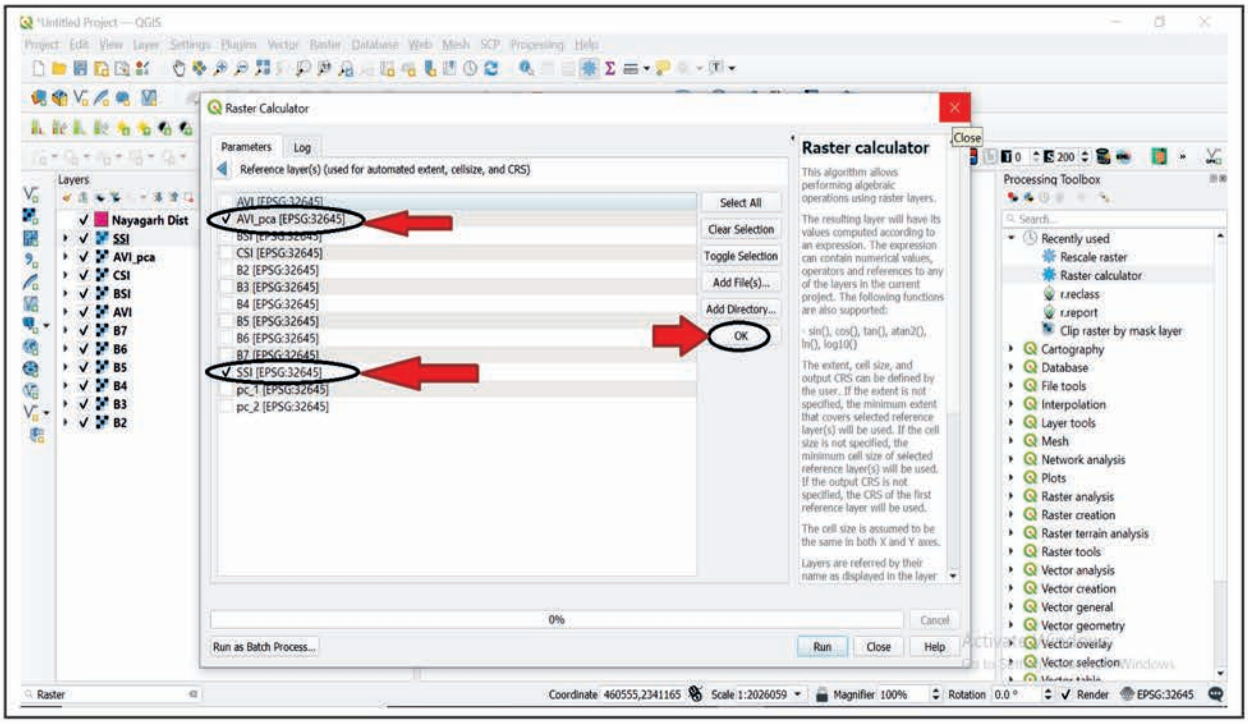


Fig.53. Tick the AVI_pca and SSI

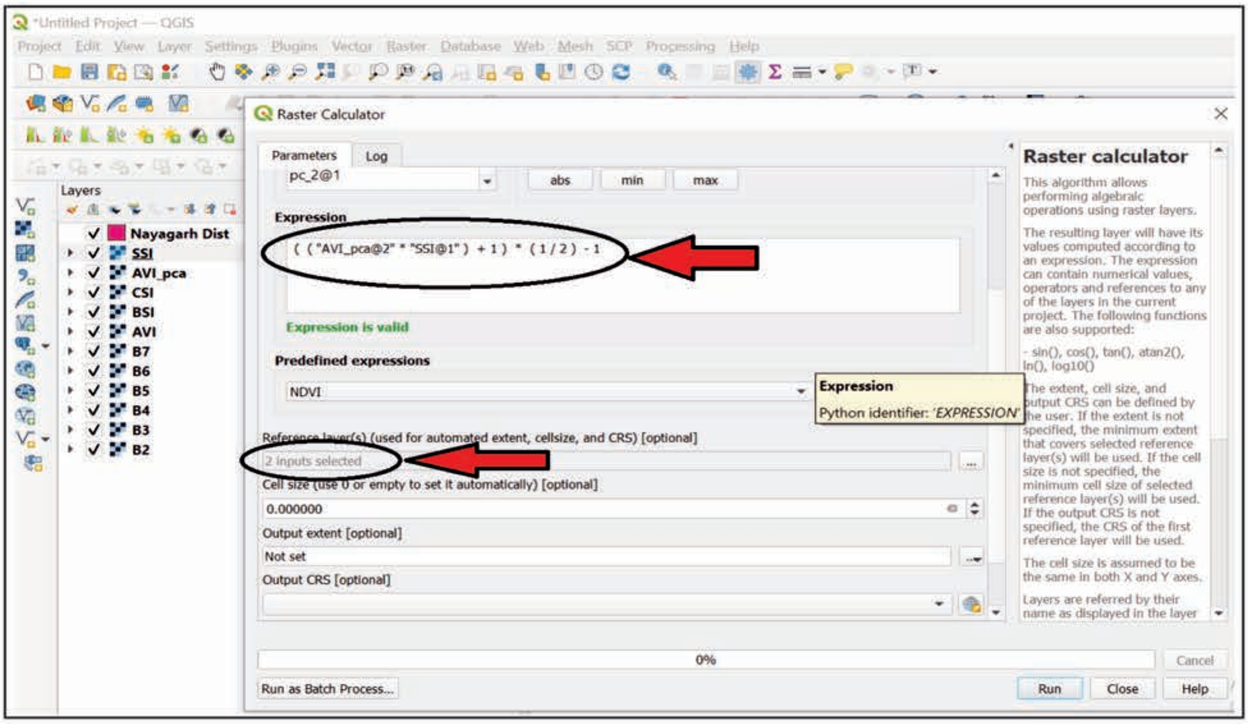


Fig.54. Use FCD formula

FCD= ((AVIPCA@2 * SSI)+1)*1/2-1

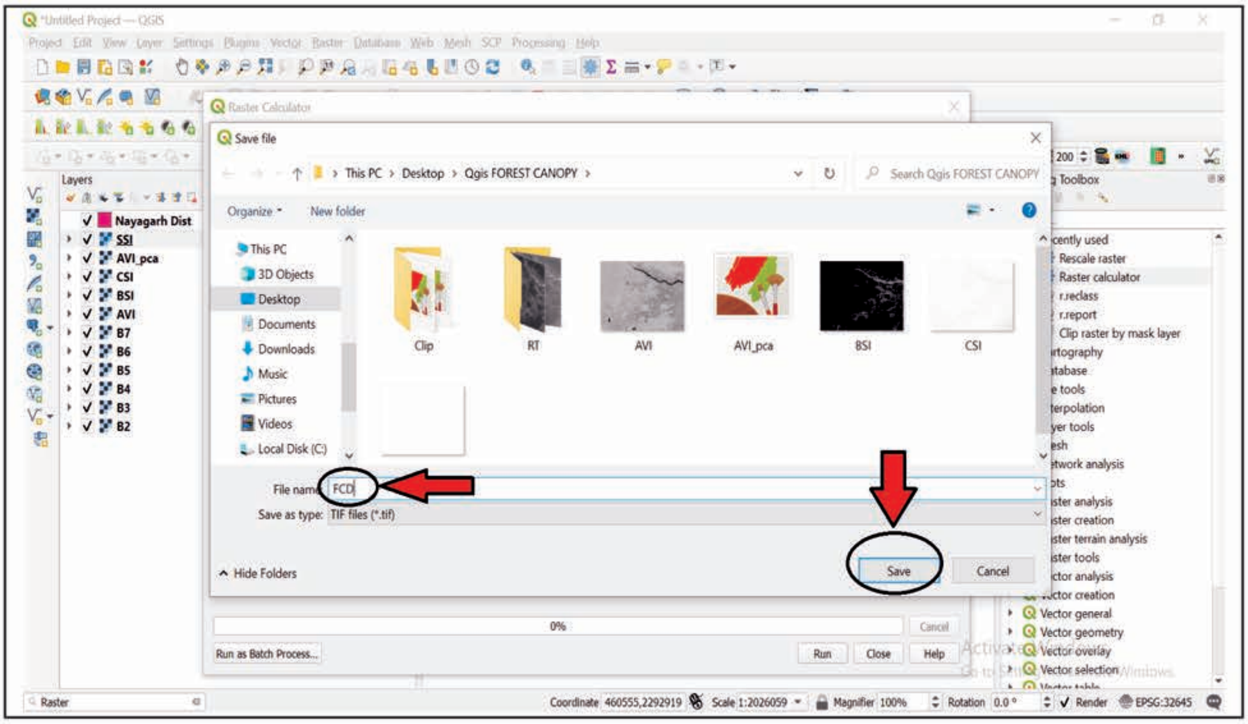


Fig.55. Create the FCD file and save the file

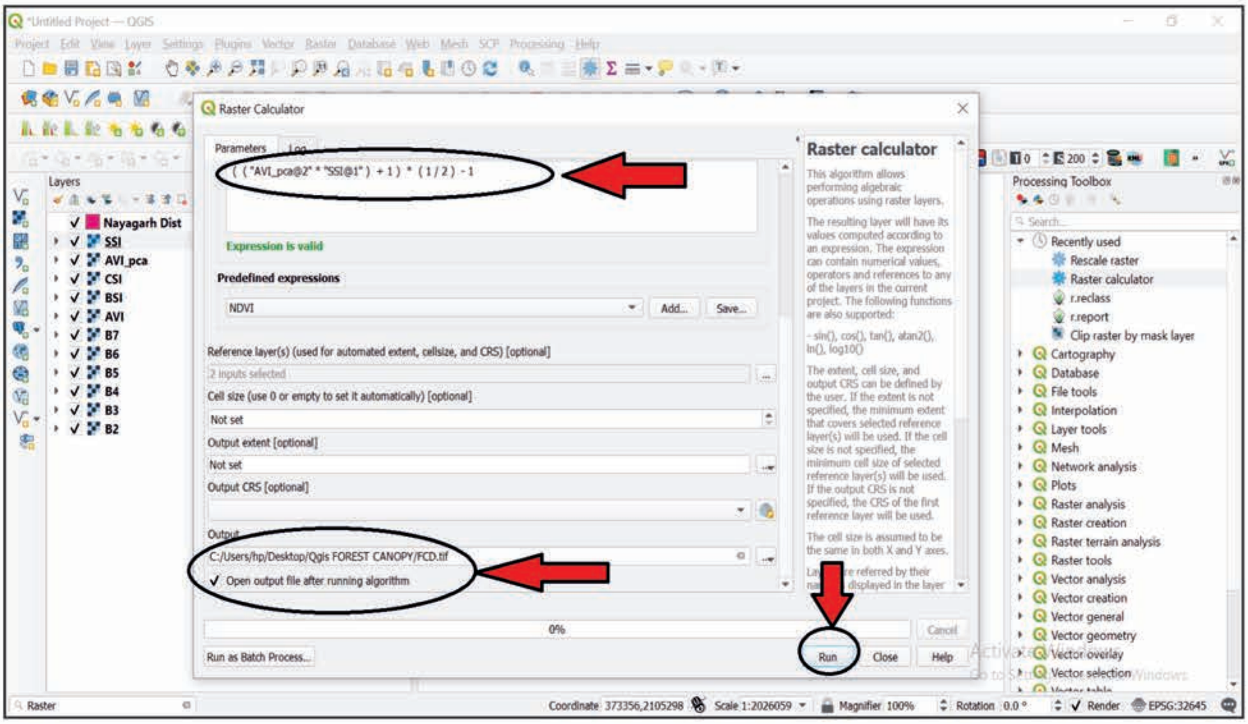


Fig.56. Run the algorithm

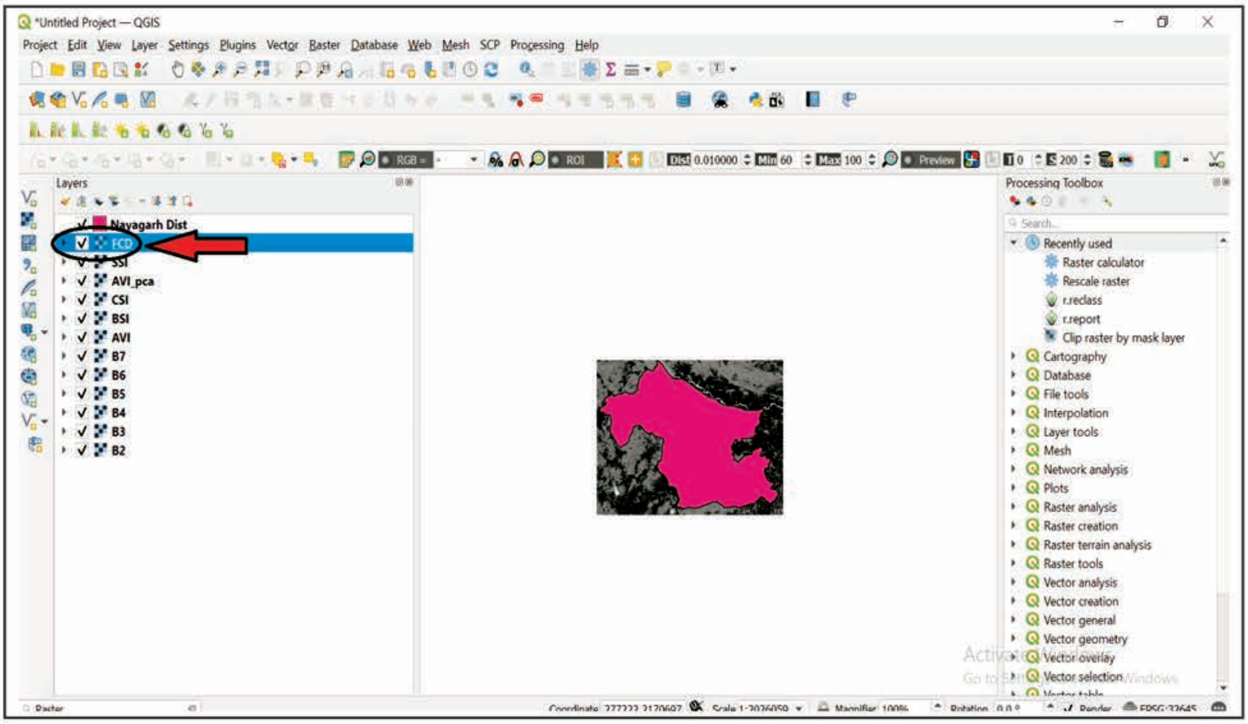


Fig.57. FCD file created

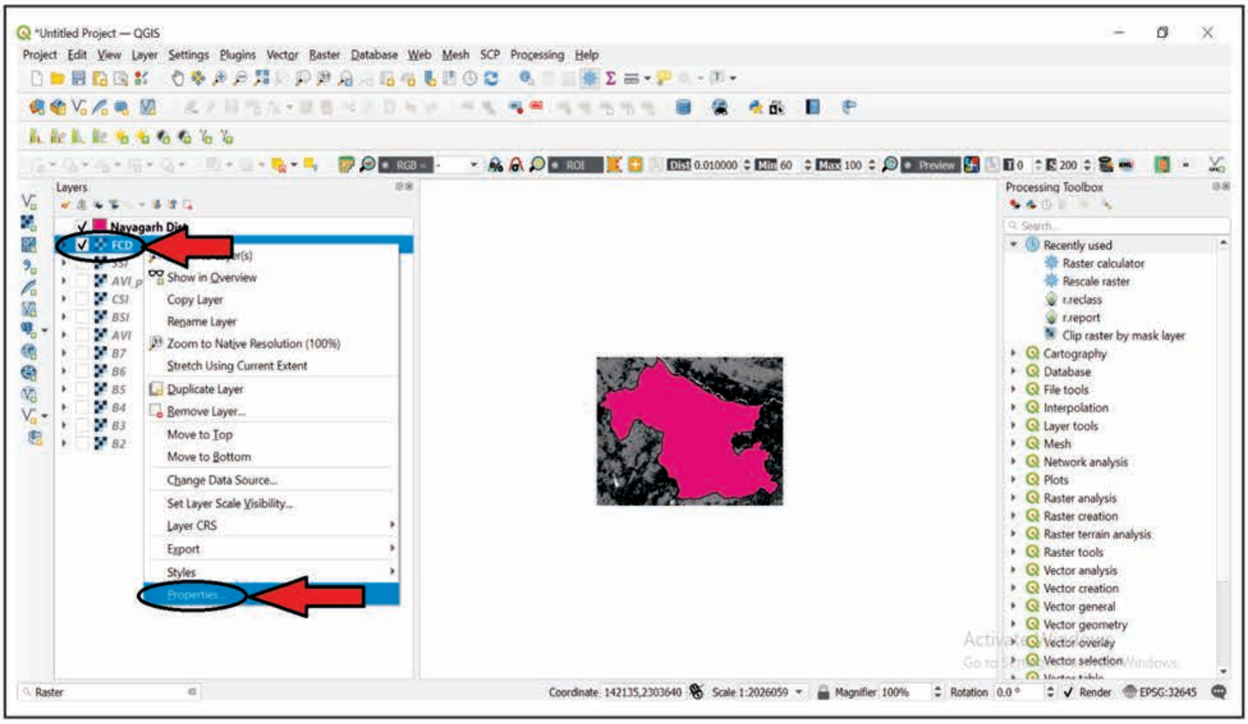


Fig.58. Select the FCD properties

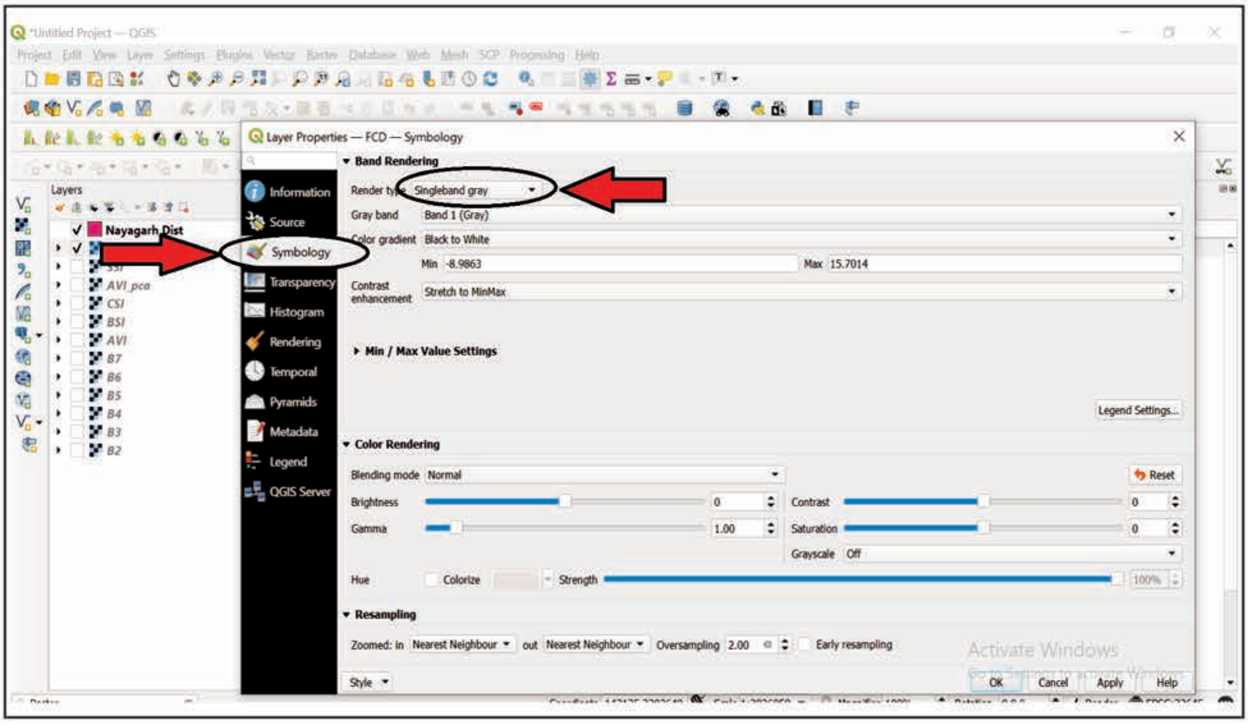


Fig. 59. Change the properties like symbology etc,

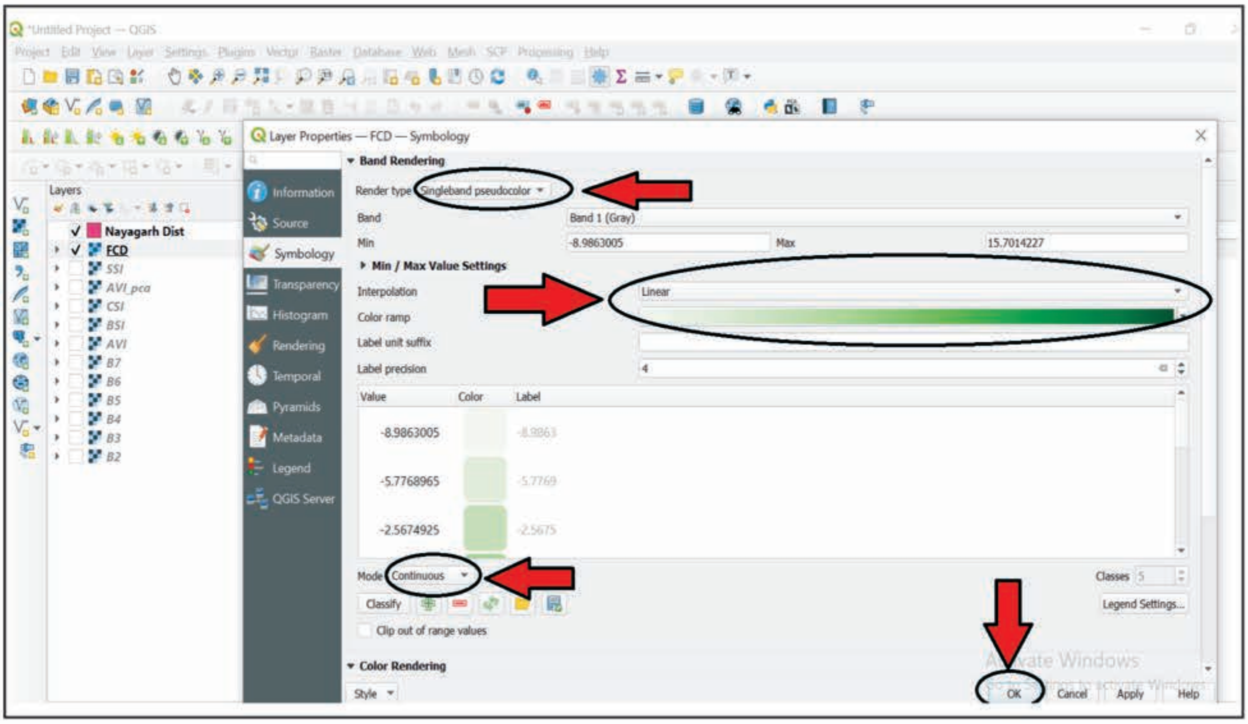


Fig.60. Change the color and mode

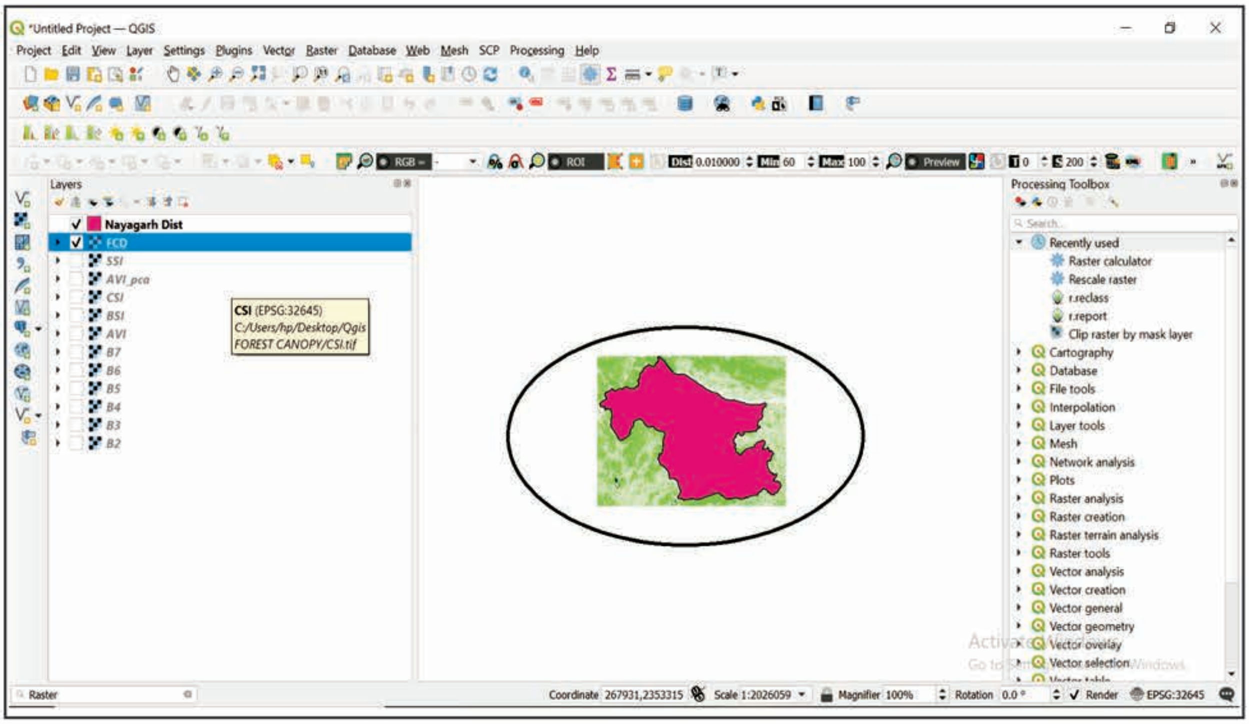


Fig.61. After changed the properties

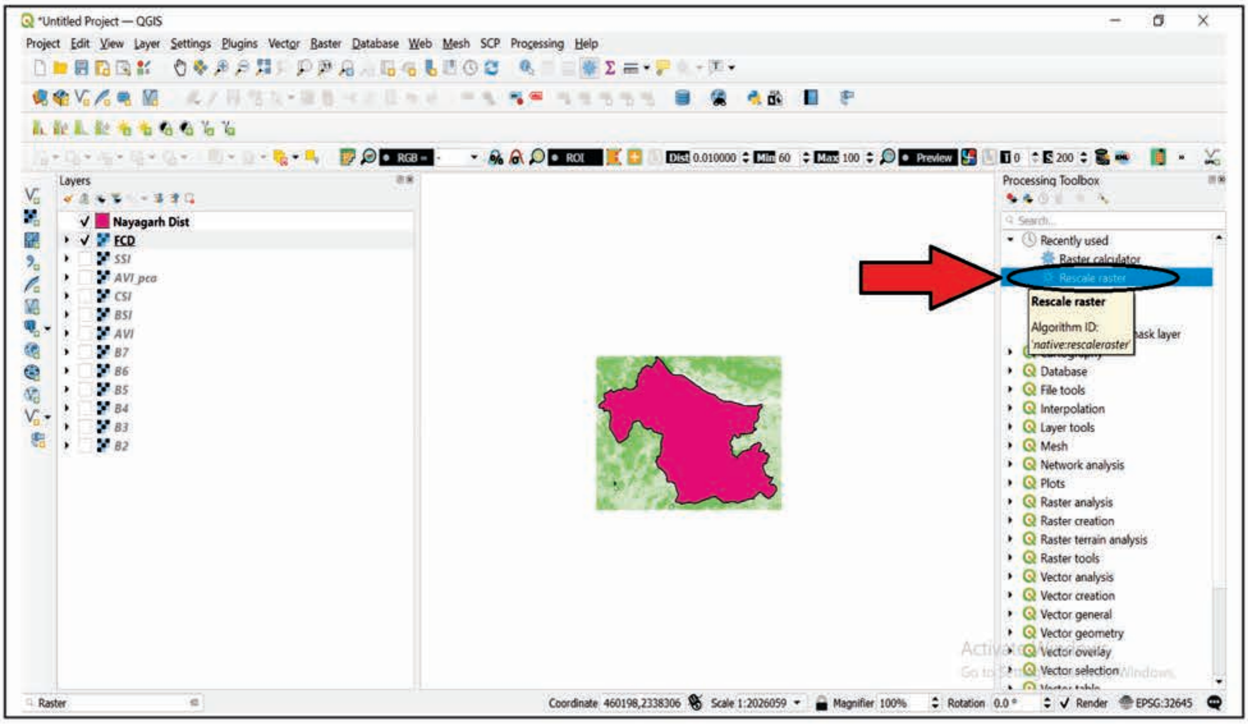


Fig.62. Select the rescale raster

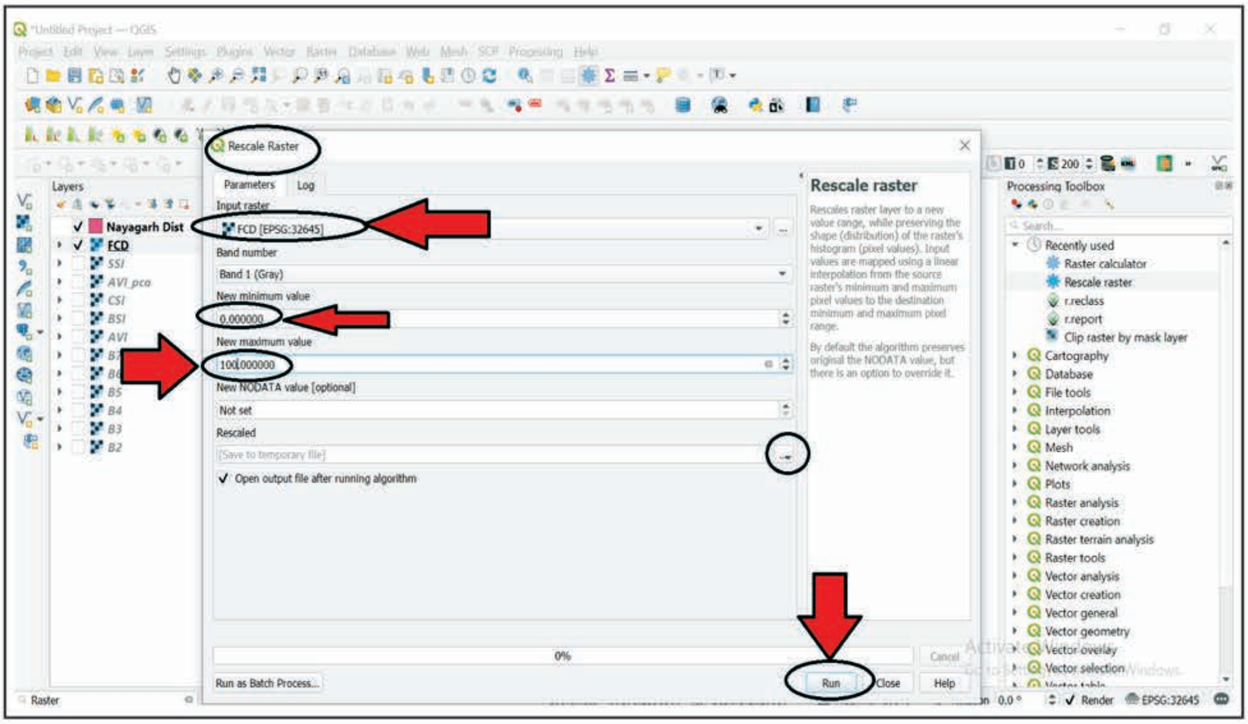


Fig.63. Enter the Band minimum and maximum value and run the algorithm

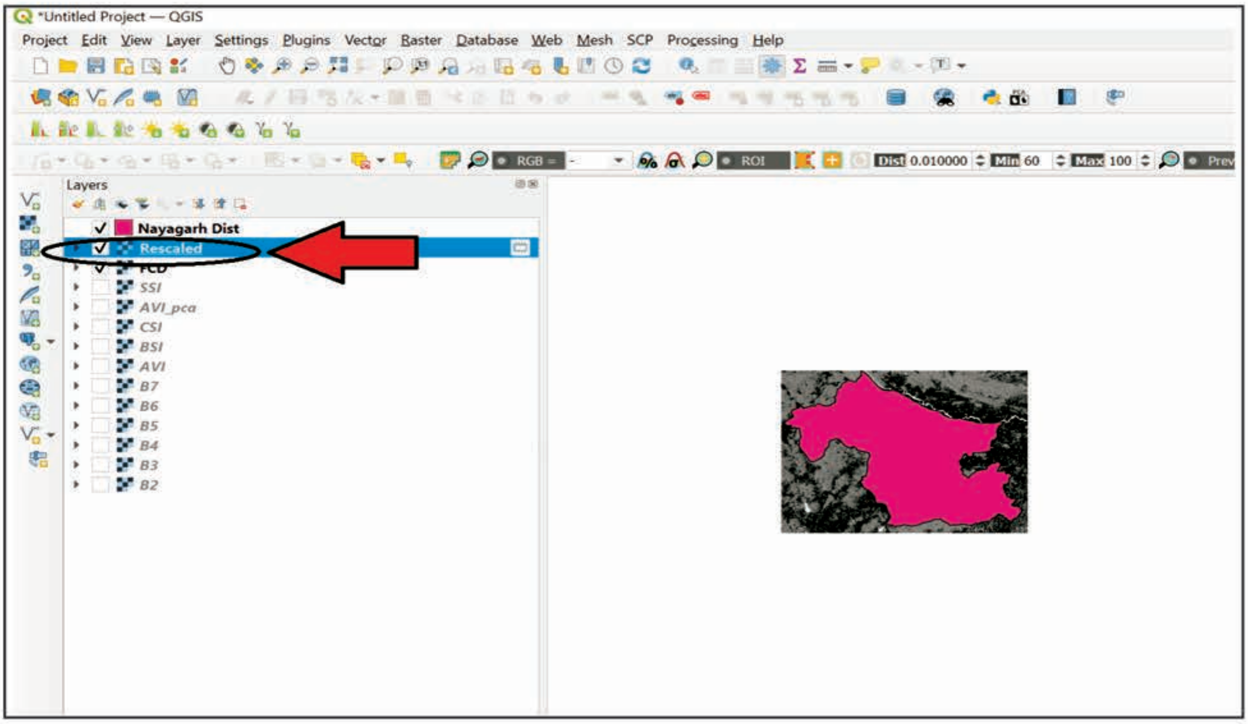


Fig.64. Rescaled image created

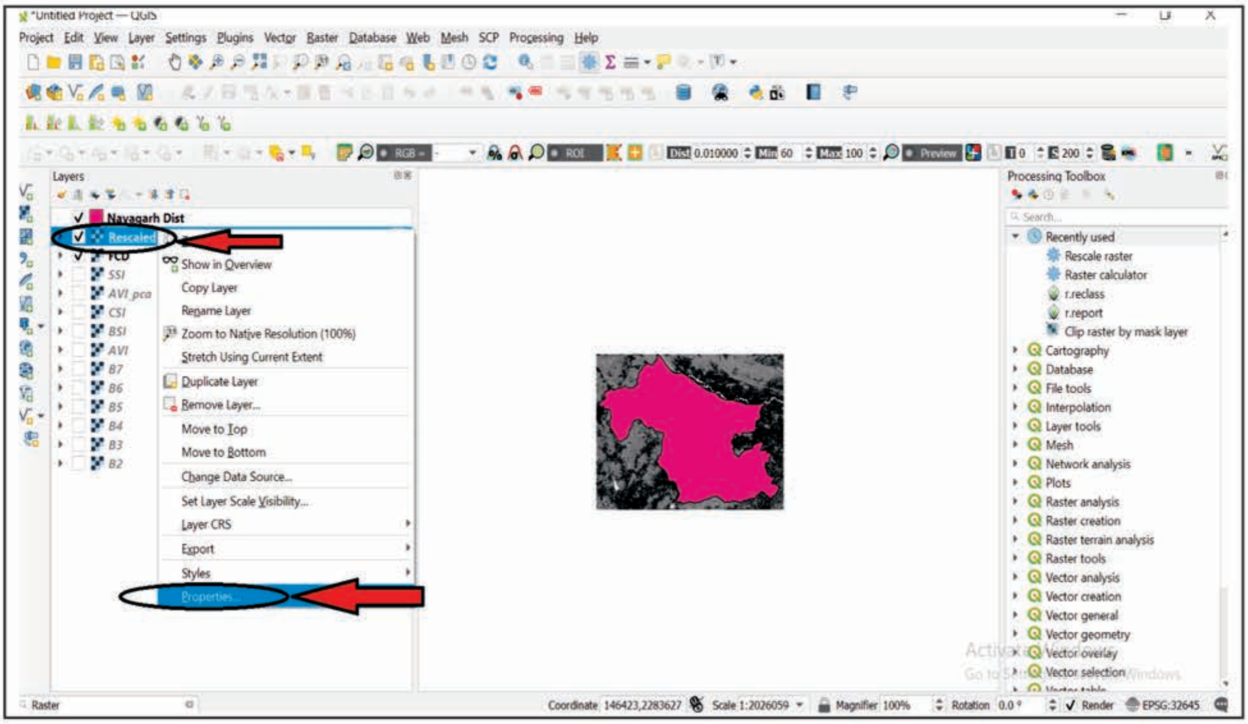


Fig.65. Select the Rescaled properties

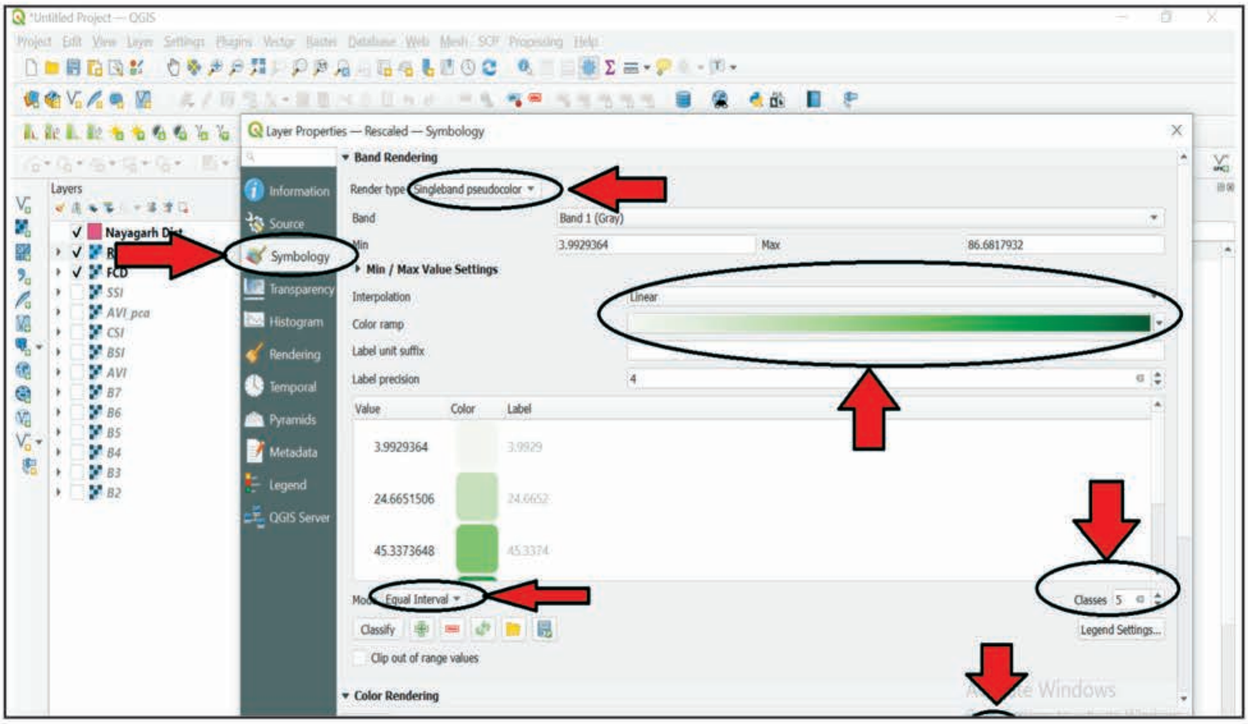


Fig.66. Change the symbology

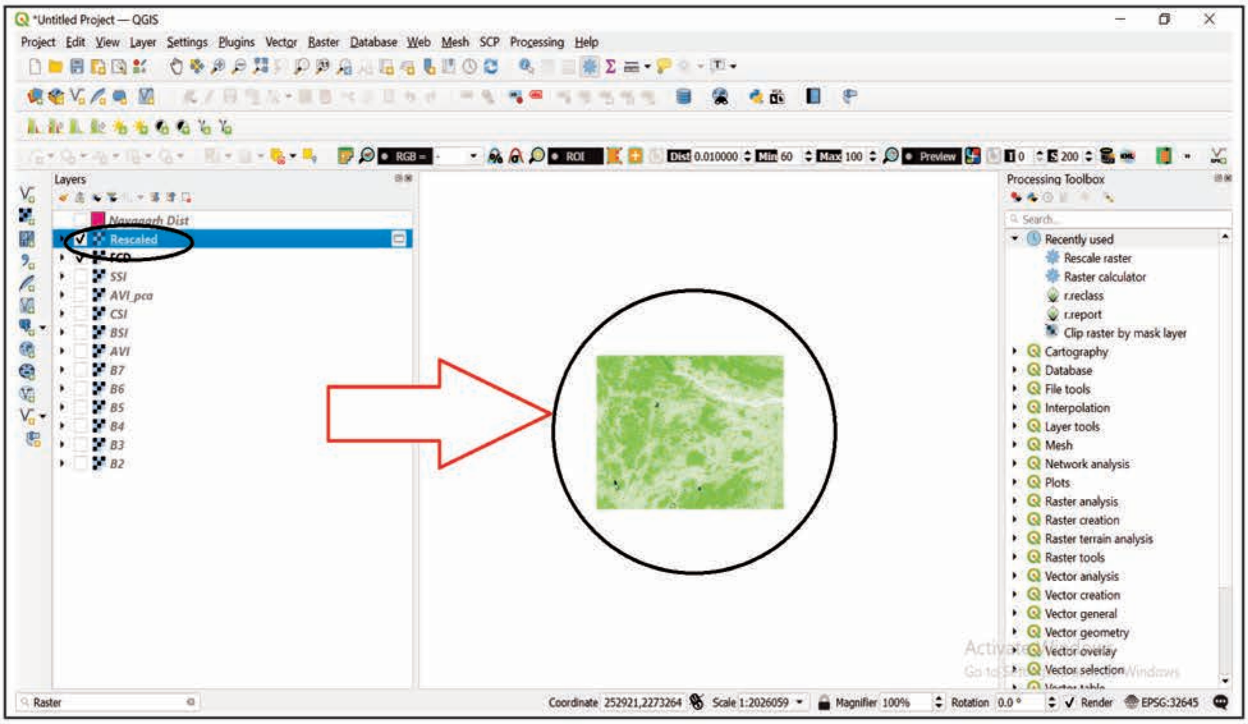


Fig.67. Untick all layer except rescaled and FCD

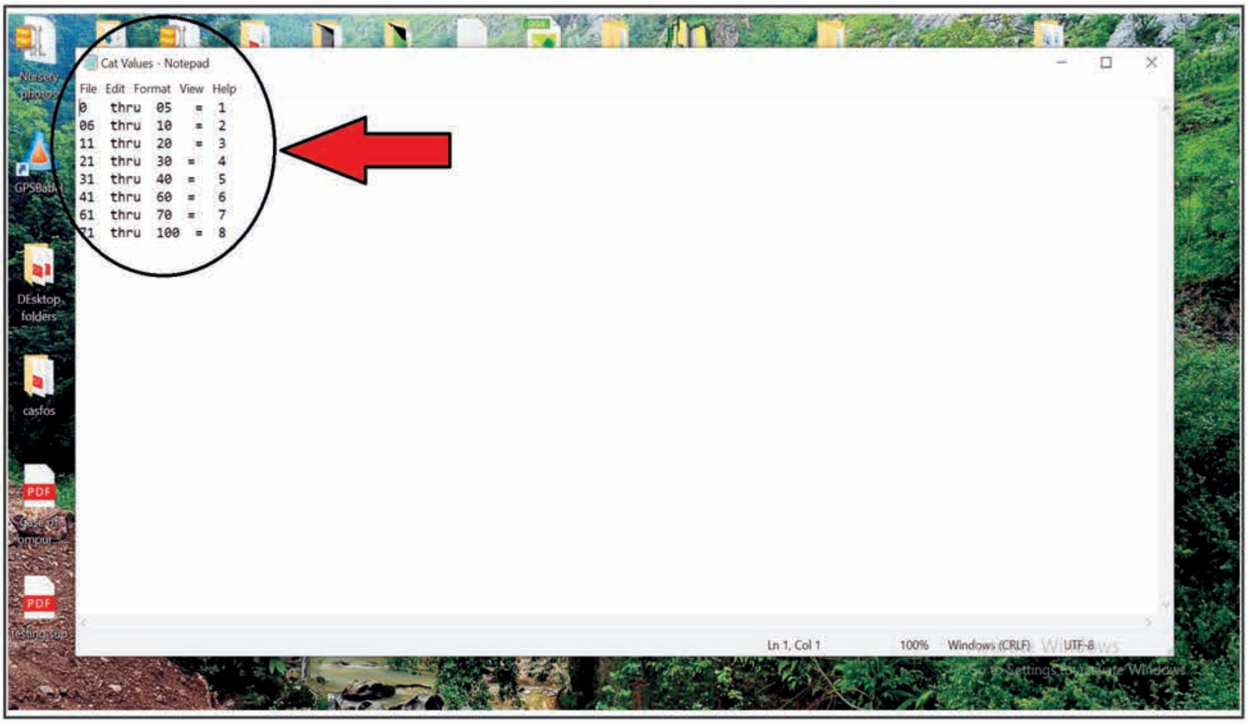


Fig.68. Create the Cat Values in Notepad

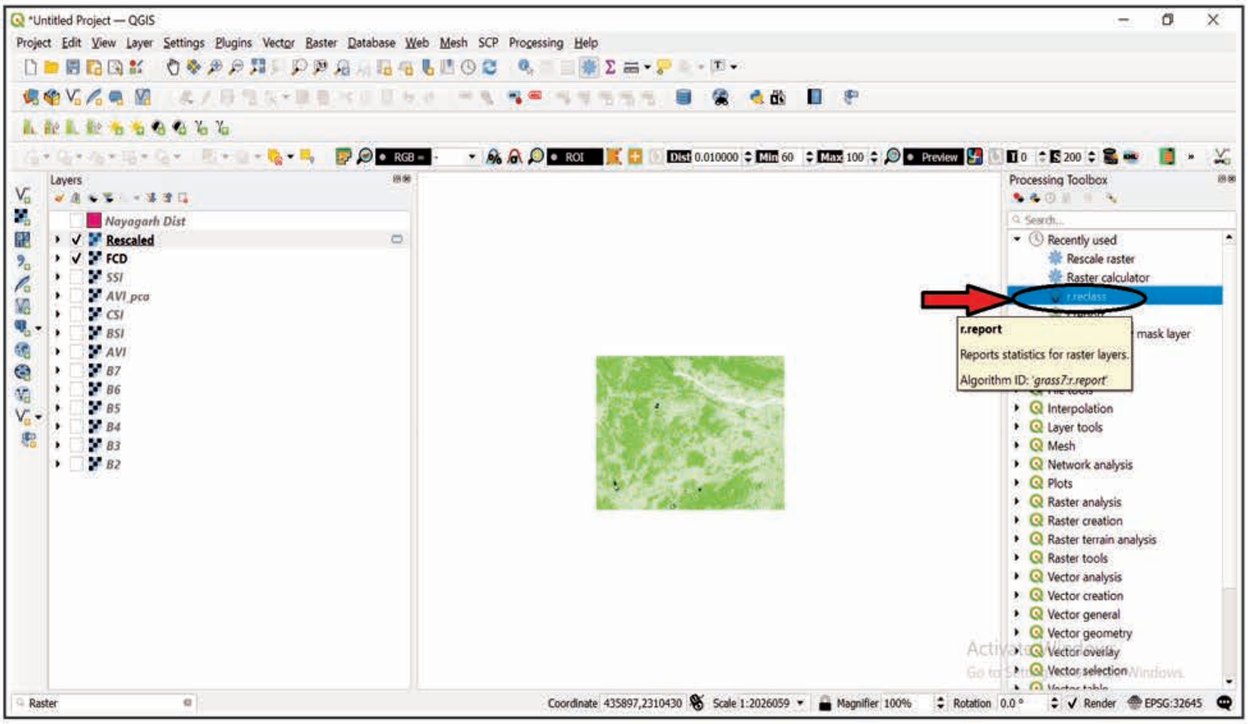


Fig.69. Select the r.reclass tool

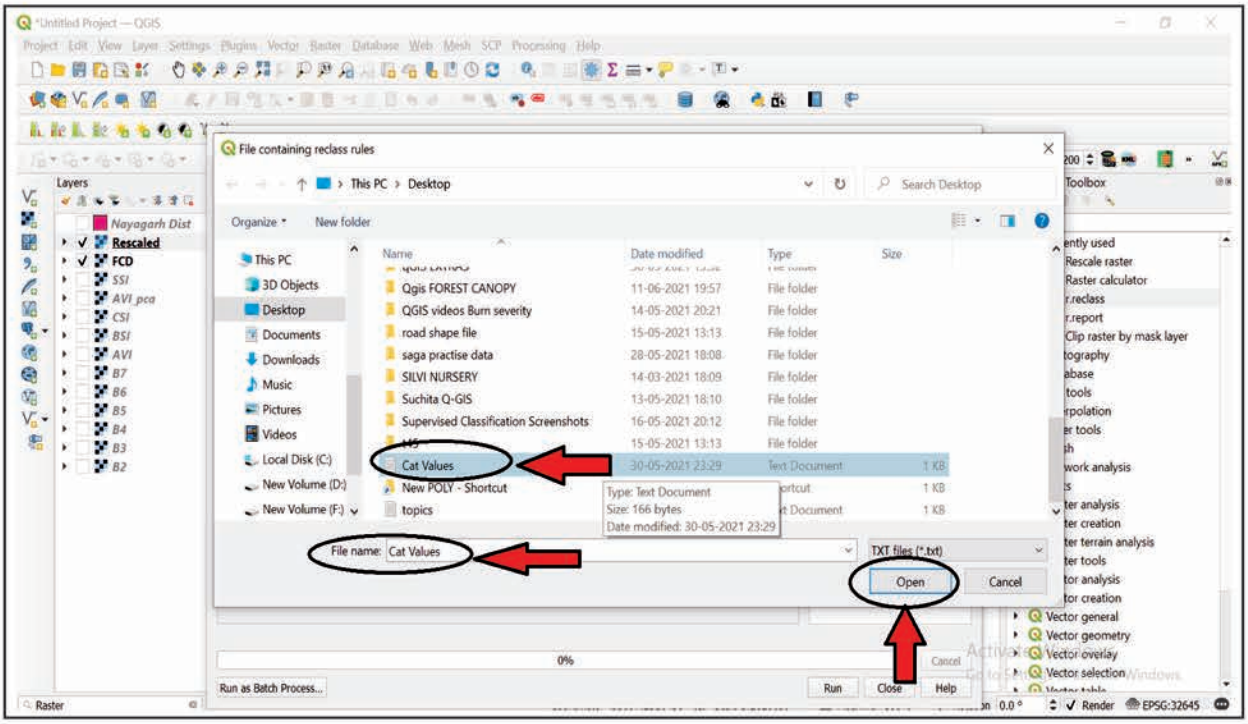


Fig.70. Select the cat values

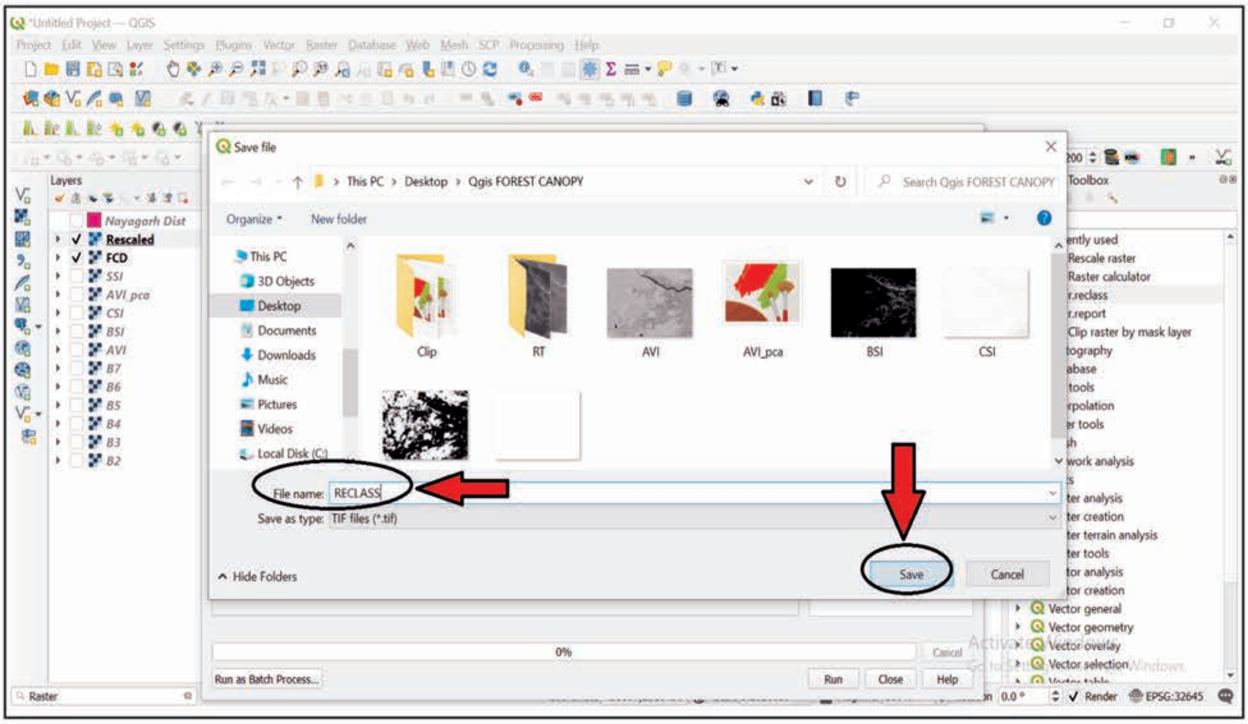


Fig.71. Create a Reclass layer and save

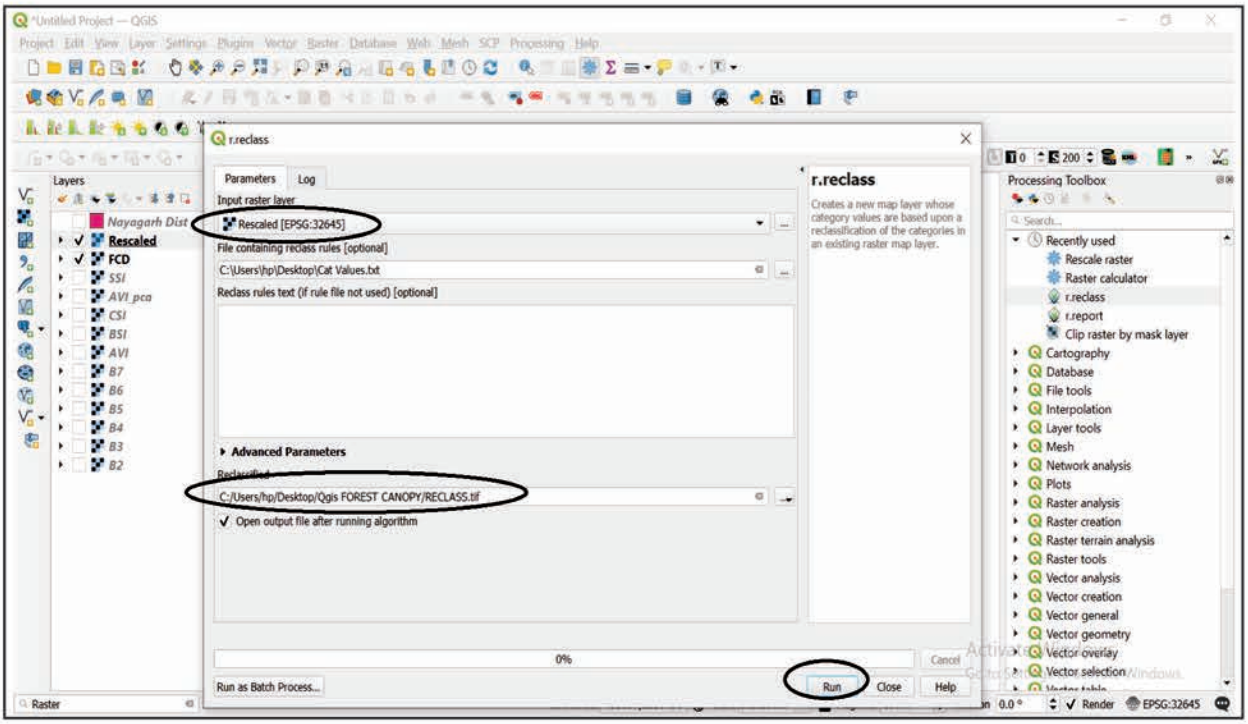


Fig.72. Run the r.reclass file

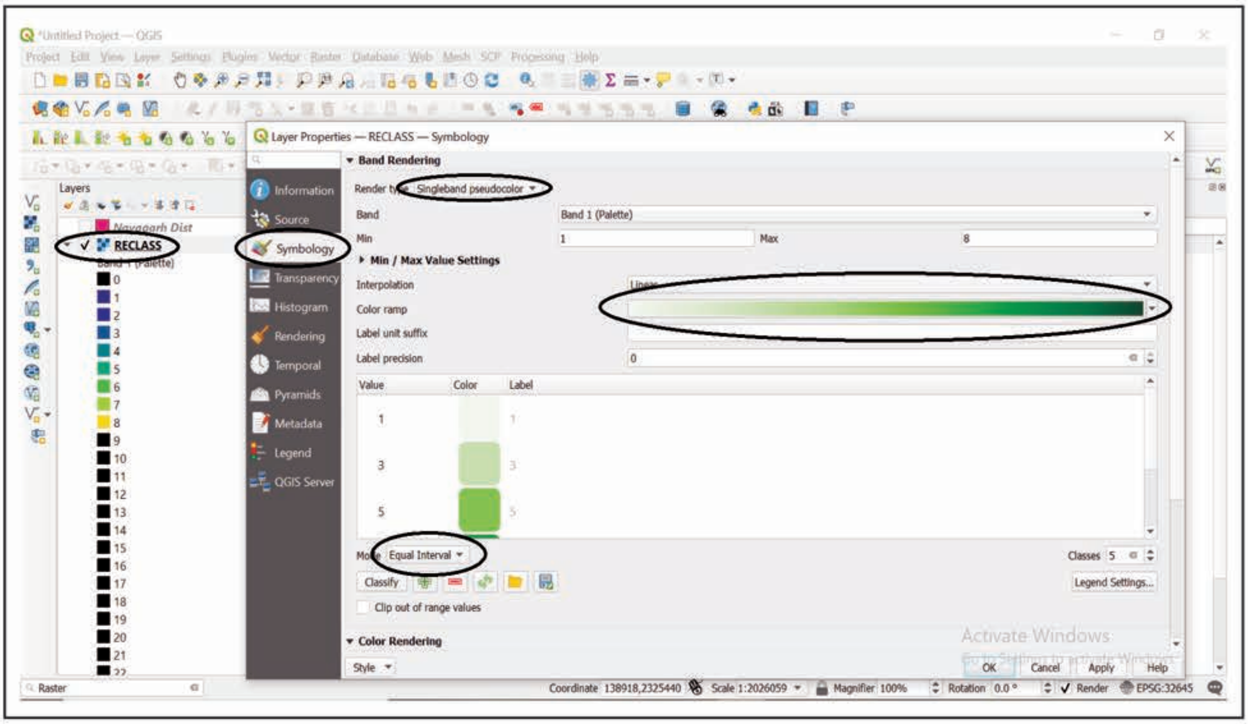


Fig.73. Change the RECLASS properties

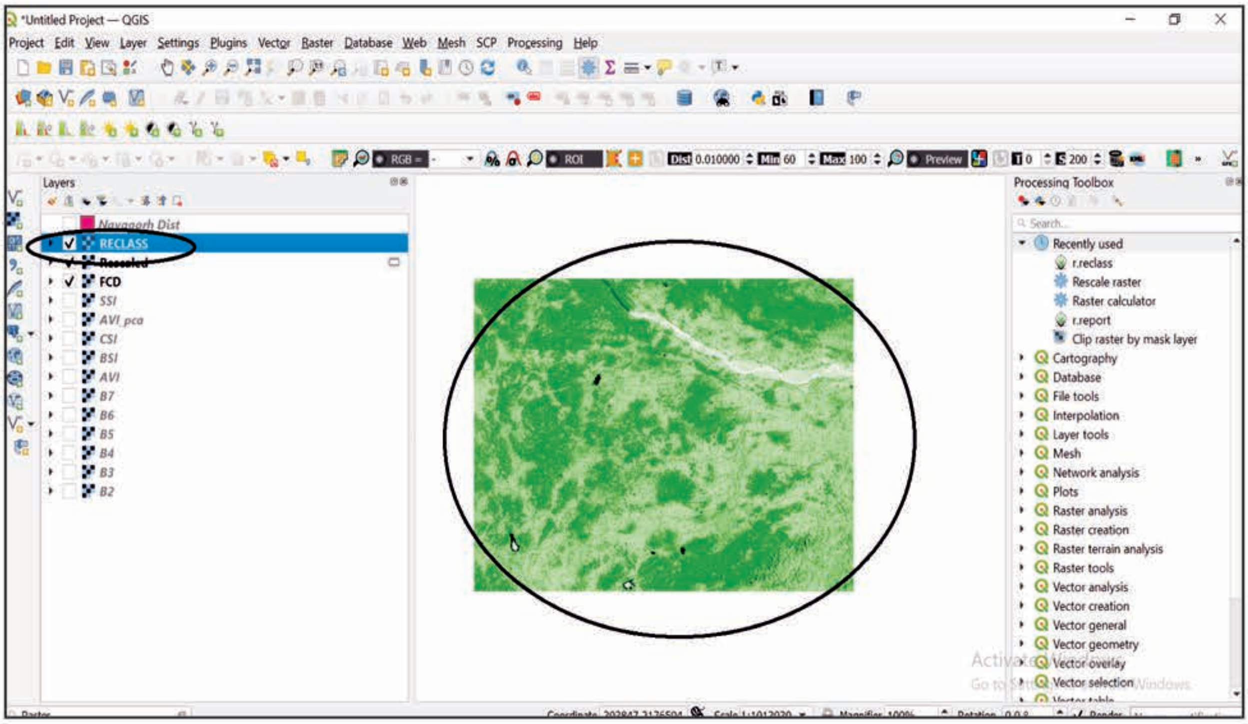


Fig.74. After change the RECLASS properties

Select the Raster and Extraction click the clip Raster by Mask layer

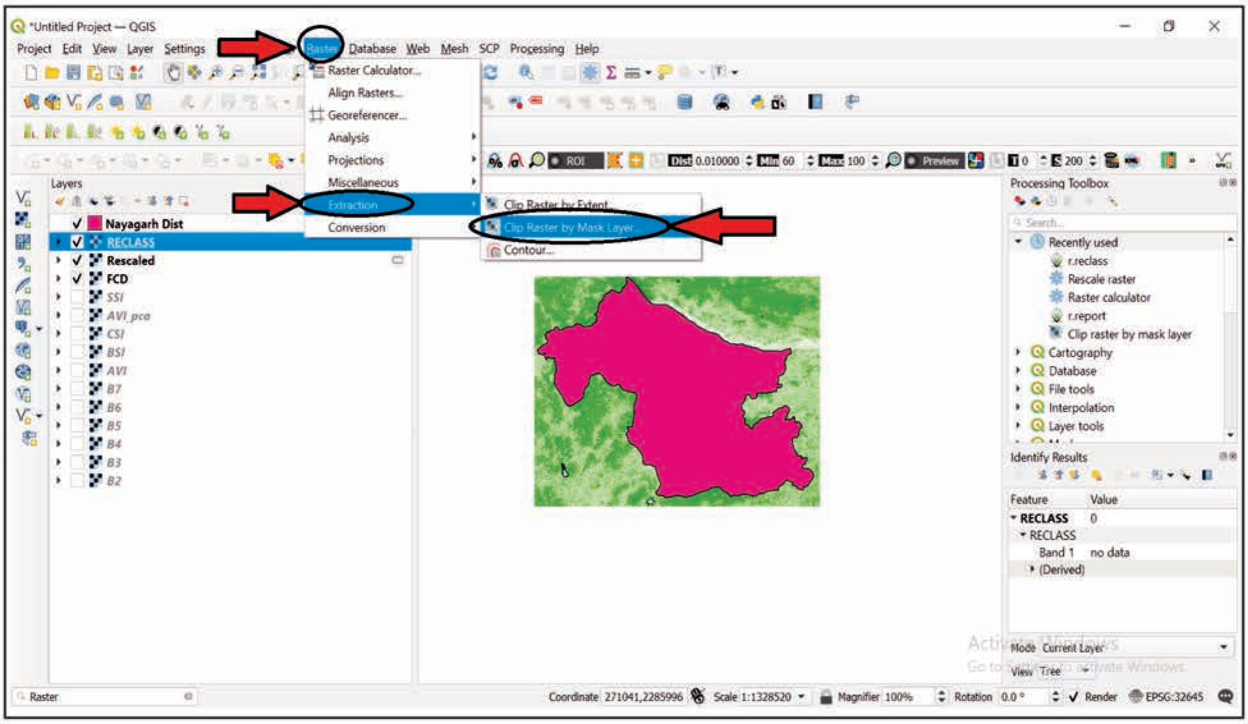


Fig.75. Click the clip Raster by Mask layer

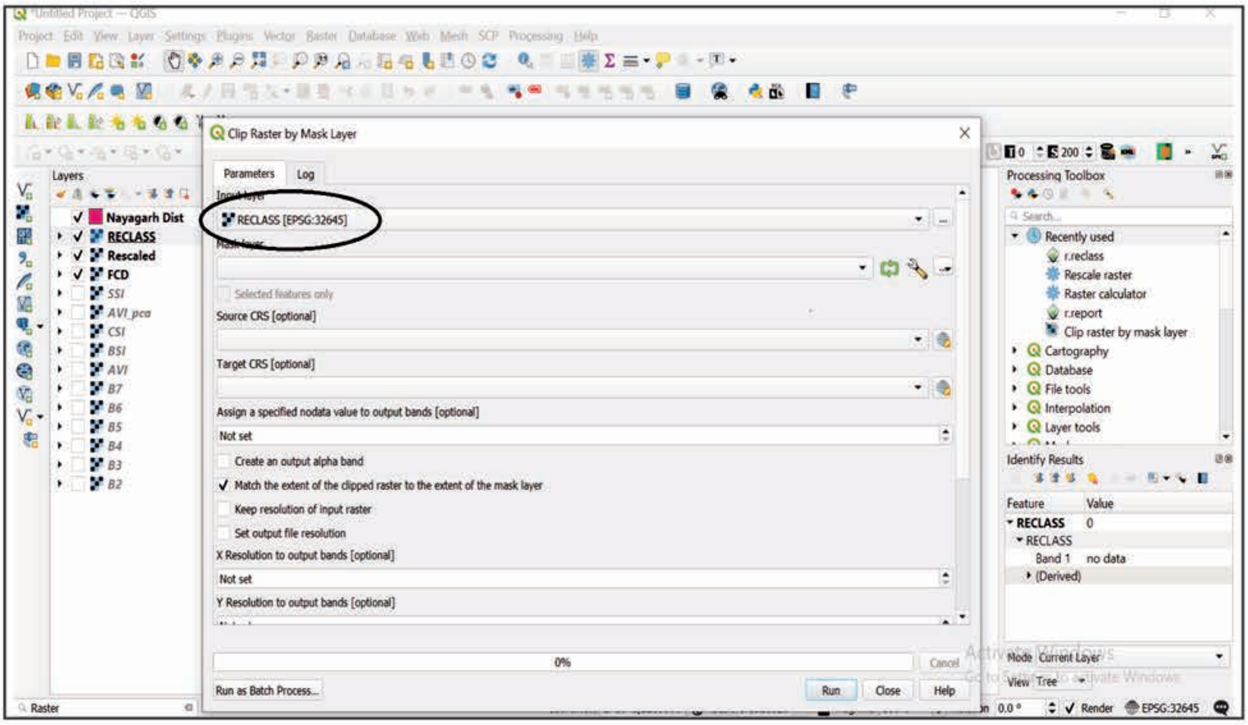


Fig.76. Select the input layer and mask layer

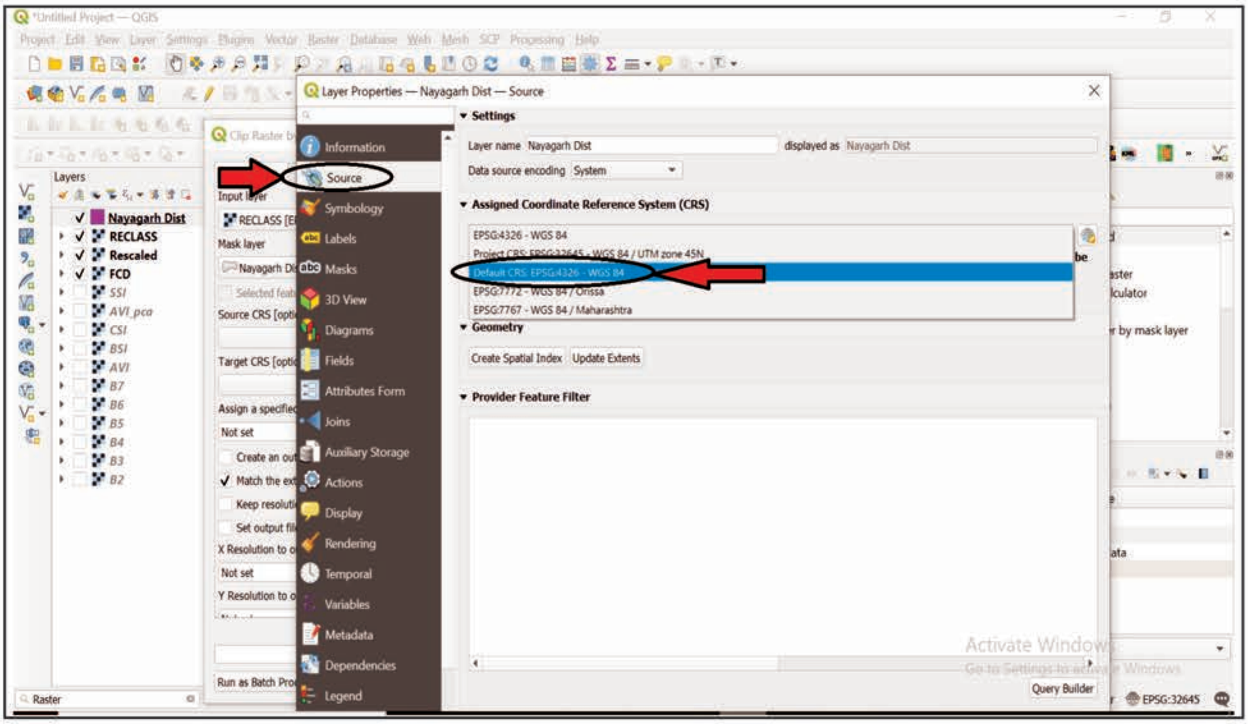


Fig.77. Select the Coordinate Reference System

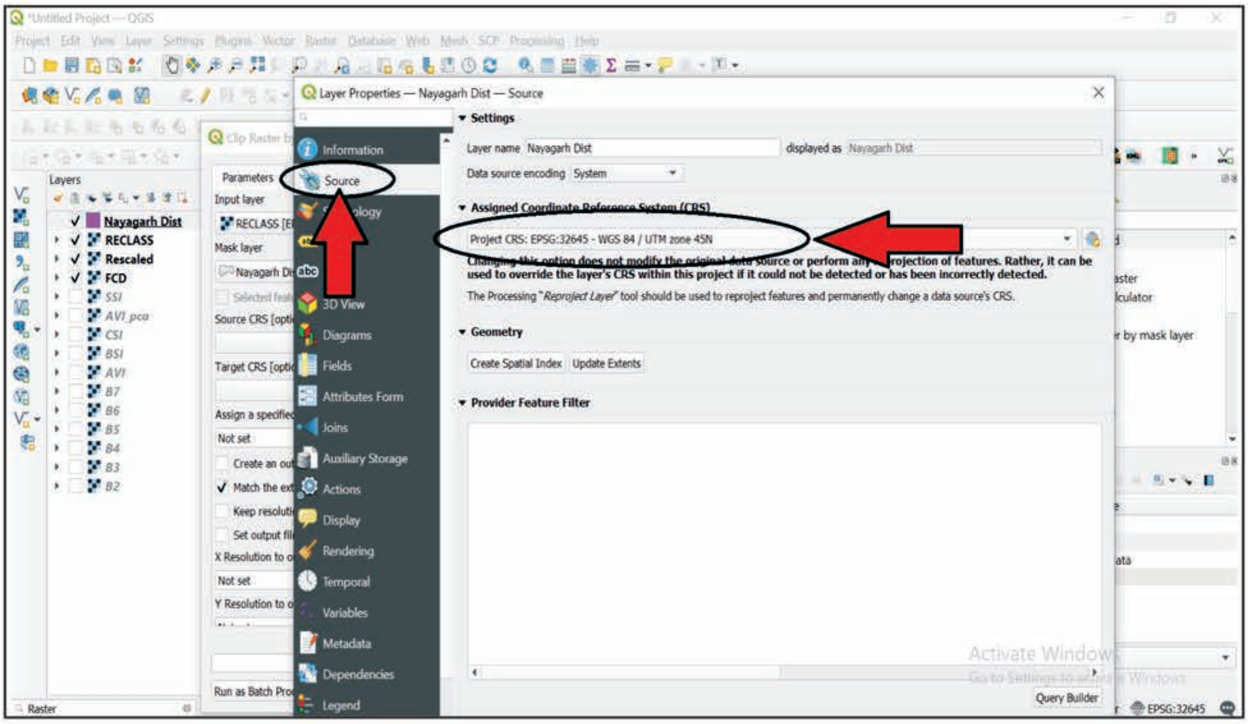


Fig.78. Change the Coordinate Reference System

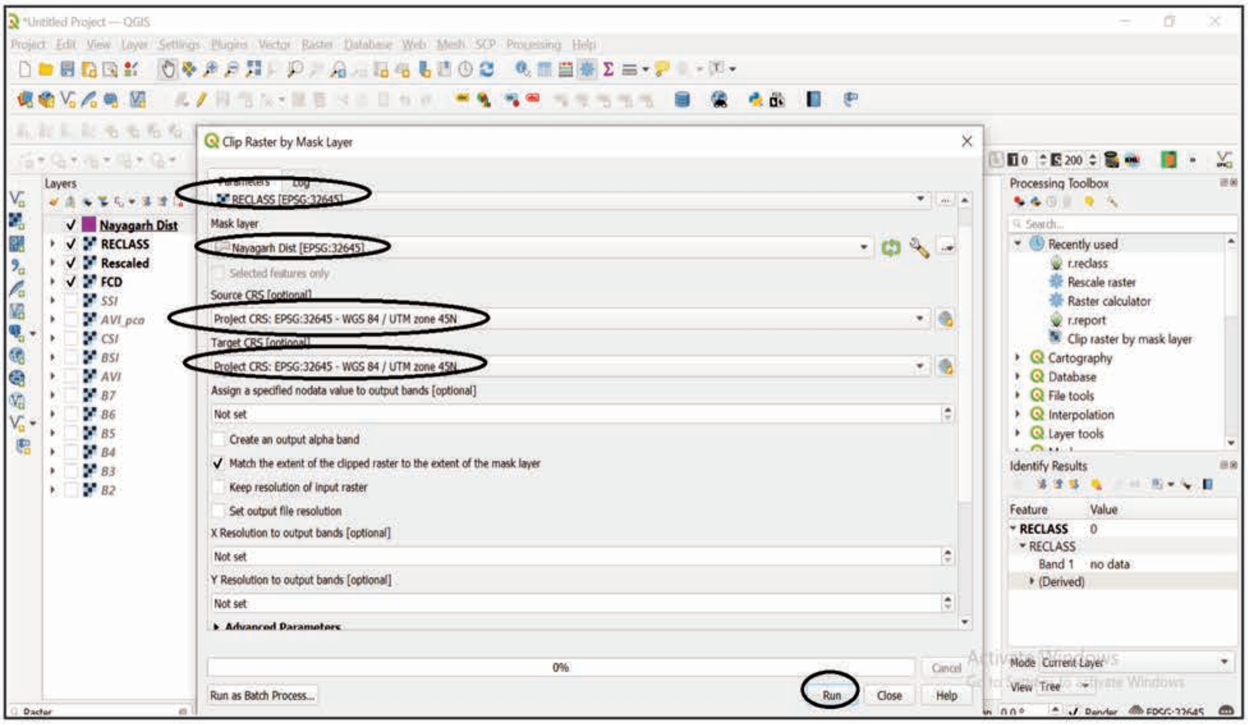


Fig.79. Run the algorithm

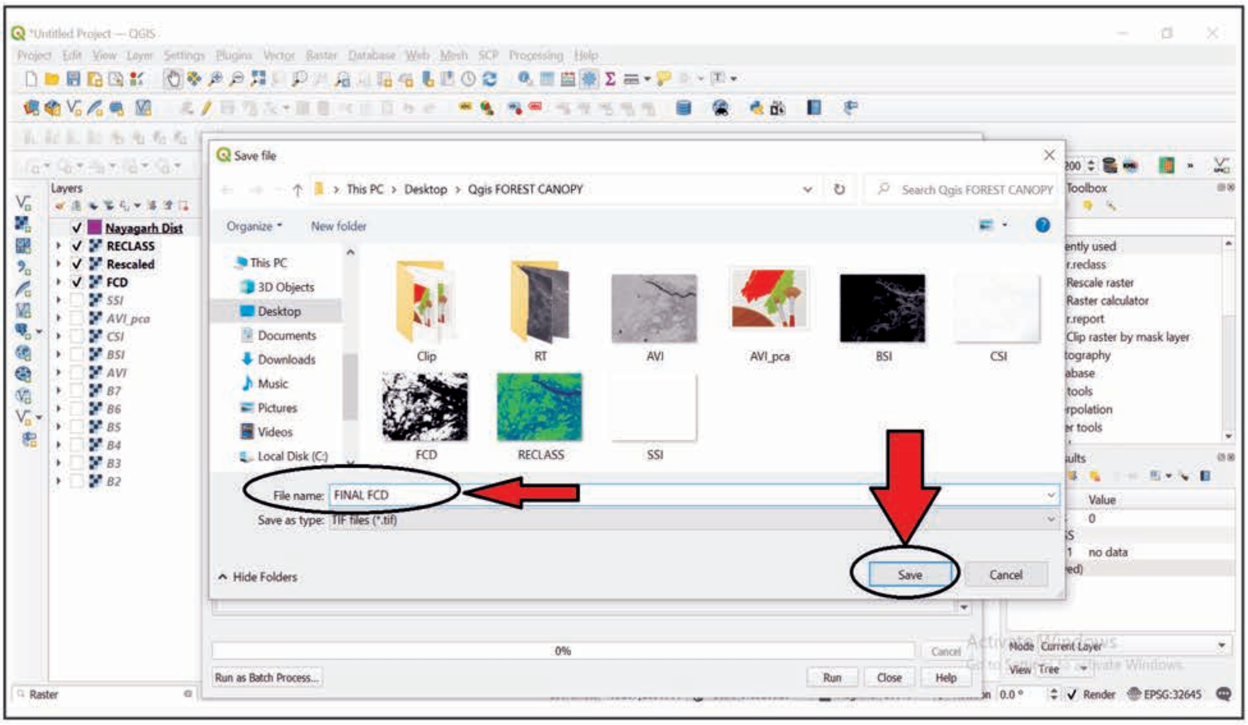


Fig.80. Create the final FCD and save

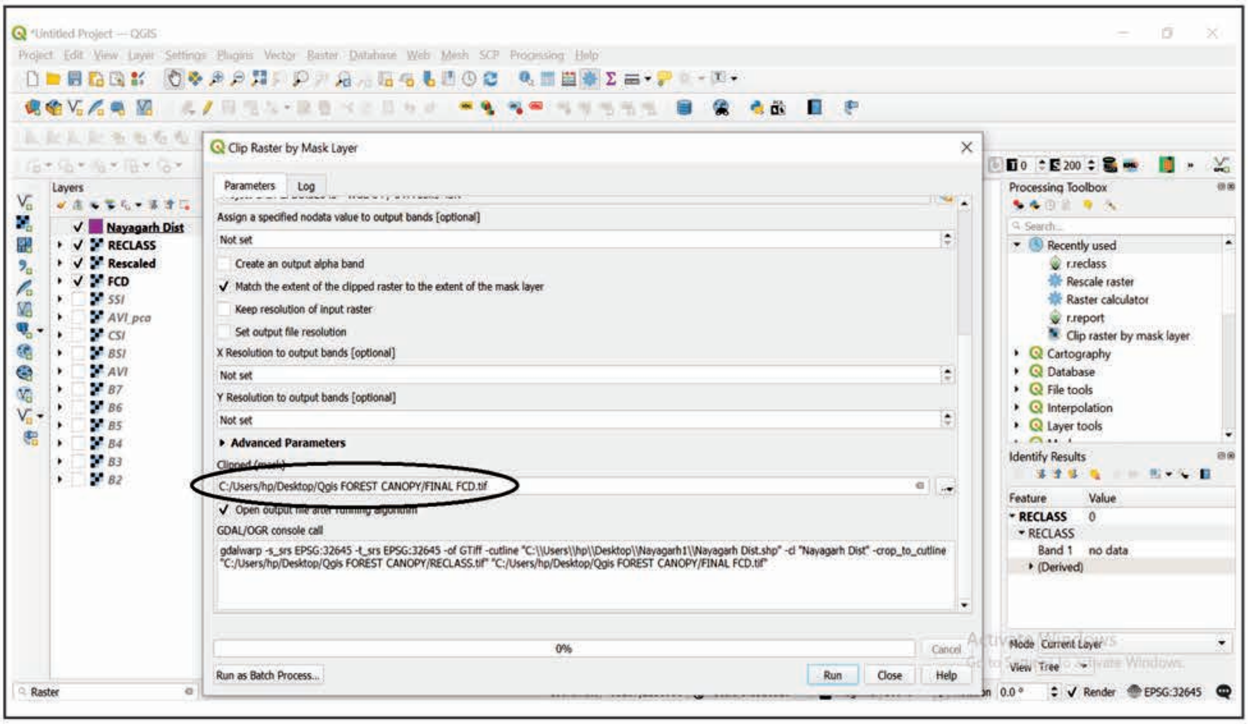


Fig.81. create the folder and run

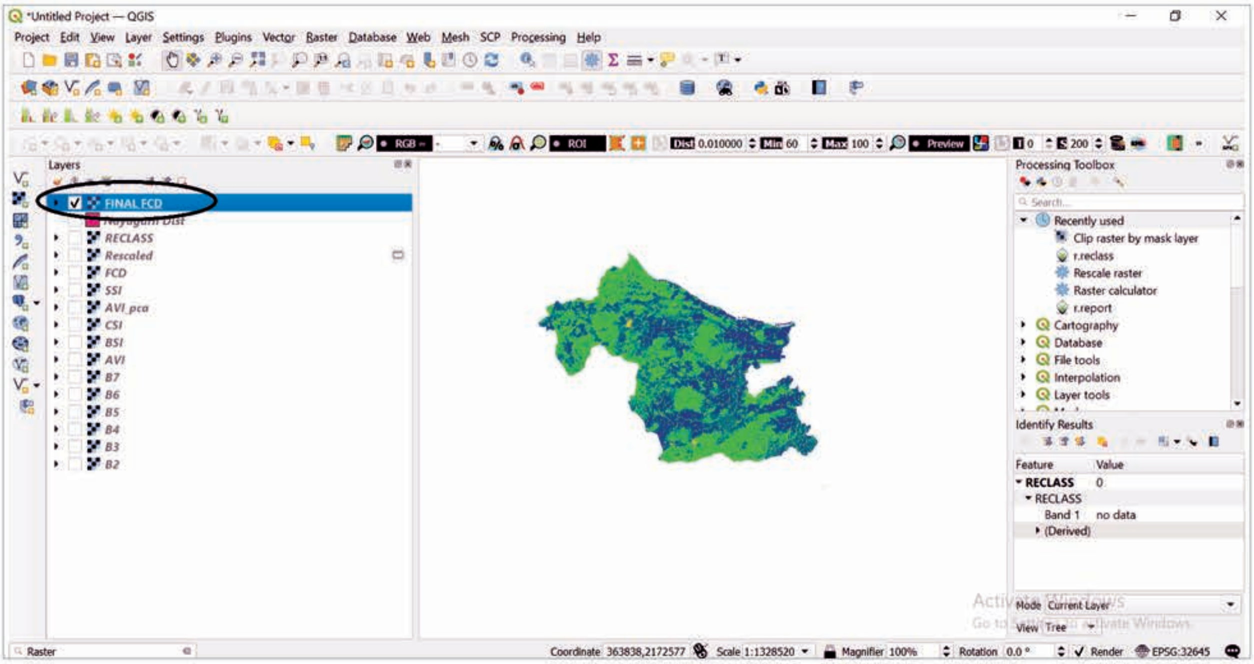


Fig.82. Final FCD created

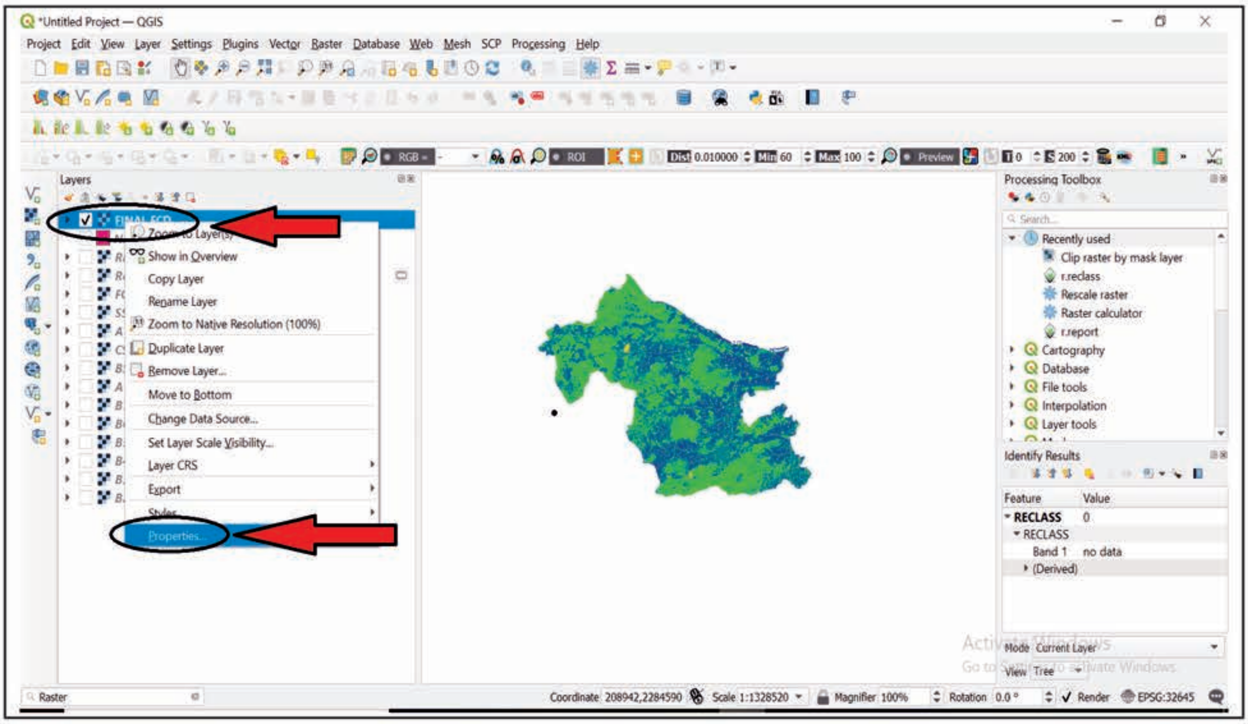


Fig.83. Change the Final FCD properties

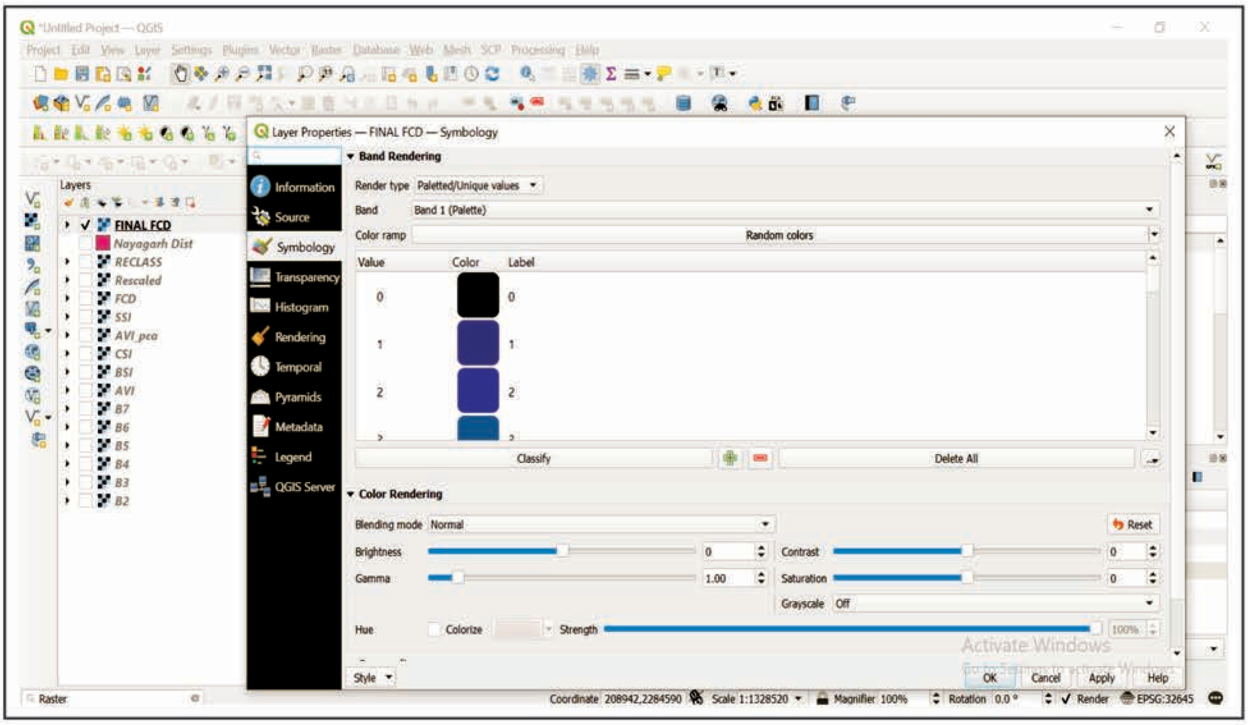


Fig.84. Change the symbology like color, mode, etc.

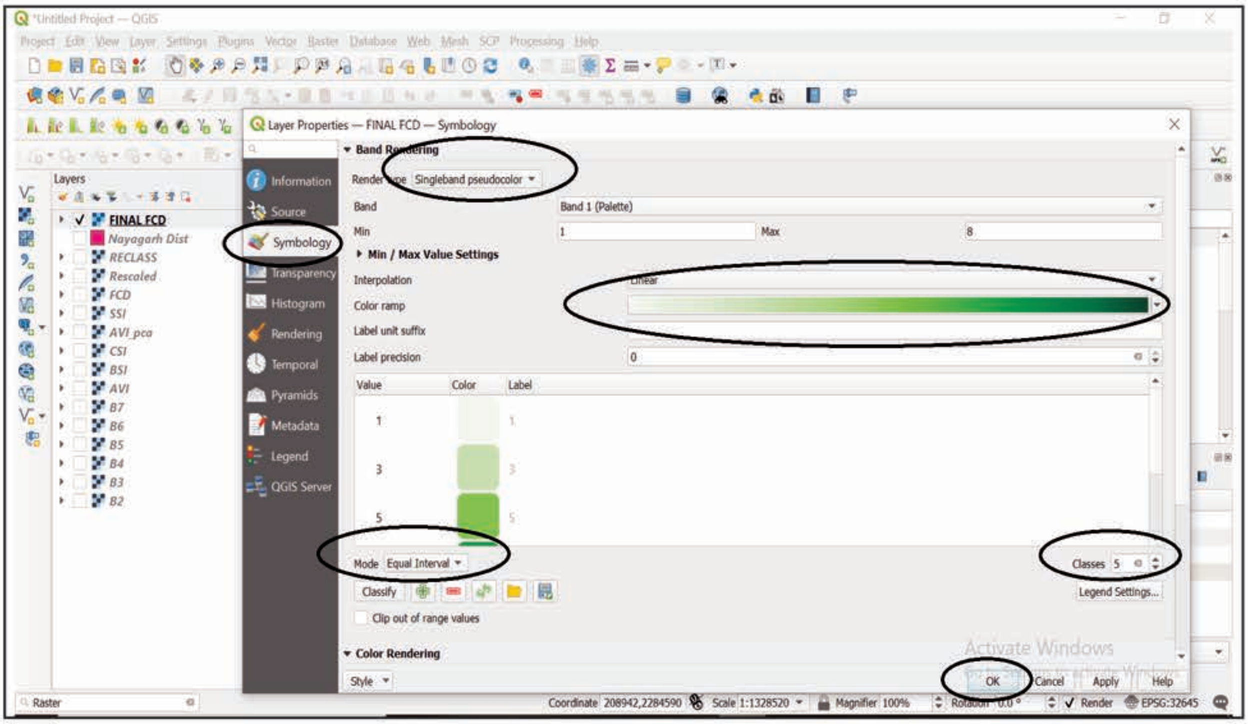


Fig.85. After change the symbology click the ok button

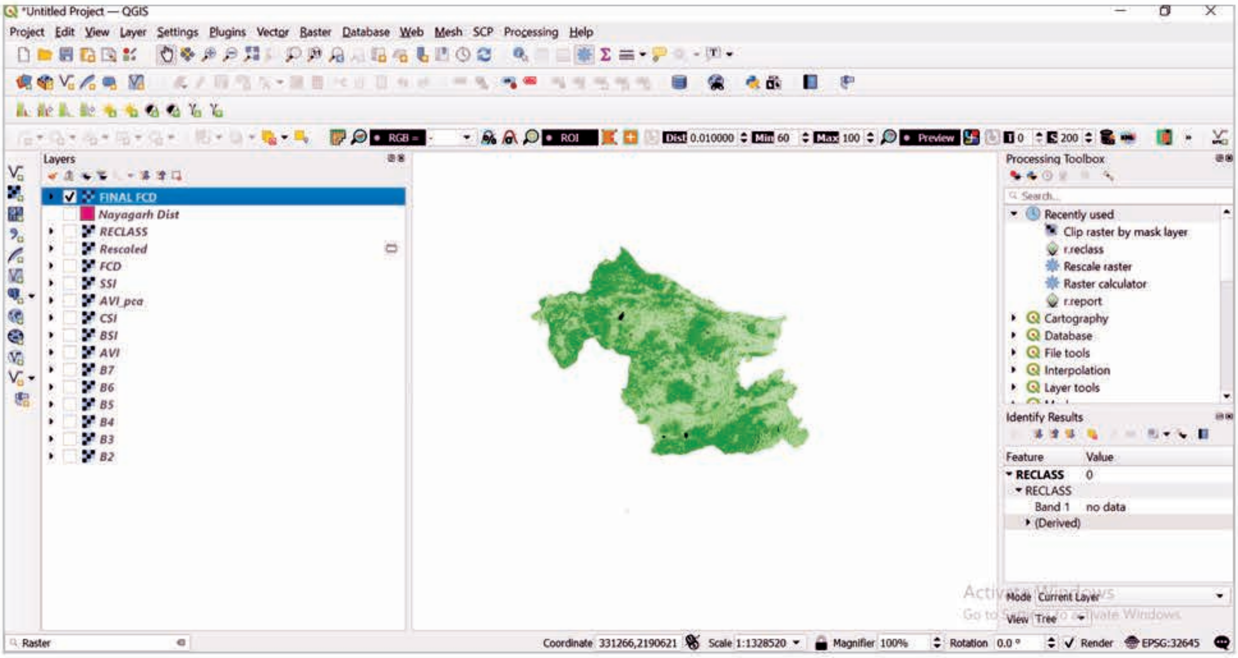


Fig.86. After changed the Final FCD Properties

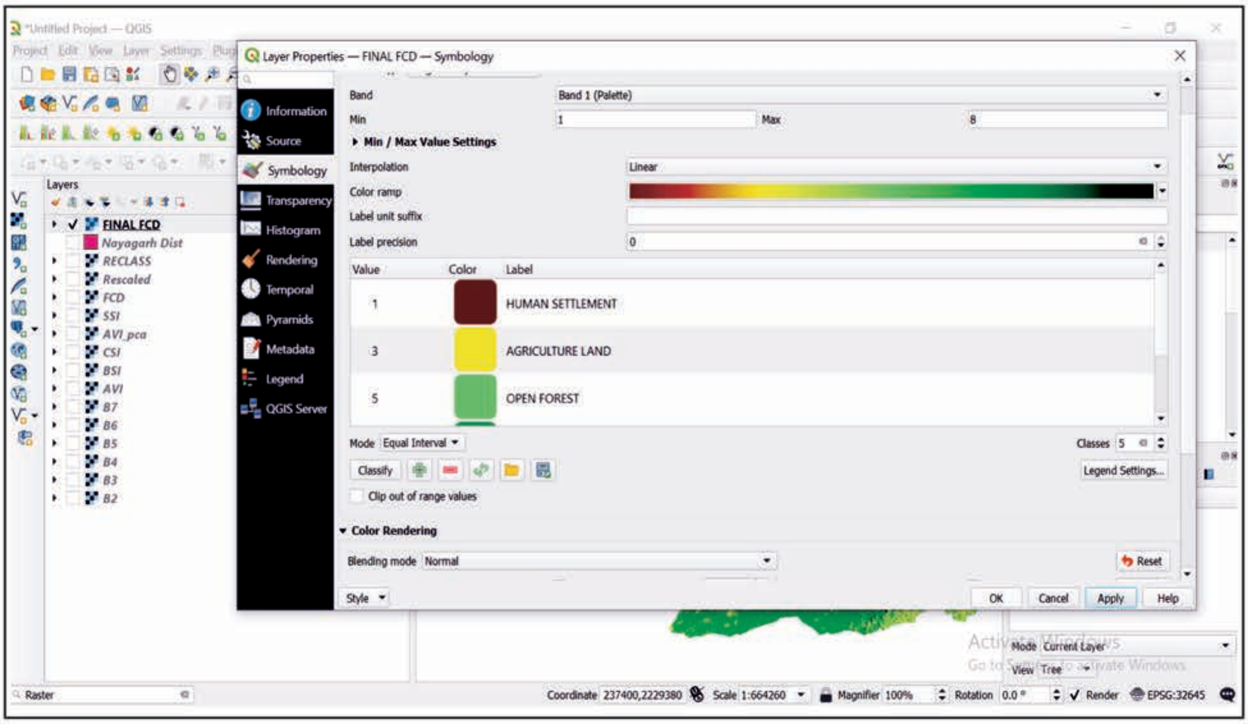


Fig.87. Classify the forest canopy and change the color based upon the density

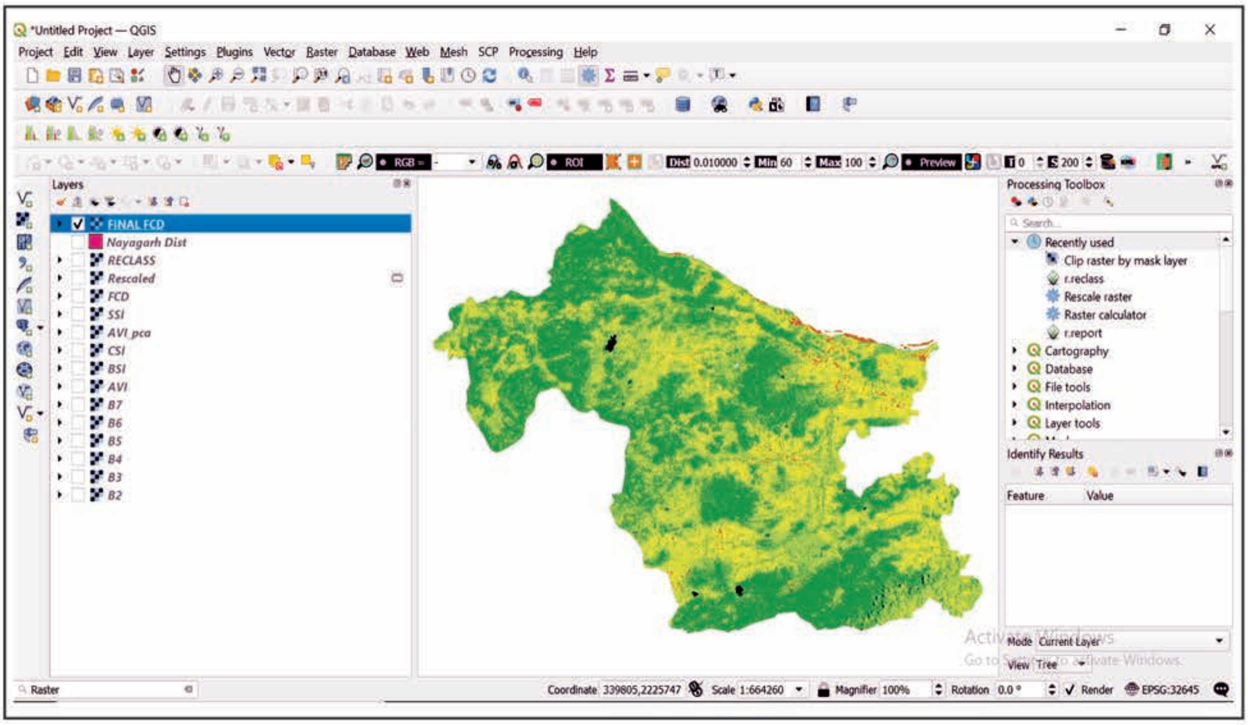


Fig.88. After classified the canopy density

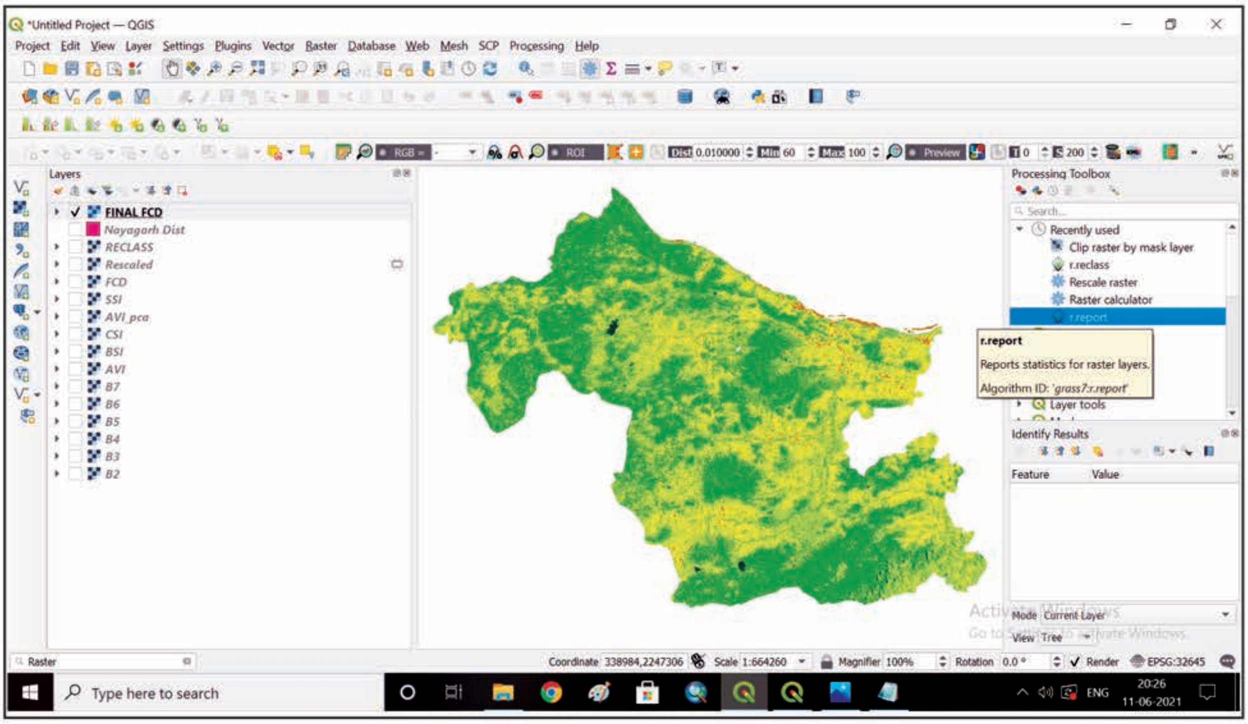


Fig.89. Select the r.report

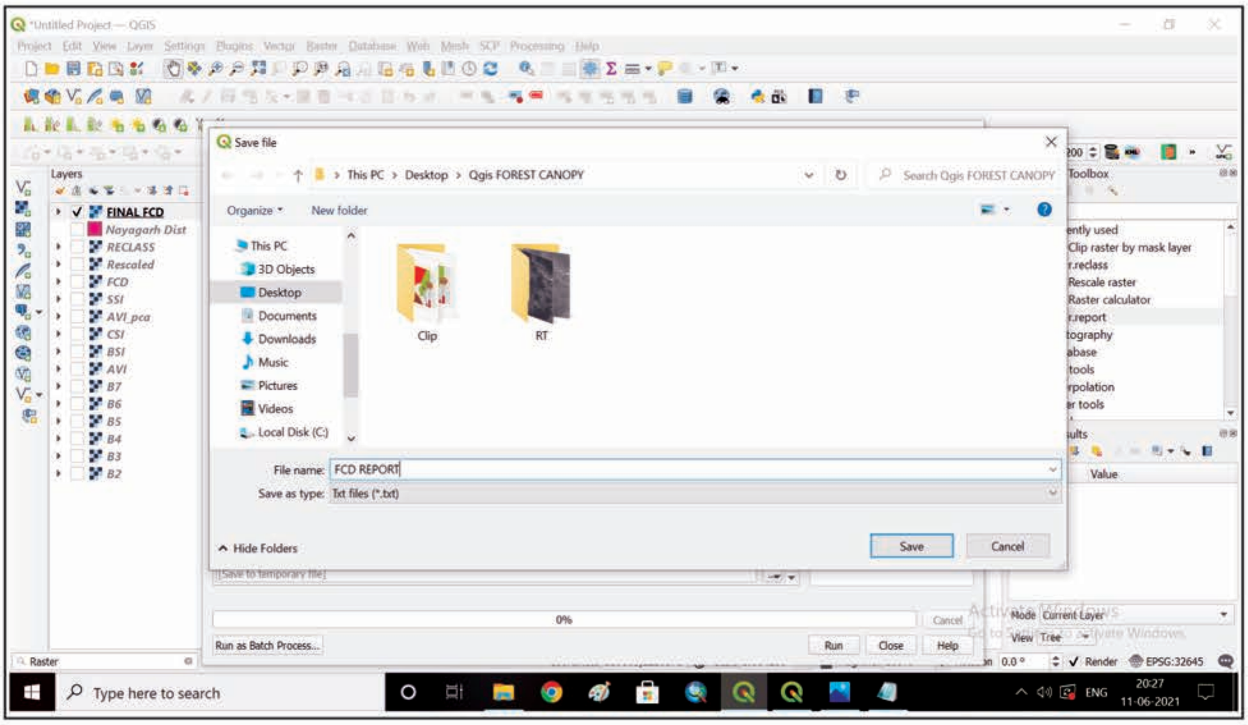


Fig.90. Create FCD report and save the folder

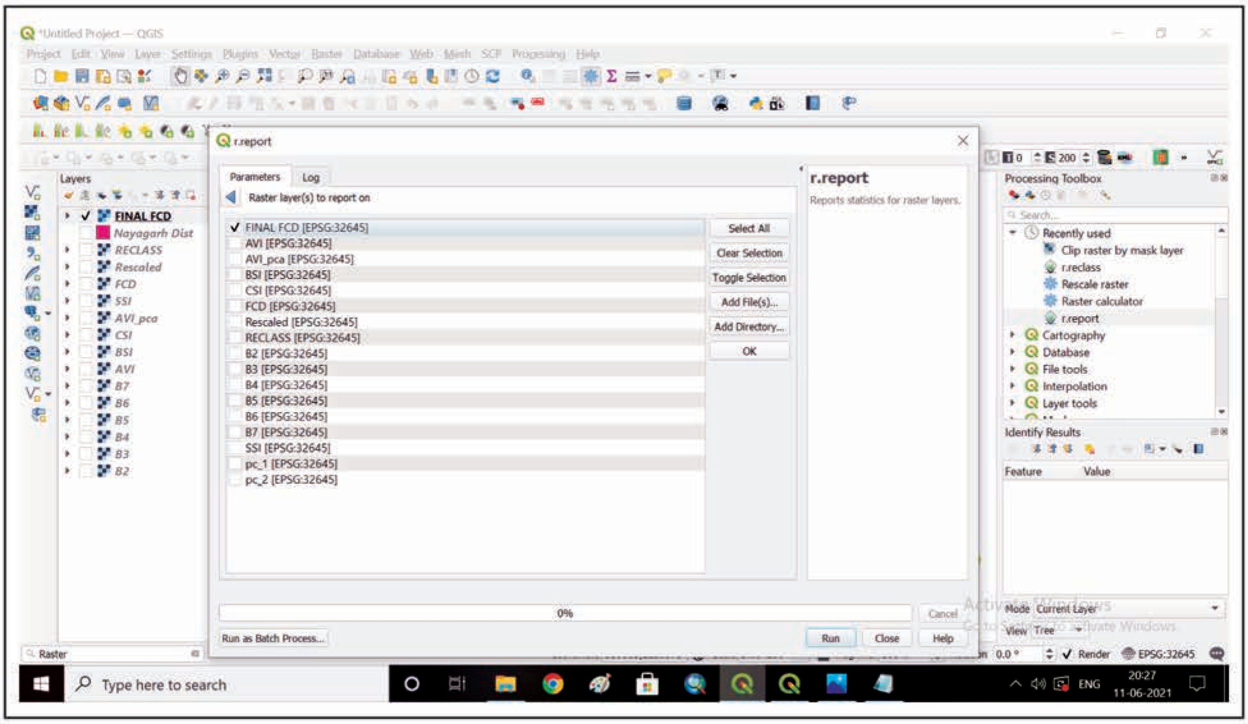
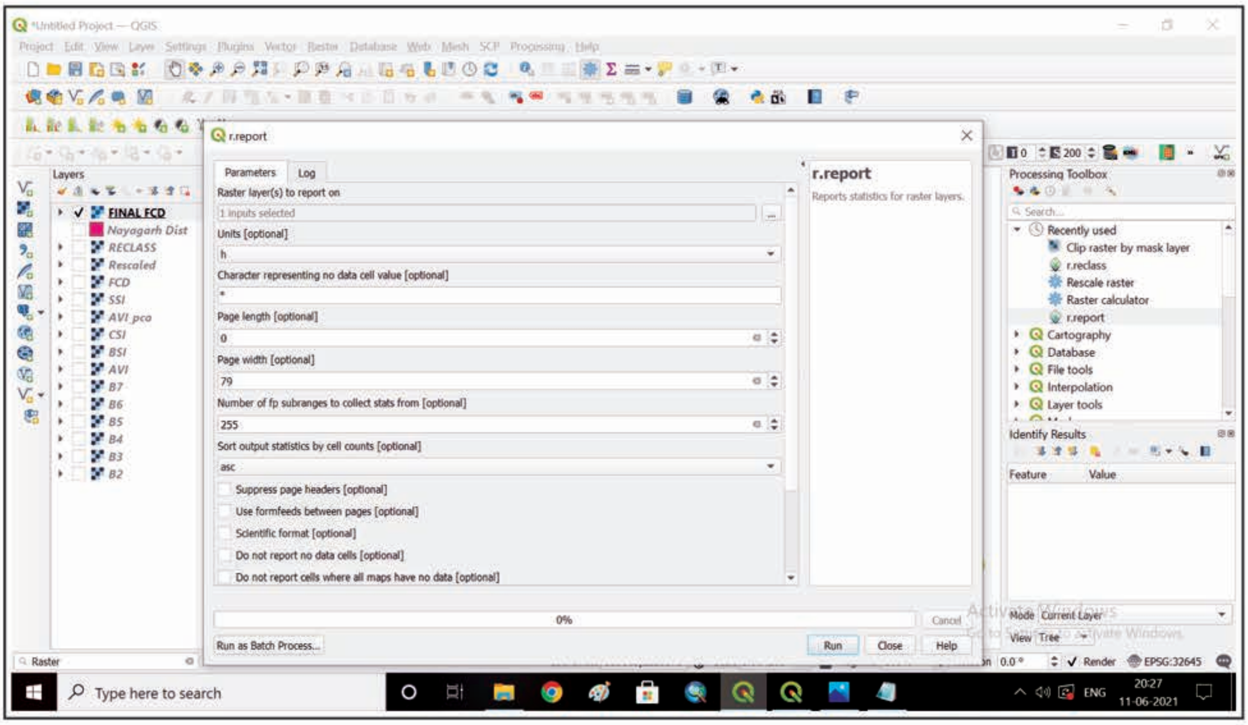
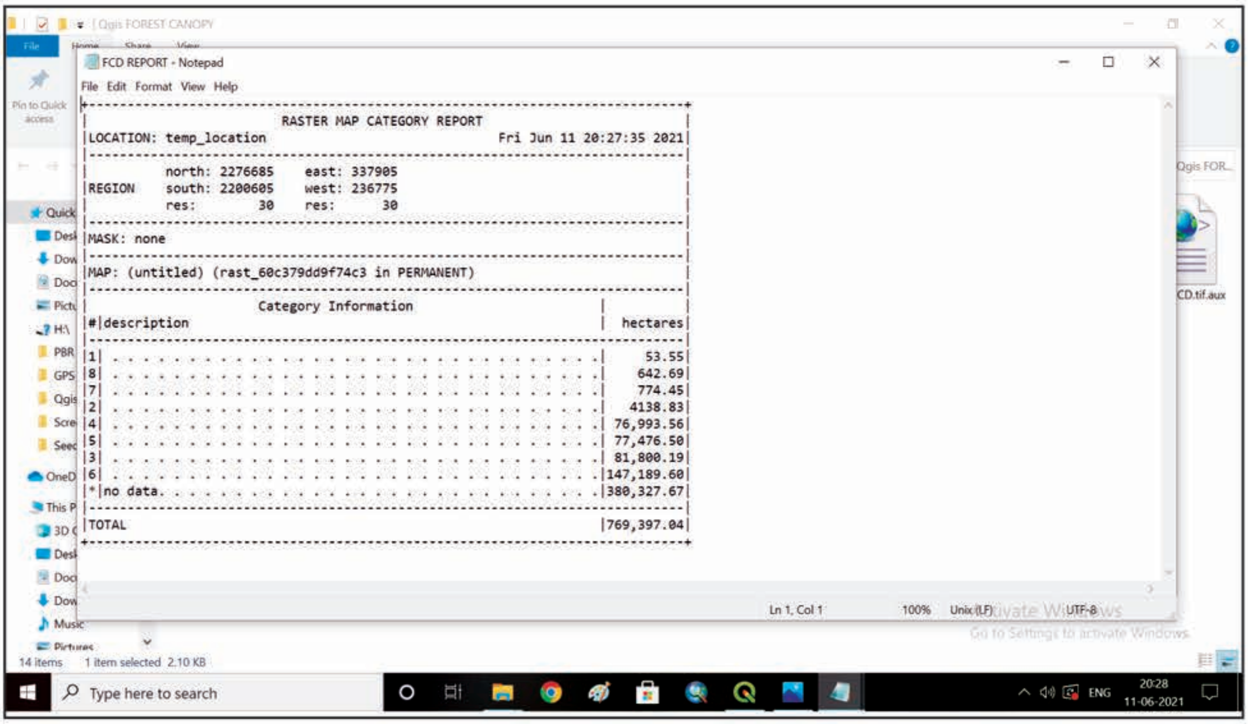


Fig.91. Select the Final FCD layer and Run



Report Generated:



FCD REPORT - Notepad

```
+-----------------------------------------------------------------------------+
|                        RASTER MAP CATEGORY REPORT                           |
|LOCATION: temp_location                             Fri Jun 11 20:27:35 2021|
|-----------------------------------------------------------------------------|
|          north: 2276685    east: 337905                                     |
|REGION    south: 2200605    west: 236775                                     |
|          res:        30    res:      30                                     |
|-----------------------------------------------------------------------------|
|MASK: none                                                                   |
|-----------------------------------------------------------------------------|
|MAP: (untitled) (rast_60c379dd9f74c3 in PERMANENT)                           |
|-----------------------------------------------------------------------------|
|                      Category Information                       |          |
|#|description                                                    |  hectares|
|-----------------------------------------------------------------------------|
|1| . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . |     53.55|
|8| . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . |    642.69|
|7| . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . |    774.45|
|2| . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . |   4138.83|
|4| . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 76,993.56|
|5| . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 77,476.50|
|3| . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . | 81,800.19|
|6| . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . |147,189.60|
|*|no data. . . . . . . . . . . . . . . . . . . . . . . . . . . . |380,327.67|
|-----------------------------------------------------------------------------|
|TOTAL                                                            |769,397.04|
+-----------------------------------------------------------------------------+
```

18.Habitat Analysis

Habitat analysis is very important aspect for protected area planning. GIS software helps us in identification of suitable habitat by the user supplied criteria for a particular animal. Then the same habitat can be analysed for improvement and it can be monitored continuously using Imagery analysis. In this chapter we will deal about the Habitat Analysis of Satkosia Tiger reserve for a particular animal. Suppose you want to create a habitat for particular animal with criteria:

* Above 500 m elevation
* 2 km away from road network
* 100 m near to waterbodies

Add Satkosia Tiger Reserve, highway and river shapefile layer.

↓

Clip vector(highway,rivershapefile) to Satkosia Tiger Reserve layer.

↓

Download satellite imagery (raster) of the area of interest from Bhuvan Portal. [Merge the rasters if two satellite imageries jointly represent the entire area of interest]

↓

Clip satellite imagery to Satkosia Tiger Reserve shapefile.

↓

Find areas with elevation greater than 500 m using Raster Calculator

↓

Convert raster to vector of the elevation toposheet and remove areas with elevation less than 500 m through operations in attribute table.

↓

Fix geometries of all shapefiles to remove geometrical errors.

↓

Create buffer around river and highway of prescribed dimensions using vector geoprocessing tools.

↓

Find difference between vector elevation toposheet and buffer around river and highway to get final habitat.

↓

Using “Quick Map Service” plugin, lay topo map beneath final map to get the desired map

Steps for habitat analysis of Satkosia Tiger Reserve using Multi-criteria Vector Analysis

Step 1:- Add Vector layer of Satkosia Tiger Reserve,
River and Highway from the respective folders.

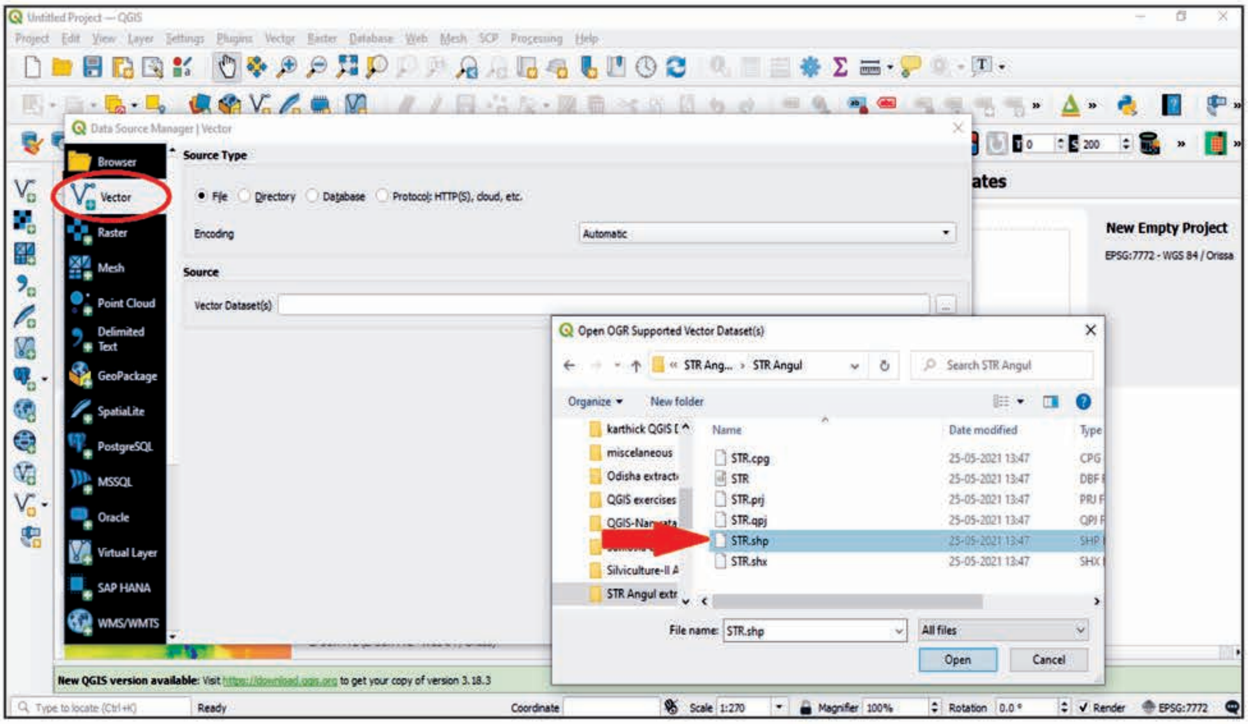


Fig.1(a) Adding Satkosia Tiger Reserve vector layer(STR shapefile).

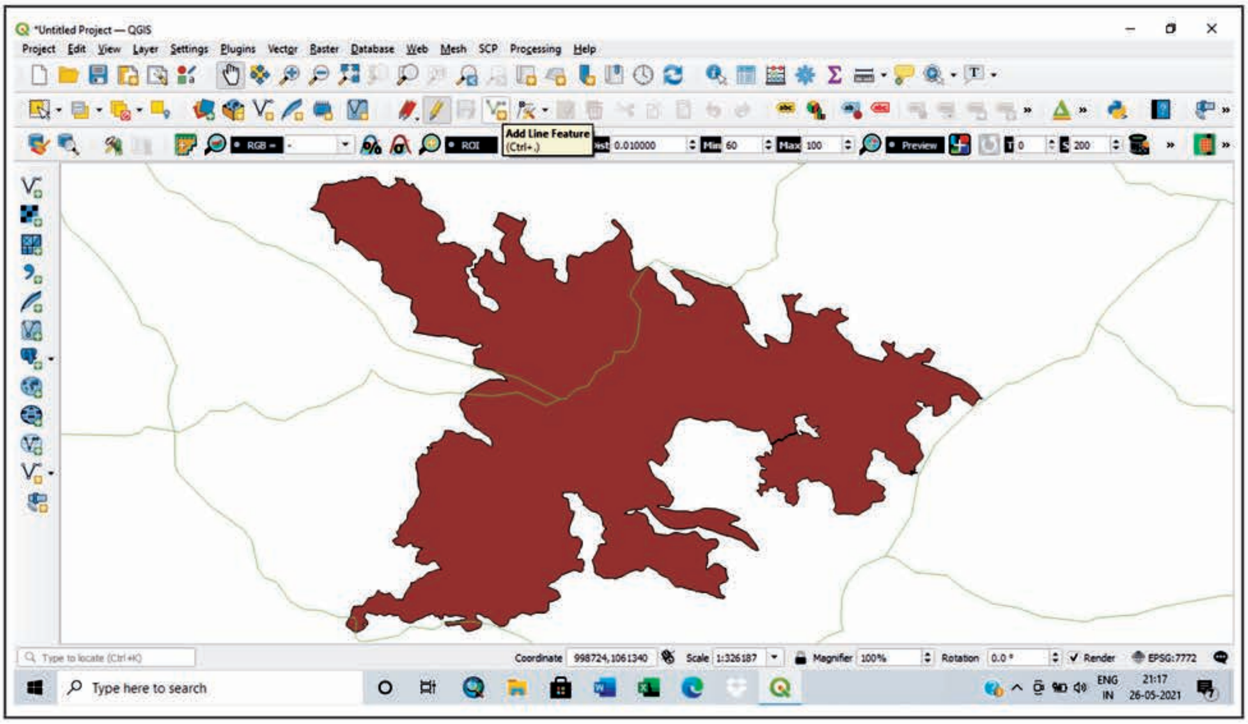


Fig.1(b) Adding Highwayshapefile.

* As the no. of road networks crossing the area of interest are less, for a better understanding ,we add more road networks to the Highway shapefile by going to Toggle Edit >>Add Line Features.

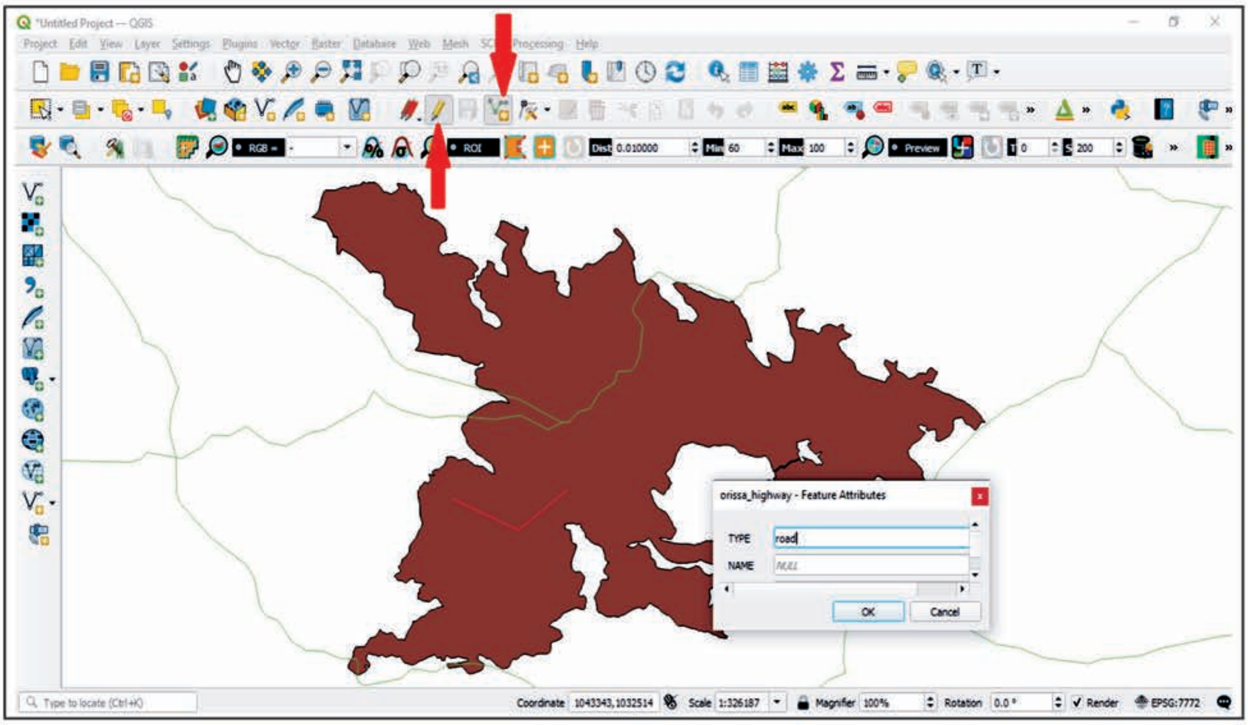


Fig.1(c) Adding more attributes of road in highway feature attributes.

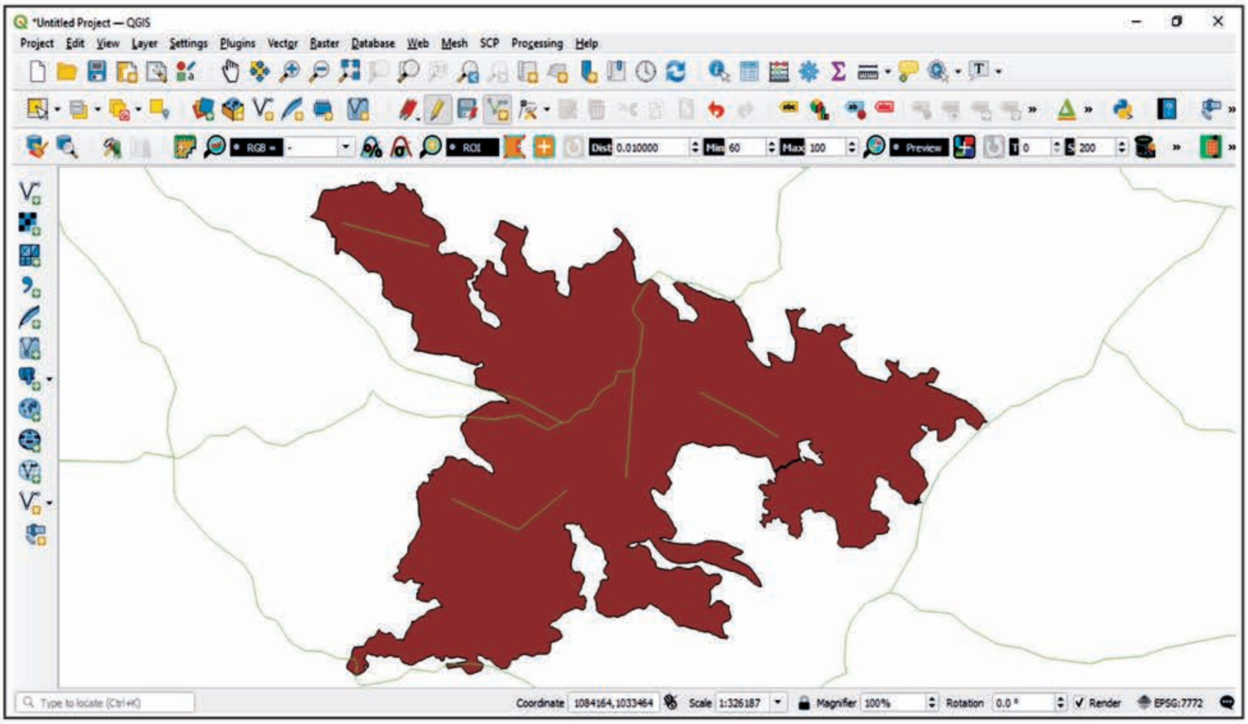


Fig.1(d) Added attributes of road in highway feature attributes.

* Similarly in the added River layer shapefile, draw additional waterbody feature by going to Toggle Edit>>Add Polygon Feature.

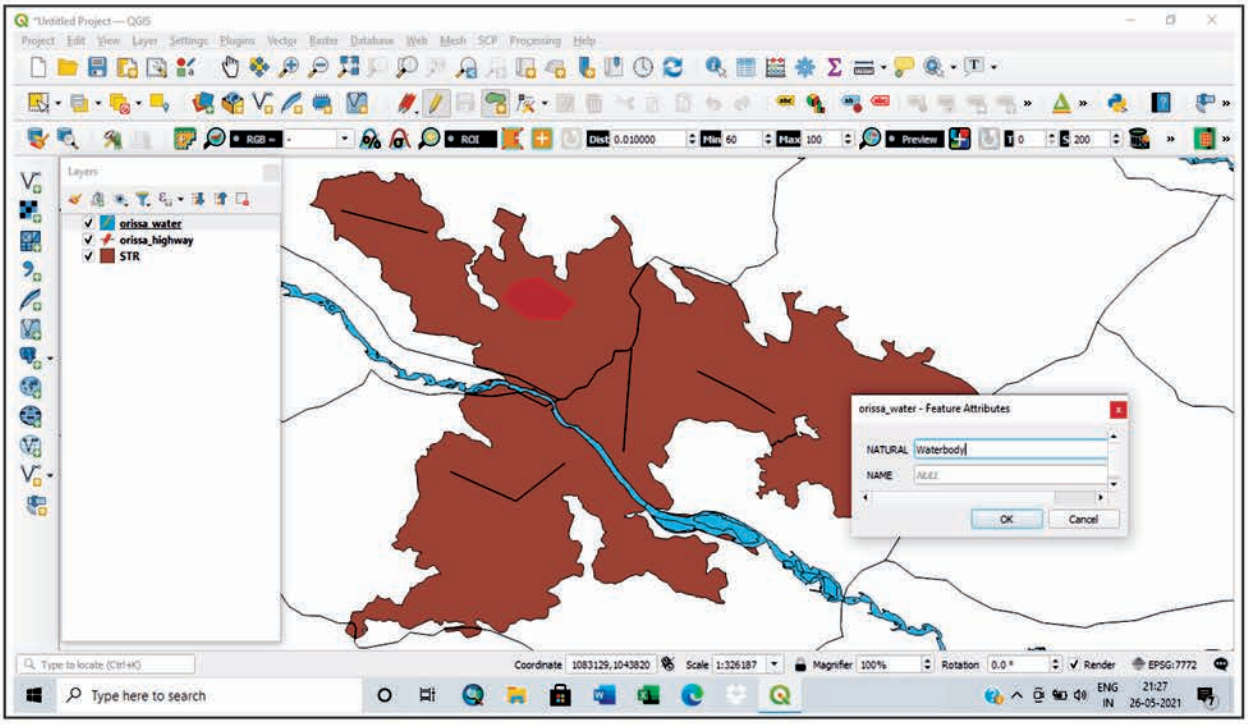


Fig.1(e) Adding more waterbody features in added shapefile of River.

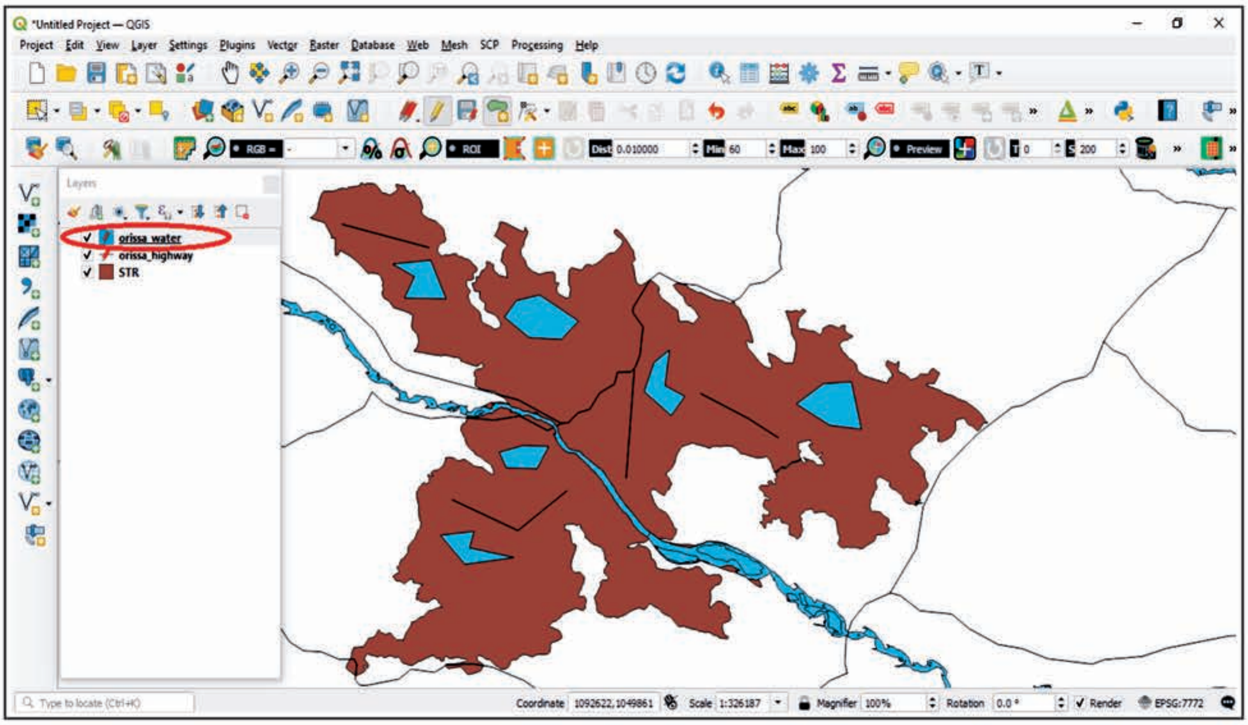


Fig.1(f) Added more waterbody features in added shapefile of River.

Step 2 :- Clipping river and highway layer to Satkosia Tiger Reserve layer.
Go to Vector >> Geoprocessing Tools >> Clip.

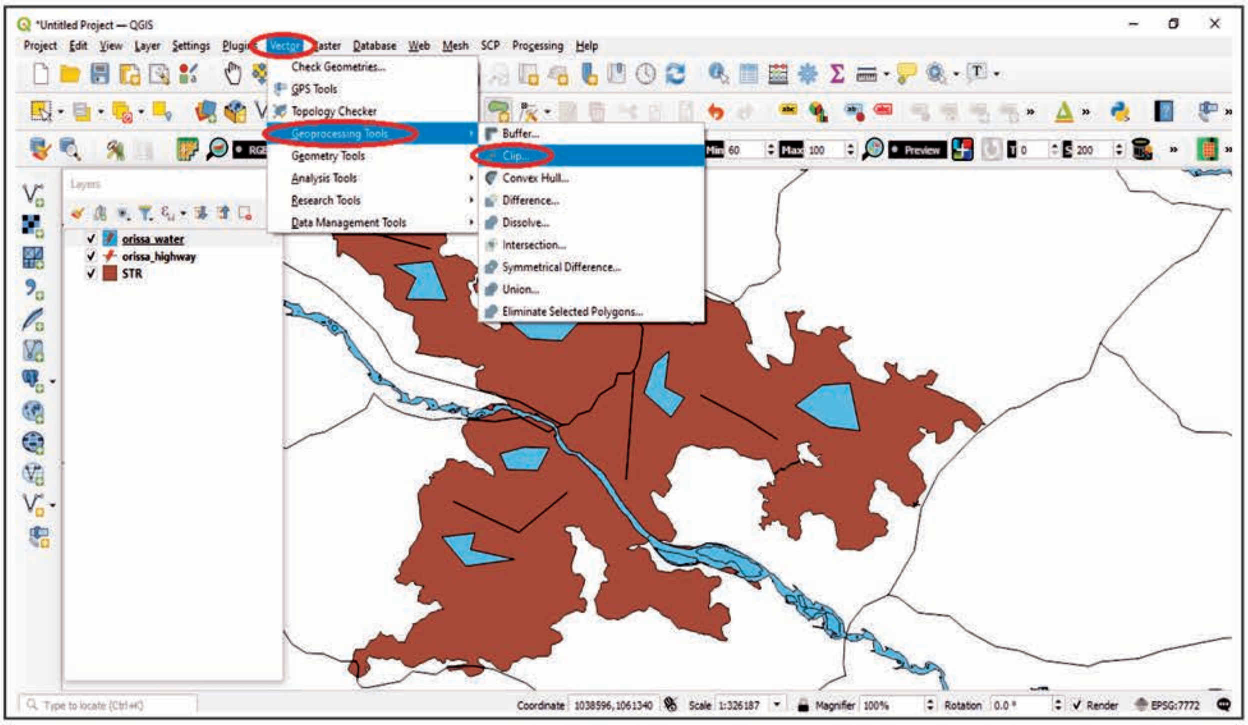


Fig.2(a) Sequence of steps for clipping process.

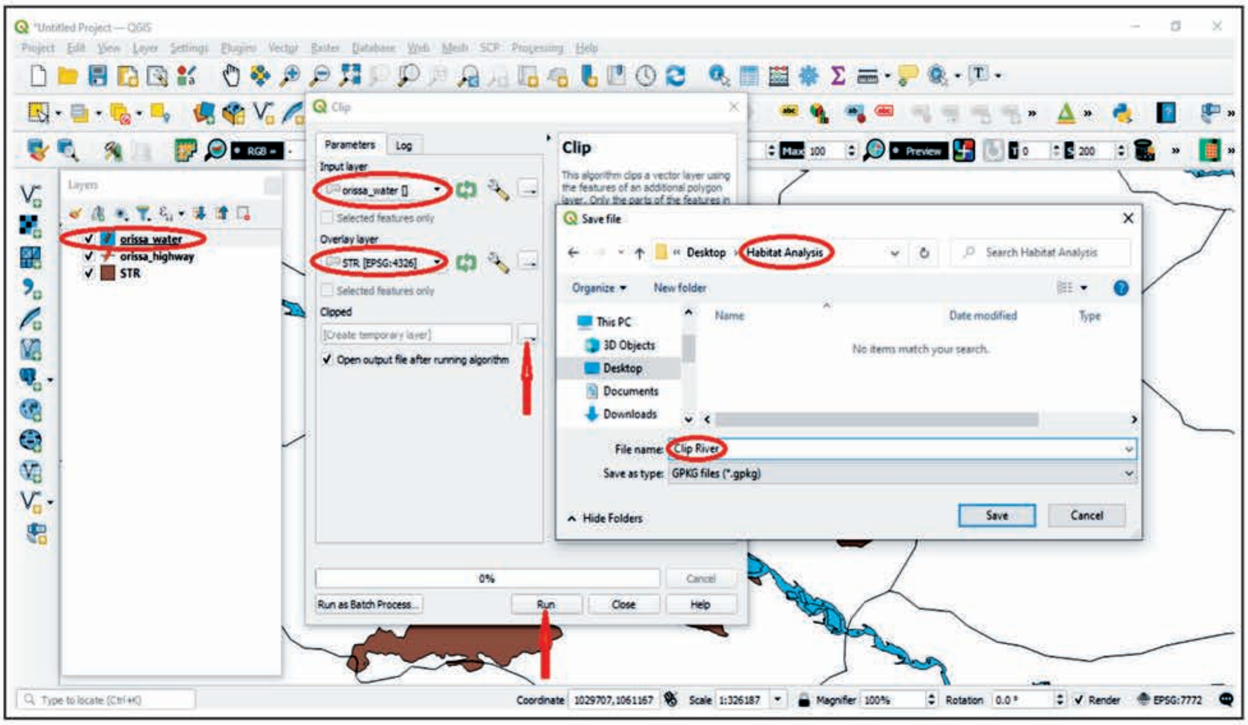


Fig.2(b) Selecting the Input and Overlay layers as above and saving file as “Clip River”

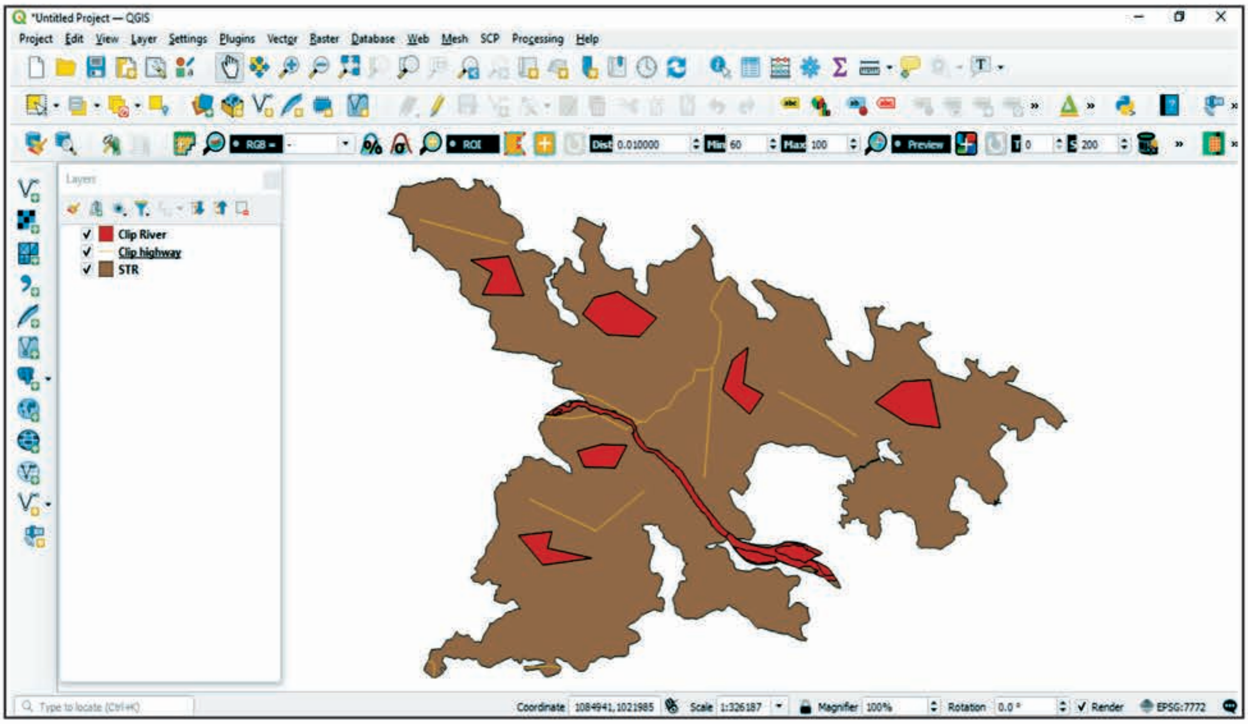


Fig.2(c) "Clip River" appears after the algorithm is RUN.

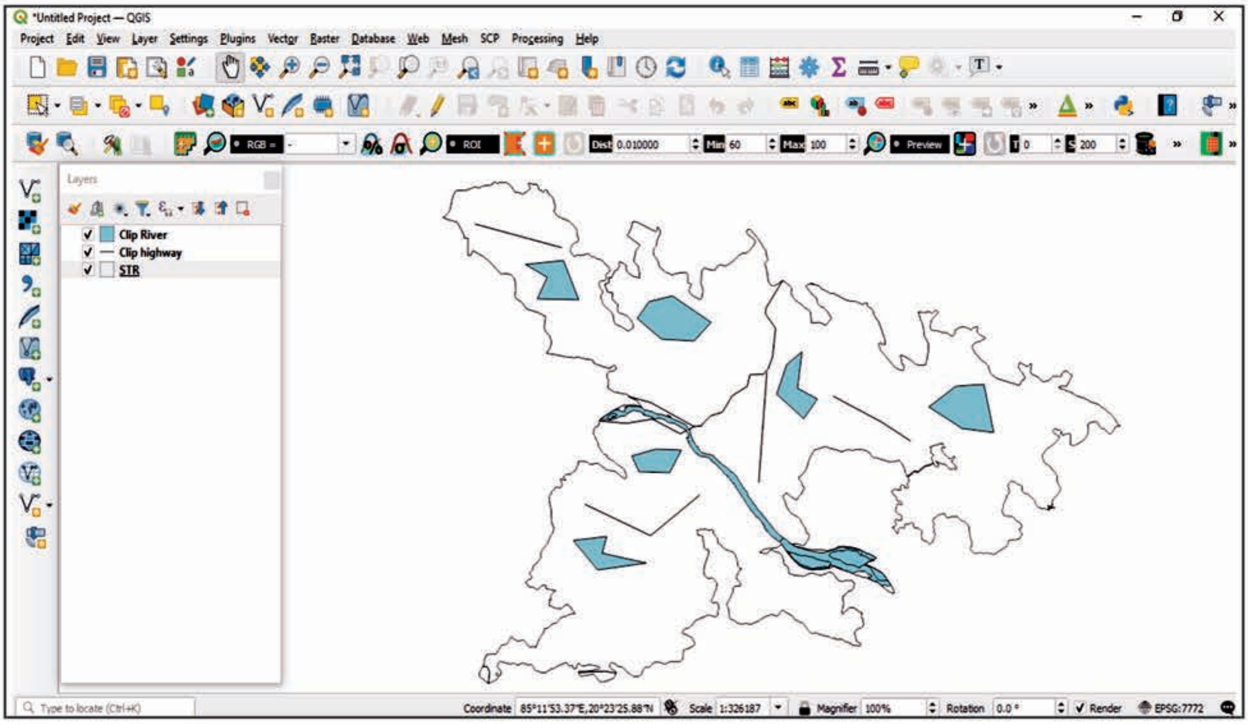


Fig.2(d) Similarly, clipping highway and keeping only clipped layers of river, highway and STR layer. Removing other layers by right click on the layers to be removed and going to "Remove Layers".

* Set project properties : In General Tab Setting display co-ordinates to Degree, Minutes,Second.

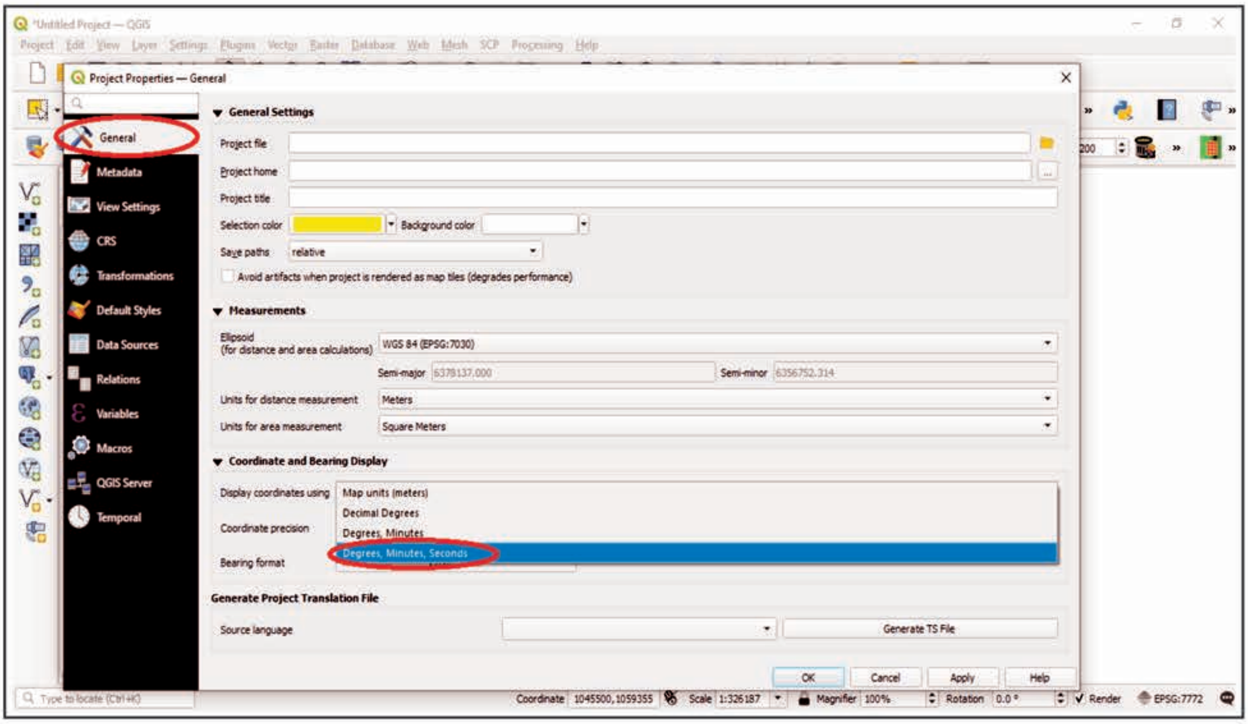


Fig.2(e) Go to Project>>Project Properties>> General>>Coordinate and Bearing Display>>Display coordinates using "Degree,Minutes,Second">>Apply>>OK.

Note :- We get the longitudinal and latitudinal extent of the Satkosia Tiger Reserve by putting the cursor over Left side top and Right side bottom of the displayed STR layer.

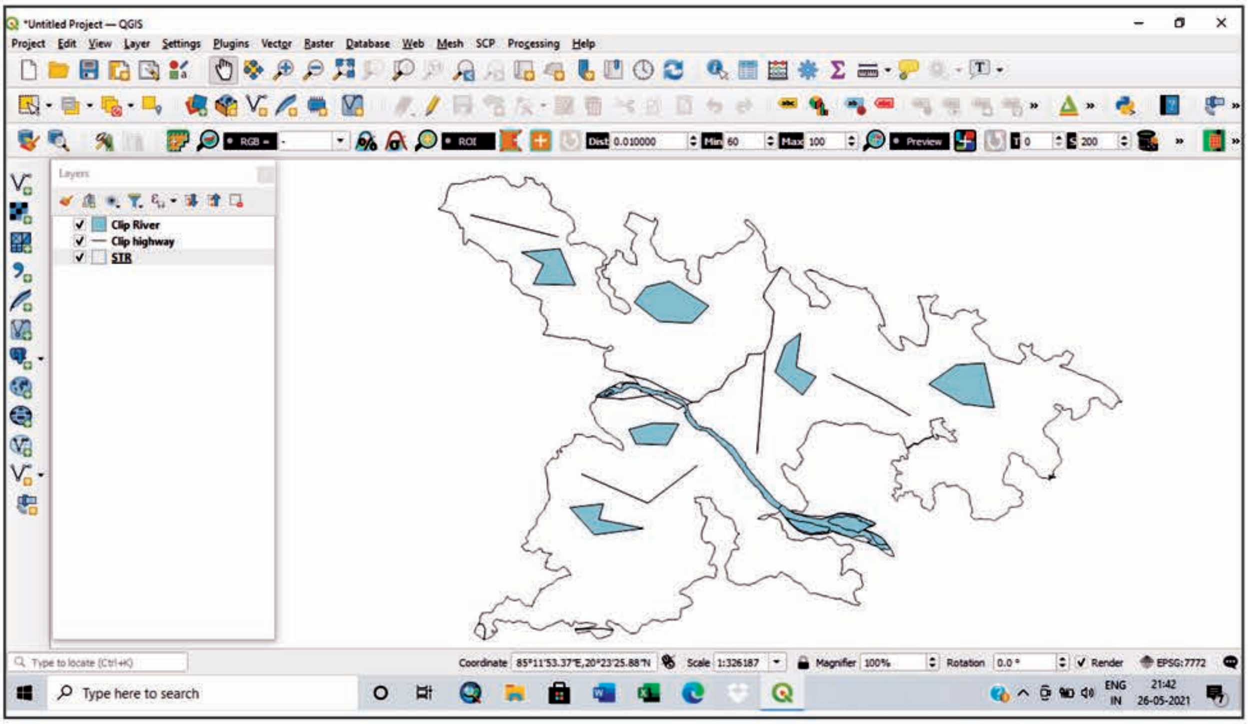


Fig. 2(f) Latitude and Longitude as measured by keeping cursor at right side bottom as shown by arrow. Similarly, latitude and longitude at left side top is measured.

Step 3 :- Now to download satellite imagery of the area of interest from Bhuvan Portal

Login >>https://bhuvan.nrsc.gov.in" >> use the option Boundingbox

(Set min. longitude=84,max. longitude=85,min.latitude=20 & max. latitude=21)
(Lat , Lon extent of the preferred area) >>Select>>Next.

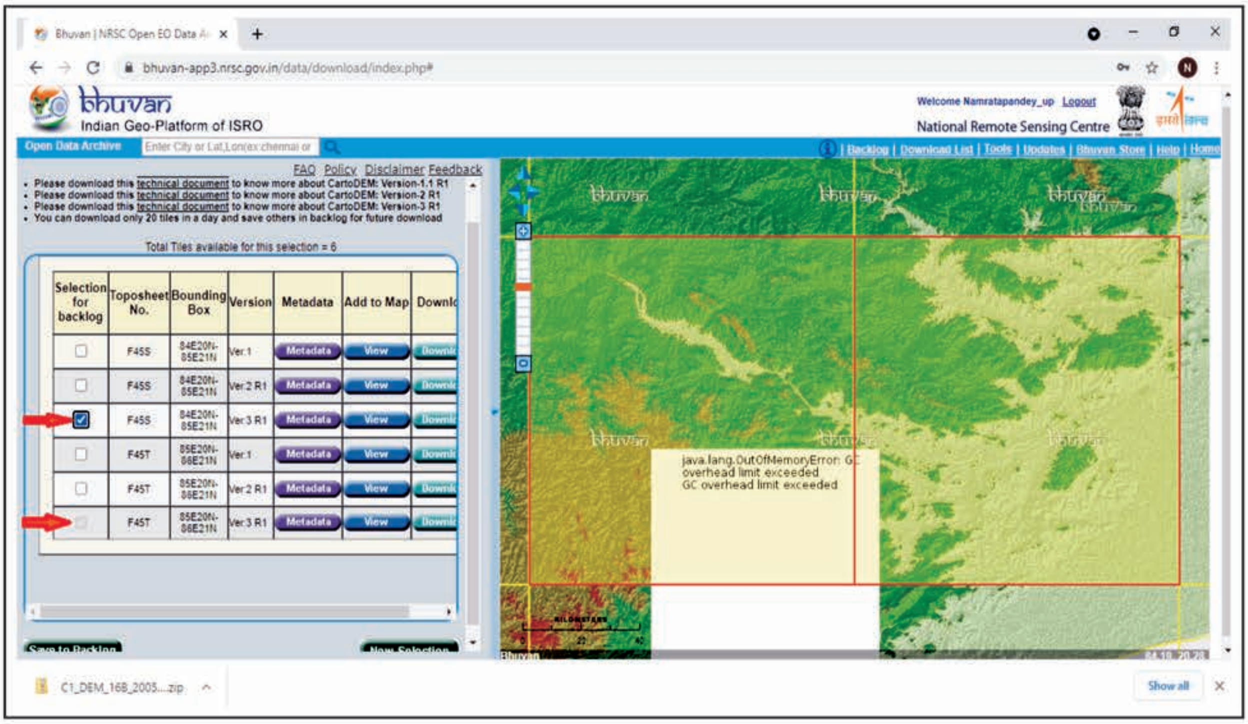


Fig.3 Selecting Ver.3 of F4SS and F4ST file and downloading it.
The downloaded file is in ".zip" format from which files are extracted.

Step 4 :- The raster layers of extracted satellite imagery are uploaded (here ".tif" files of "cdnf45s" and "cdnf45t").

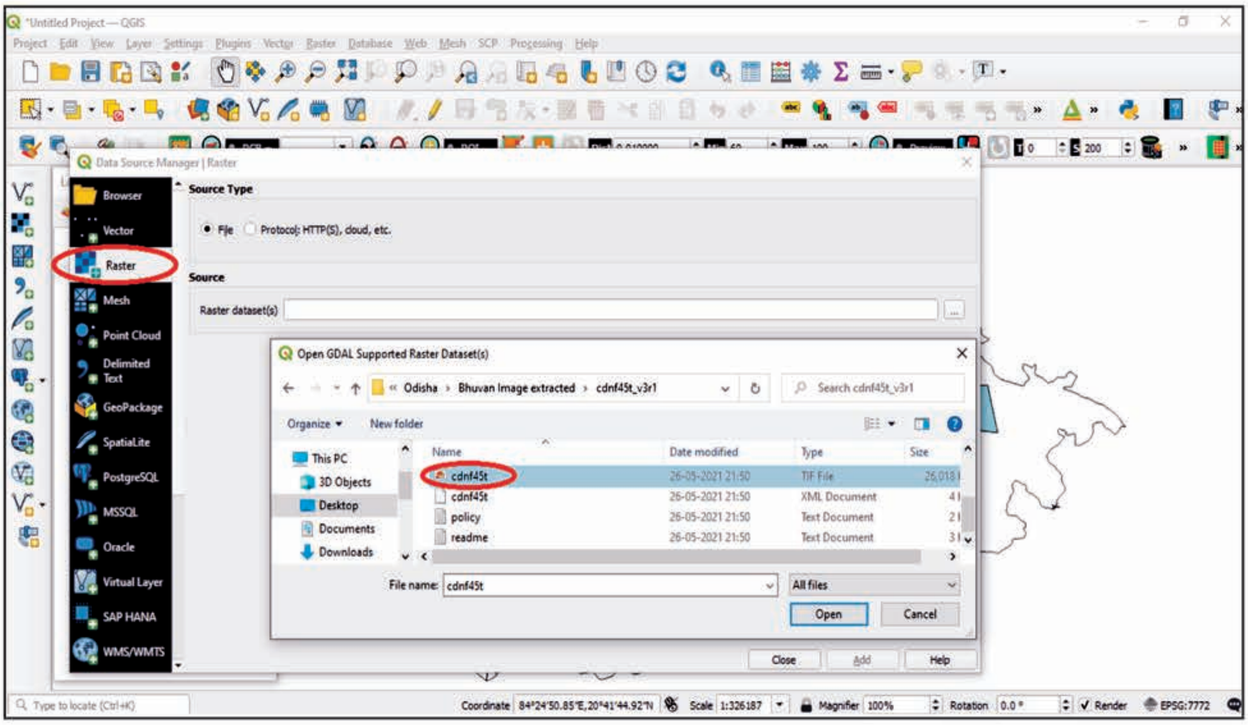


Fig. 4(a) Selecting the .tif files of the satellite imageries.

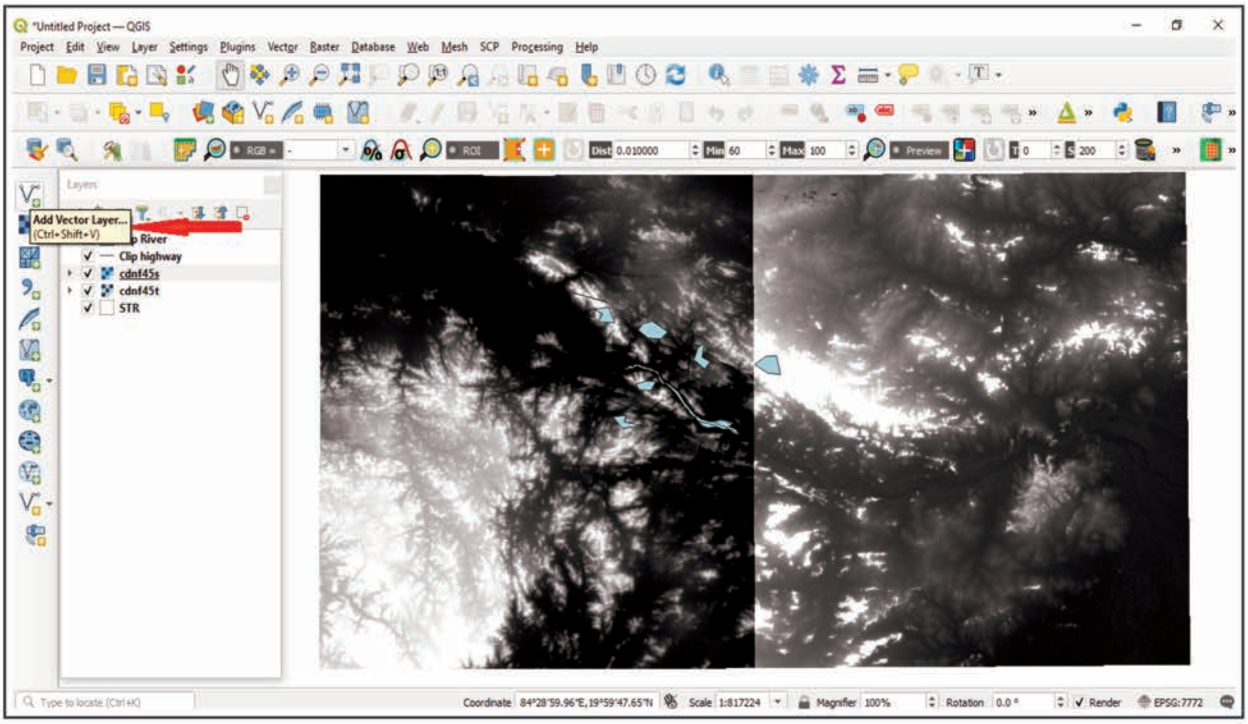


Fig.4(b) The uploaded satellite imageries of “cdnf45s” and “cdnf45t” appear as above.

* Merging the satellite imageries of “cdnf45s” and “cdnf45t” by going to Raster>> Miscellaneous>>Merge>>Select All>> OK>>Run and Save merged toposheet.

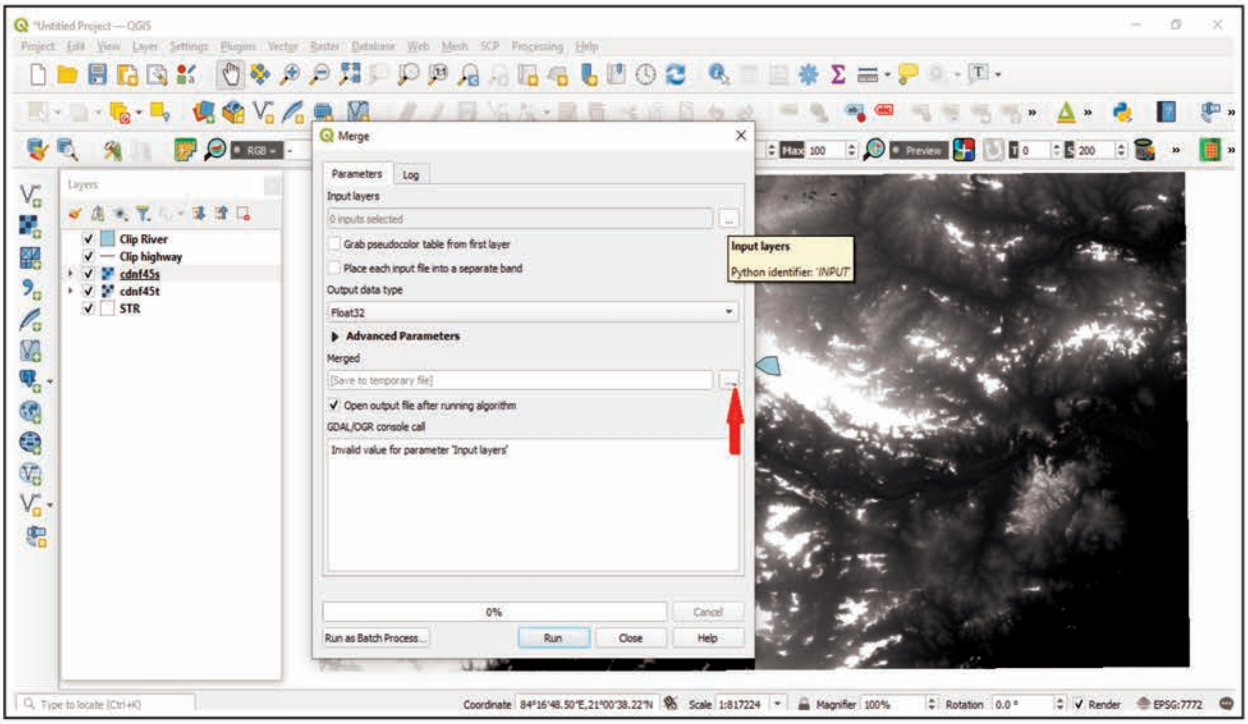


Fig.4(c) Merging two satellite imageries.

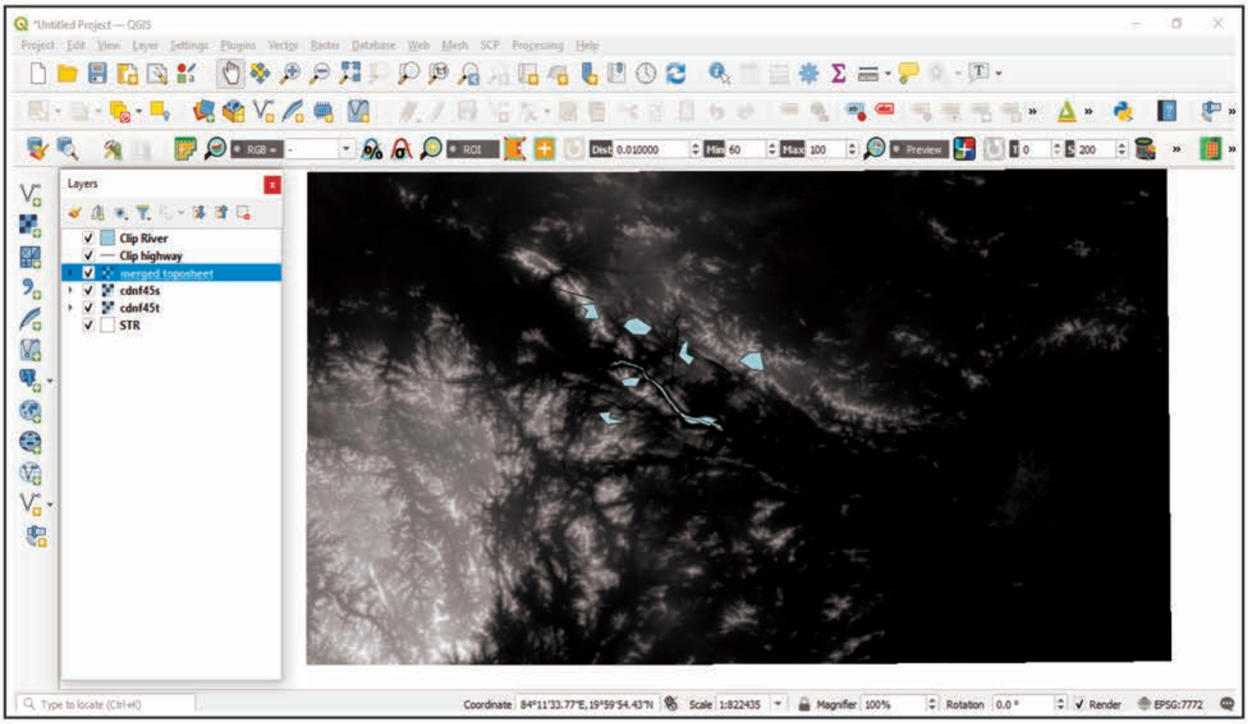


Fig.4(d) Merged toposheet appears as above.

Step 5:- Clipping the river and highway features. Goto Raster>>Extraction>>Clip raster by mask layer. Input parameters are set as below and file saved as "Clipped River" & "Clipped Highway" respectively. Similarly "Clipped topo "file is created by clipping merged toposheet from STR layer.

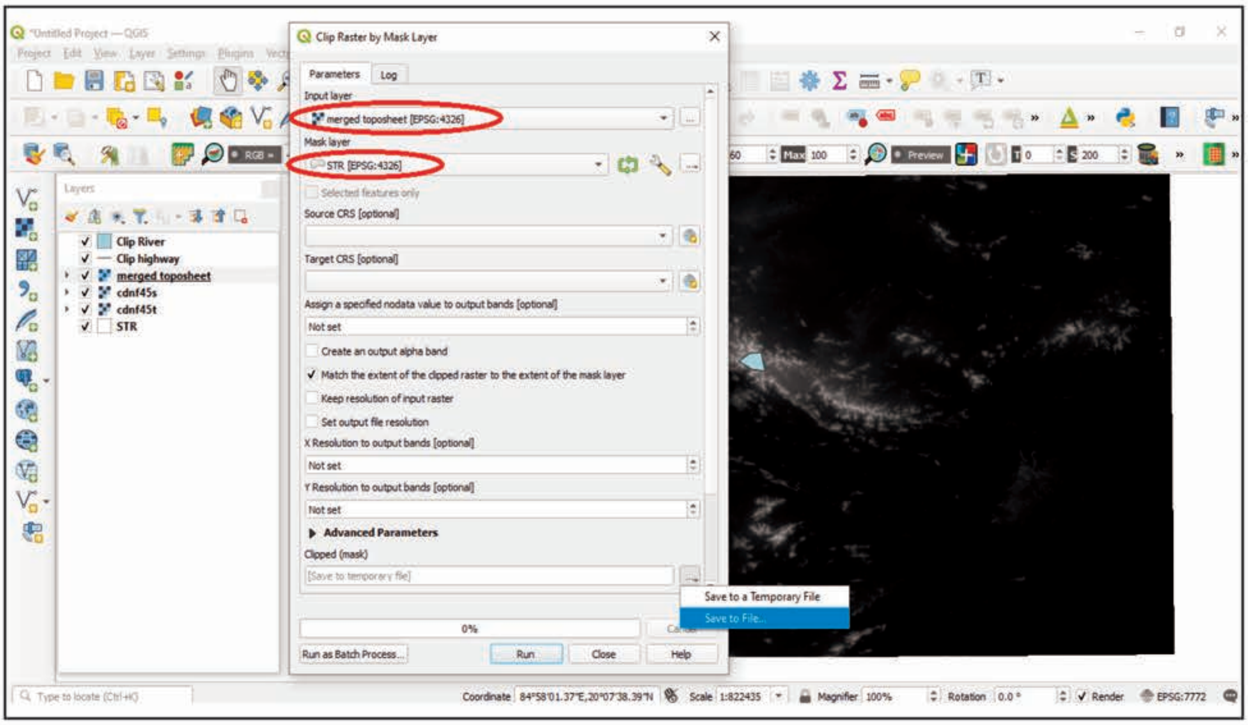


Fig.5(a) Clipping river,highway and merged toposheet with mask layer of STR.

Step 6 :- To select areas with elevation greater than 500 m, go to Raster>>Raster Calculator>>Put expression

(Clipped topo@1<500)*0+(Clipped topo@1>=500)*1>>Select input file>> Save file

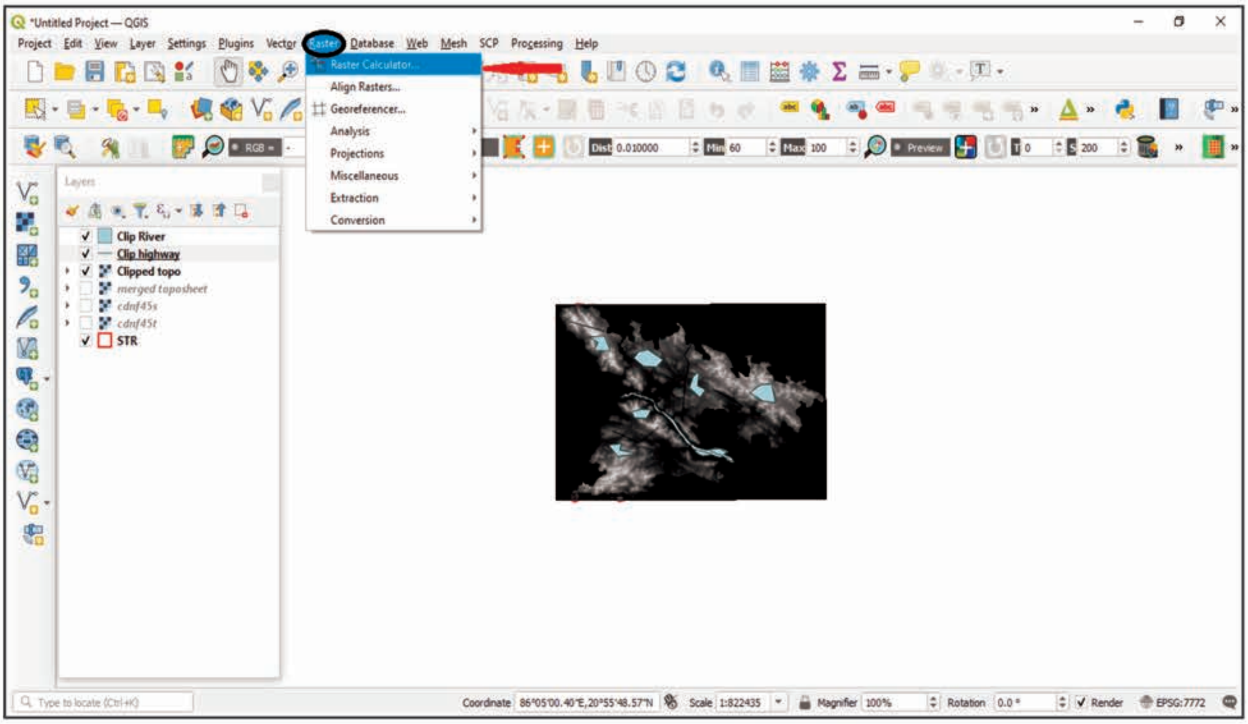


Fig.6(a) Opening raster calculator.

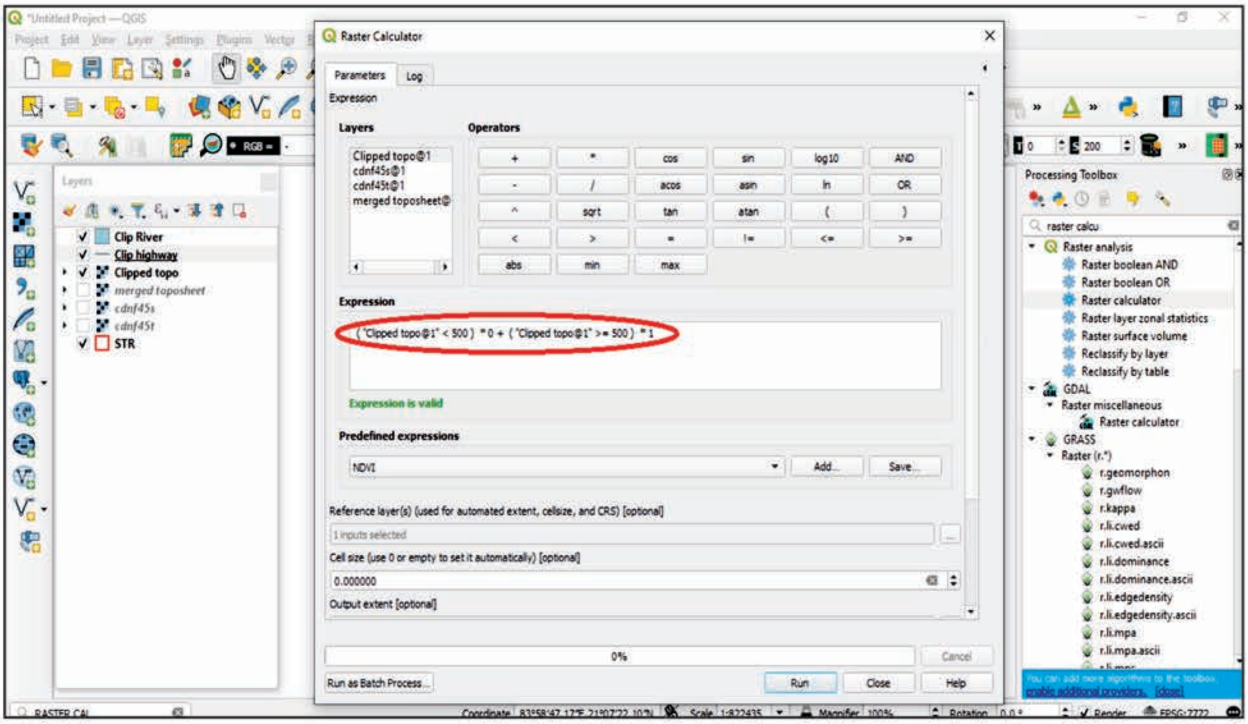


Fig.6(a) Setting expression for selecting areas with elevation above 500 m as above.

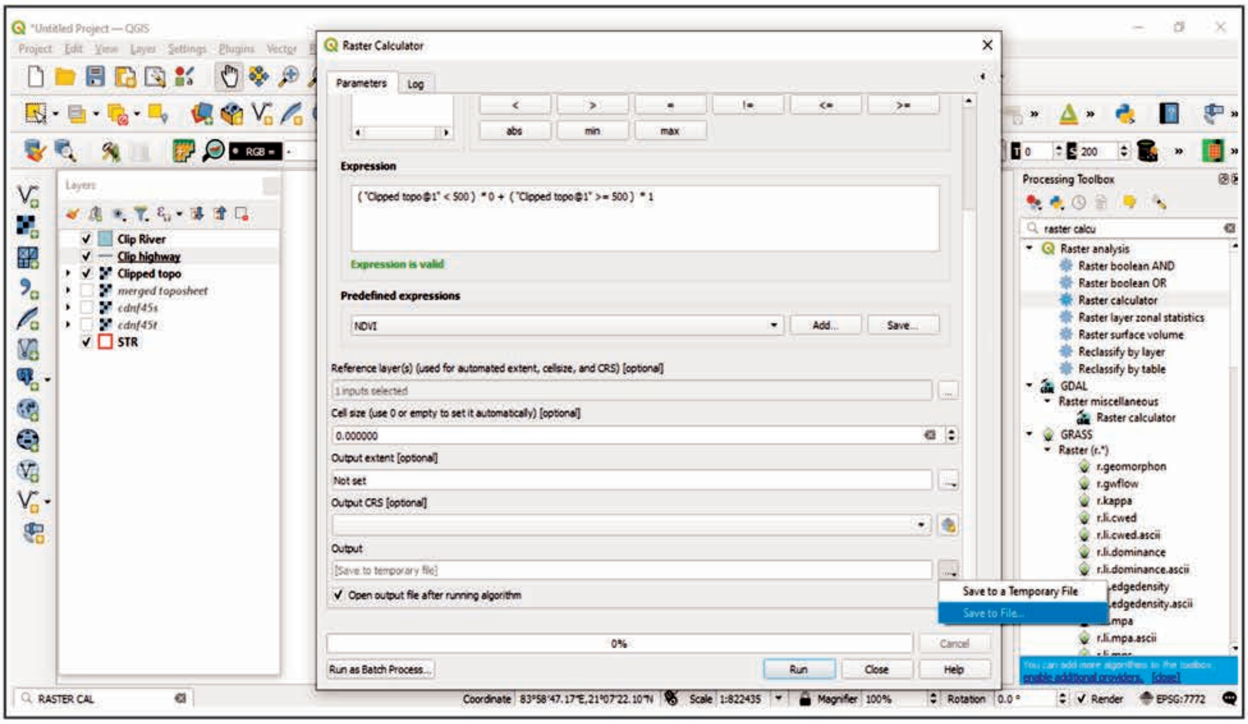


Fig.6(c) Selecting reference layer and saving the output file as"Elevation topo".

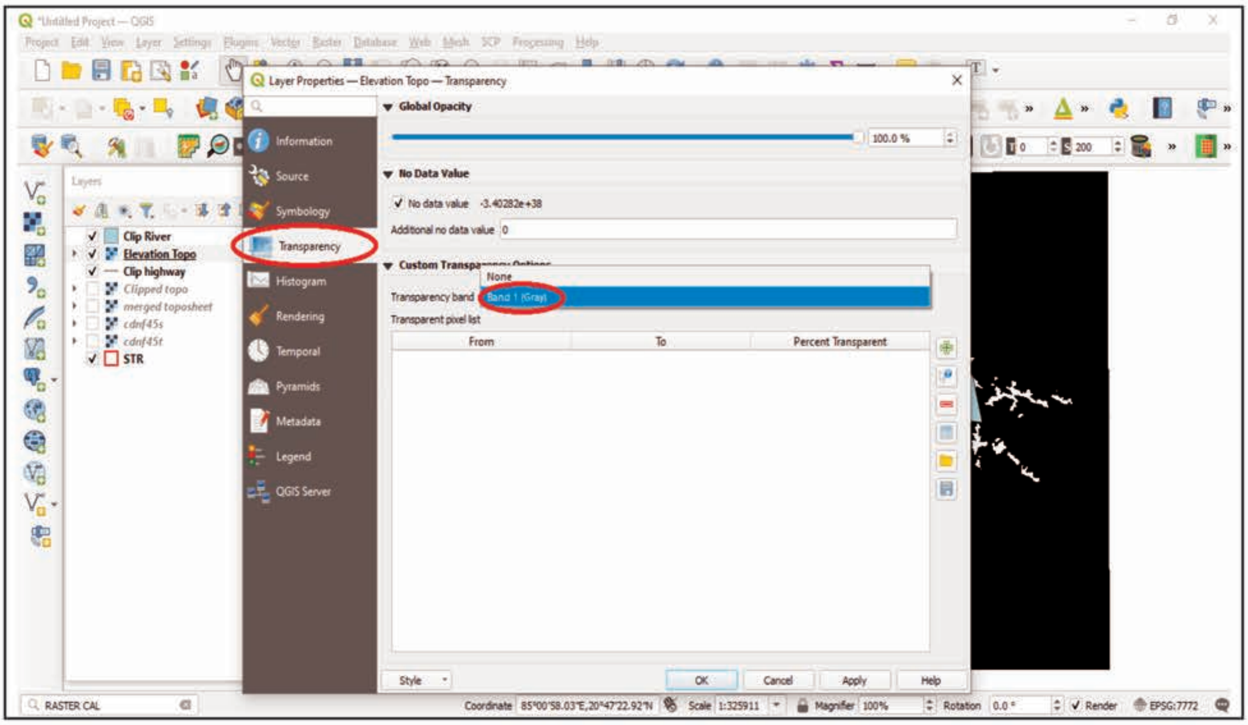


Fig.6(d) In Symbology of "Elevation topo", selecting transparency as "Band 1(Gray)" and "Additional no data value" as 0.

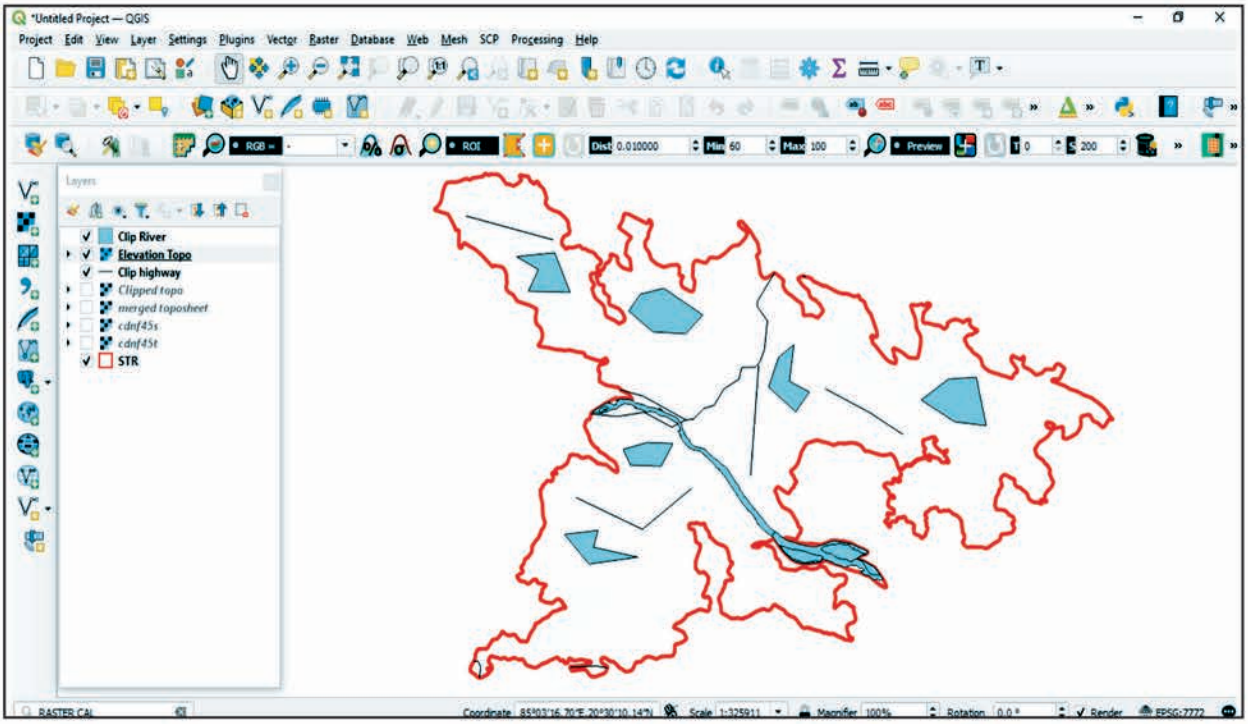


Fig.6(e) The layers of interest are ticked and stroke width of STR layer is set as 1 in Symbology.

Step 7 :- Converting Raster to Vector.

Go to Raster >> Conversion >> Polygonize (Raster to Vector)

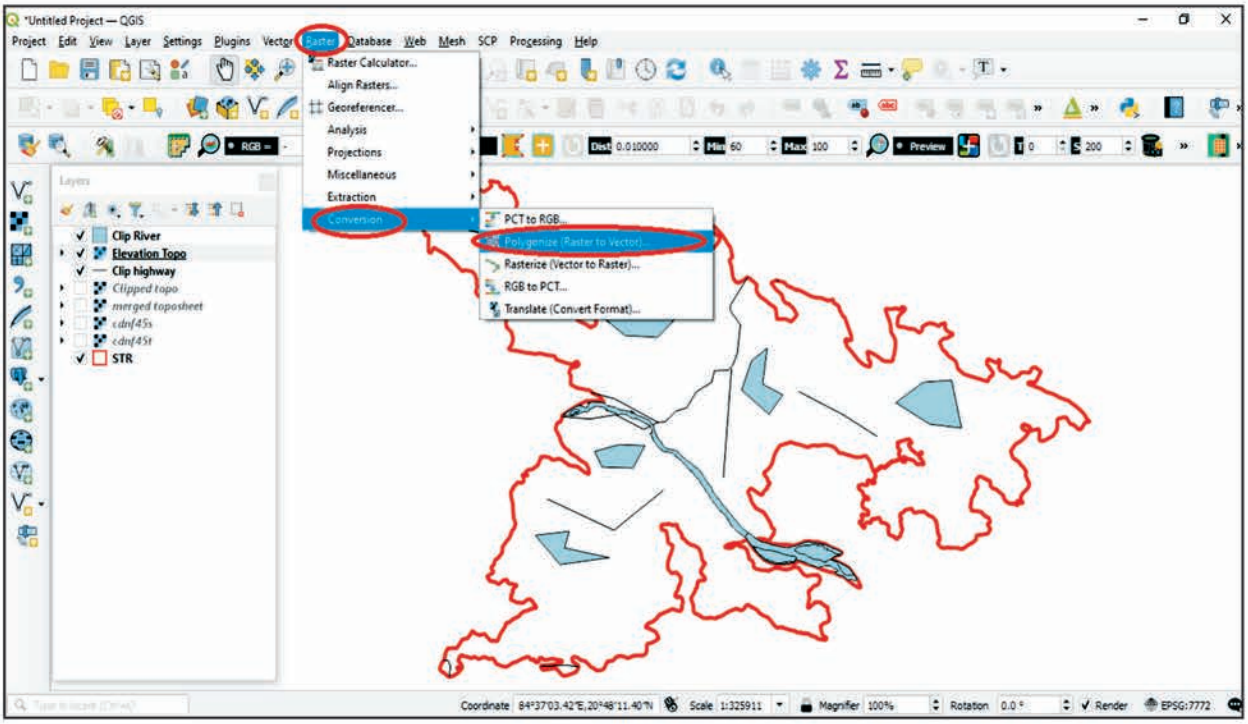


Fig.7(a) Raster to Vector conversion procedure.

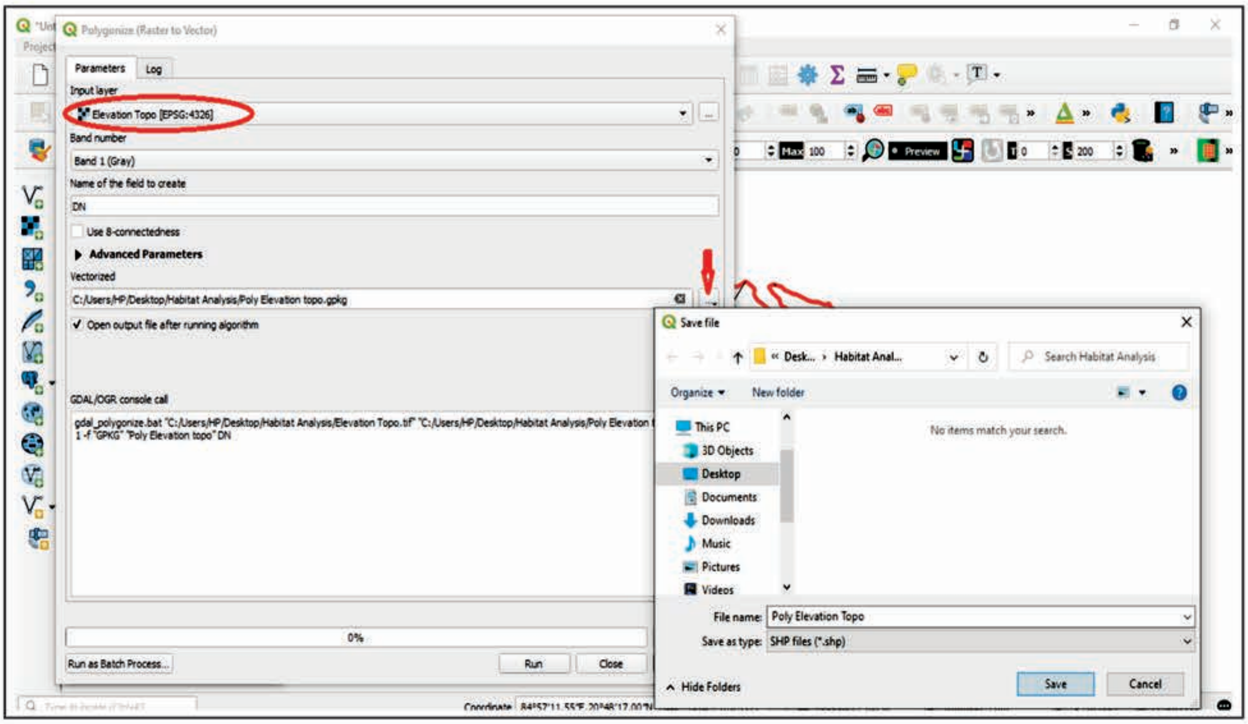


Fig.7(b) Setting parameters as above and saving file as "Poly Elevation Topo."

* In order to select regions with elevation greater than 500m, go to "Poly Elevation Topo">>Right Click>>Open Attribute Table.

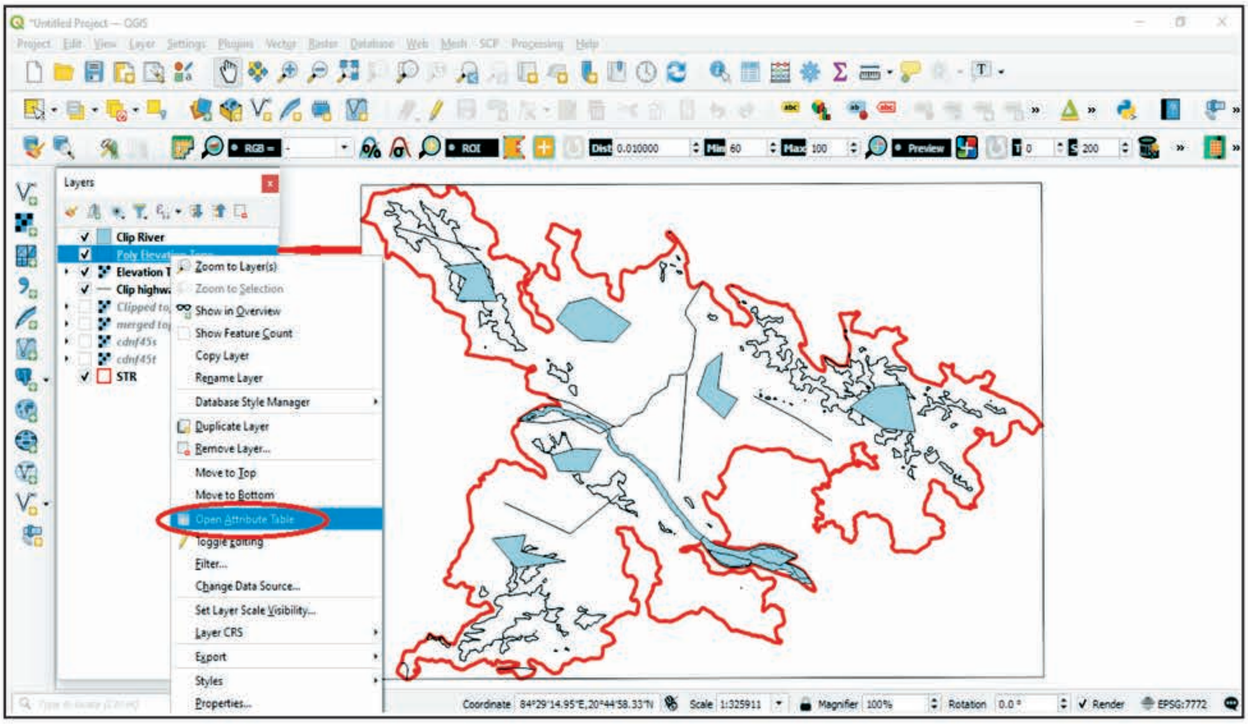


Fig.7(c) The Layers showing areas with elevation greater than 500 metres in polygons with black boundary as above.

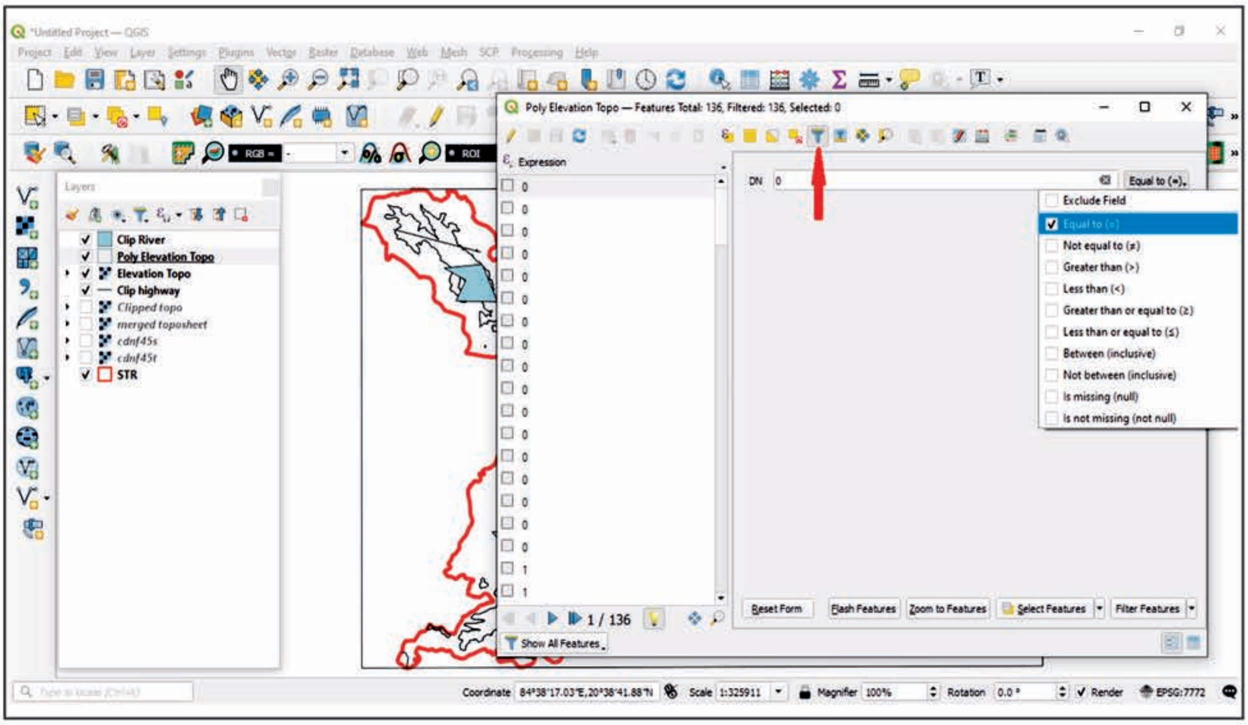


Fig.7(d) Go to Filter>>Set DN equal to "0">>Select Feature>> Edit Mode>>Delete Selected>>Stop Edit>>Save Changes.

Step 8:- Fixing geometries of Highway,River,Poly Elevation topo and STR boundary in order to remove geometrical errors.Go to Processing>>Processing toolbox.

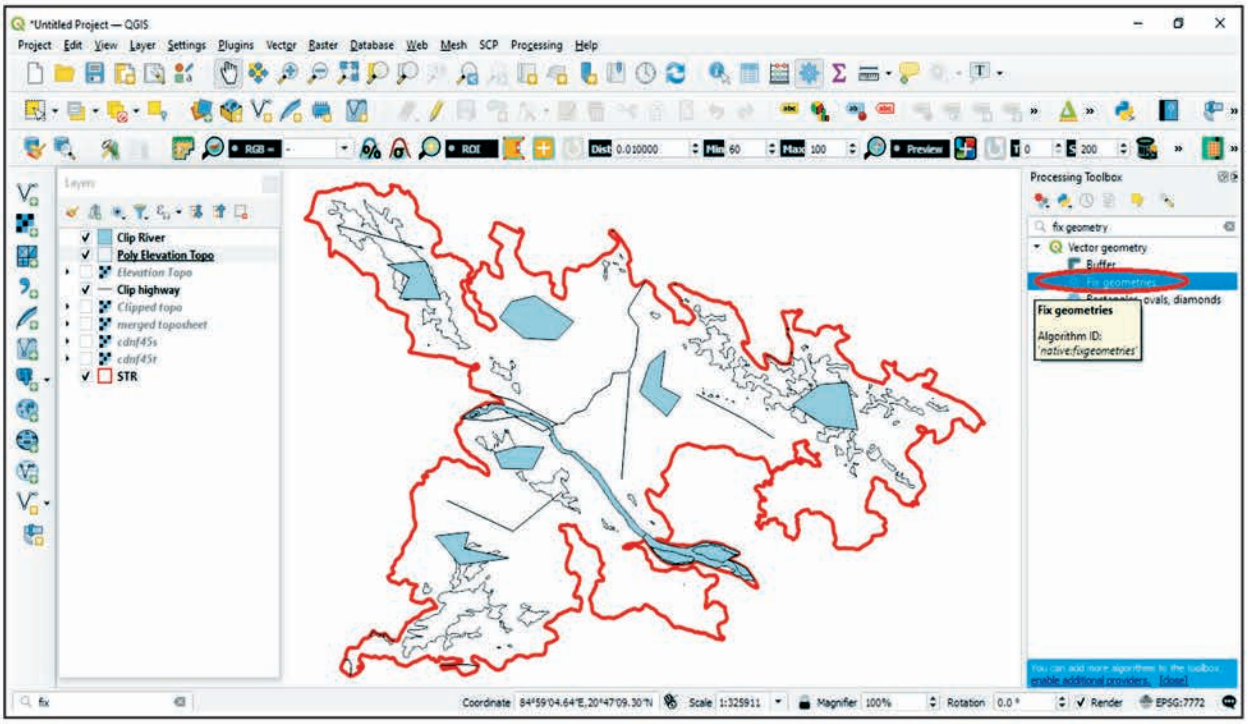


Fig.8(a) Opening Fix Geometries in Processing toolbox.

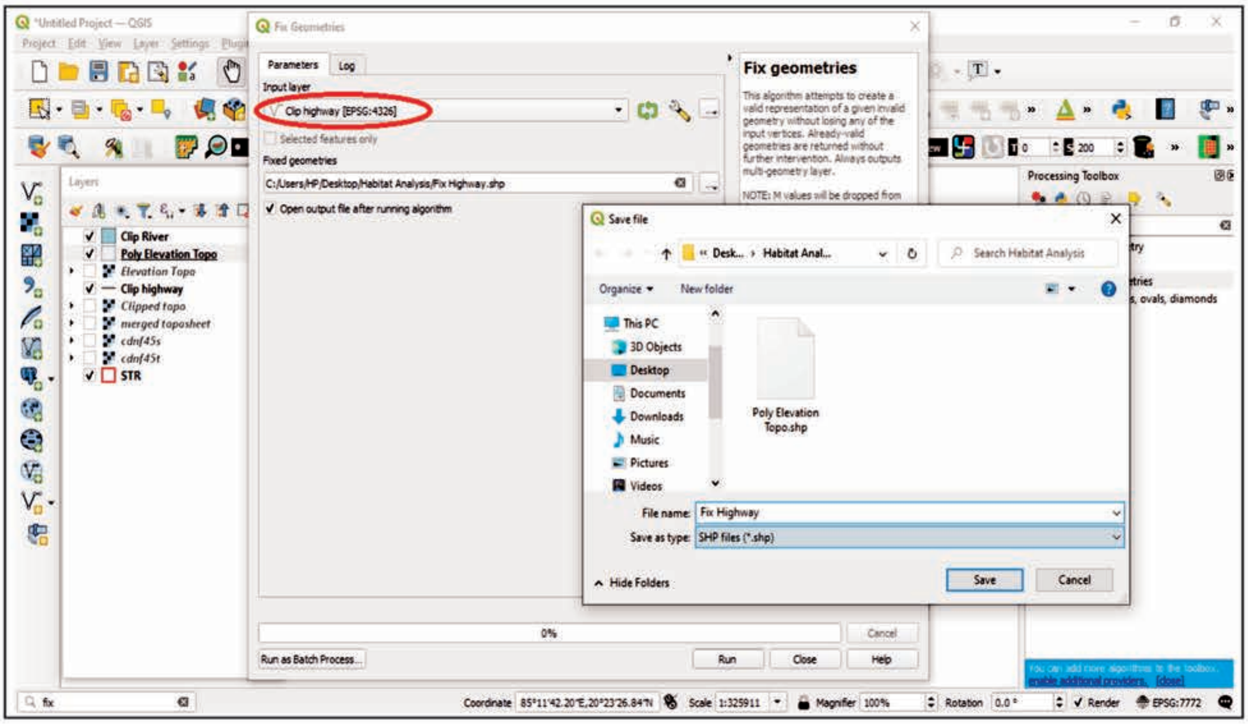


Fig.8(b) Setting Input parameters as above and saving the file with fixed geometries. (Similarly done for Highway,River,Poly Elevation topo and STR boundary).

Step 9:- Creating Buffer for Highway and River.

Go to Vector>>Geo processing tool>>Buffer.

Set parameters as below.

(For buffer of highway set Distance in degrees as 0.02 for 2 km buffer around highway and setting distance in degrees as 0.001 for 100 m buffer around river.)

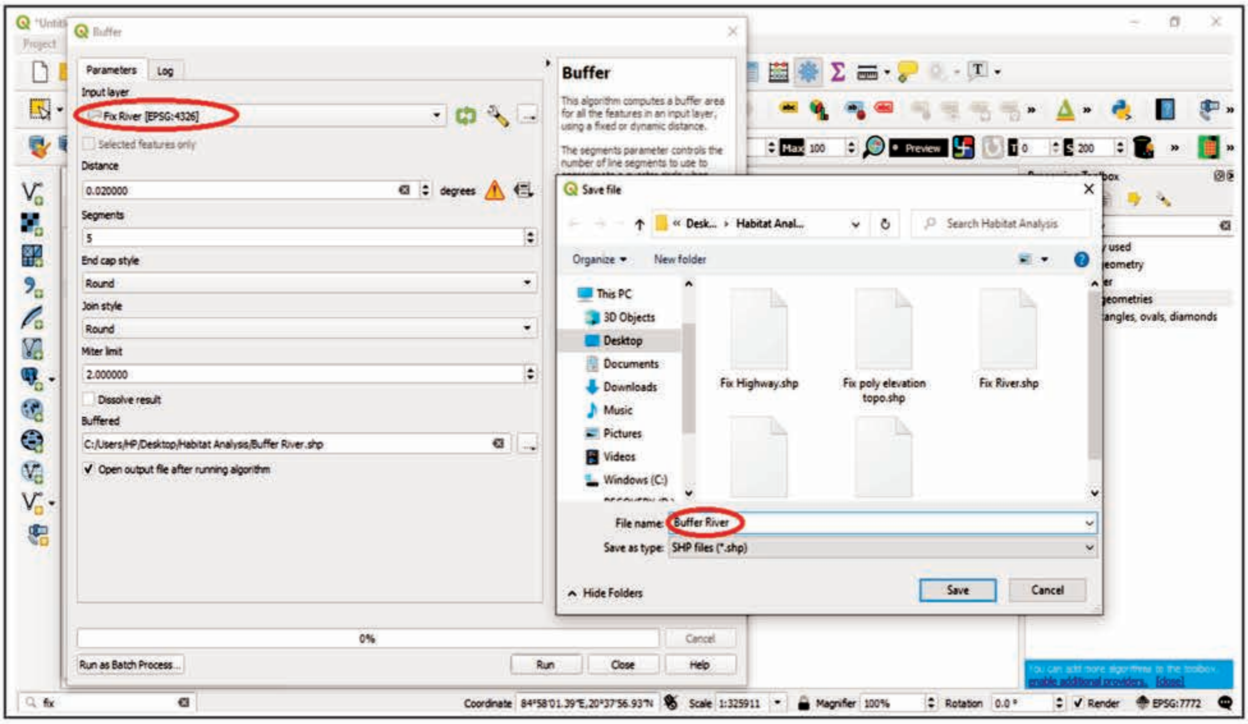


Fig.9(a) Setting input parameters and saving file of created buffer.

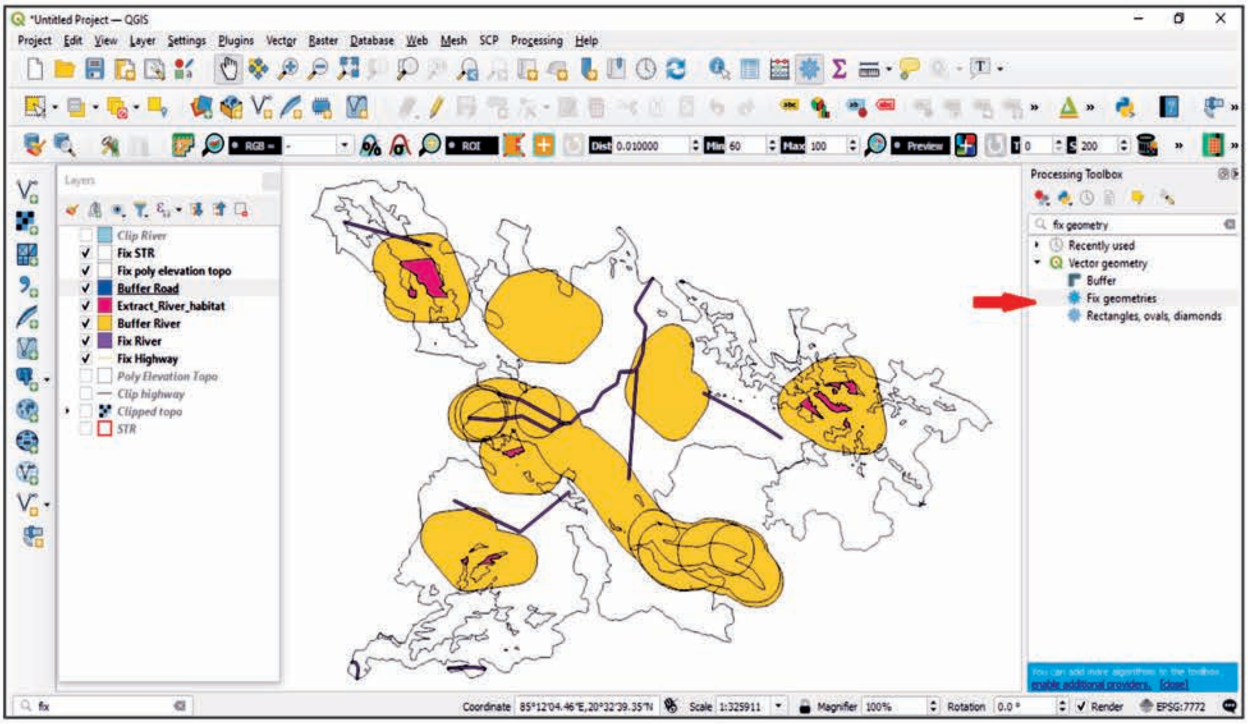


Fig.9(b) Buffer for highway and River created.

Step 10:- Extracting habitat from river by clipping (Go to Vector>>Geo-processing tool) and setting parameters as below.

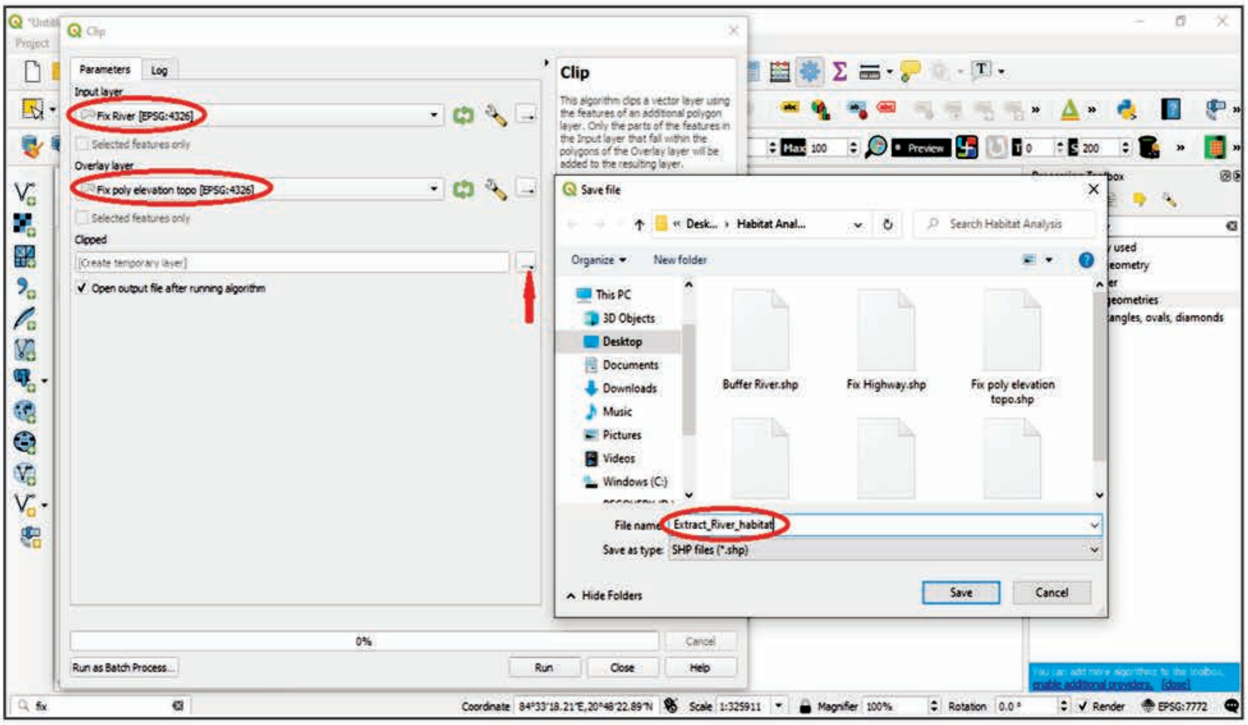


Fig. 10(a) Clipping habitat with river within 2 km radius.

Step 11:- For final Habitat, difference between extracted habitat(clipped elevation with 2km distance from waterbody) and buffer road is taken.

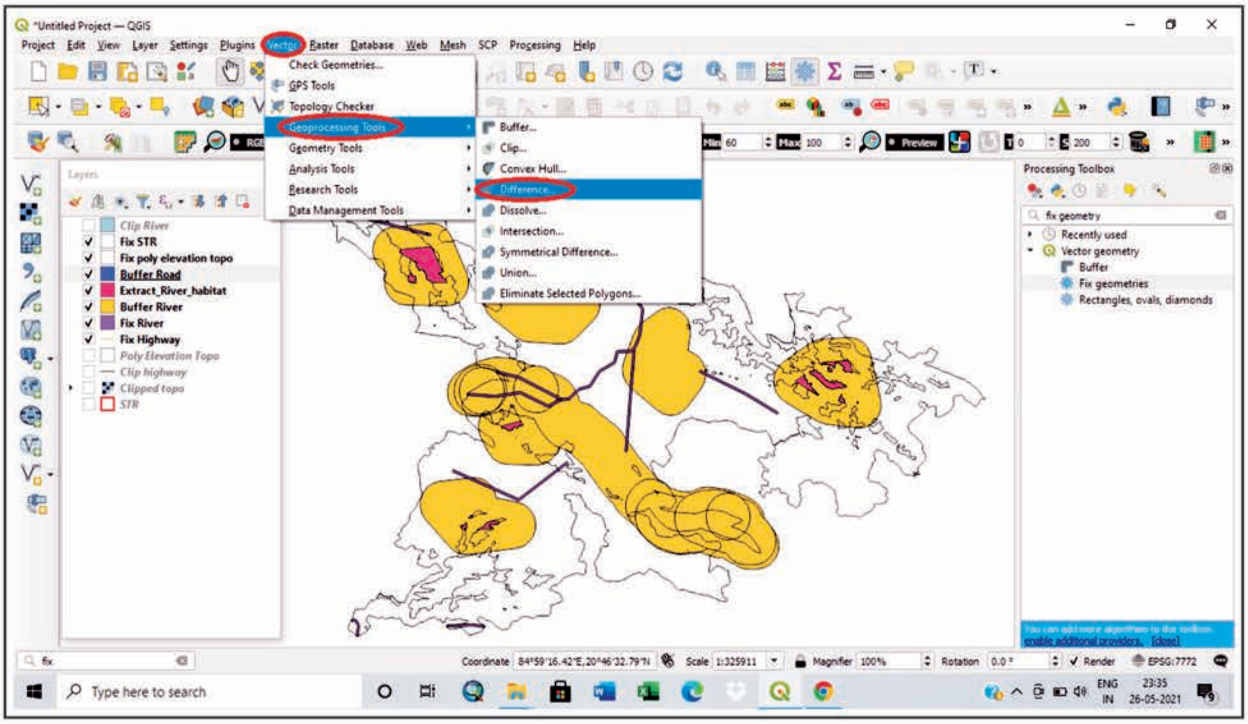


Fig.11(a) Vector Geoprocessing of difference done to get final habitat.

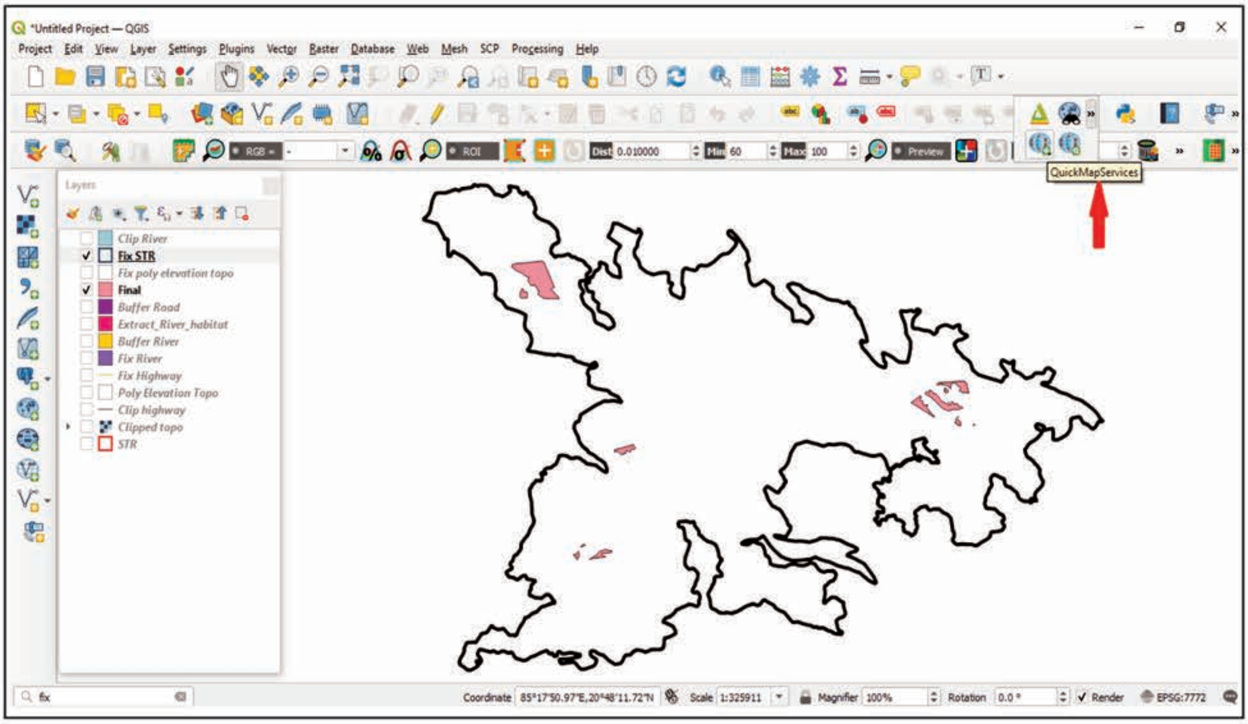


Fig.11(b) Final preferred habitat as per the criteria appears as above.

Step 12:- Lay thetopo map beneath final map.
Go to Quick Map Service plugin>>OSM>>OSM standard.

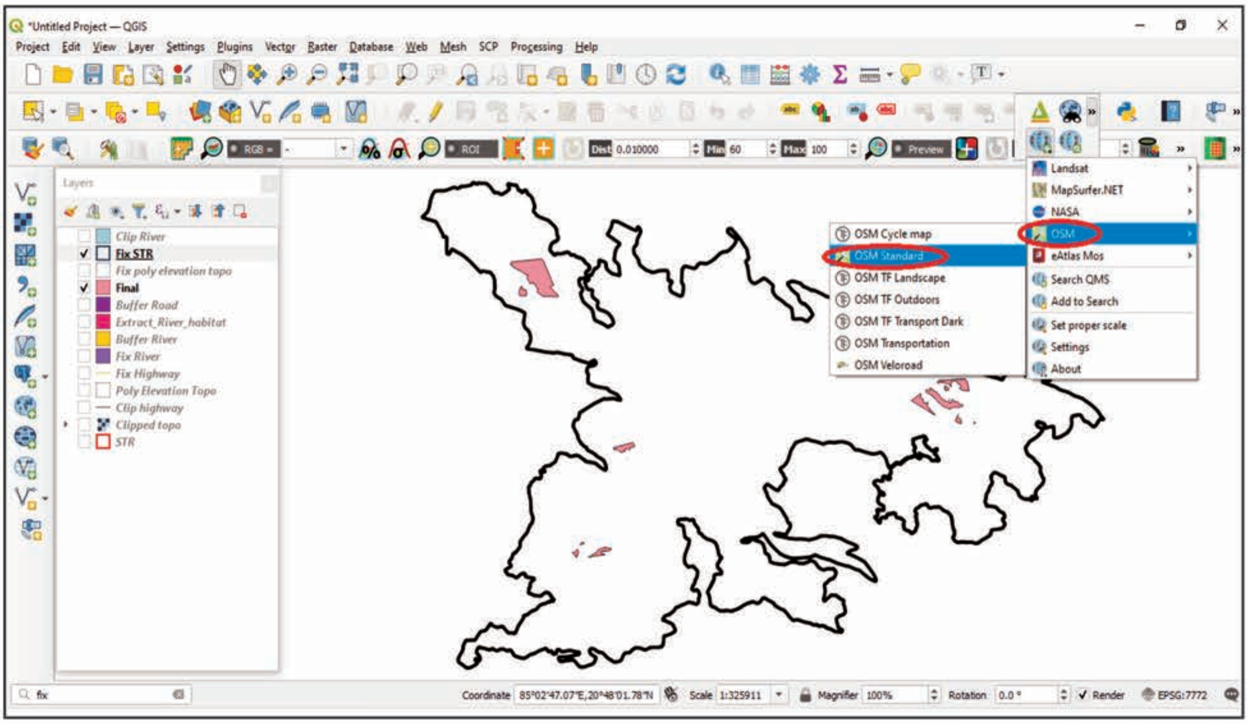


Fig. 12(a) Putting final map on the toposheet.

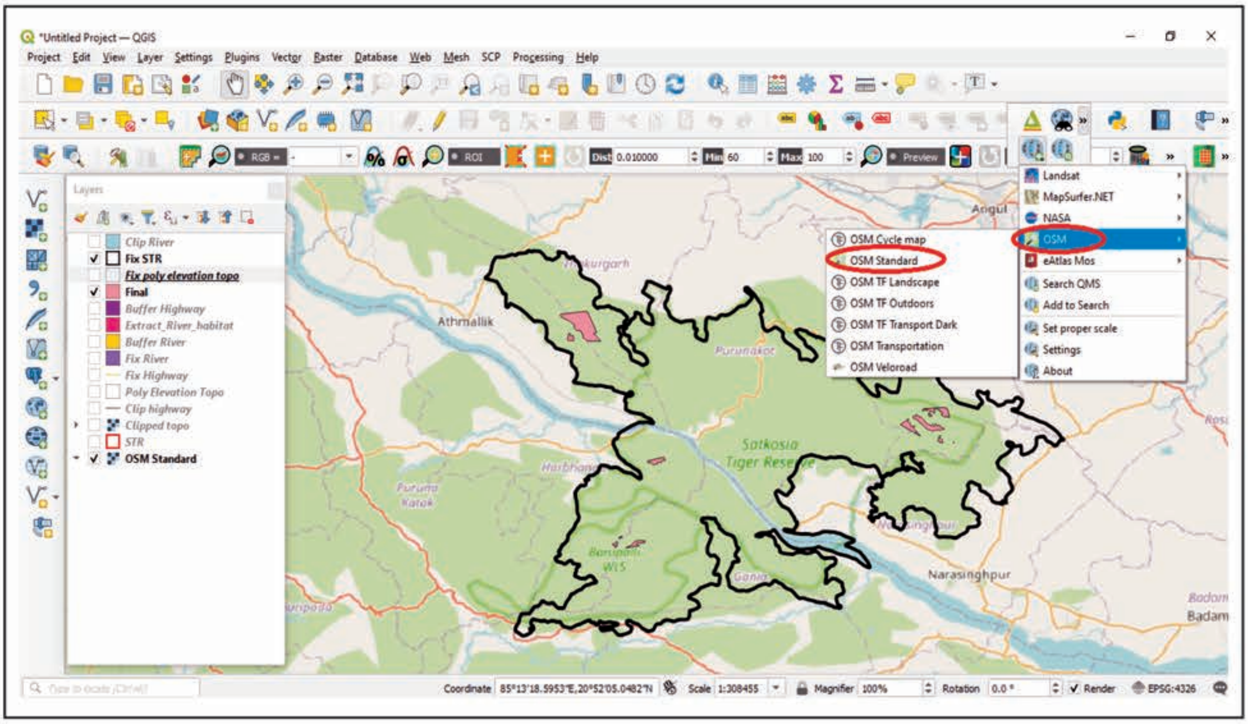


Fig.12(b) Final map now appears as above.

Step 13:- Creating layout of Final map.

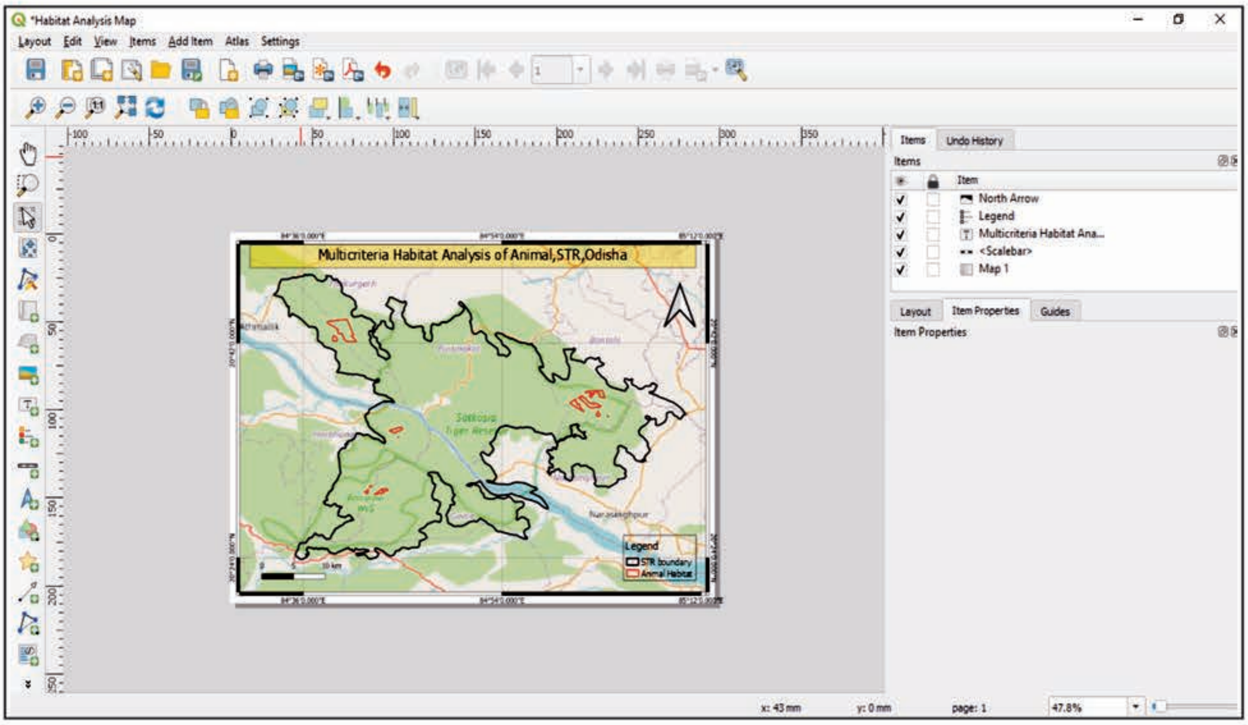


Fig. 13(a) Adding label,legend,scale and arrow to the final map.

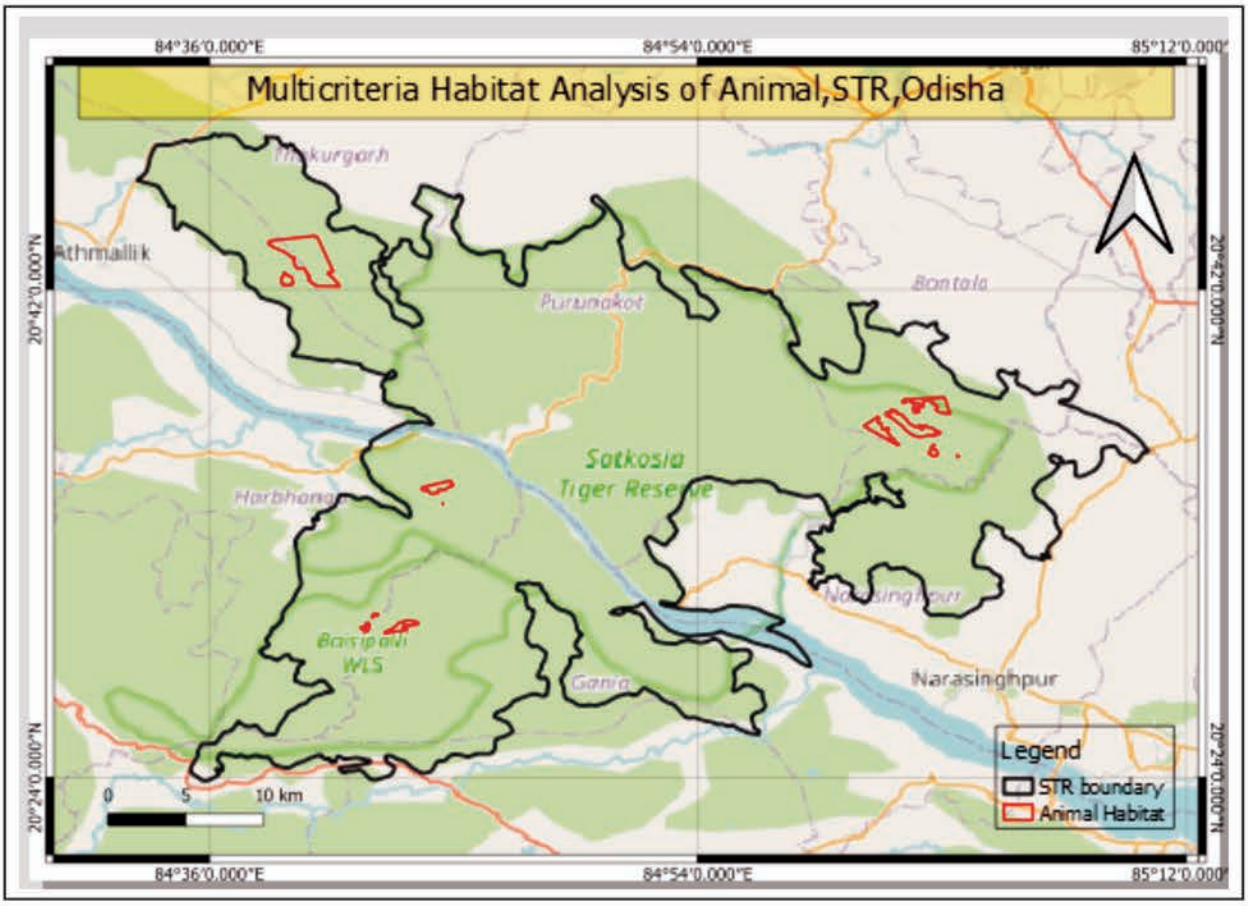
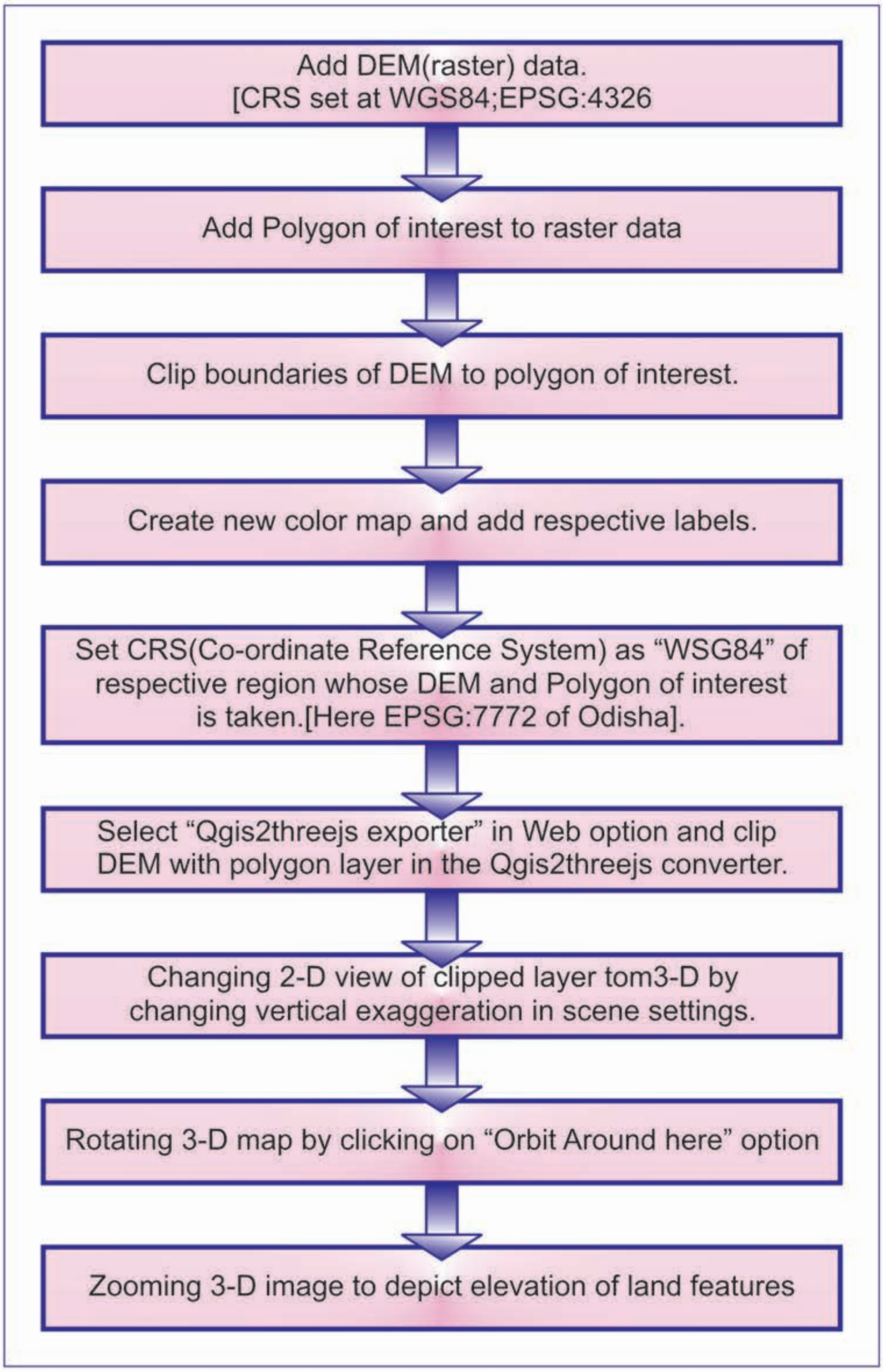


Fig. 13(b) Final layout of the habitat map.

20.Creating 3-D map using Digital Elevation Model (DEM) data

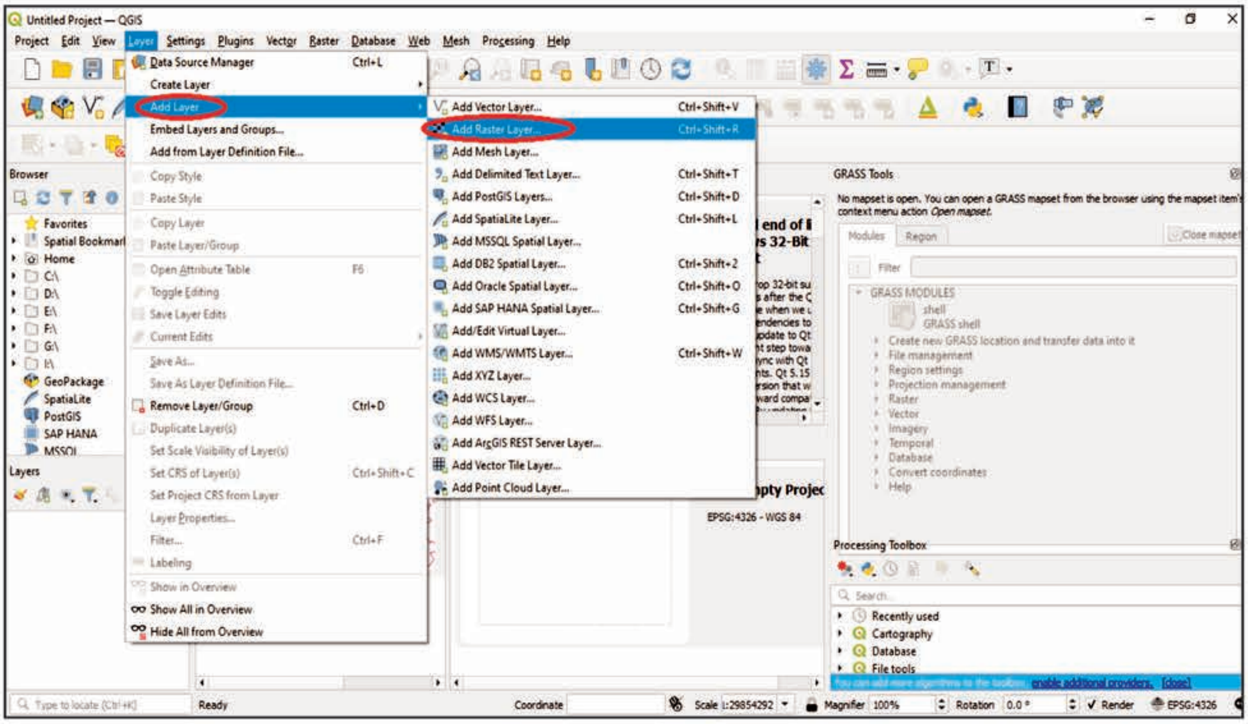
DEM Digital elevation data gives idea about the topography of the terrain. It helps the forester in planning protection strategy for vulnerable areas of poaching, timber smuggling, fire fighting etc. It is easy to create a 3-D map with the help of QGIS. This chapter deals exclusively about the creation of 3D Map and steps involved there in.

It involves the process of creating 3-D model of an area of interest through use of “Qgis2threejs” plugin with input as Digital Elevation Model(DEM) layer and polygon of area of interest.



Steps for creating 3-D Map using DEM data

Step 1:- Add DEM data (satellite imagery)
by clicking on "Layer" "Add Layer" "Add Raster Layer"



Step 2:- Select Digital Elevation Model data in ".tif" format (here "cdne44e" layer of Orissa) from the folder and add in the form of layer in QGIS

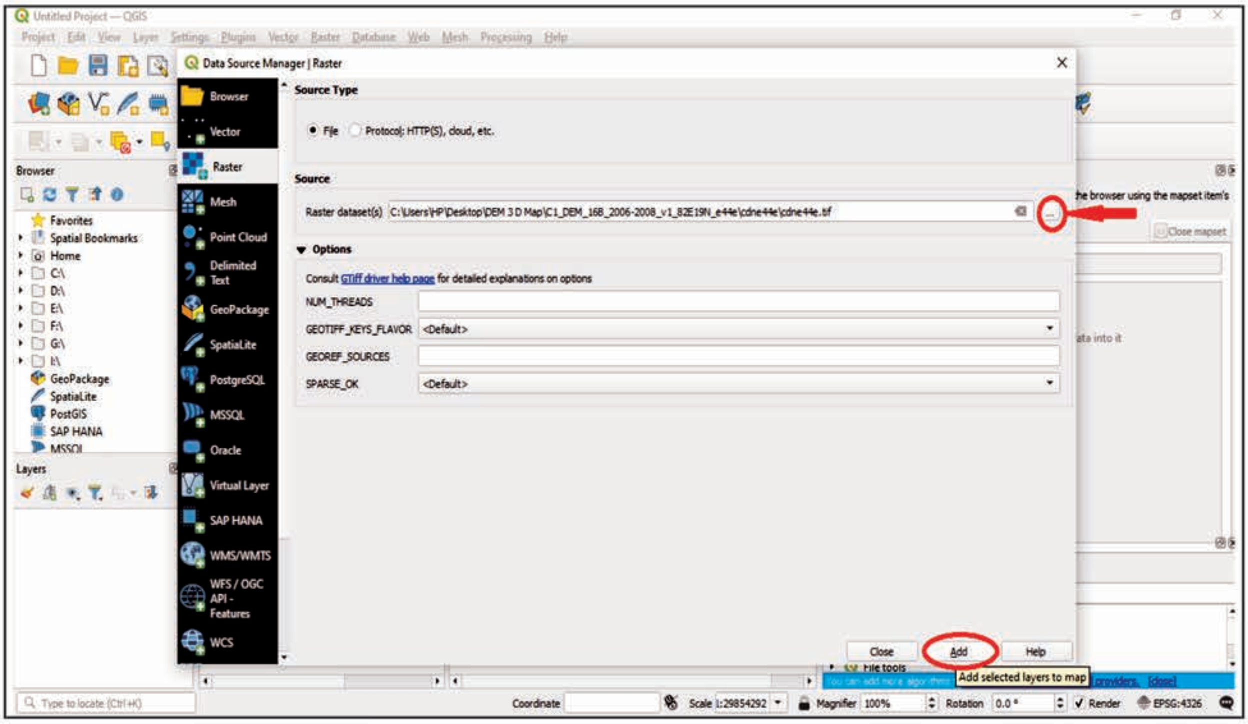


Fig.2Adding satellite imagery (raster layer)in QGIS

Step 3:- Adding the polygon of interest to the raster and clip the DEM to the boundaries of the polygon.

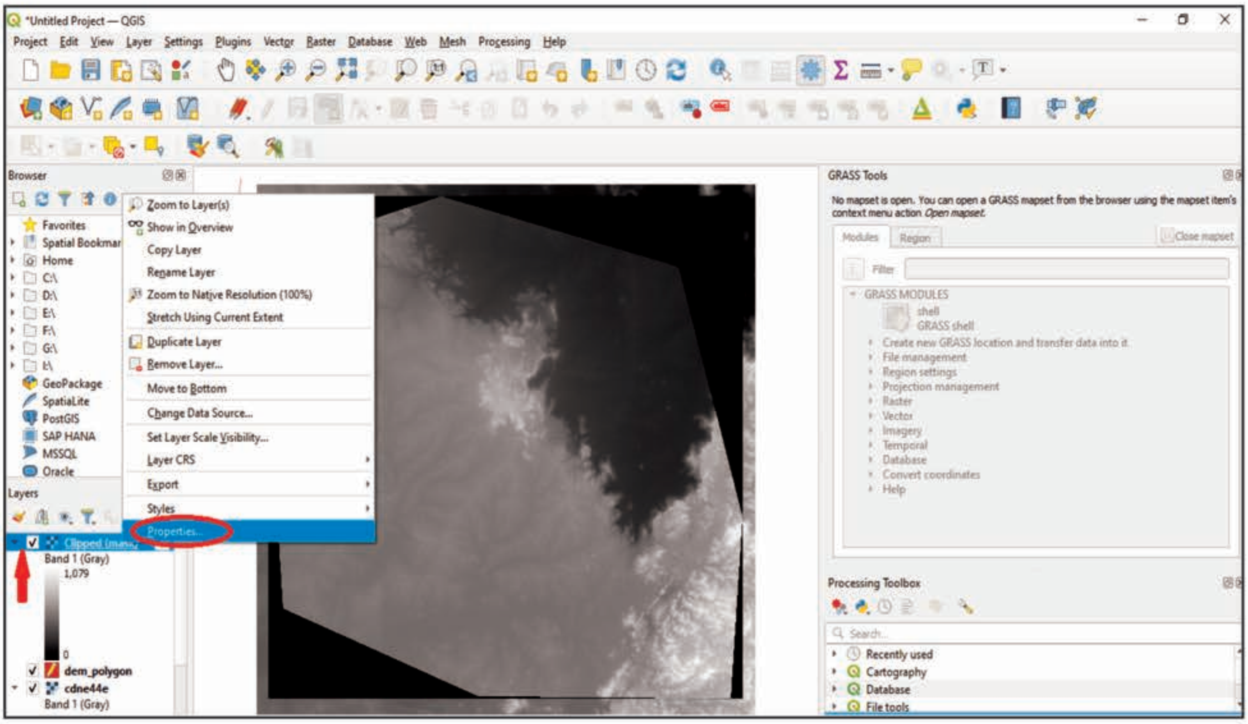


Fig.3 Opening Properties attribute of clipped layer in order to change color band.

Step 4:- Creating new color ramp by going to "Symbology", then scroll down "Color ramp" menu and select "Creating New Color Ramp". Select"Mode" as "equal interval" and "classes" as "5"(as per the requirement)

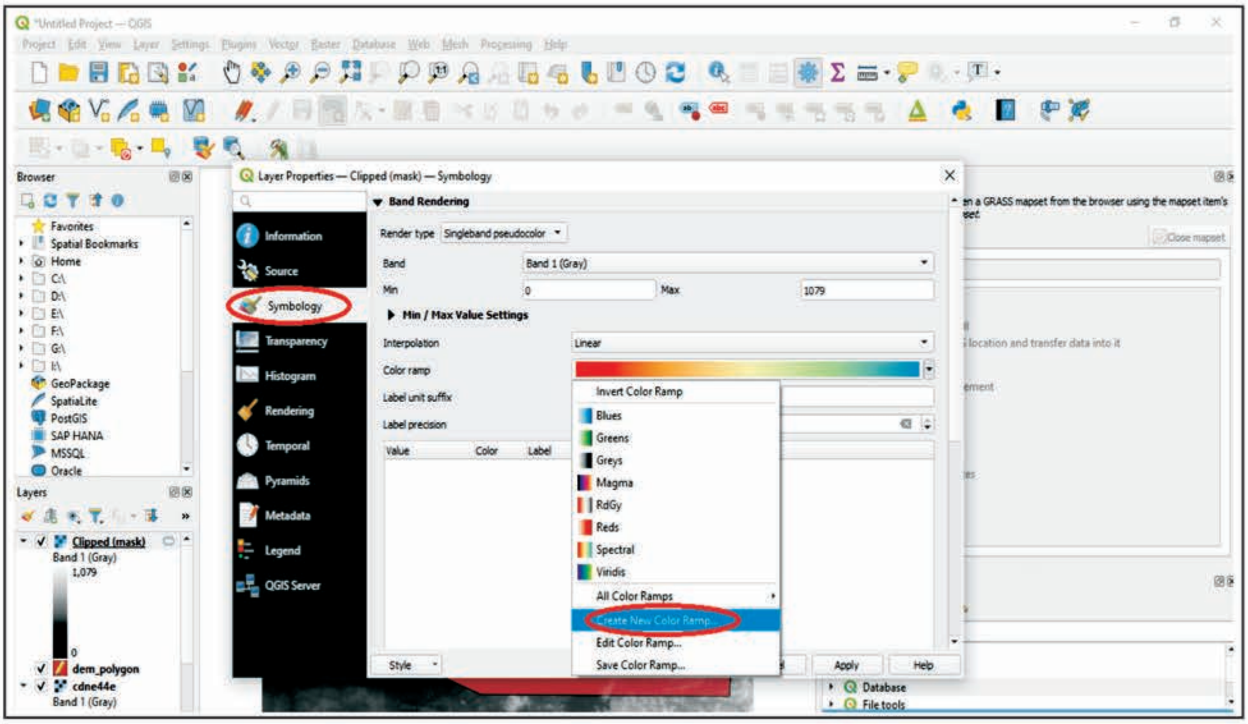


Fig. 4(a) Selecting "Create New Color Ramp"

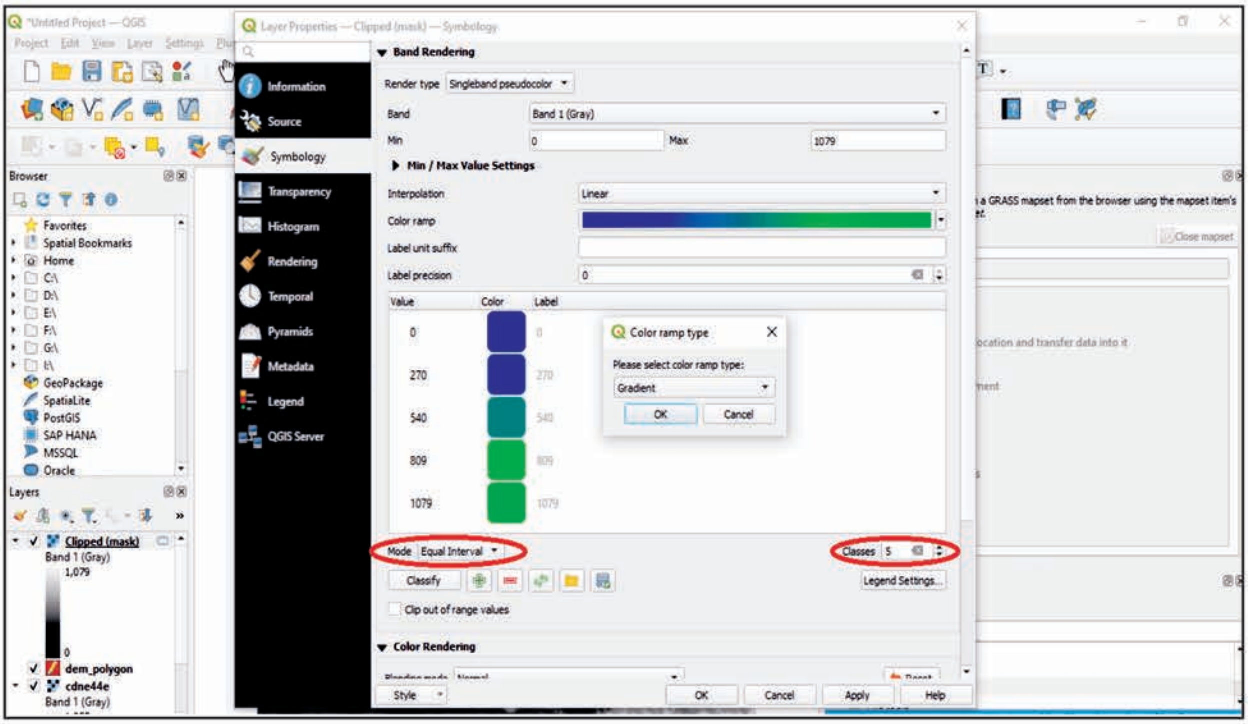
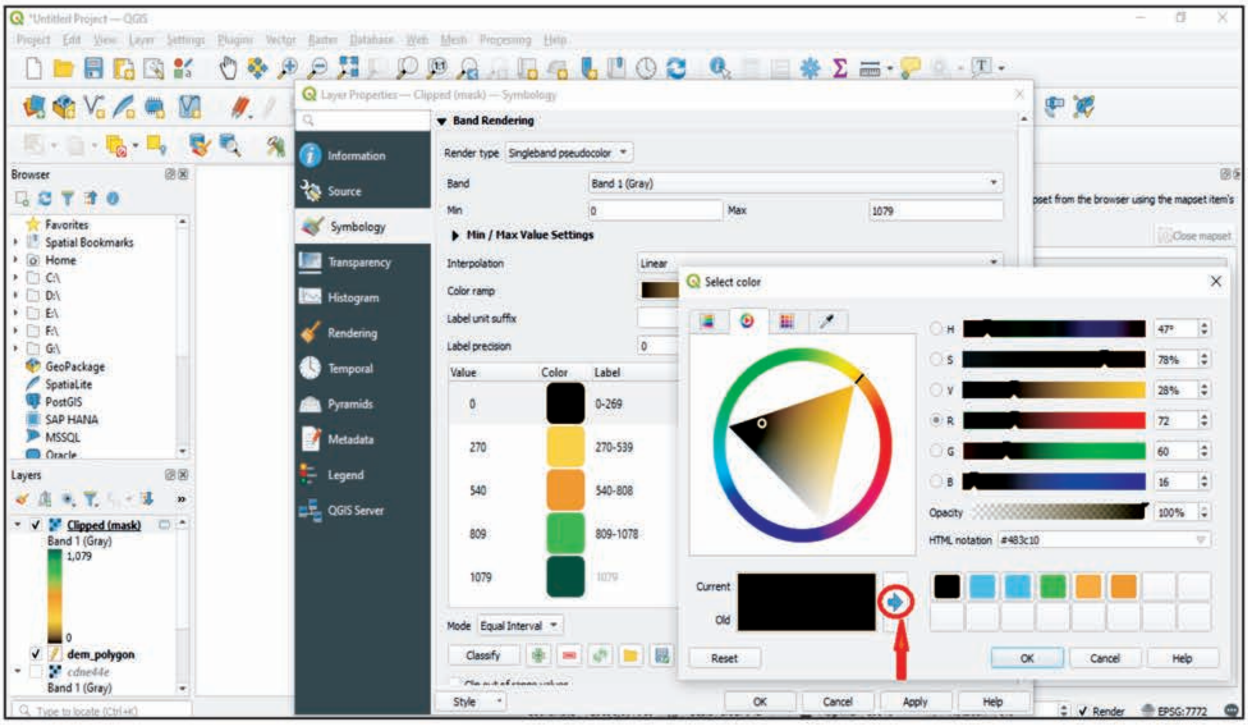
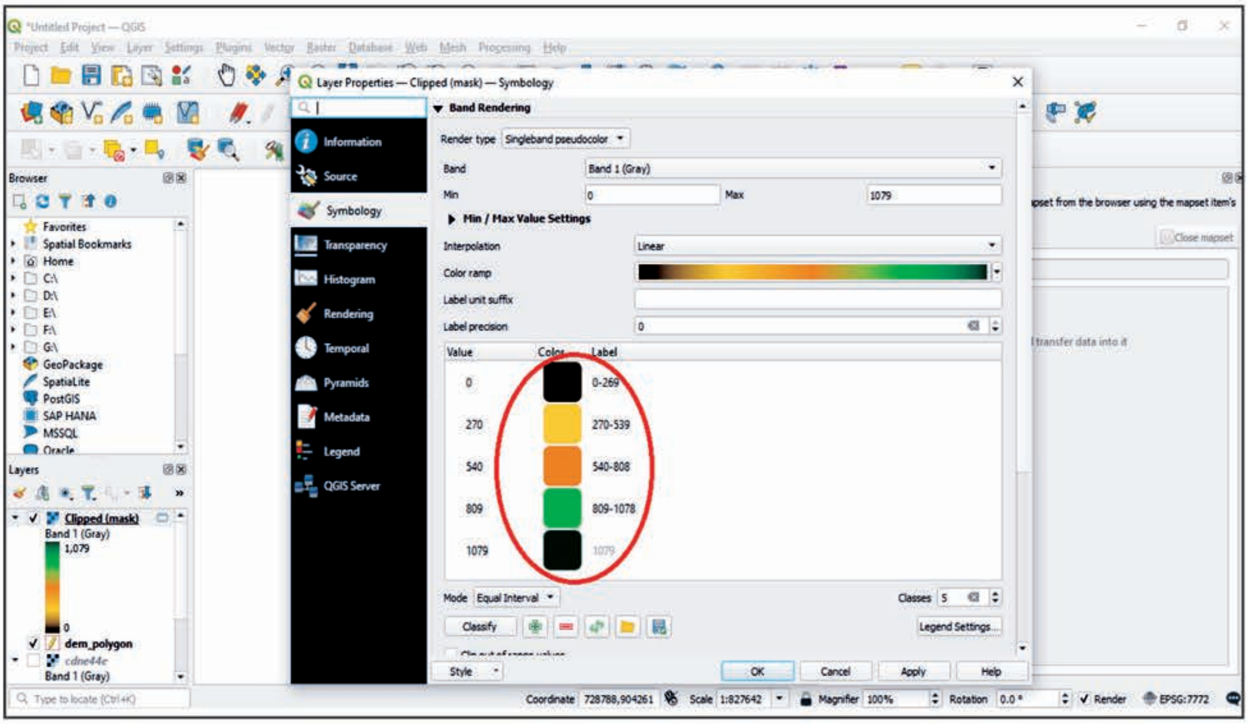


Fig.4(b) Selecting “Gradient” in “Color ramp type” pop-up window.

Step 5:-you can select the colour of your choice by using the colour ramp by double clicking the colour button.



Step 6:- Now we left click on different color boxes as encircled below one at a time and add color in them from the selected color shades as above appearing in "Select Color" window.



Step 7:- Right click on Shape file layer and Open "Properties". Go to "Symbology" and select "Simple Fill" and set "Fill Style" as "No Brush". This will make clipped layer distinctly visible.

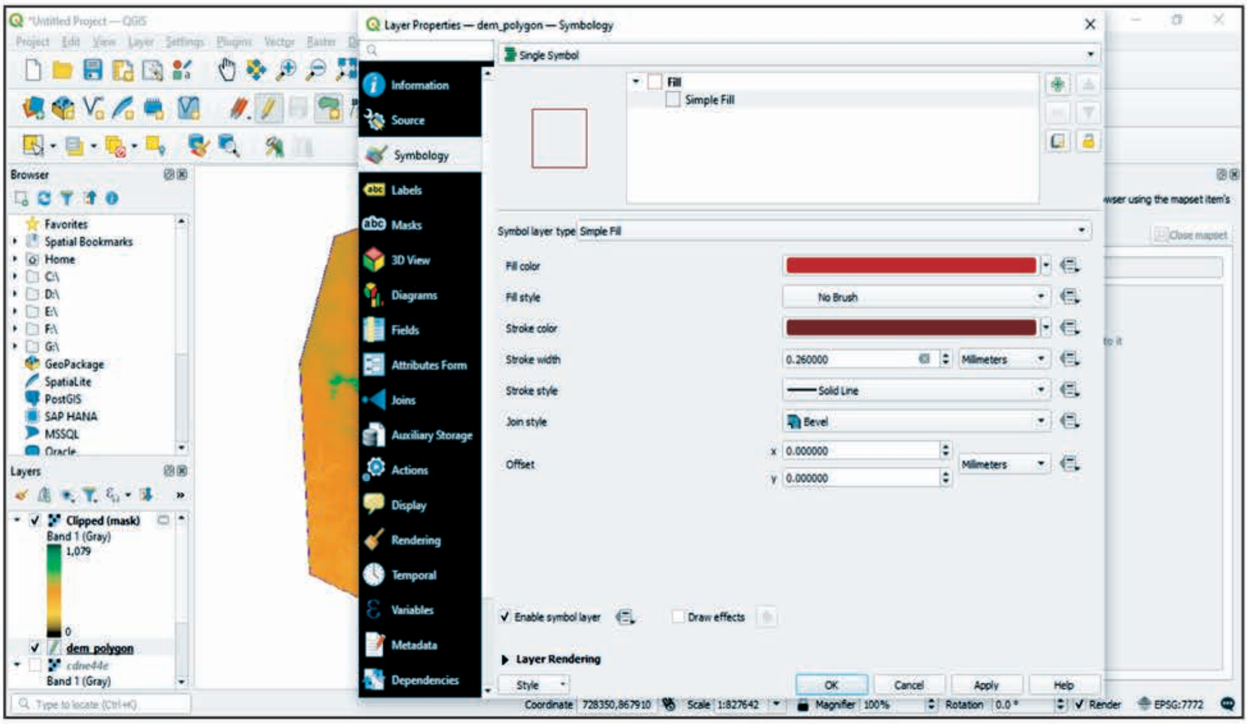


Fig.7(a) Selecting"No brush" in Fill Style and making clipped layer distinctly visible.

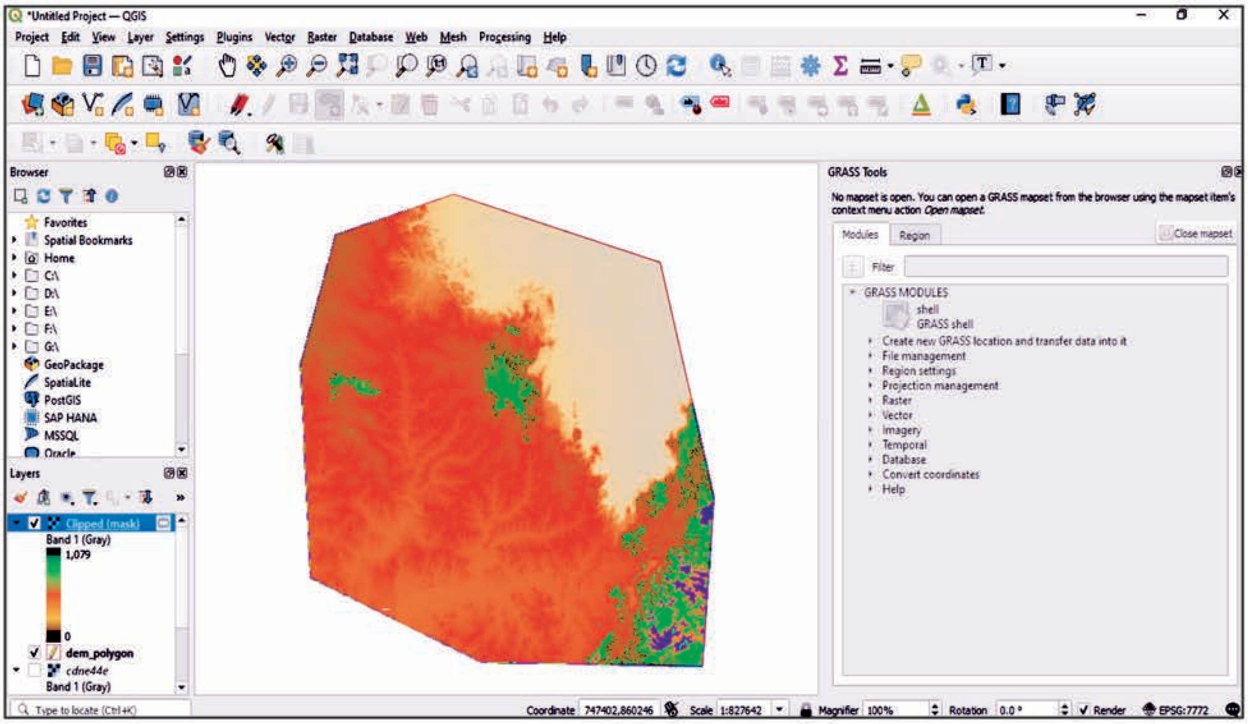
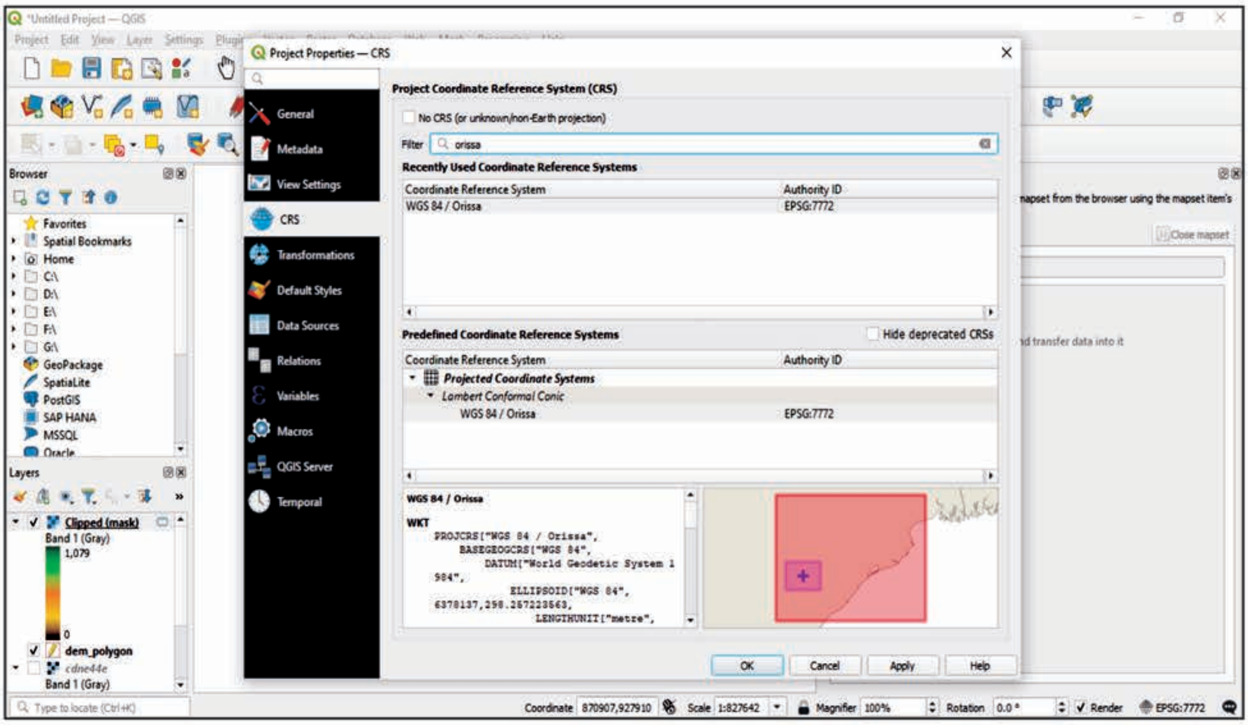


Fig.7(b) Distinct clipped layer with various shades in 2-D format.

Step 8:- On the Right hand side bottom corner, left click on EPSG. "Project Properties-CRS" window opens up.
In the "Filter" search for Orissa as we are working on Orissa DEM layer. Select Co-ordinate Reference system as "WSG84/Orissa" with Authority ID as EPSG:7772.



Step 9:- Now, click on "Web" and select "Qgis2threejs exporter". (This is to be downloaded from the IE). A window opens up and the 2-D layer of the clipped layer appears.

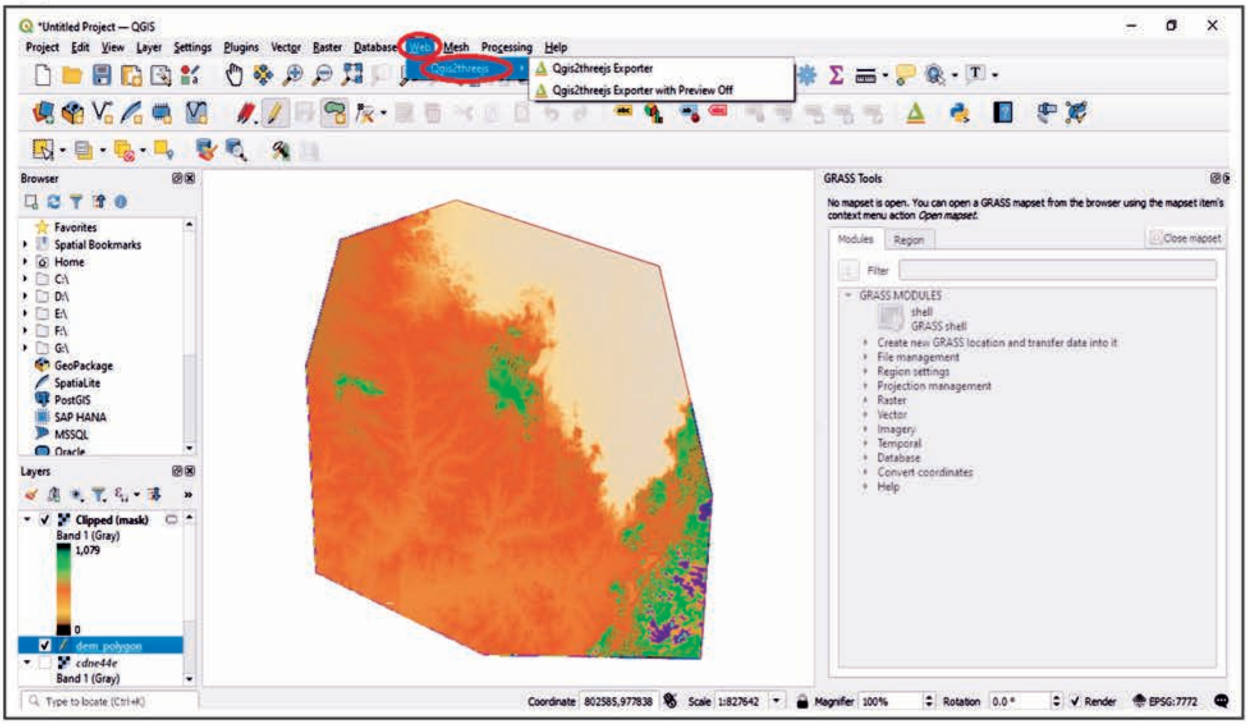


Fig. 9(a) Opening Qgis2threejs exporter

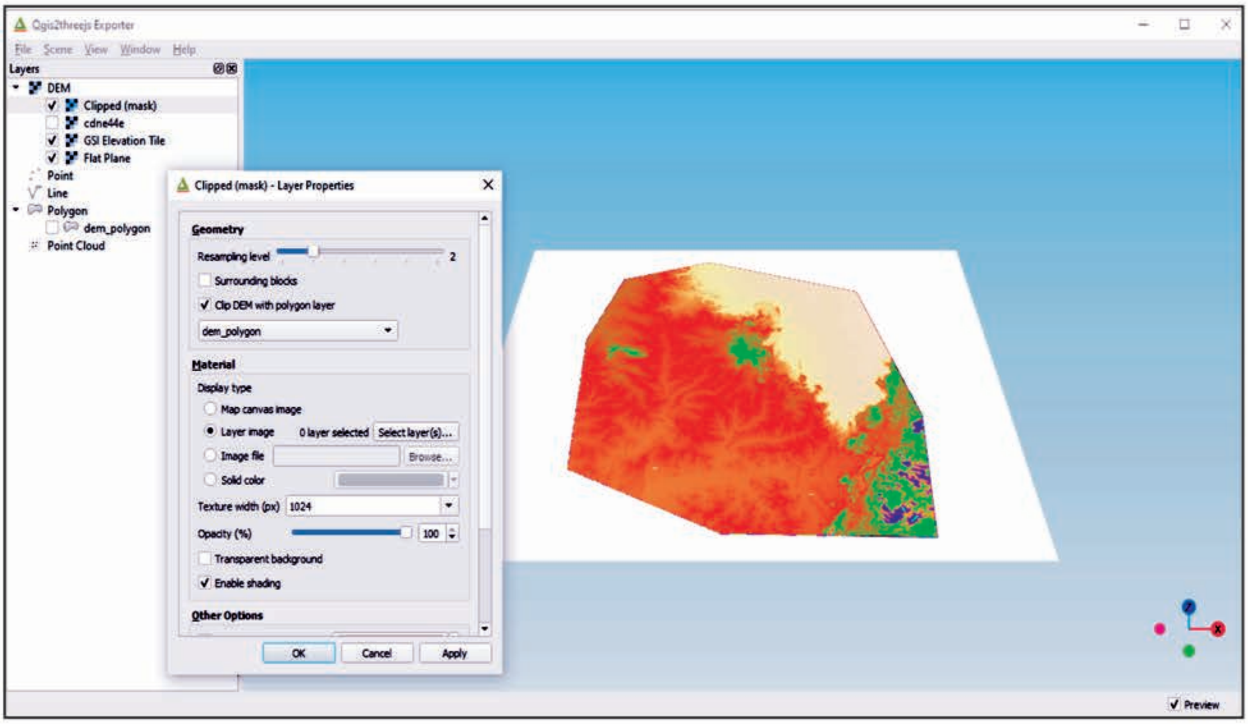


Fig. 9(b) Right click on the "Clipped(mask)" layer."Properties" appear.Open it and select "Clip DEM with polygon layer".Select dem_polygon shapefile in the drop down menu just below "Clip DEM with polygon layer".

Step 10 :- The uploaded layer appears as below.Select “Scene” and in “Scene Settings”, set Vertical Exaggeration as “30” in World Co-ordinates. 3-D view of the clipped layer appears with various color shades depicting different elevation features

Fig.10(a) 2-D view of the clipped layer in Qgis2threejs convertor.

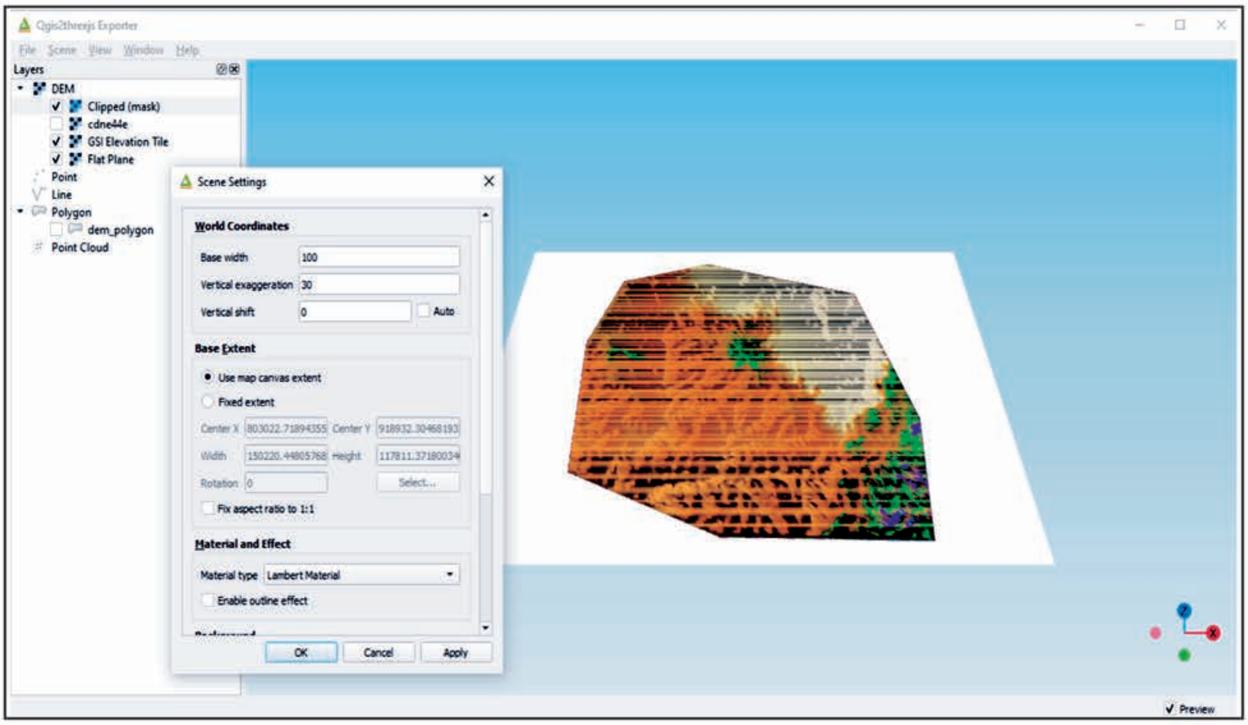


Fig.10(b) Set vertical exaggeration as “30” in scene settings.

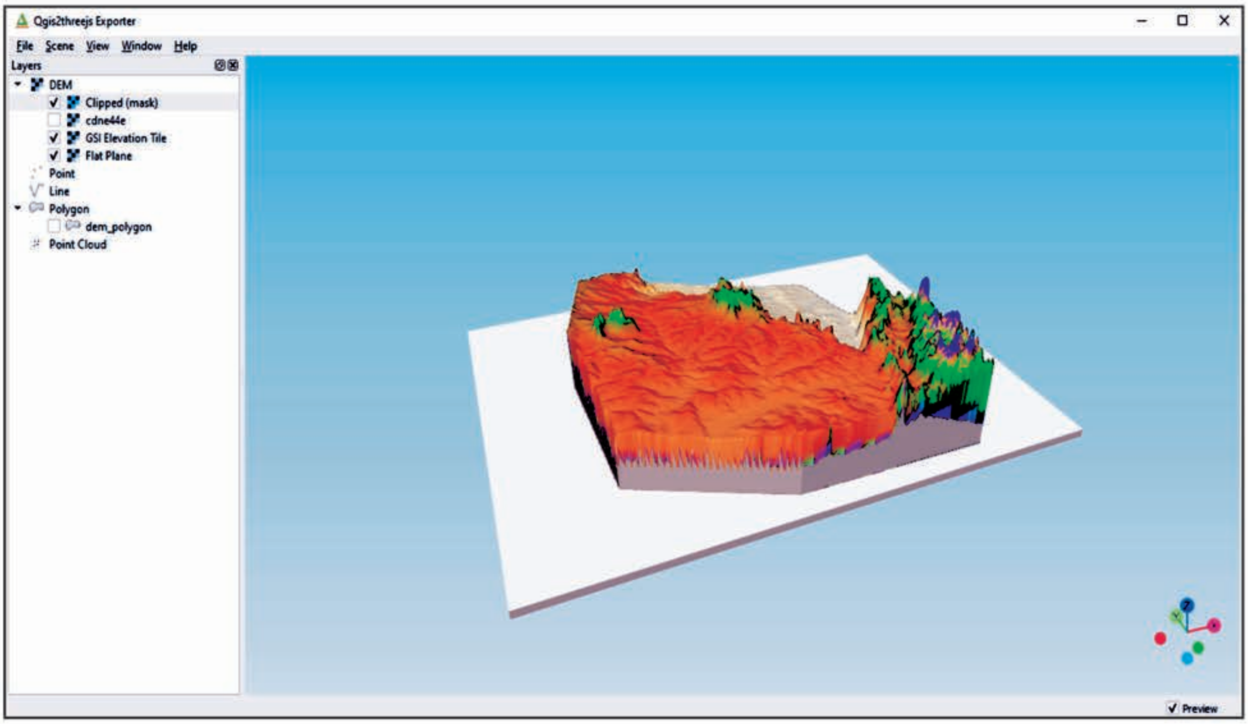


Fig.10(c) Created 3-D map through Qgis2threejs feature with different colors depicting various elevation features.

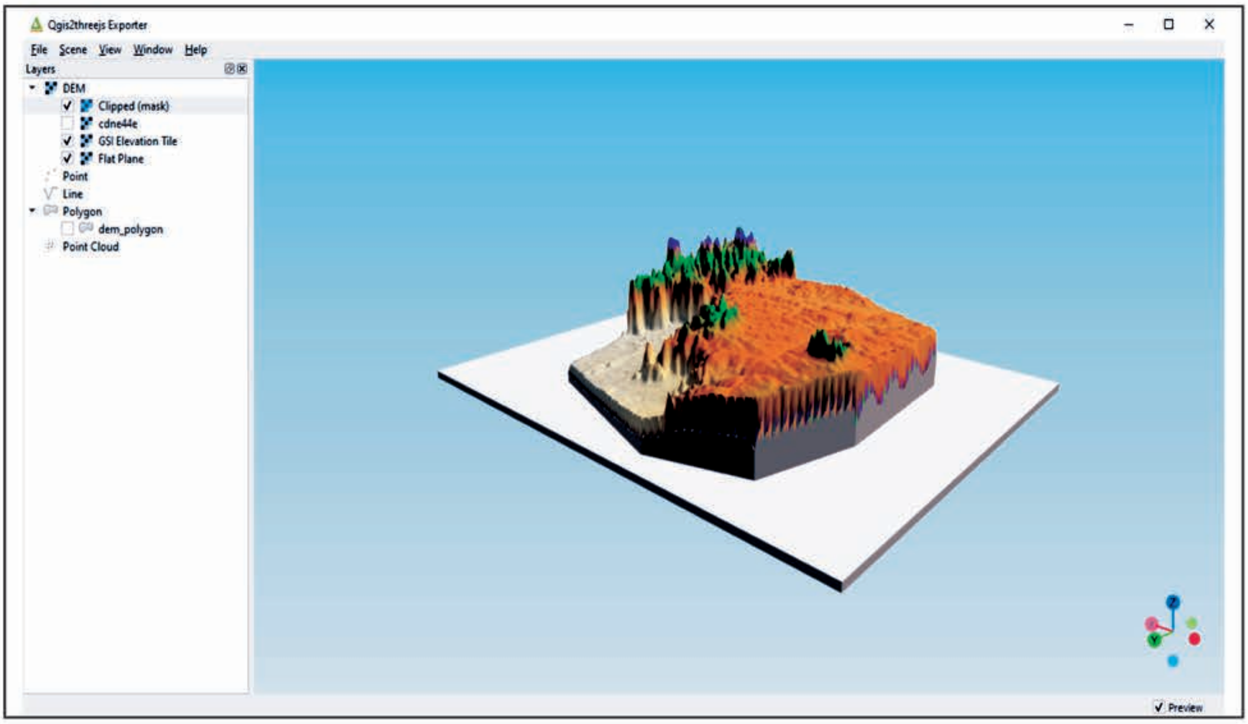


Fig.10 (d) View from different angle of the Created 3-D map through Qgis2threejs feature with different colors depicting various elevation features.

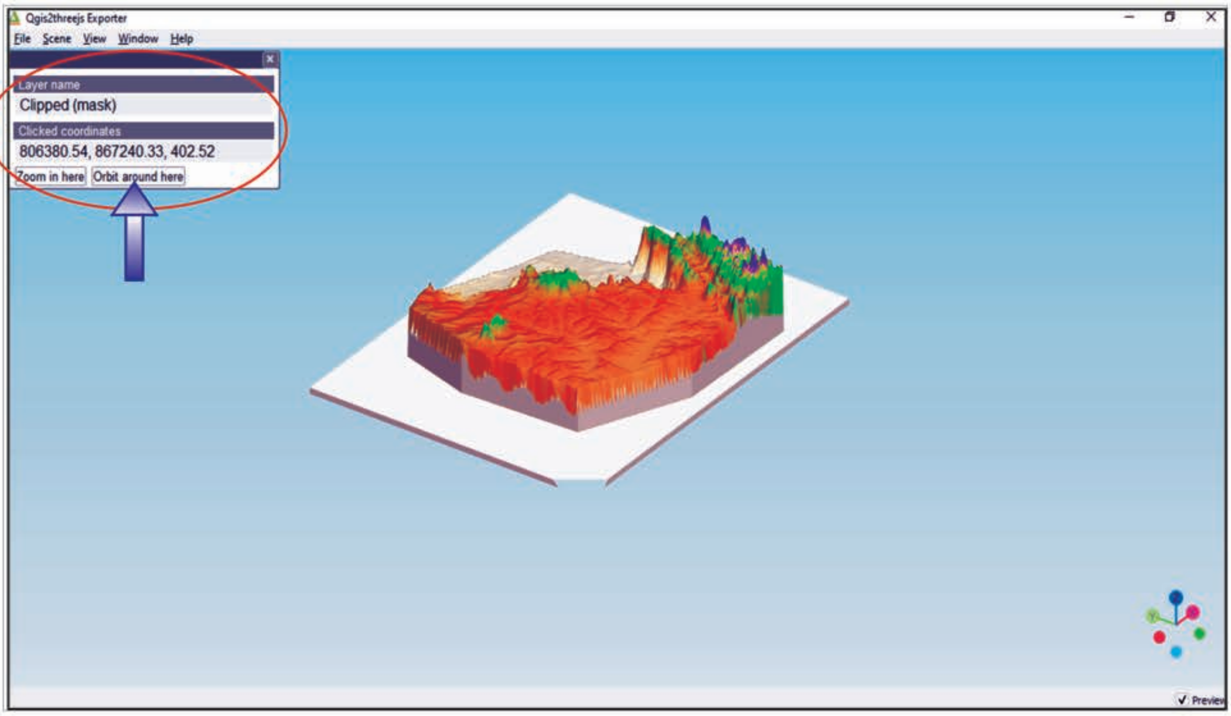


Fig. 10 (e) The generated 3D map can be viewed through different perspectives by making it to rotate manually by holding through left click on map and rotating in different directions. Automatic rotation of 3D image can be made by right click on the map. This opens window encircled above. Clicking on "Orbit around here" rotates the 3-D map automatically.

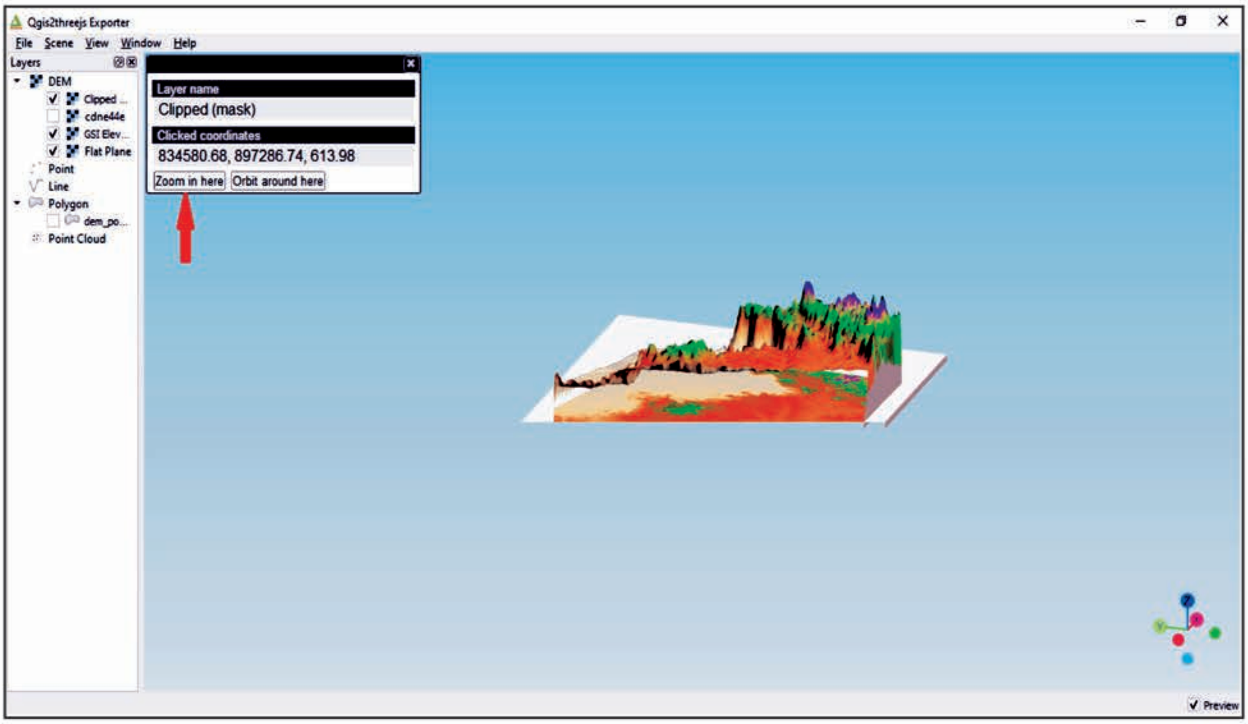


Fig.10(f) The zoomed image of the 3D map depicting elevation of land features with respect to flat plane.

Keywords

Co-ordinate Reference System(CRS) :- 3-D surface is projected in 2-D.The system is used to locate geographical entity,this can be local,regional or global.

Raster :- It is row & column of cells. Each cell contains value and information.
E.g. satellite imagery, digitized toposheets etc.

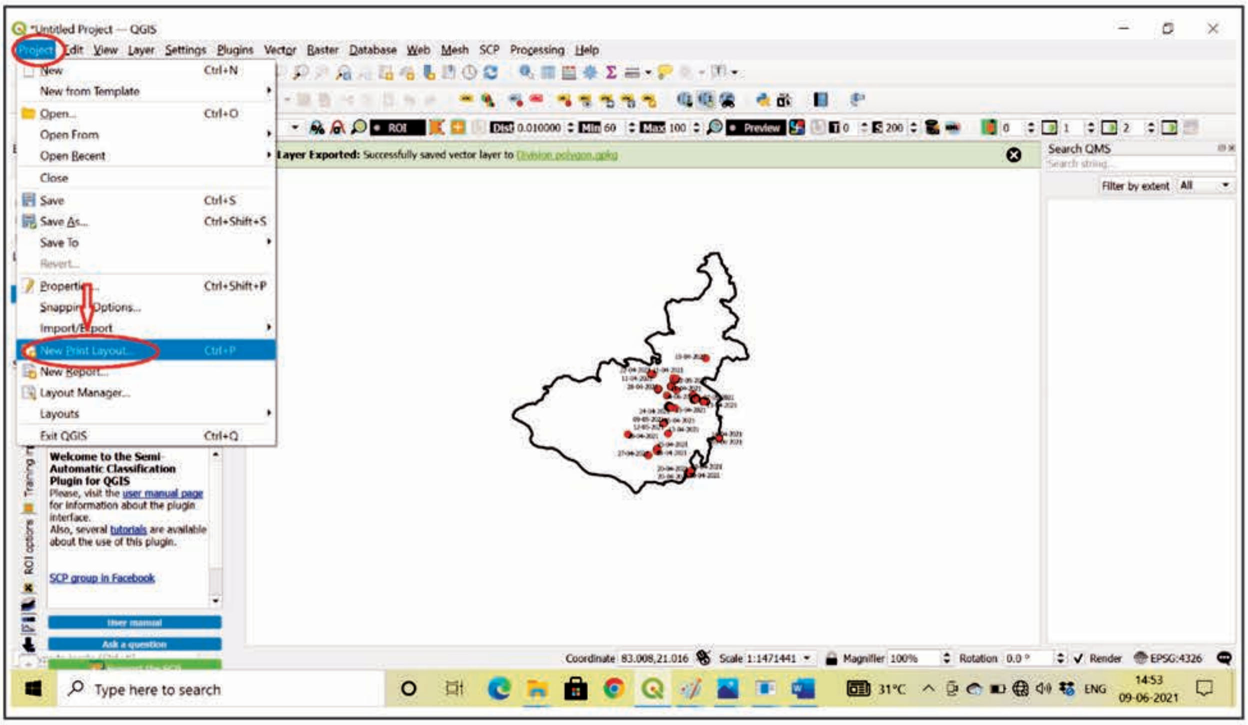
DEM :- It is Raster image. Each pixel in the DEM refers to the surface elevation.
It is again sub-divided into Digital Terrain Model(DTM) and Digital Surface Model(DSM).

21.Steps for Composing map in Q-GIS

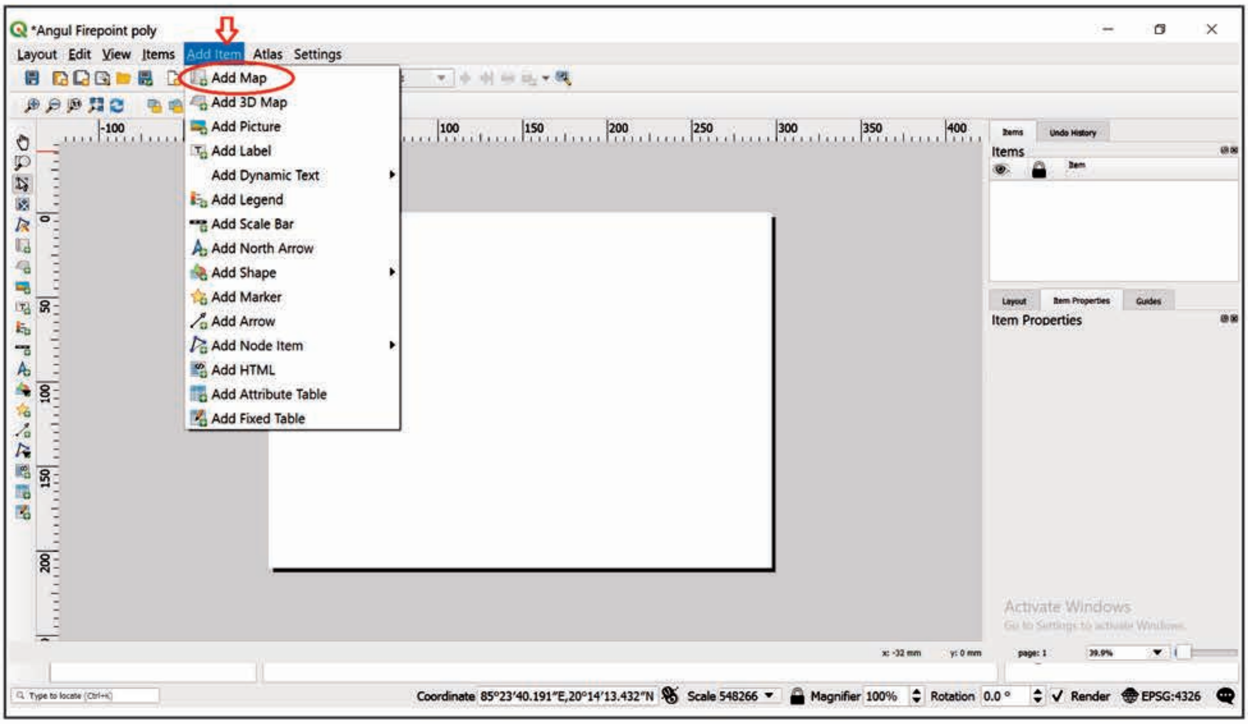
Composing map is utmost important for any forest planning. This exercise exclusively deals about the steps involved in composing the map using print composer option in QGIS.

1. Go to Project and click New Print Layout
2. Go to Layout and Select Export as PDF
3. Add Labels
4. Go to Item Properties and select Grids, CRS, co-ordinates, frame.
5. Click on Add Map.

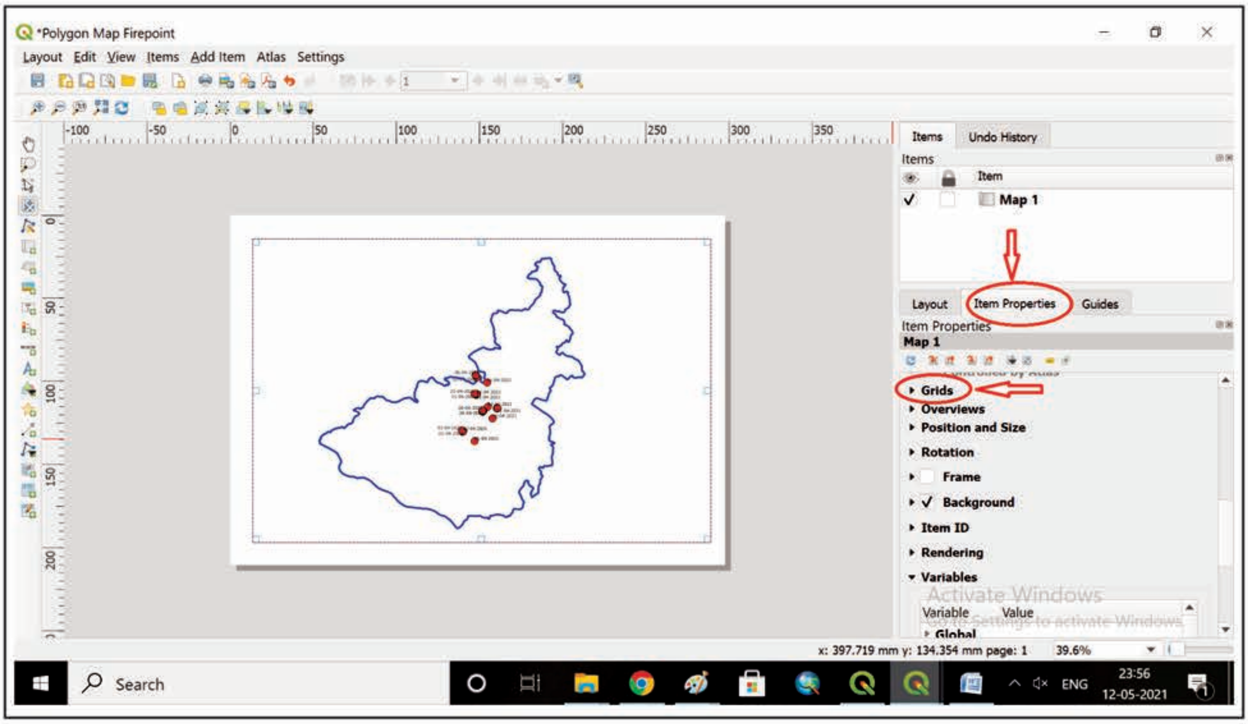
Step 1. After export of Fire Point data of a particular division on Division polygon; go to Project and click New Print Layout.



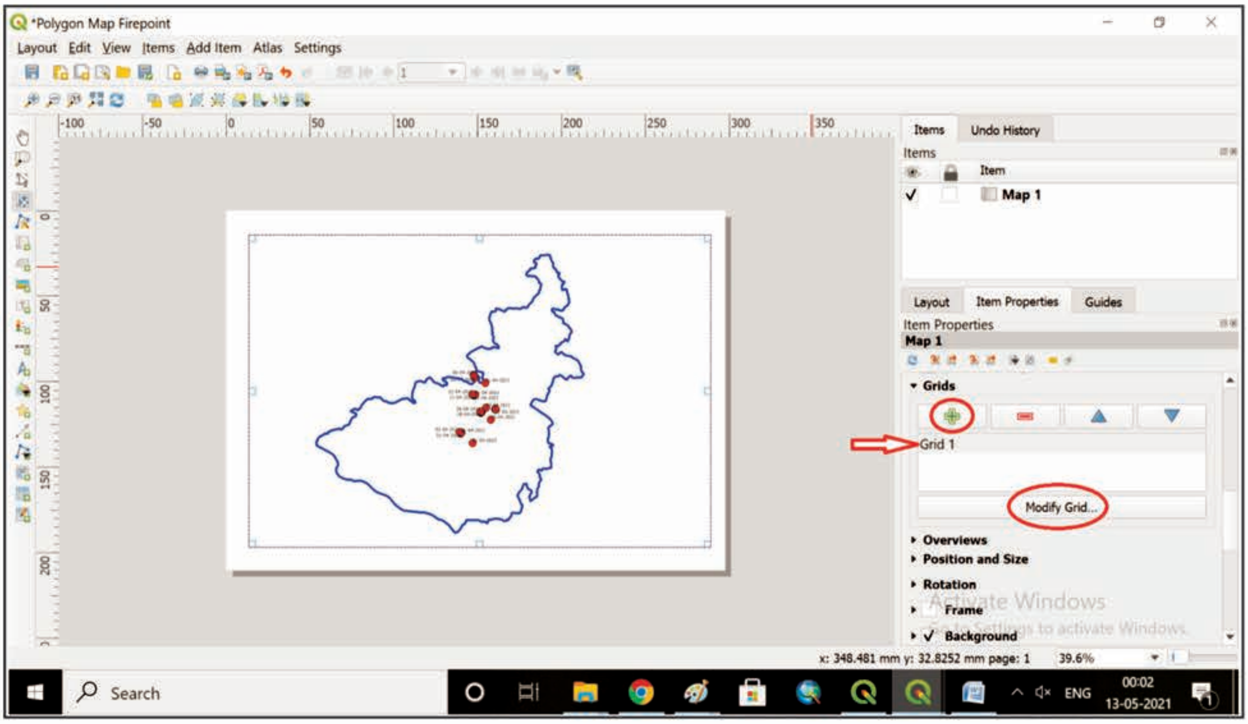
Step 2. A new window will open. Select Add Item and click Add Map.



Step 3. Polygon with Fire points will be added. Go to Item Properties and click on Grids.

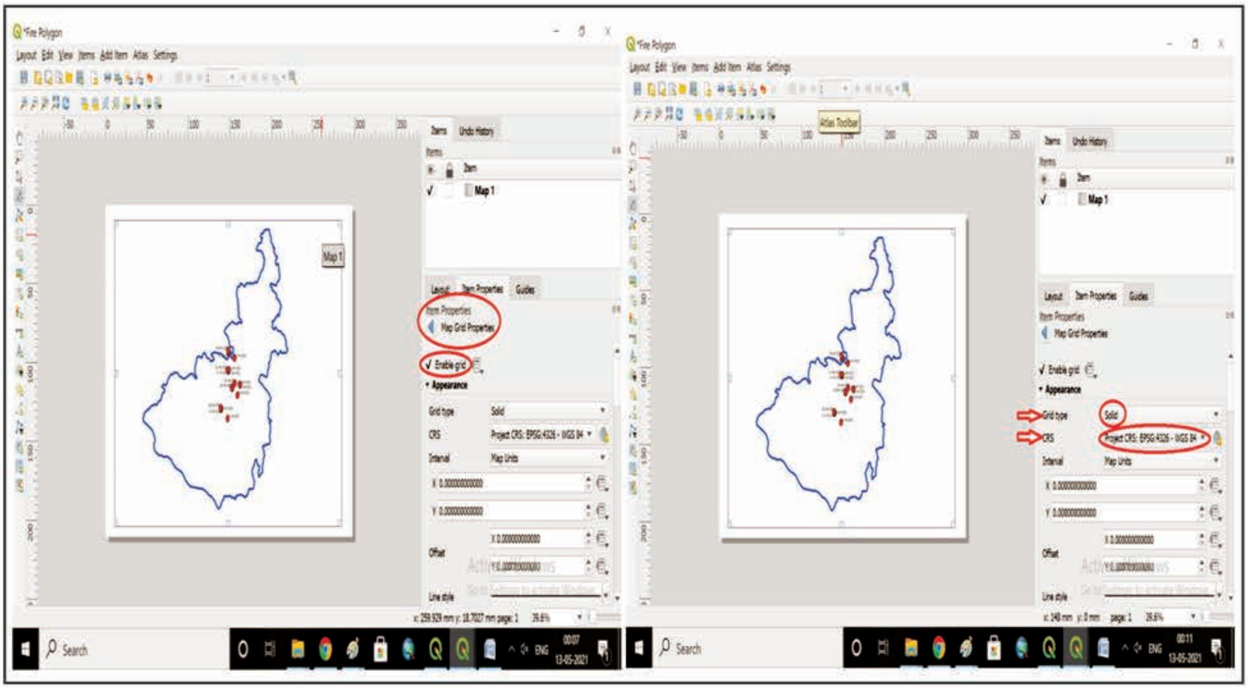


Step 4. In Grids, click on +; a new bar Grid 1 will appear. Select it and click on Modify Grid.

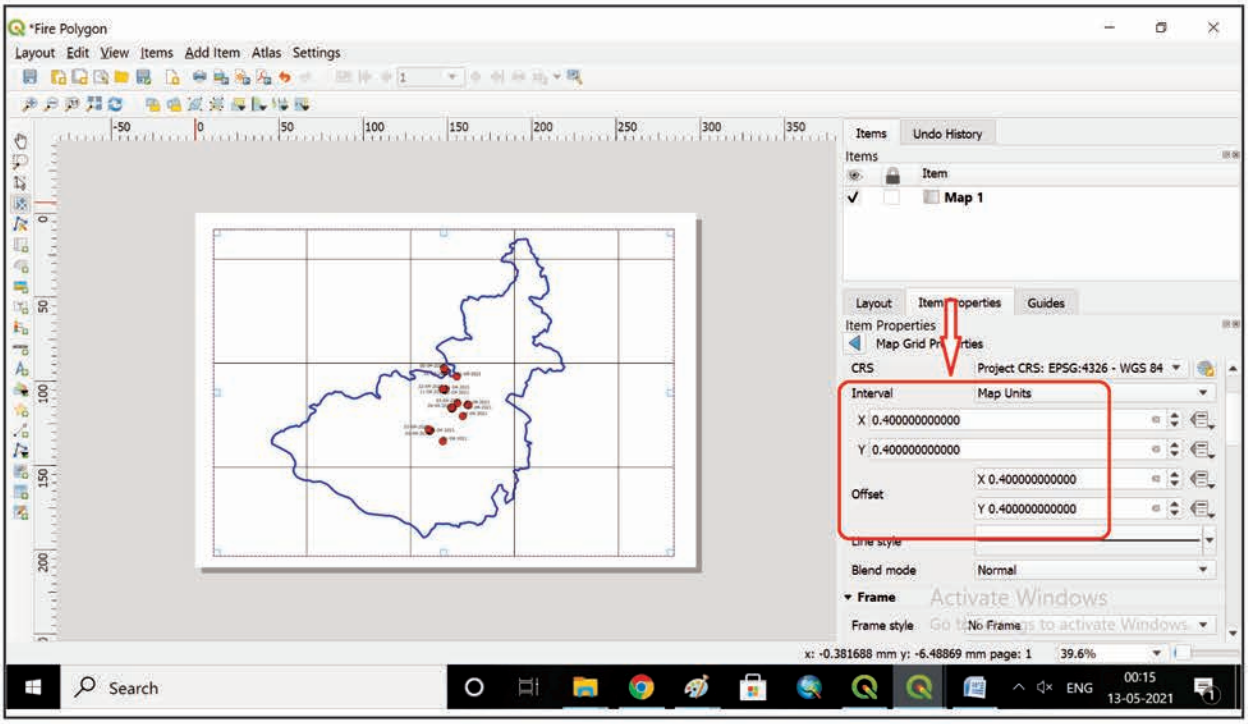


Step 5. Scroll down.

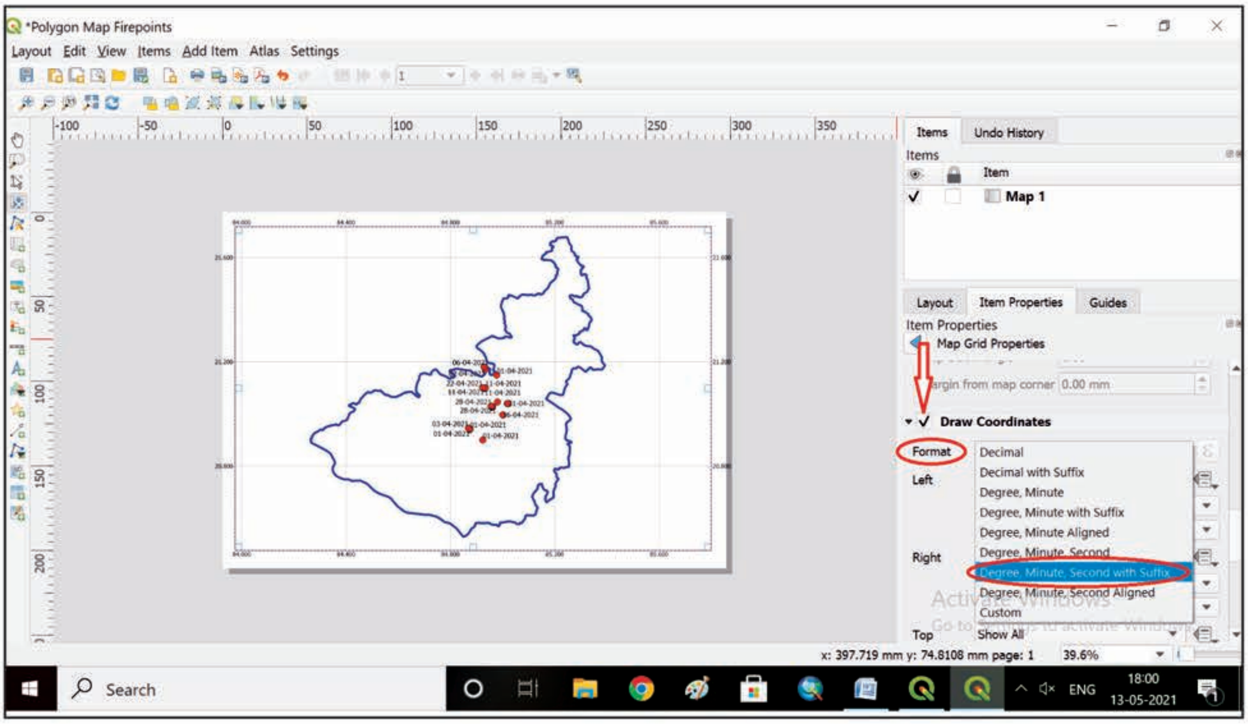
Item Properties >> Enable Grid >> Grid Type as Solid >> CRS as Project CRS: EPSG:4326 – WGS 84.



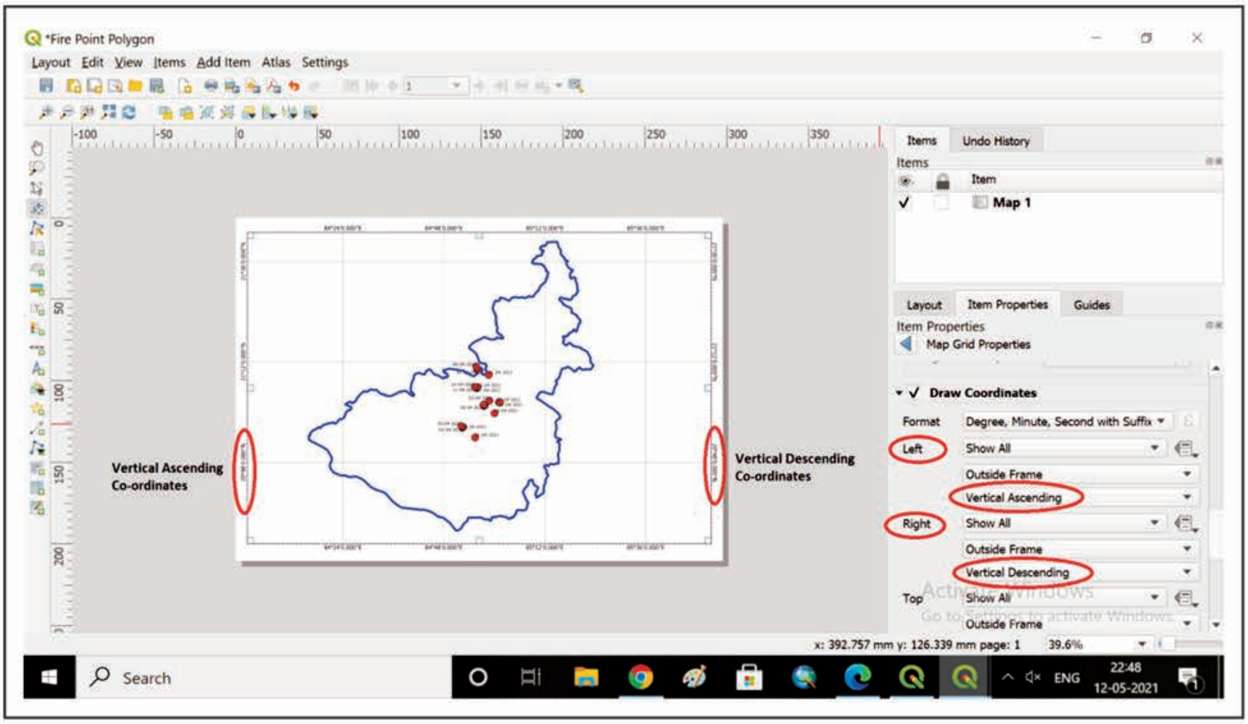
Step 6. Grids will appear on the Polygon.
Interval as Map Units >> appropriate value of X, Y of Interval and Offset considering the desirable grids on polygon map.



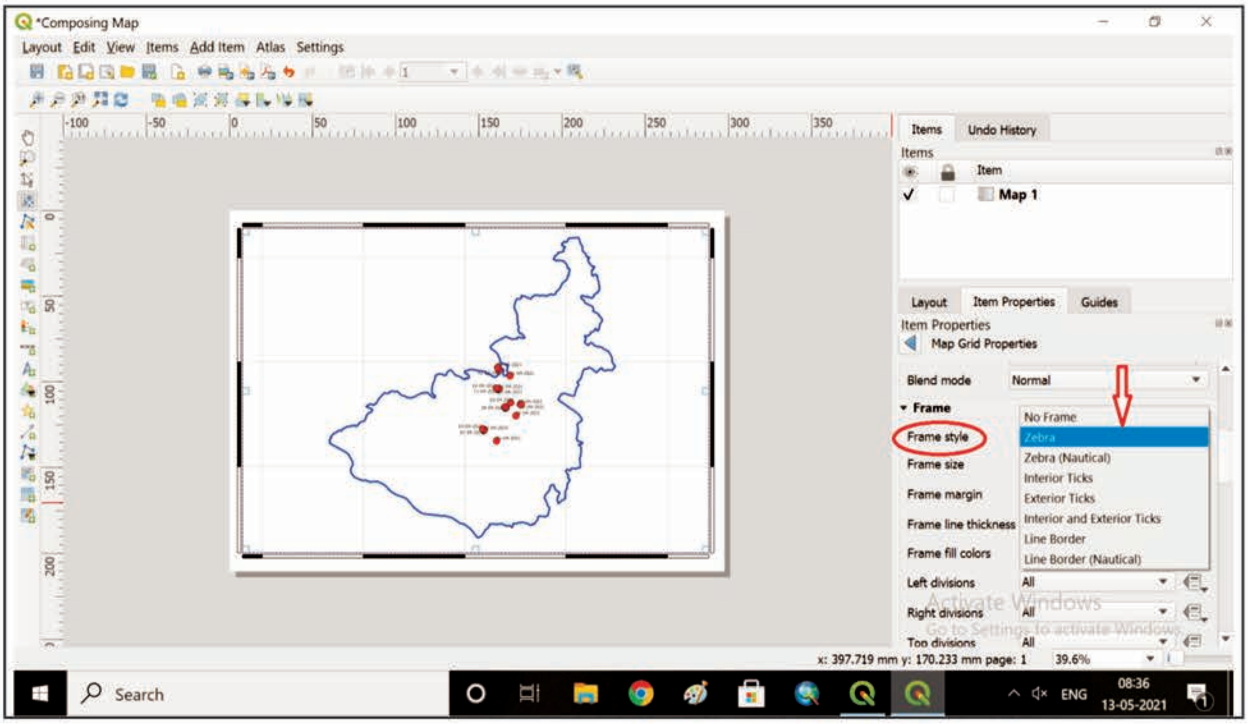
Step 7. Scroll down to Draw Co-ordinates. Mark it.
Select Format as Degree, Minute, Second with Suffix.



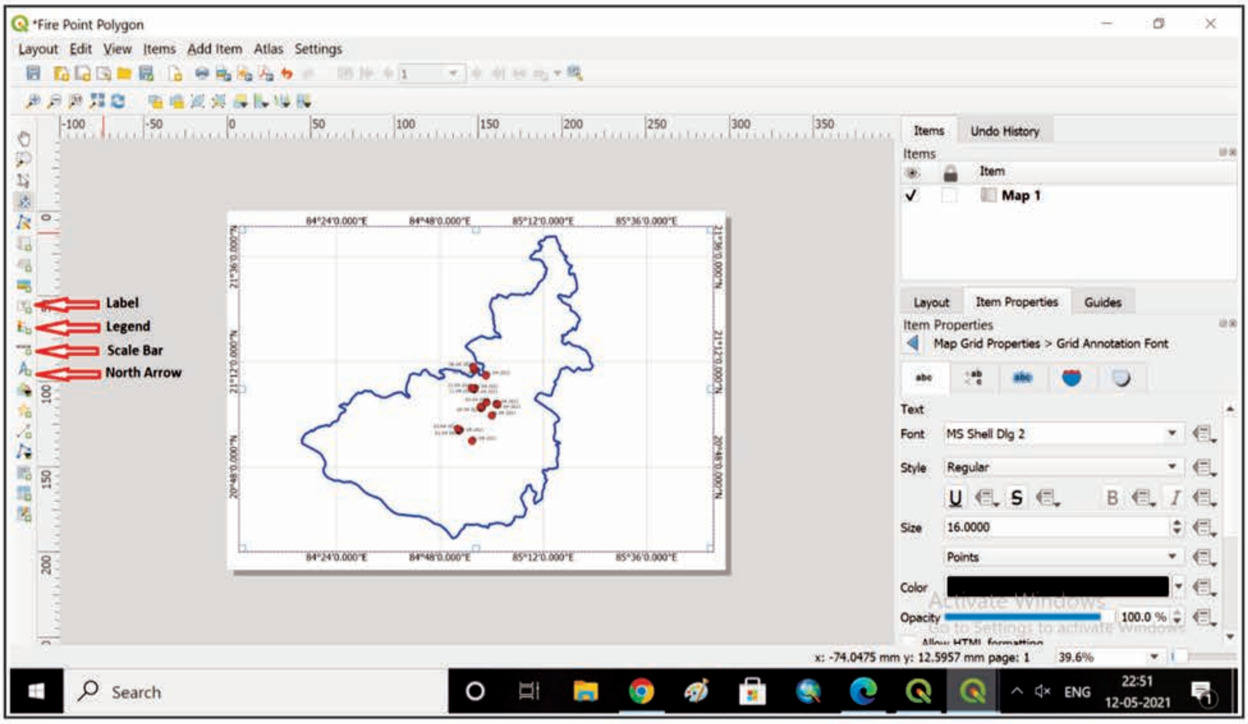
·Select Vertical Ascending in Left.
·Select Vertical Descending in Right.

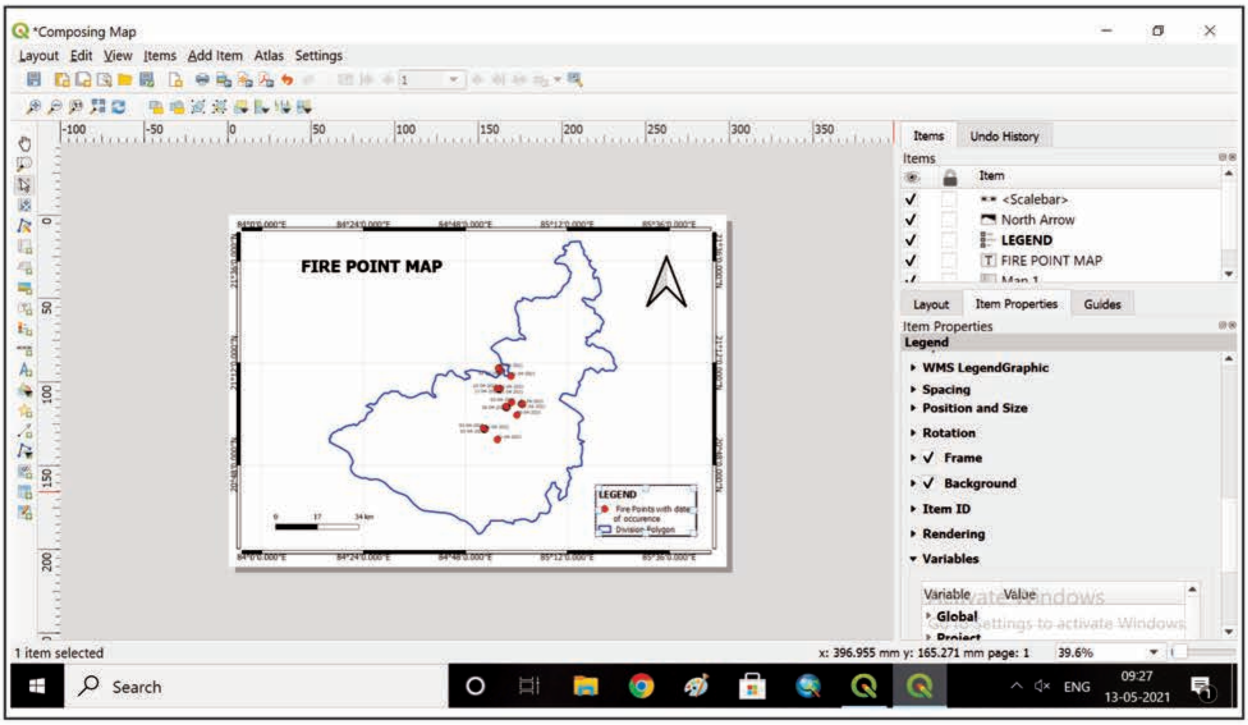


·Change the Frame by clicking on Frame Style. A drop down arrow will appear, click it and select any style. eg.,Zebra.

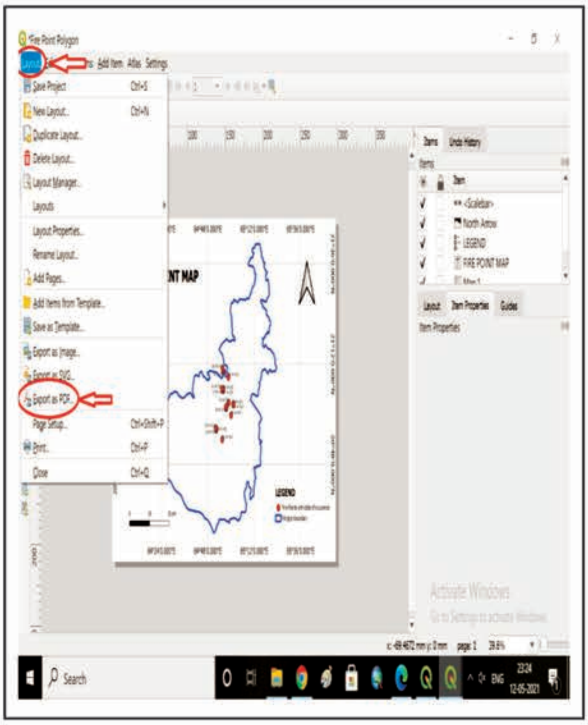


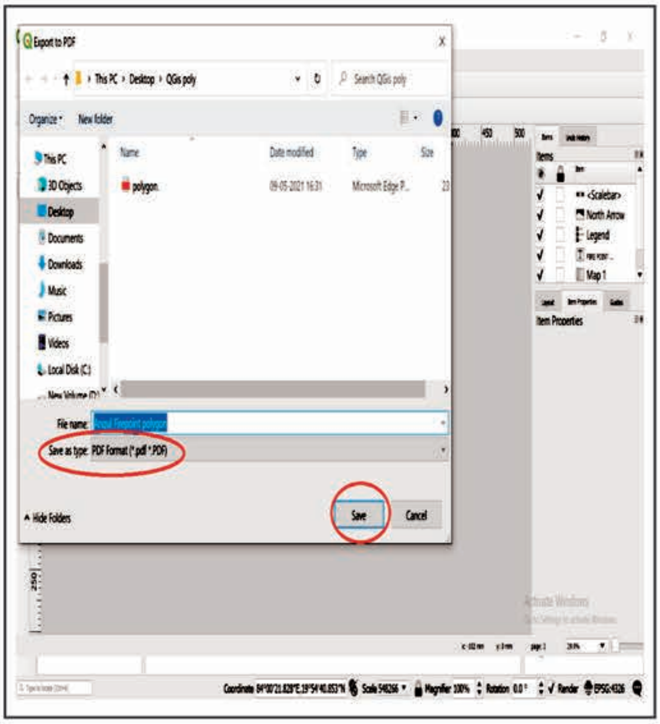
Step 8. In the Tool Box, click the indicated icons to insert Label, Legend, Scale Bar and North Arrow respectively in the grid map.



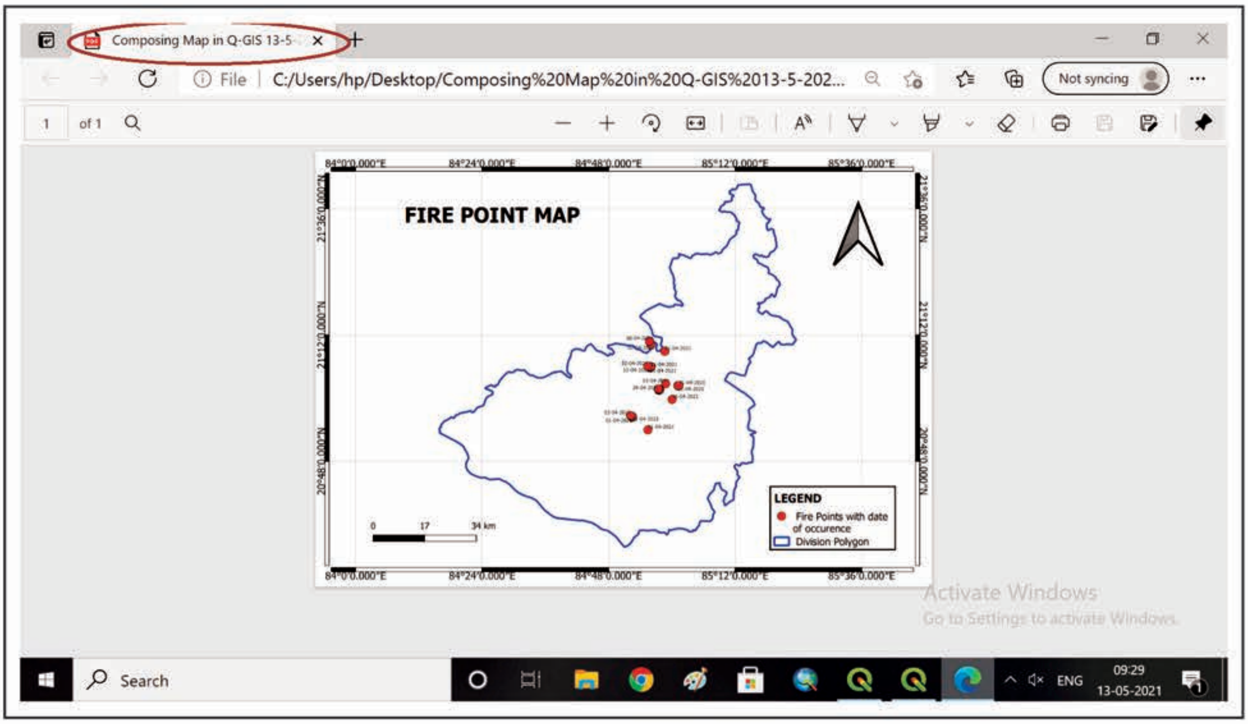


Step 9. Go to Layout and Select Export as PDF.
Save the File type in PDF Format



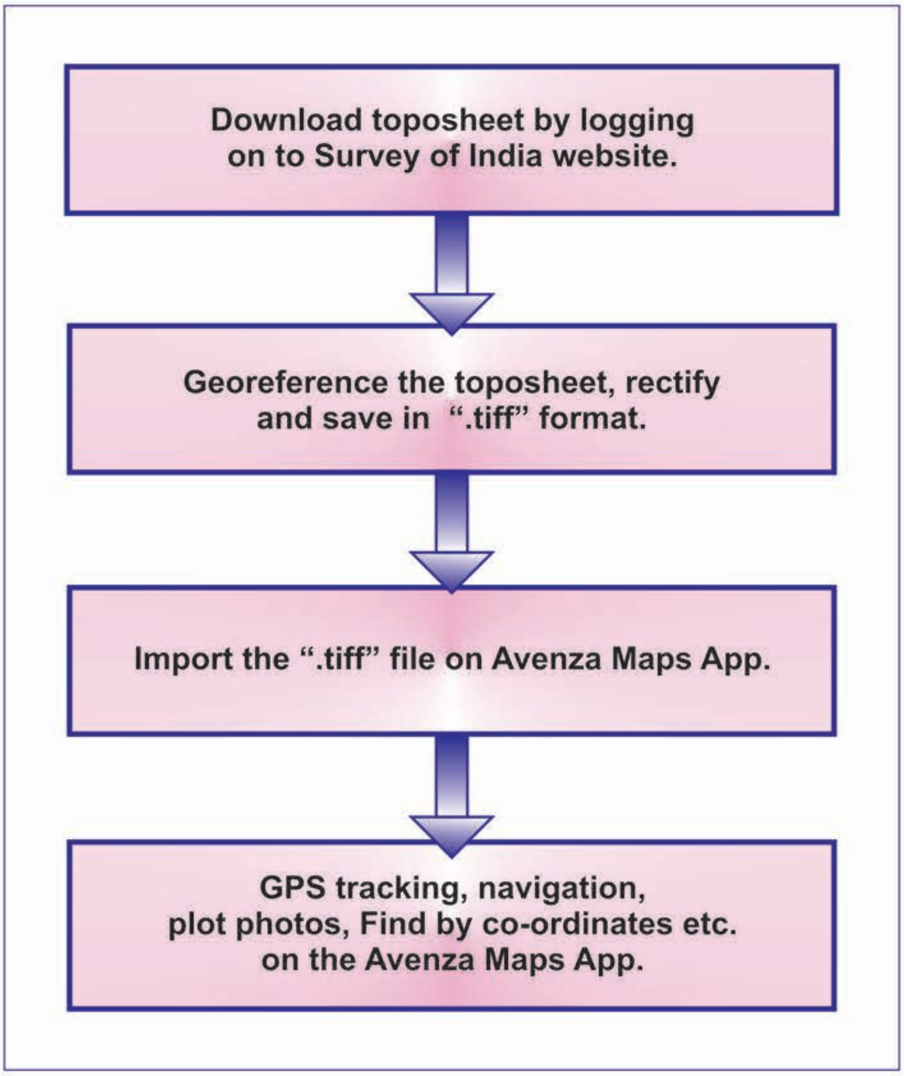


* PDF File will appear like this.



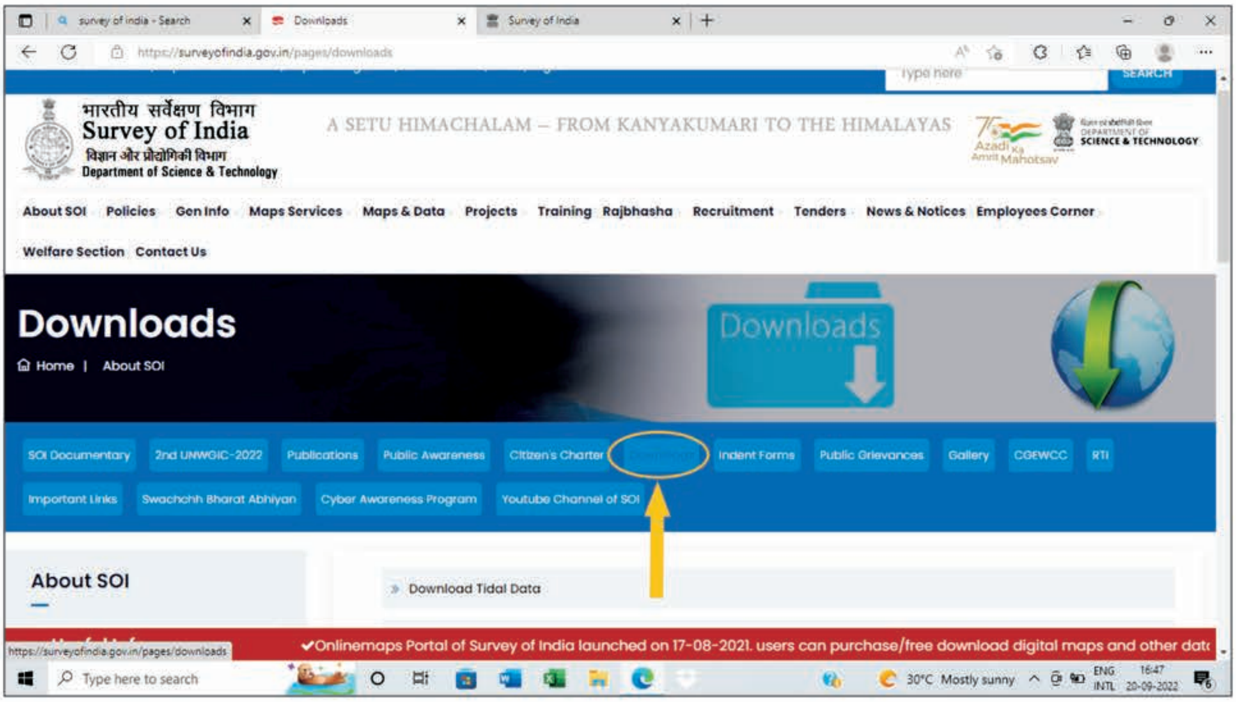
22. Downloading Toposheet from Survey of India, Geo-referencing it and exporting on Avenza app

Avenza is an Open Source Software available in both Android and i-OS platform that is used for various purposes. It can be used for forest assessment. It is an offline App. By using GPS technology, it helps in recording tracks, and also choose position on pre-loaded base map. One can add the topo map or find position on any available pre-loaded base map. Thus it helps to identify present position and save the point data and track in addition.

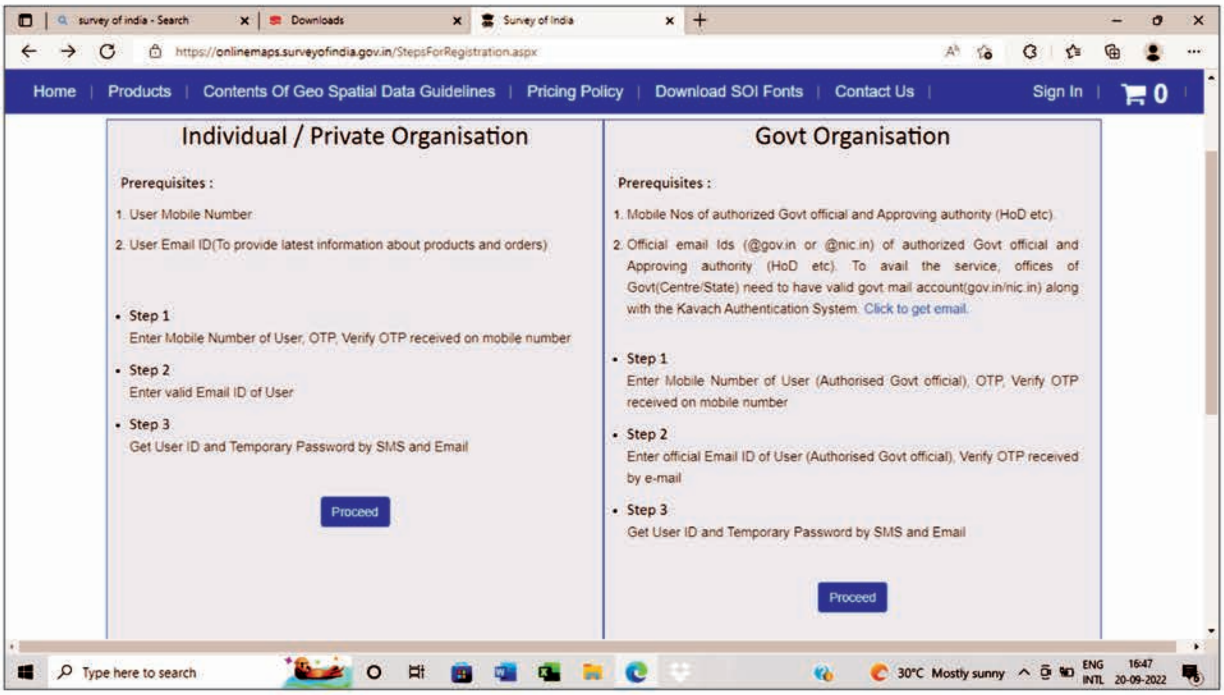


ØSteps involved :-

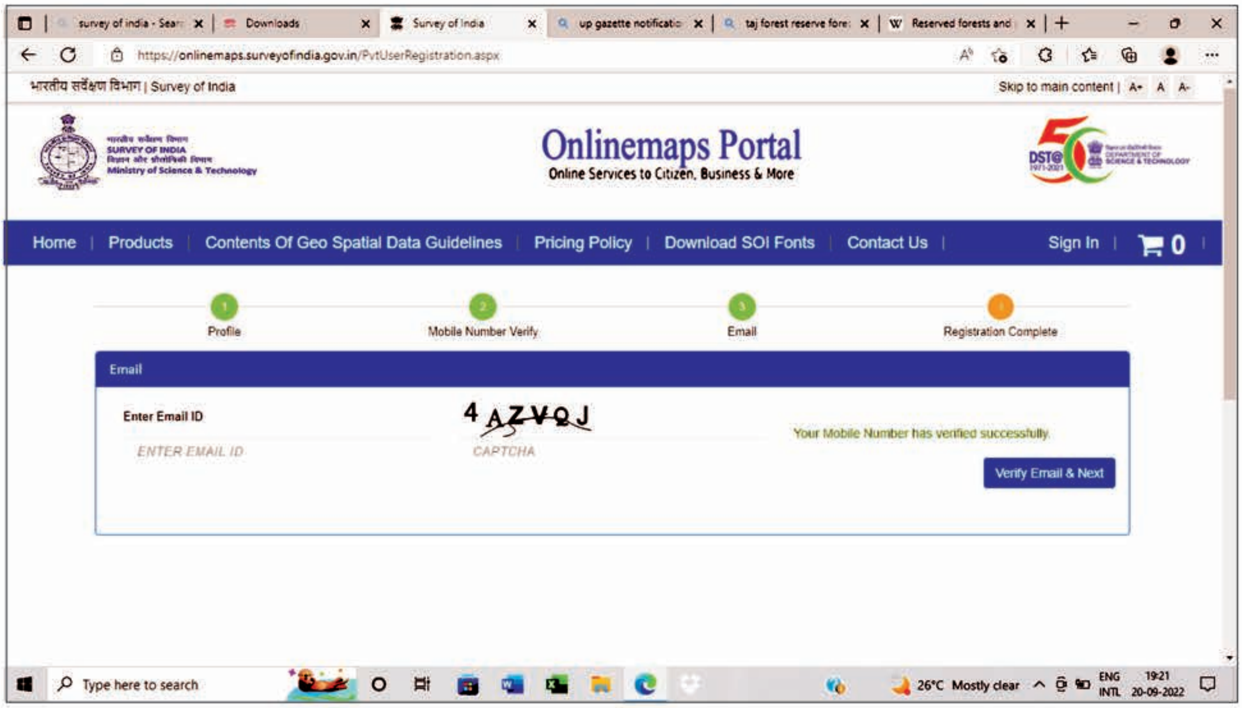
Step 1 :- Login to surveyofindia.gov.in and click on “Downloads”.



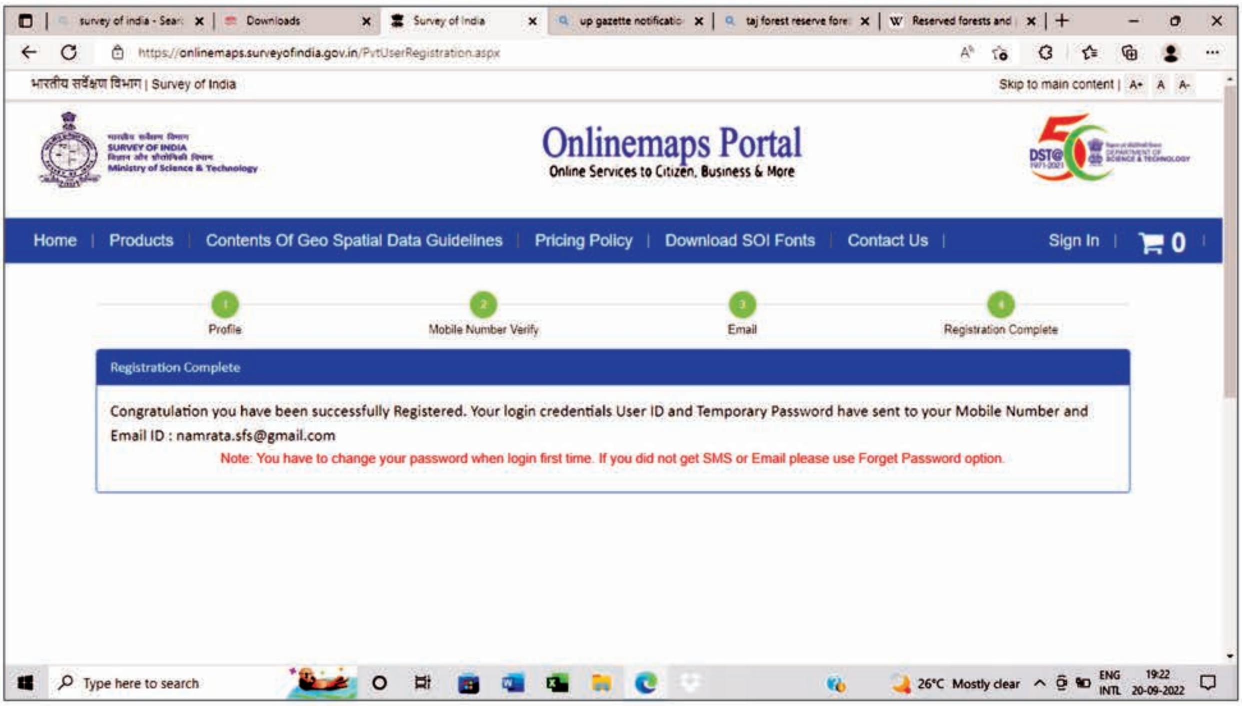
Step 2 :- Proceed as “Individual/Private Organisation” if not having registered Government employee mail id with extension gov.in or nic.in



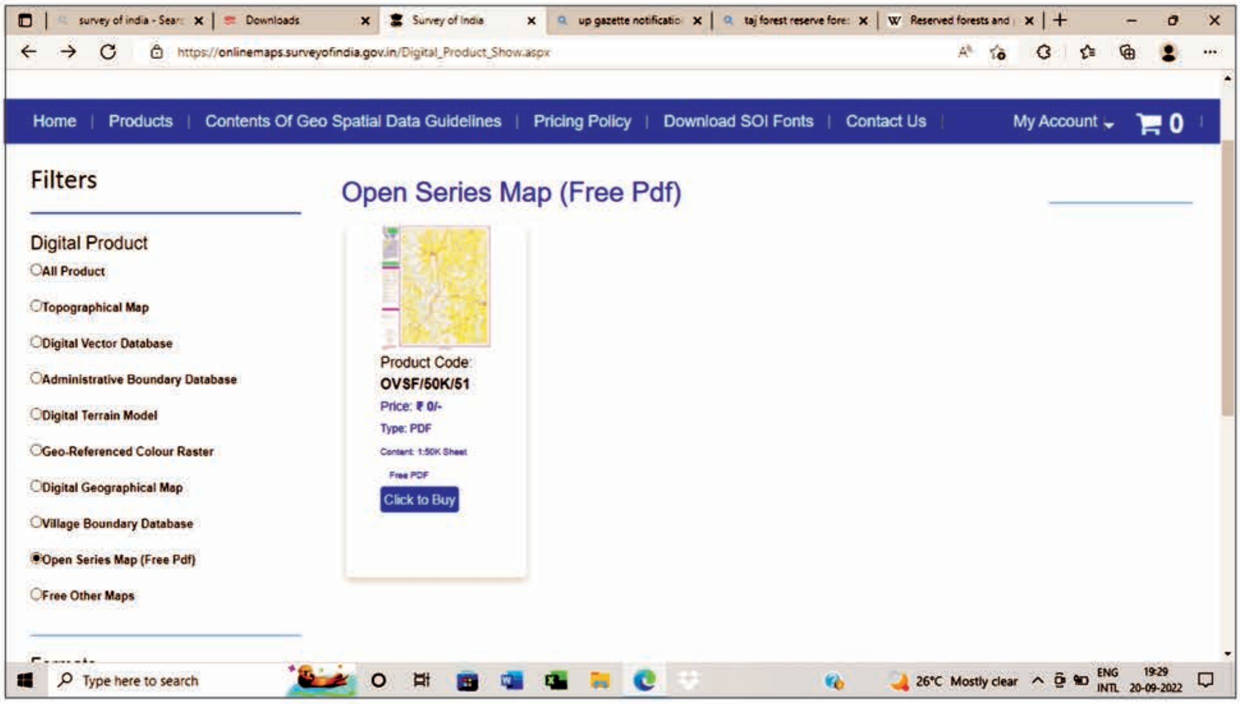
Step 3 :- Enter Name and mobile number and after entering OTP received on mobile number,verify the mobile number.



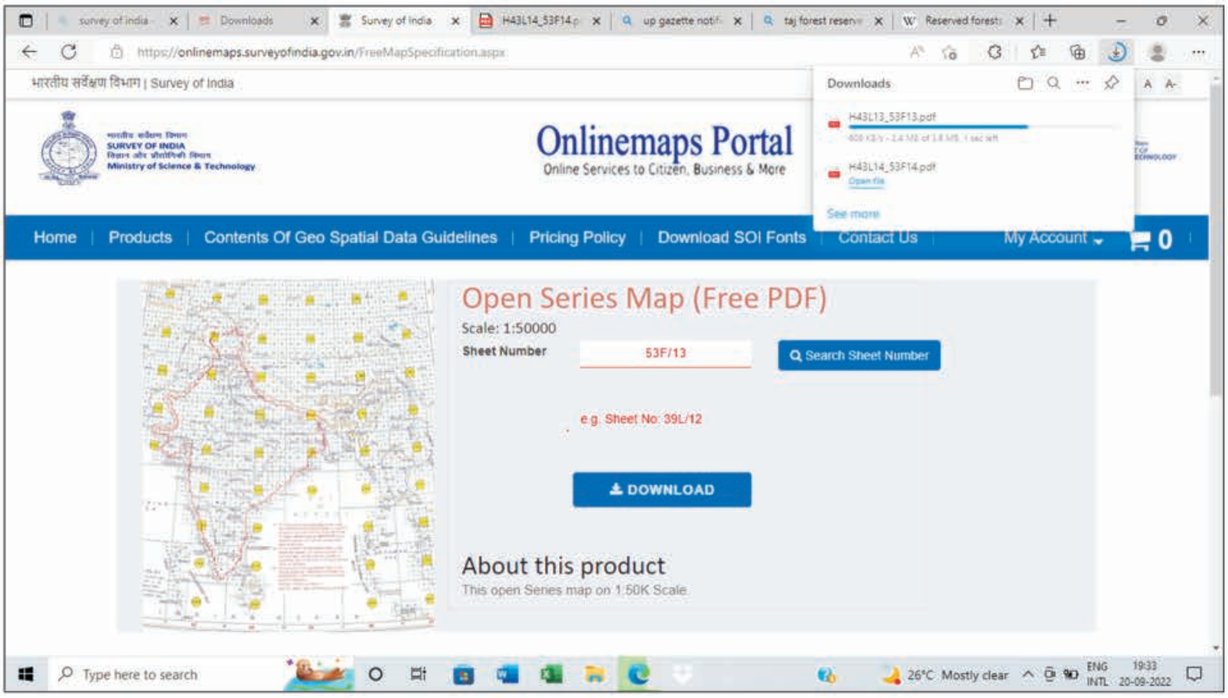
Step 4 :- Click on "Verify and email",get registered on the SOI site and reset the password.



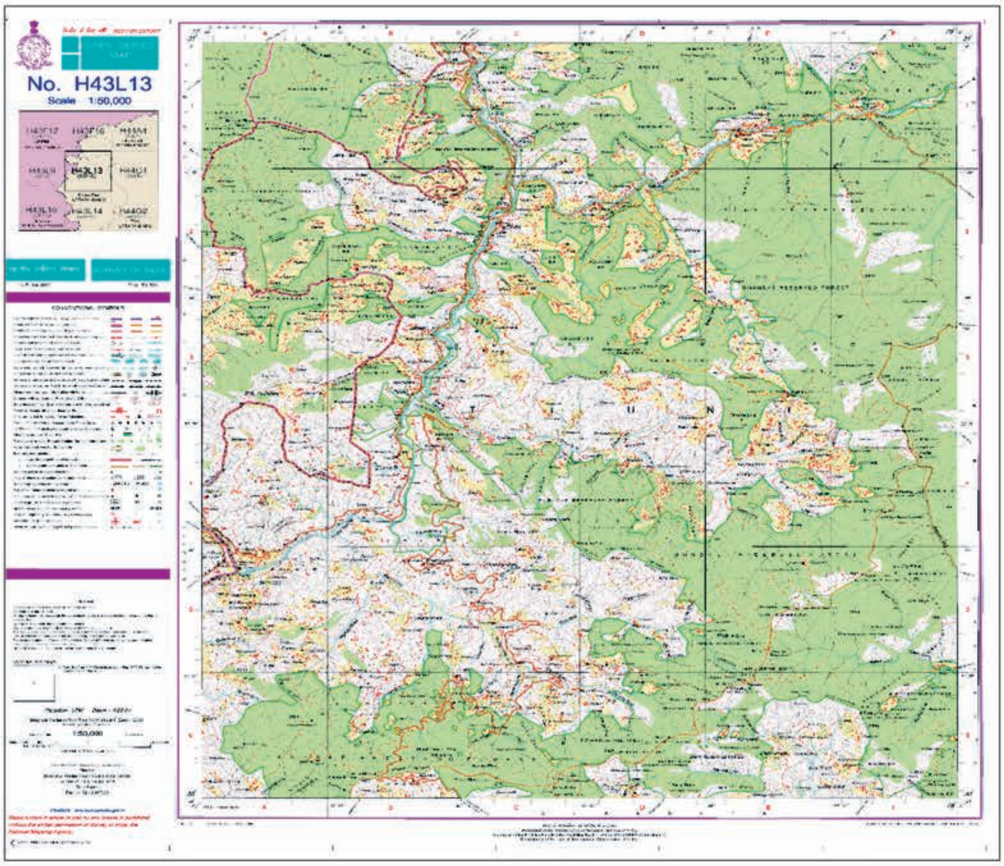
Step 5 :- Login to the SOI website with changed password and download the Open Series map of the desired location.



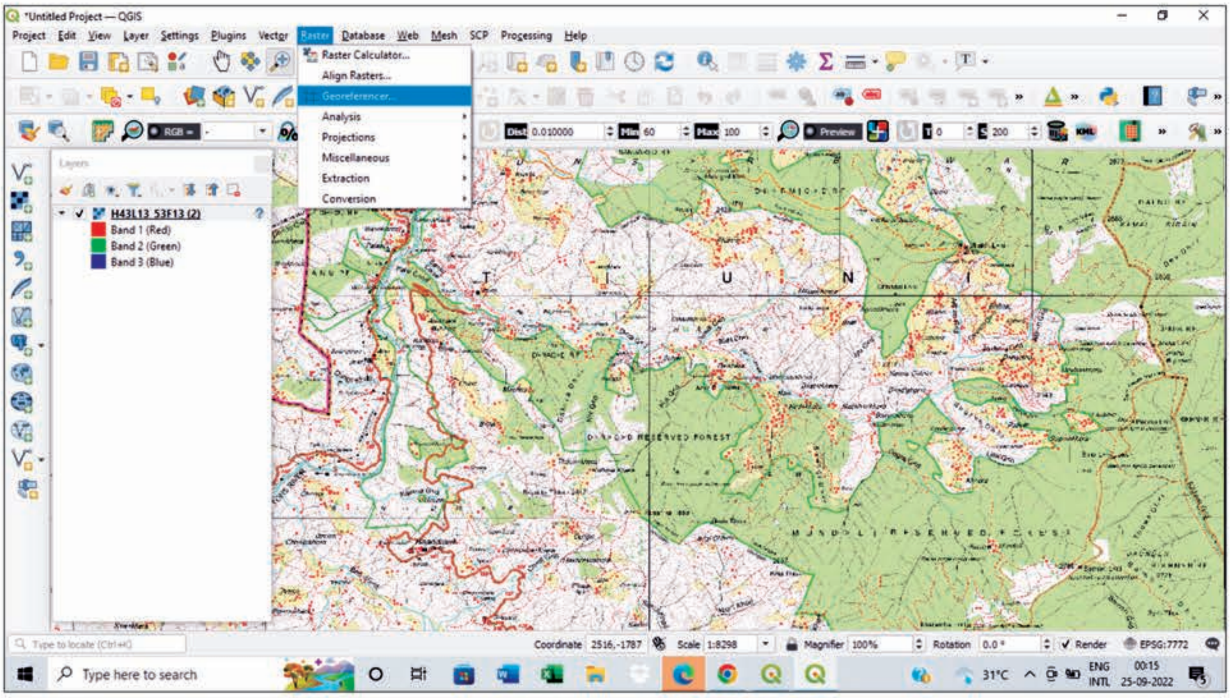
Step 6 :- Enter the desired sheet number and download it.



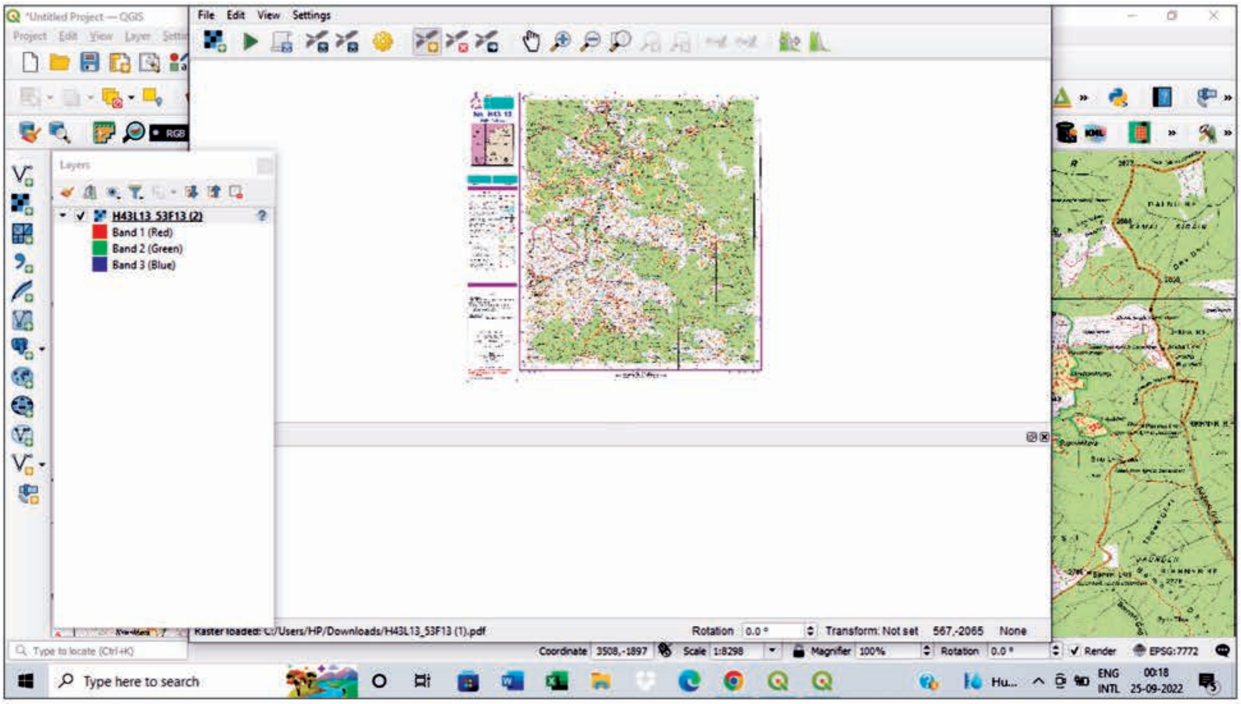
Step 7:- The downloaded toposheet (here Toposheet no. H43L13 for Chakrata division has been downloaded).



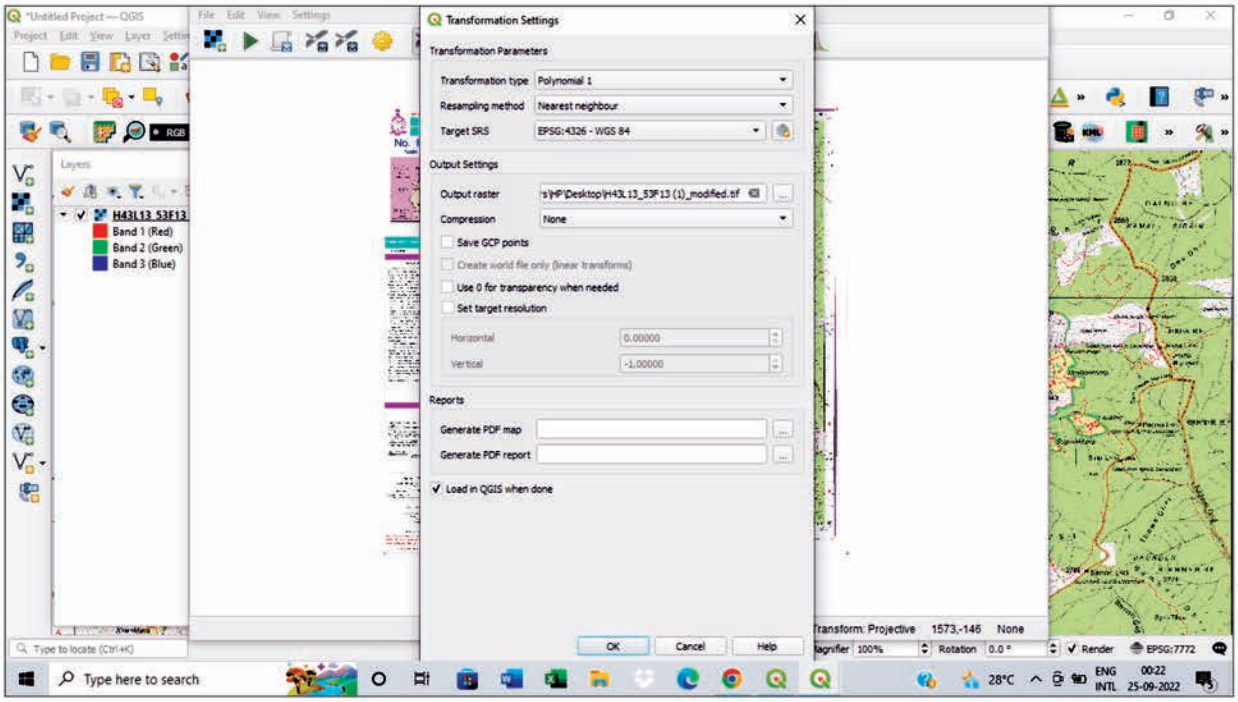
Step 8:- For geo-referencing the downloaded toposheet, add it on Q-GiS; Go to "Raster >>Georeferncing



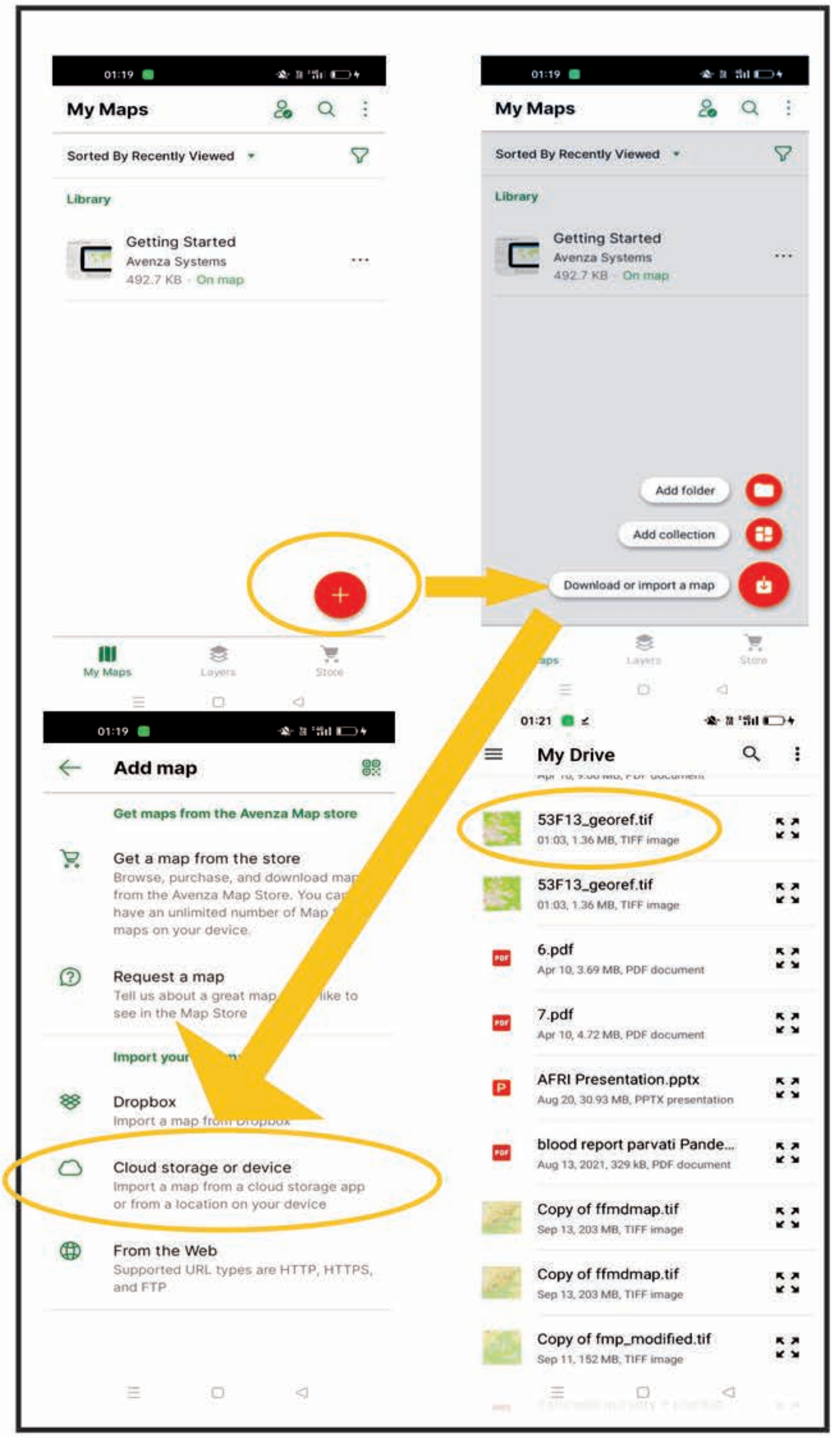
Step 9 :- Add Ground Control Points.



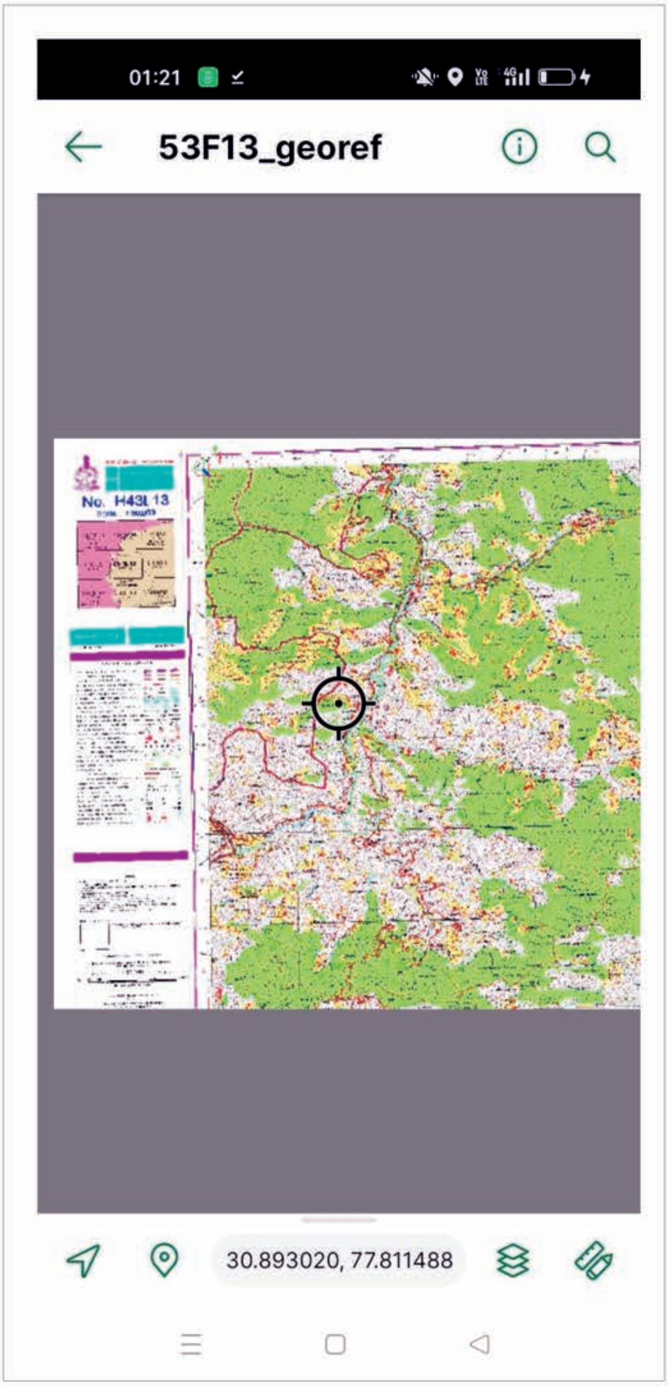
Step 10 :- Set the transformation settings to “Transformation type as Polynomial 1”,”Target PRS as EPSG 4326:WGS84” and start “geo-referencing”. Rectify and save the geo-refernced file in”.tiff” format.



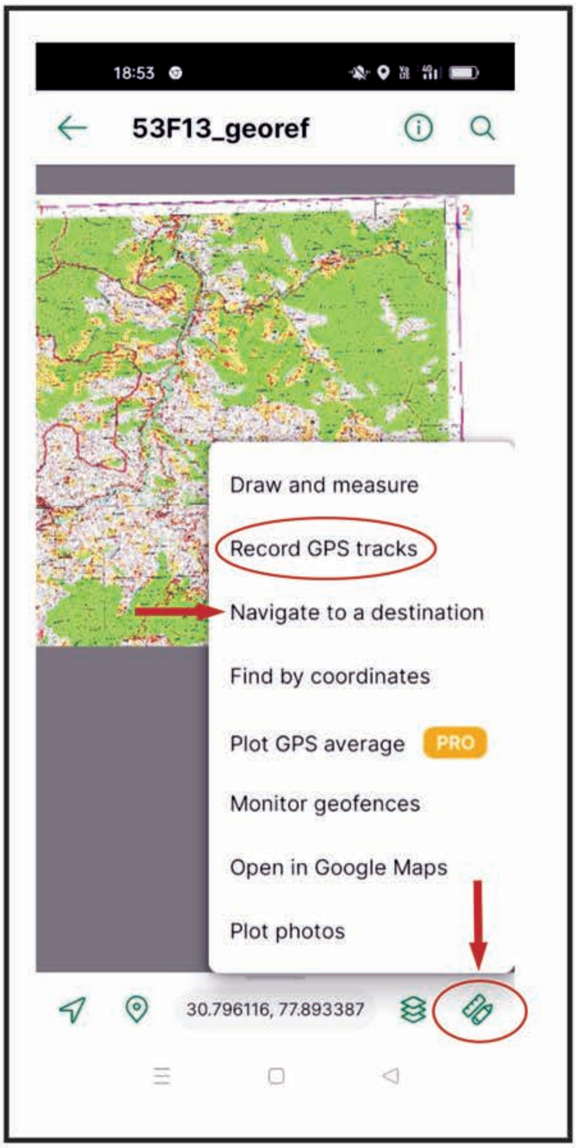
Step 11:- Download Avenza Maps App(works both on iOS and Android system) and "Download/import a map" from "cloud storage or device".

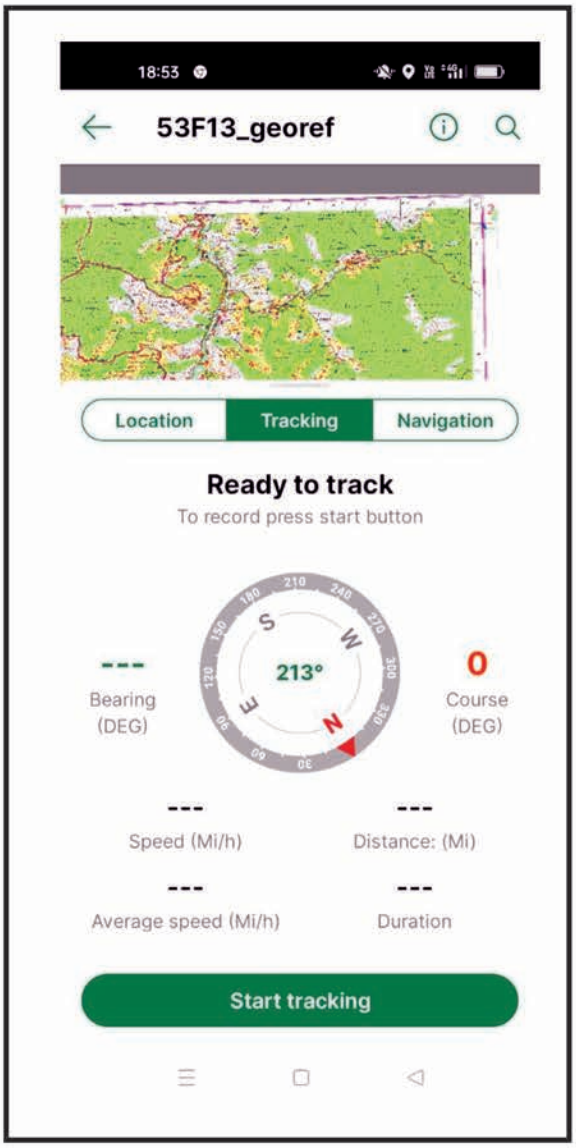


Step12:- After importing the map on Avenza,the screen appears as below,on which we can add significant locations while tracking.

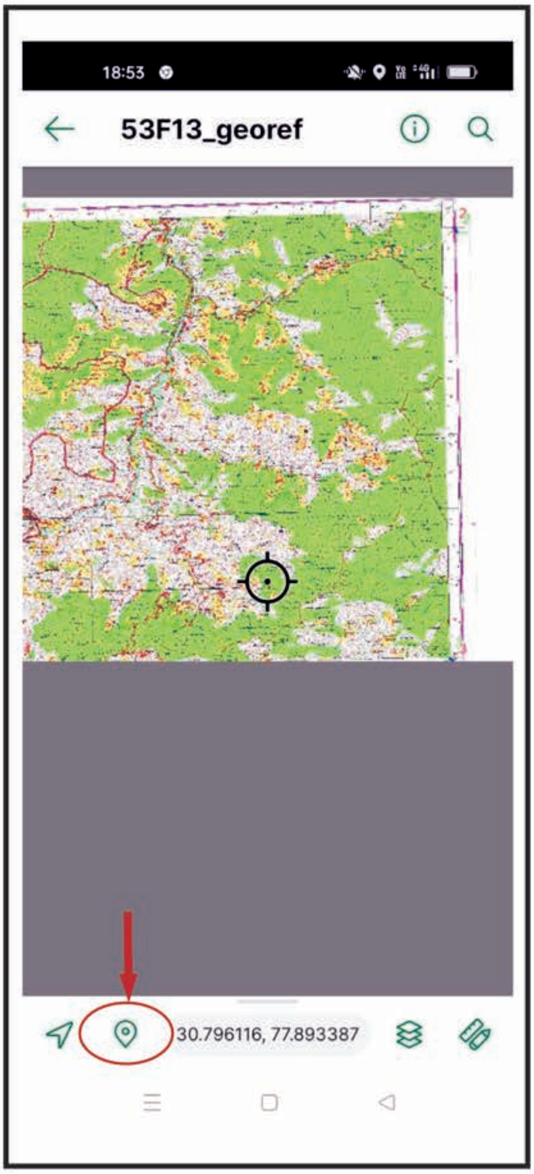


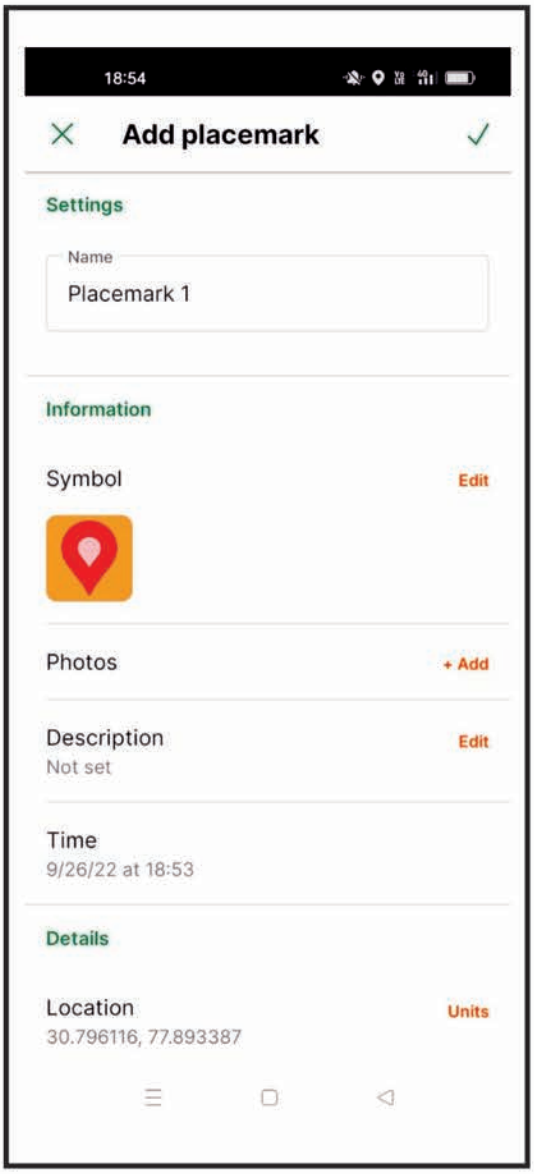
Step 13:- In the Avenza Maps App,we can track the GPS track and navigate to a destination.





Step 14:- We can add new points on the track with photographs.

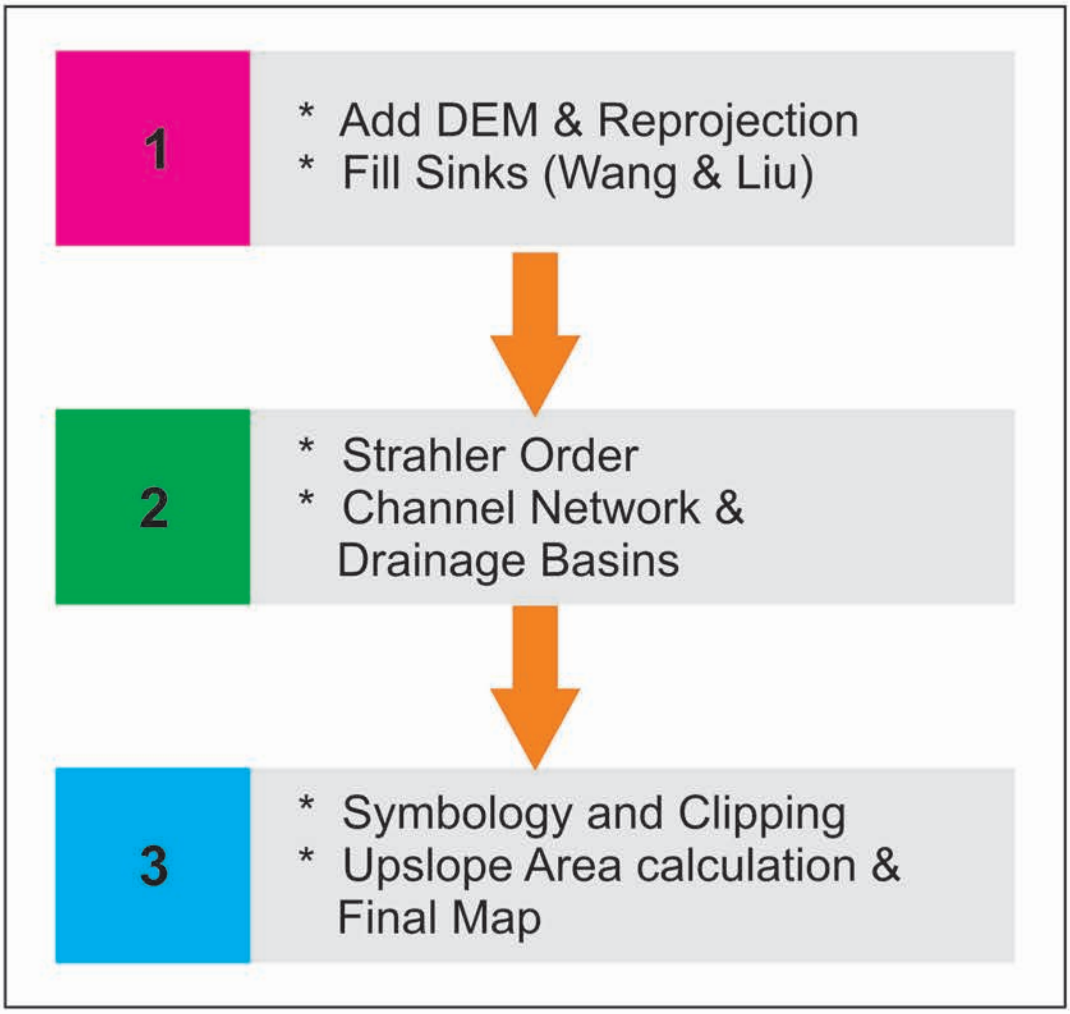




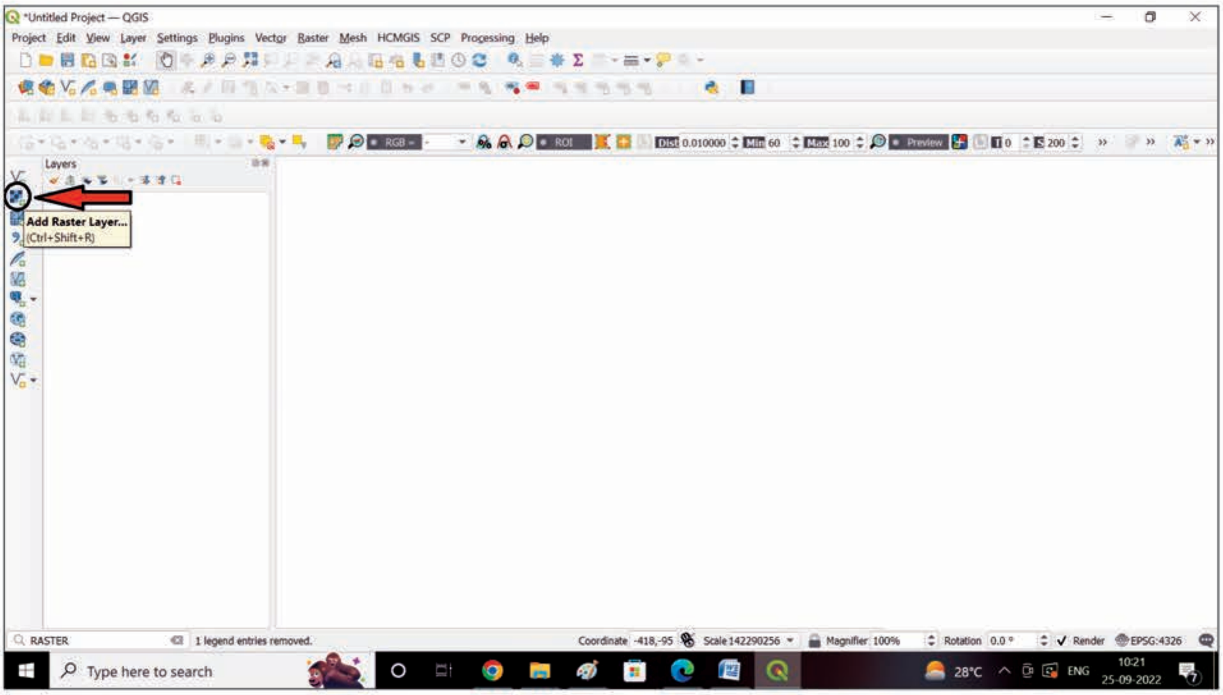
23. Watershed Delineation using QGIS

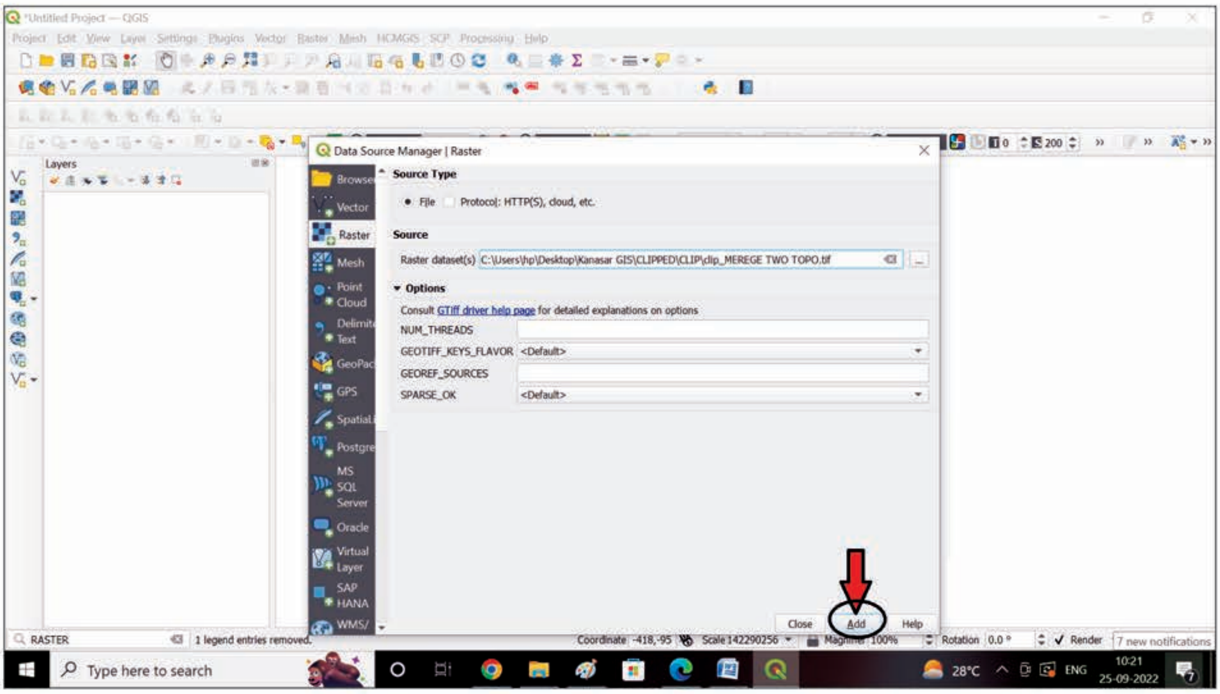
Watershed encompasses the forests and wetlands surrounding it, hence its management constitutes an important exercise in Forestry. Watershed delineation is first step in this direction. This exercise aims to delineate Watershed using satellite data and GIS and will be handy for foresters in fields like Working Plan exercise, Habitat Management, SMC works etc.

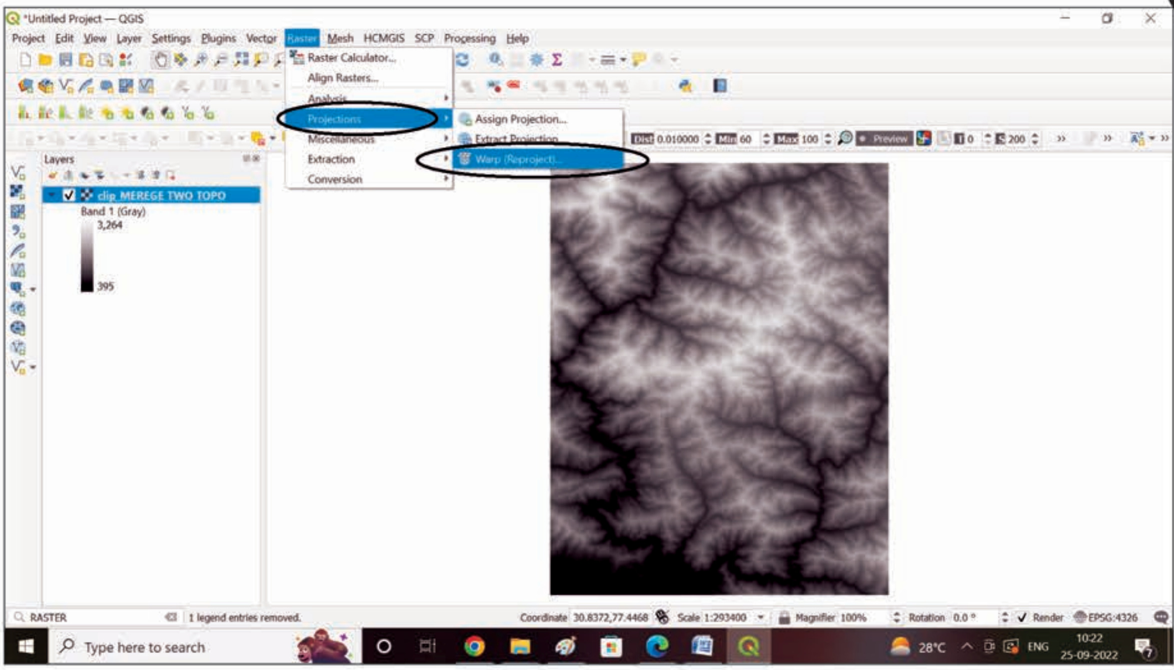
Flowchart of steps

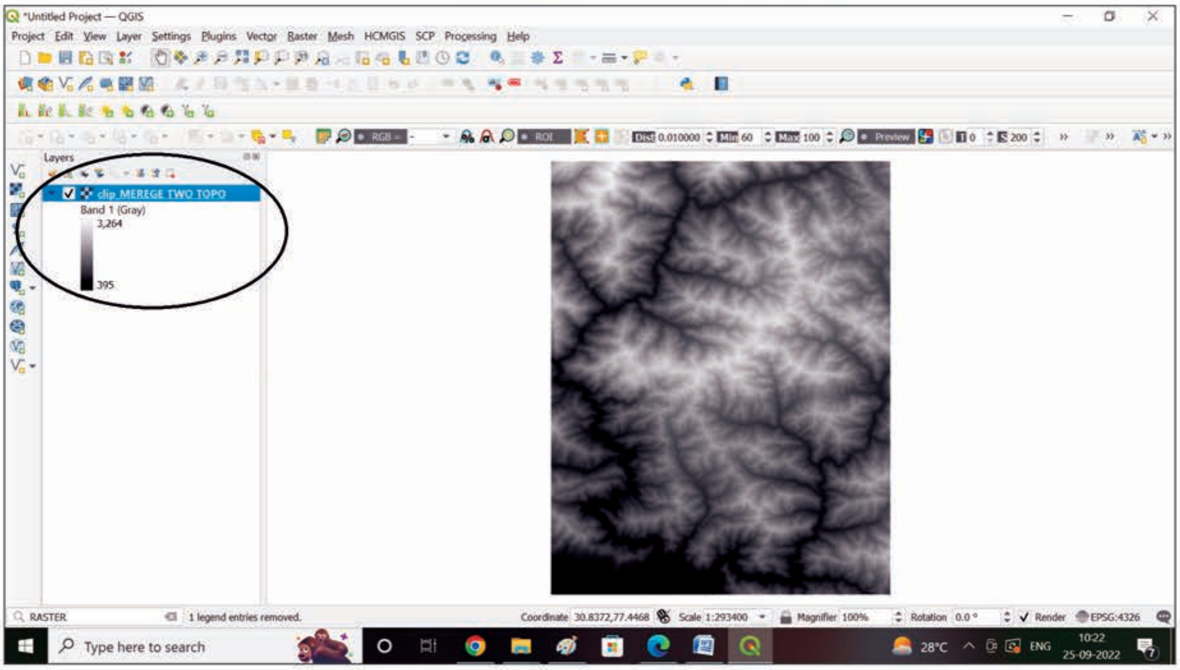


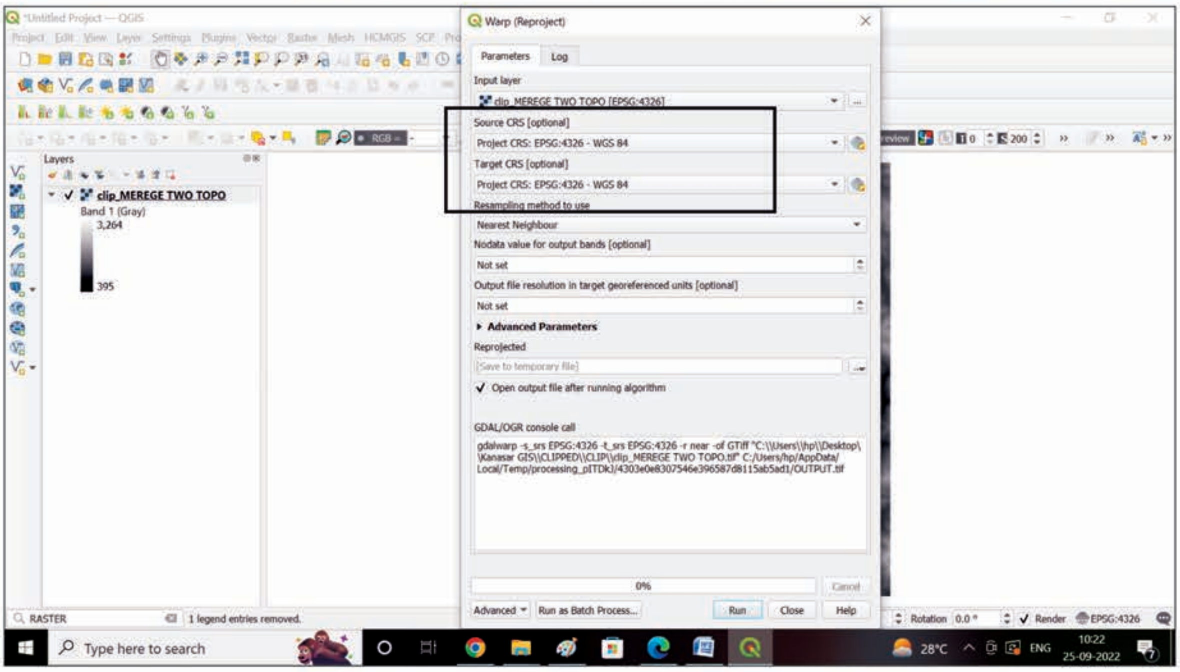
Step 1: Add DEM File as Raster and Reproject it using Wrap (Projection) tool in 'Raster' tab.



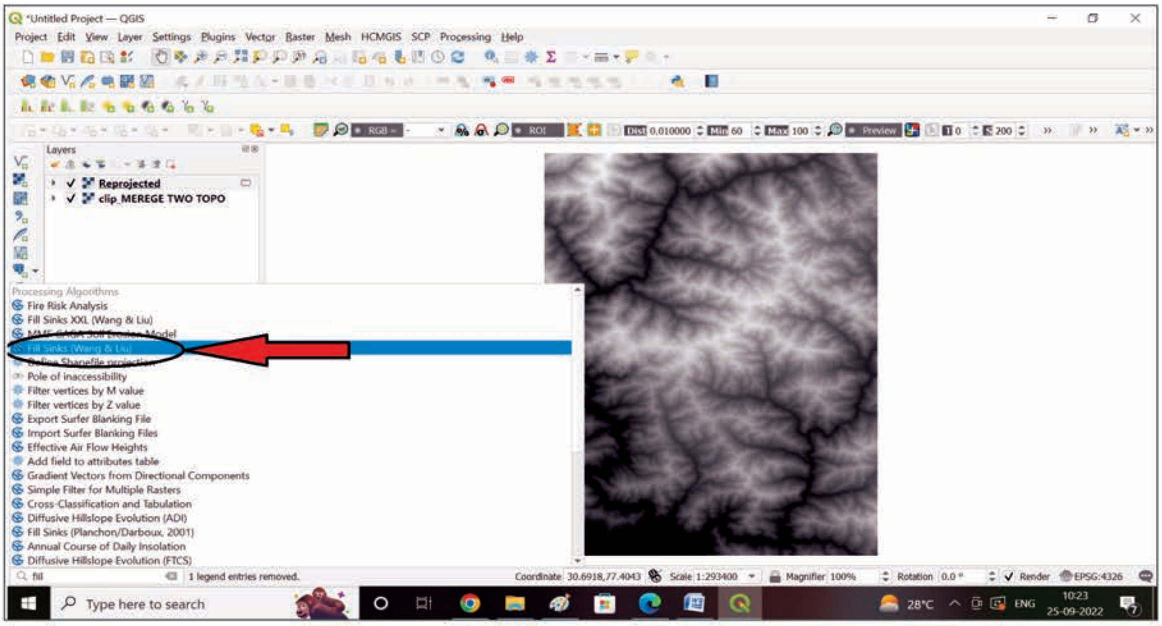


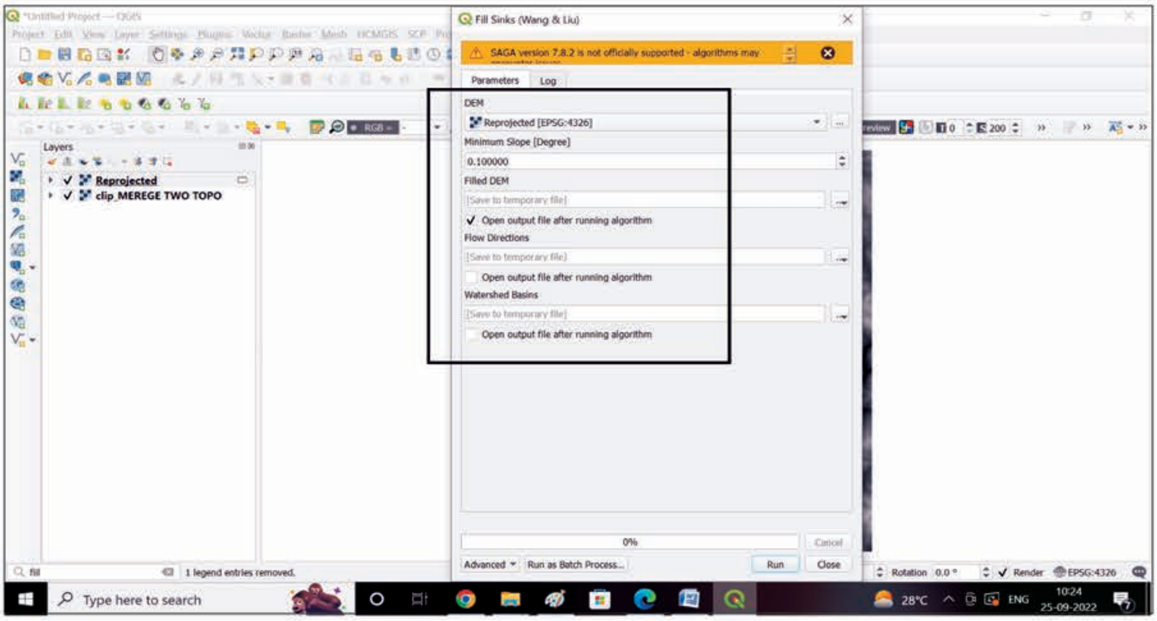

*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Mesh HCMGIS SCP Processing Help
Raster Calculator...
Align Rasters...
Analysis
Projections
Miscellaneous
Extraction
Conversion
Assign Projection...
Extract Projection
Warp (Reproject)...
Layers
clip_MEREGE TWO TOPO
Band 1 (Gray)
3,264
395
RASTER
1 legend entries removed.
Coordinate 30.8372,77.4468
Scale 1:293400
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326
Type here to search
28°C
ENG
10:22
25-09-2022

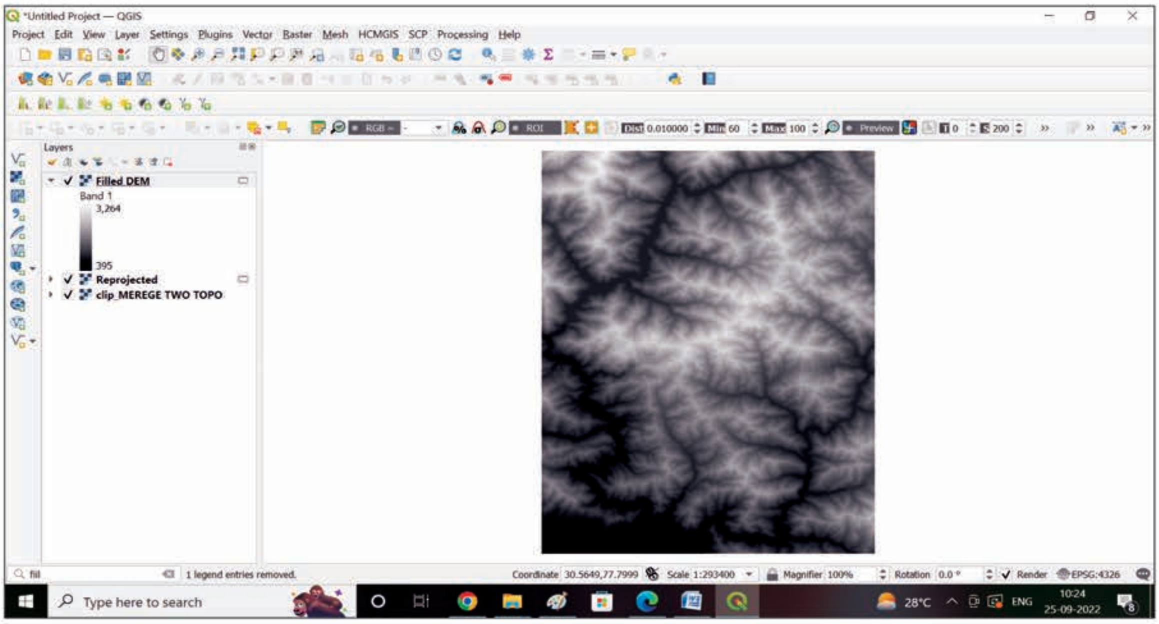

*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Mesh HCMGIS SCP Processing Help
Layers
clip_MEREGE TWO TOPO
Band 1 (Gray)
3,264
395
RASTER
1 legend entries removed.
Coordinate 30.8372,77.4468
Scale 1:293400
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326
Type here to search
28°C
ENG
10:22
25-09-2022


Warp (Reproject)
Parameters
Log
Input layer
clip_MEREGE TWO TOPO [EPSG:4326]
Source CRS [optional]
Project CRS: EPSG:4326 - WGS 84
Target CRS [optional]
Project CRS: EPSG:4326 - WGS 84
Resampling method to use
Nearest Neighbour
Nodata value for output bands [optional]
Not set
Output file resolution in target georeferenced units [optional]
Not set
Advanced Parameters
Reprojected
[Save to temporary file]
Open output file after running algorithm
GDAL/OGR console call
0%
Cancel
Advanced
Run as Batch Process...
Run
Close
Help
Layers
clip_MEREGE TWO TOPO
Band 1 (Gray)
3,264
395
RASTER
1 legend entries removed.
Type here to search
28°C
ENG
10:22
25-09-2022

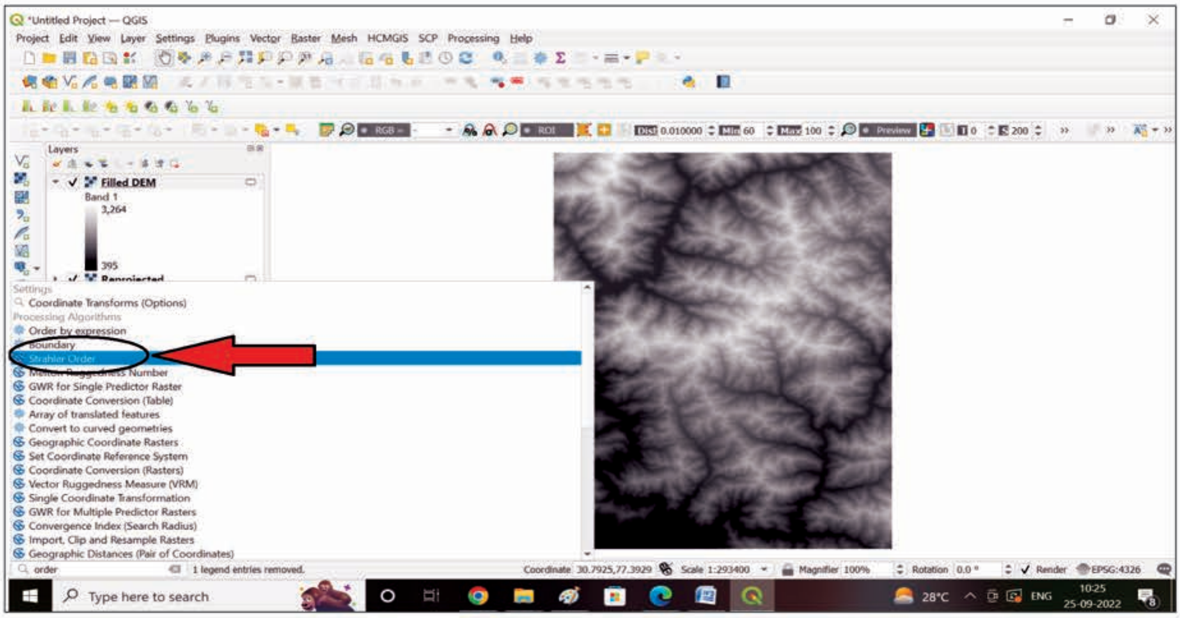
Step 2: Use Fill Sinks (Wang & Liu) to fill gaps.

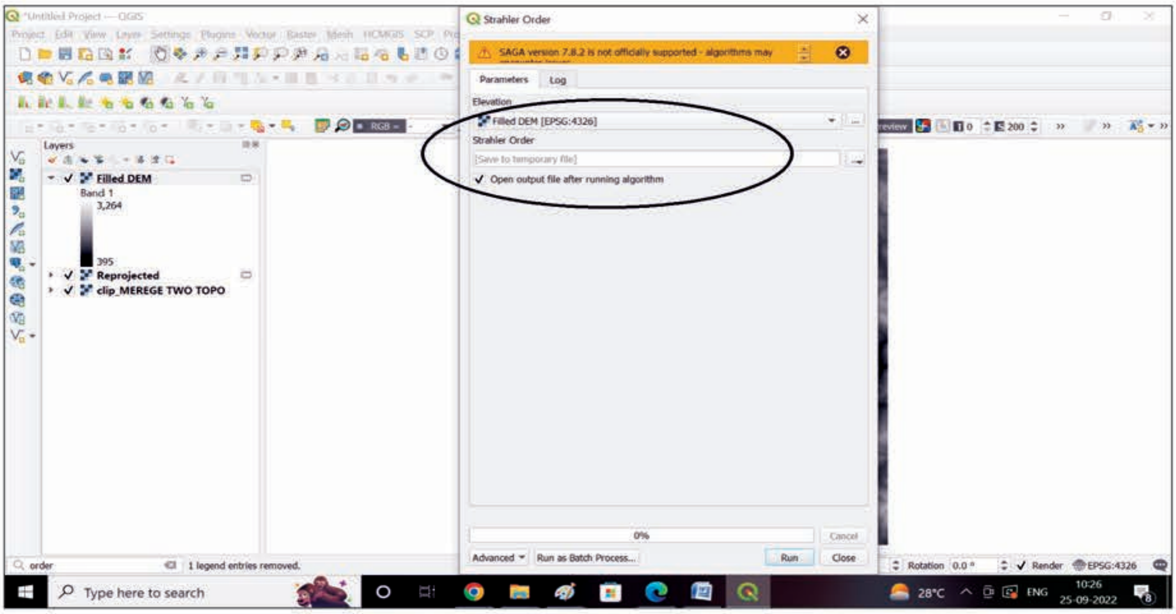


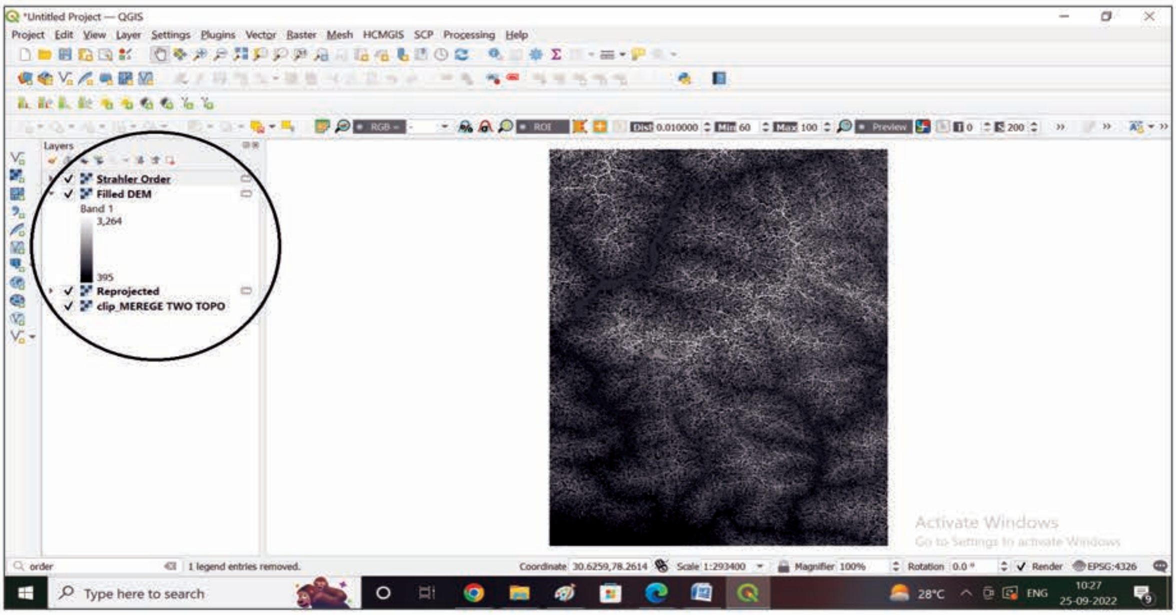




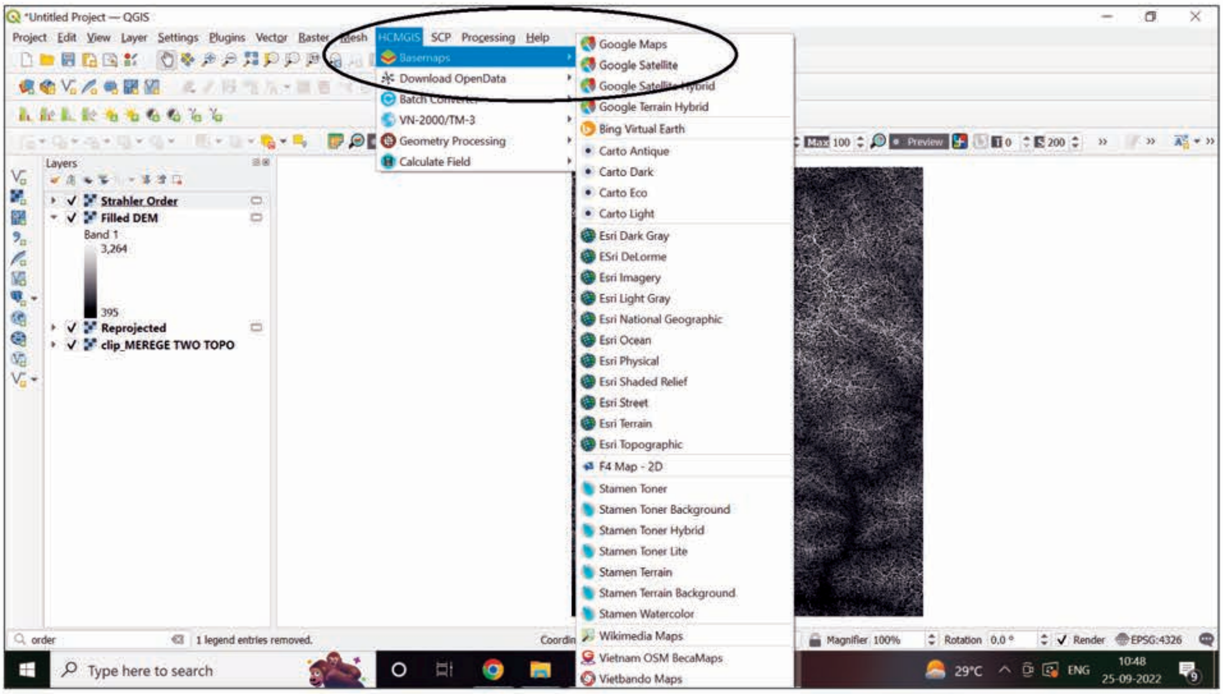
Step 3: Use Strahler order tool.

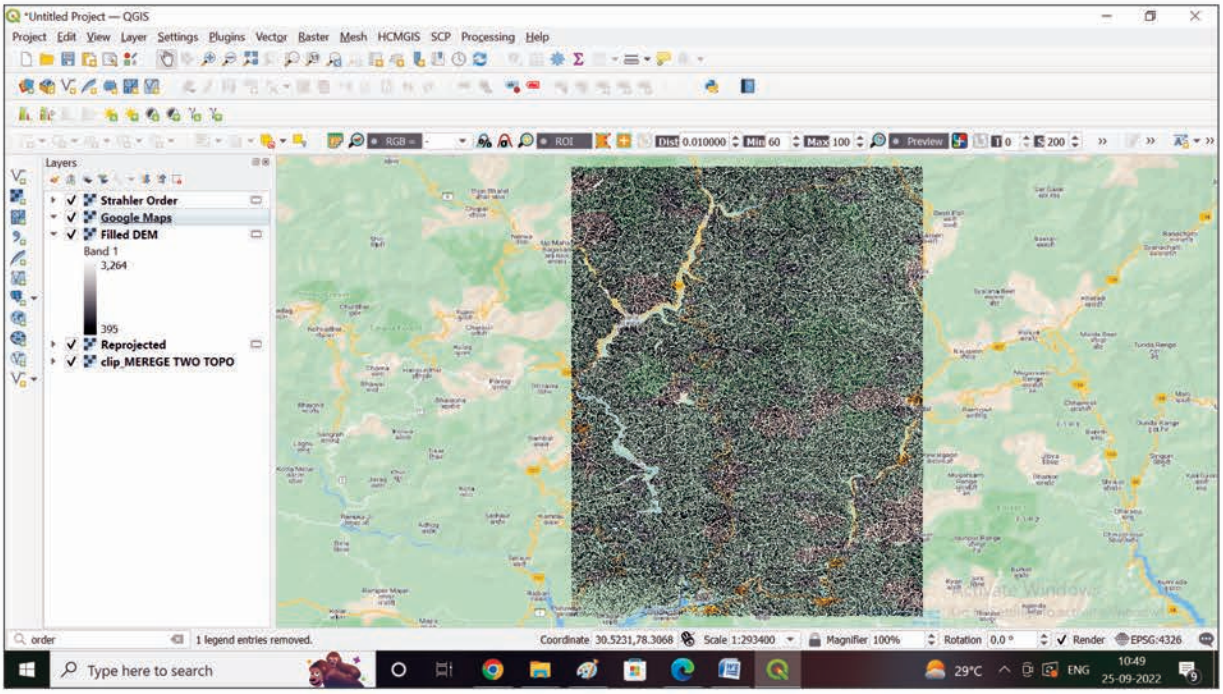




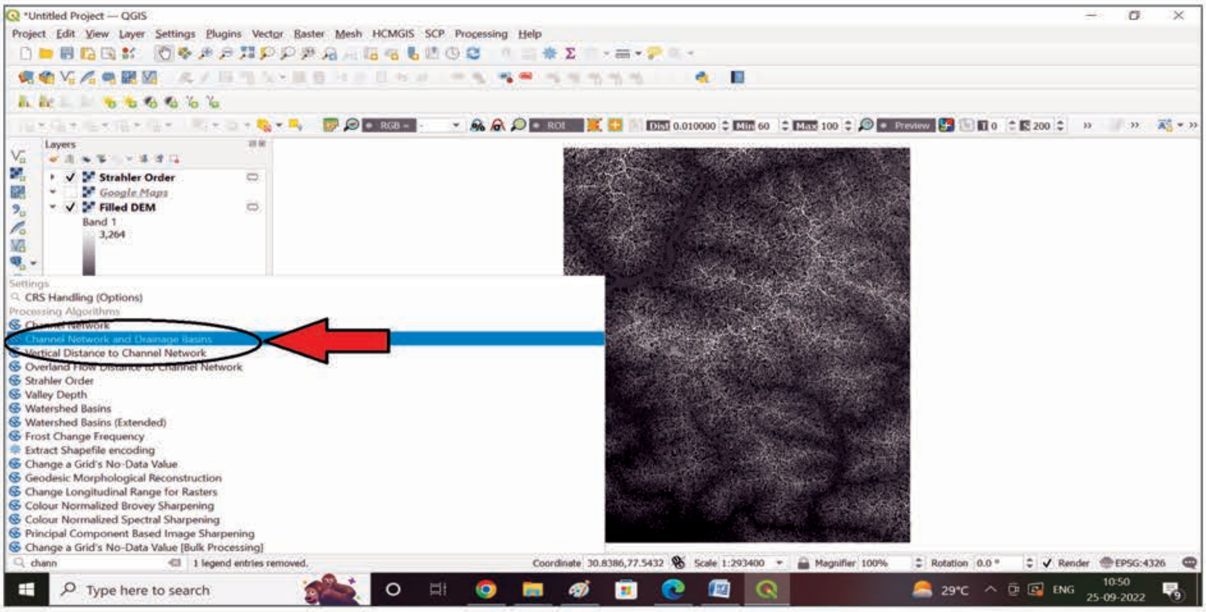


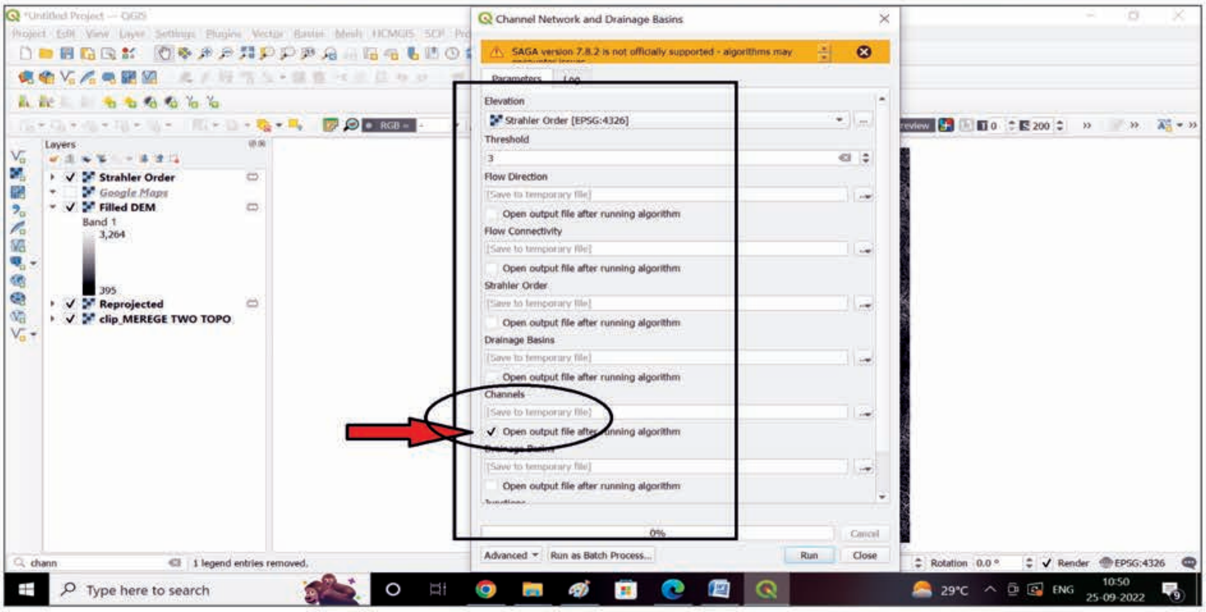
You may use Google Maps in 'HCMGIS' pluggin to verify the output layer.

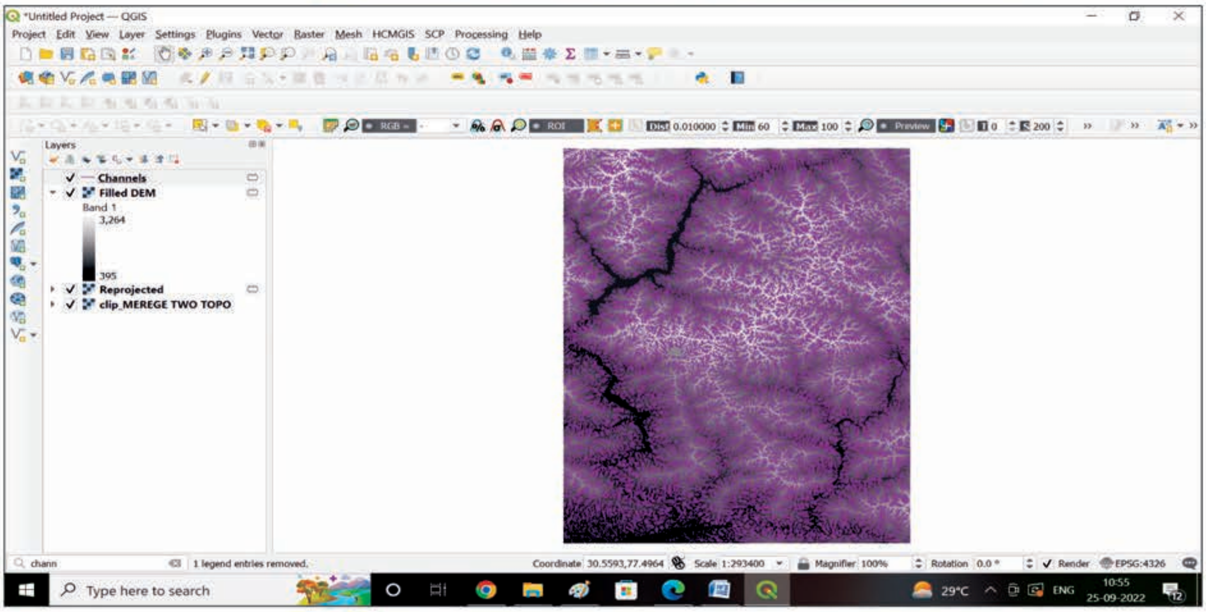




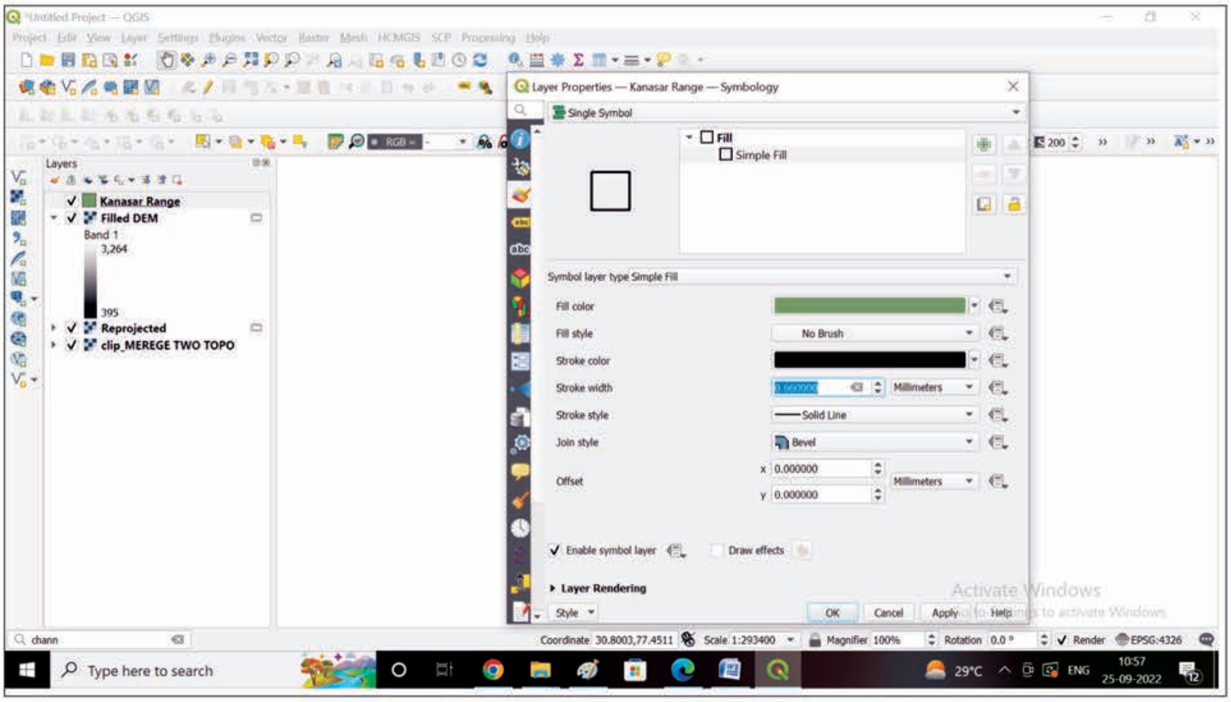
Step 4: Use 'Channel Network and Drainage Basins' tool to generate Channel Network. (uncheck irrelevant output options).

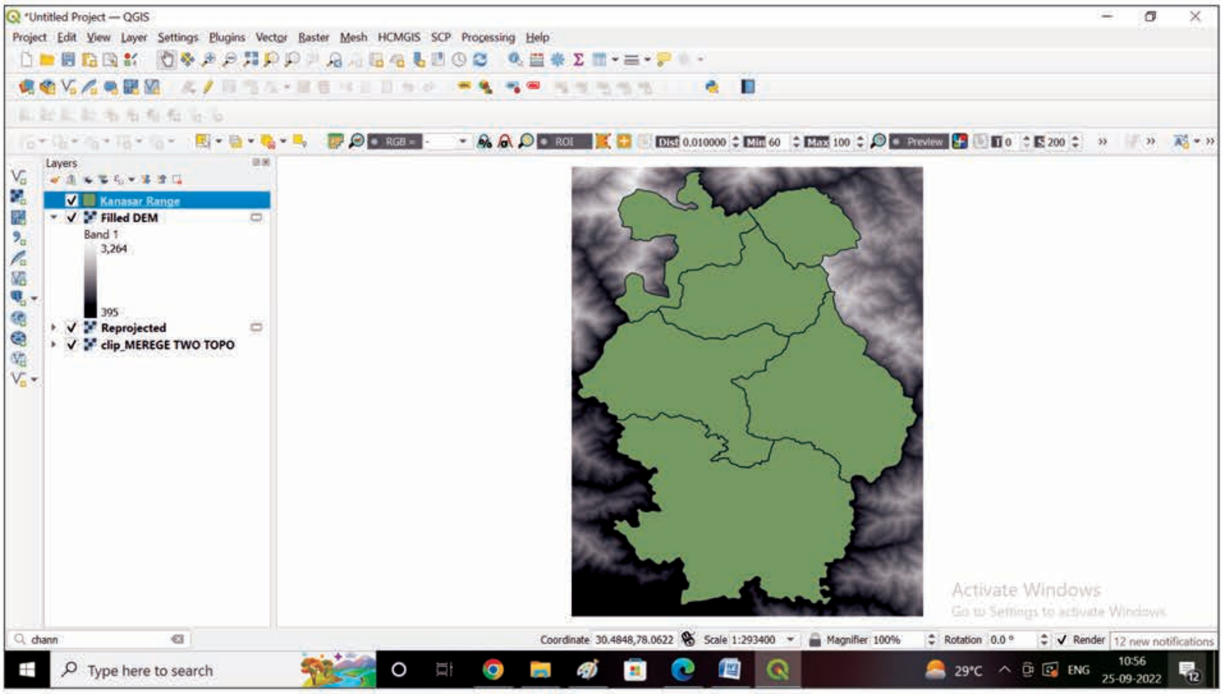


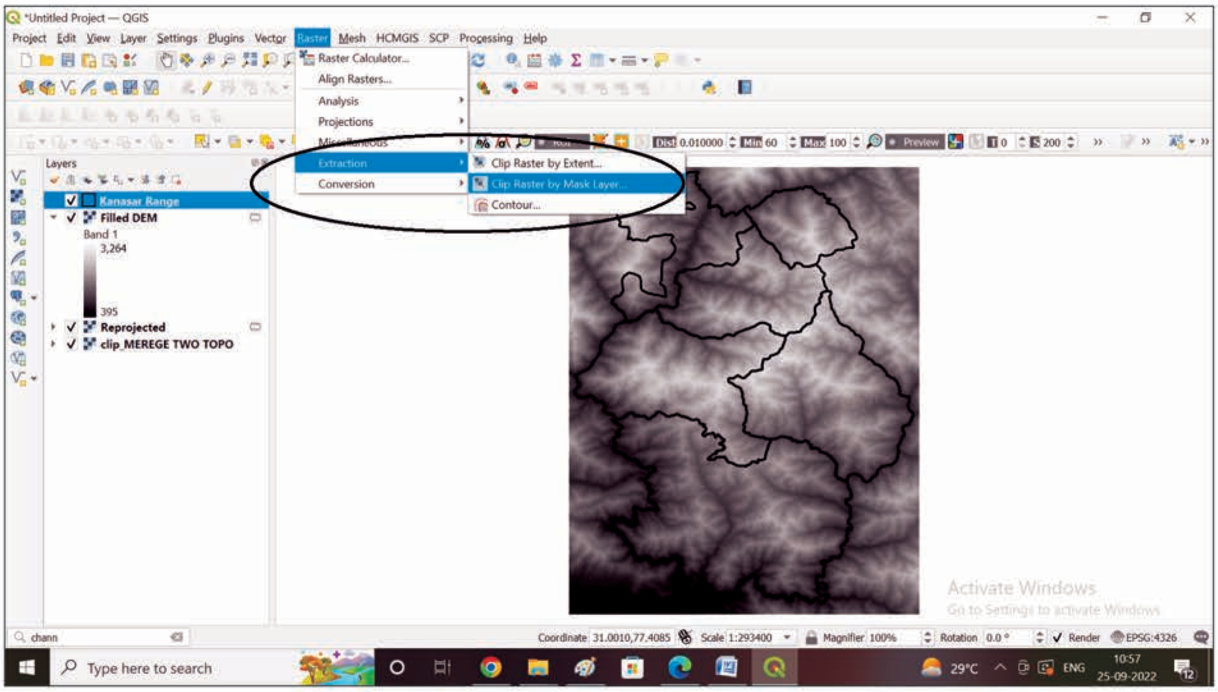




Step 5: Clip the Raster using Vector shapefile & Change symbology.



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Project Edit View Layer Settings Plugins Vector Raster Mesh HCMGIS SCP Processing Help
Raster Calculator...
Align Rasters...
Analysis
Projections
Miscellaneous
Extraction
Conversion
Clip Raster by Extent...
Clip Raster by Mask Layer...
Contour...
Layers
Kanasar Range
Filled DEM
Band 1
3,264
395
Reprojected
clip_MEREGE TWO TOPO
Activate Windows
Go to Settings to activate Windows
Coordinate 31.0010,77.4085
Scale 1:293400
Magnifier 100%
Rotation 0.0 °
Render
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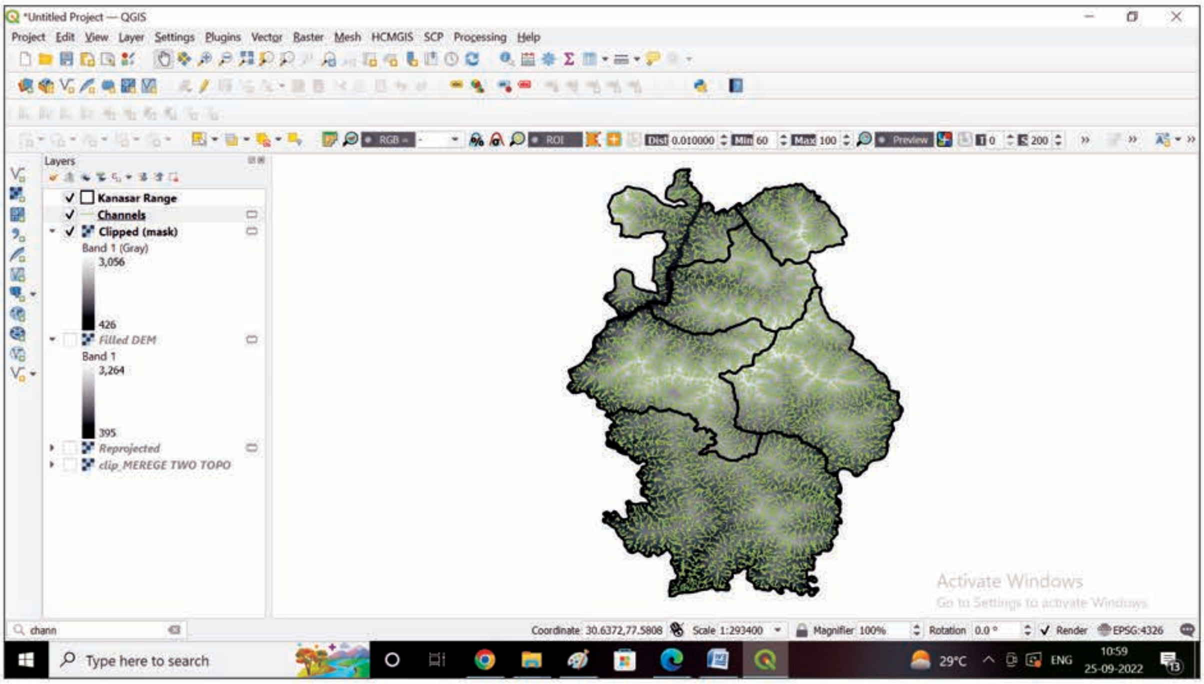
29°C
ENG
10:57
25-09-2022


*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Mesh HCMGIS SCP Processing Help
Layers
Kanasar Range
Channels
Clipped (mask)
Band 1 (Gray)
3,056
426
Filled DEM
Band 1
3,264
395
Reprojected
clip_MEREGE TWO TOPO
Activate Windows
Go to Settings to activate Windows
Coordinate 30.6372,77.5808
Scale 1:293400
Magnifier 100%
Rotation 0.0 °
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EPSG:4326
Type here to search
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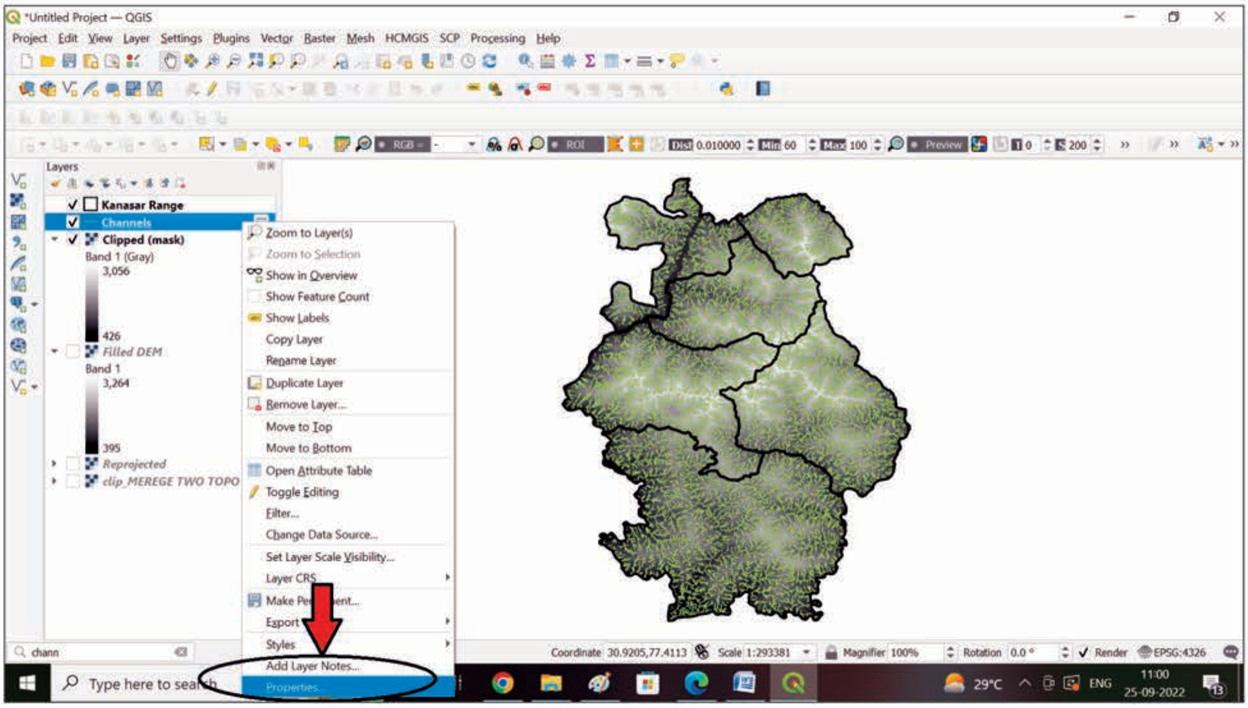
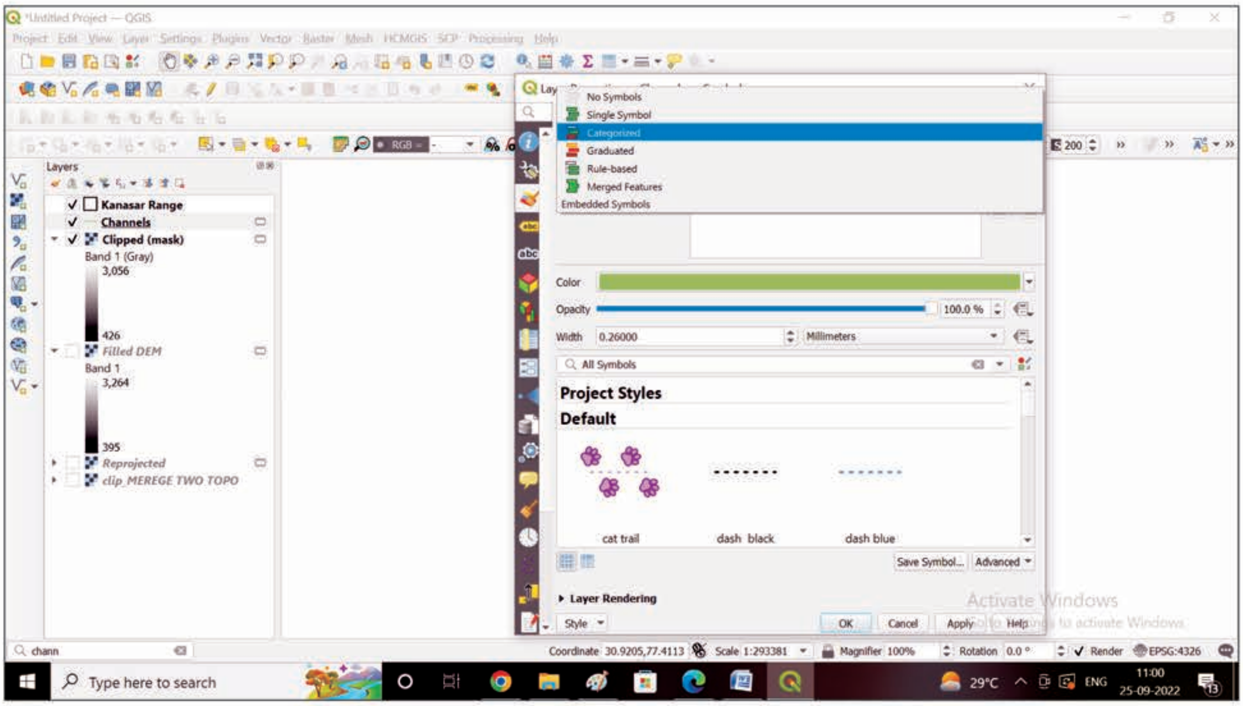
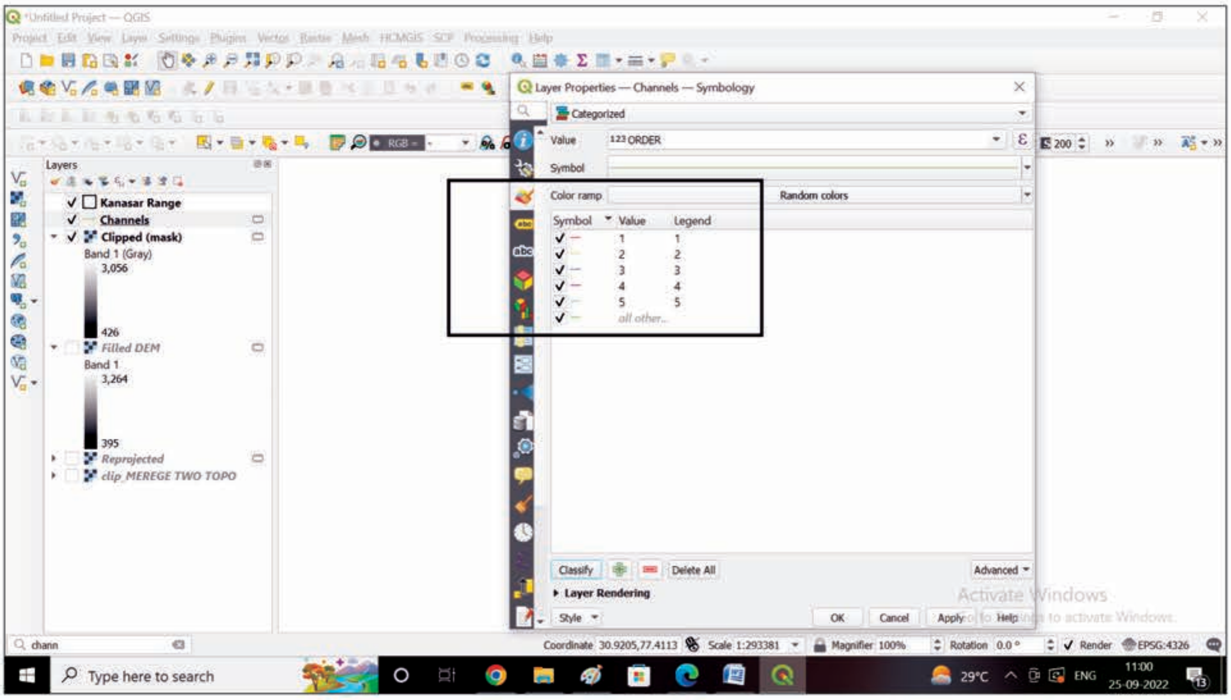
10:59
25-09-2022

Step 6: Change the symbology and label the channels as per order.






*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Mesh HCMGIS SCP Processing Help
Layer Properties — Channels — Symbology
Categorized
Value
123 ORDER
Symbol
Color ramp
Random colors
Symbol Value Legend
1 1
2 2
3 3
4 4
5 5
all other...
Classify
Delete All
Advanced
Layer Rendering
Style
OK
Cancel
Apply
Help
Layers
Kanasar Range
Channels
Clipped (mask)
Band 1 (Gray)
3,056
426
Filled DEM
Band 1
3,264
395
Reprojected
clip_MEREGE TWO TOPO
chann
Coordinate 30.9205,77.4113
Scale 1:293381
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326
Type here to search
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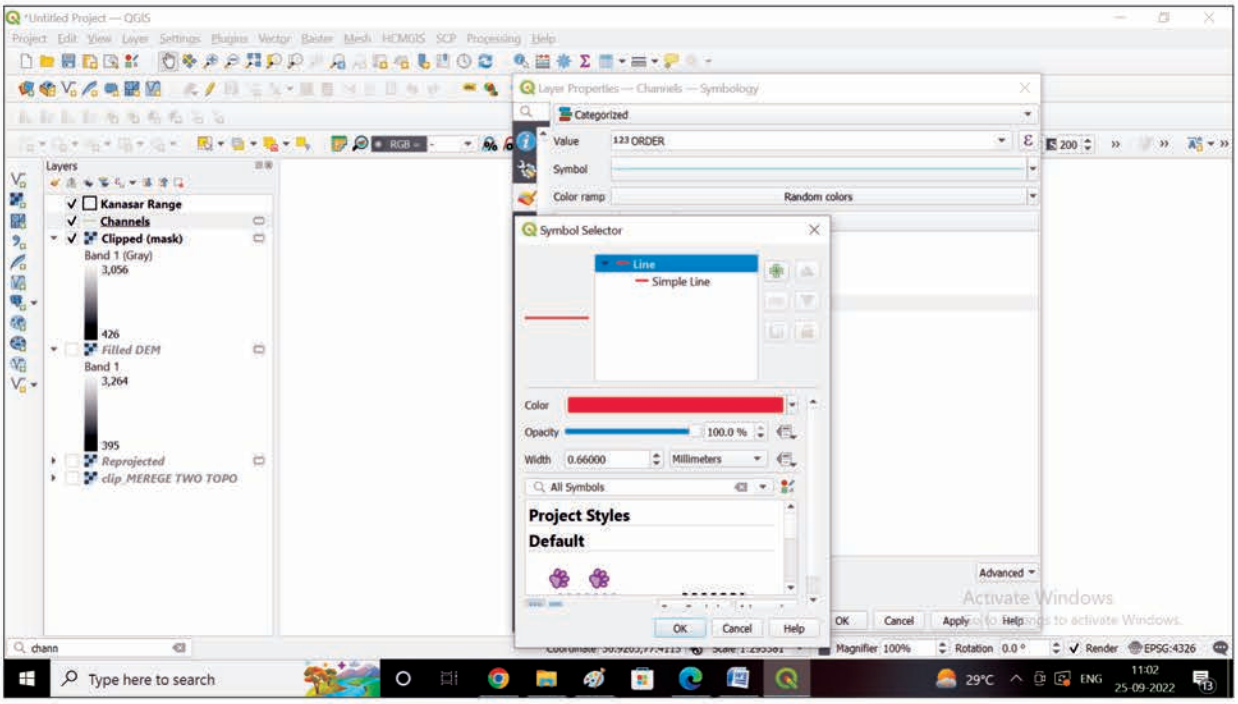
ENG
11:00
25-09-2022


*Untitled Project — QGIS
Project Edit View Layer Settings Plugins Vector Raster Mesh HCMGIS SCP Processing Help
Layer Properties — Channels — Symbology
Categorized
Value
123 ORDER
Symbol
Color ramp
Random colors
Symbol Selector
Line
Simple Line
Color
Opacity
100.0 %
Width
0.66000
Millimeters
All Symbols
Project Styles
Default
OK
Cancel
Help
Advanced
Layers
Kanasar Range
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Reprojected
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chann
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326
Type here to search
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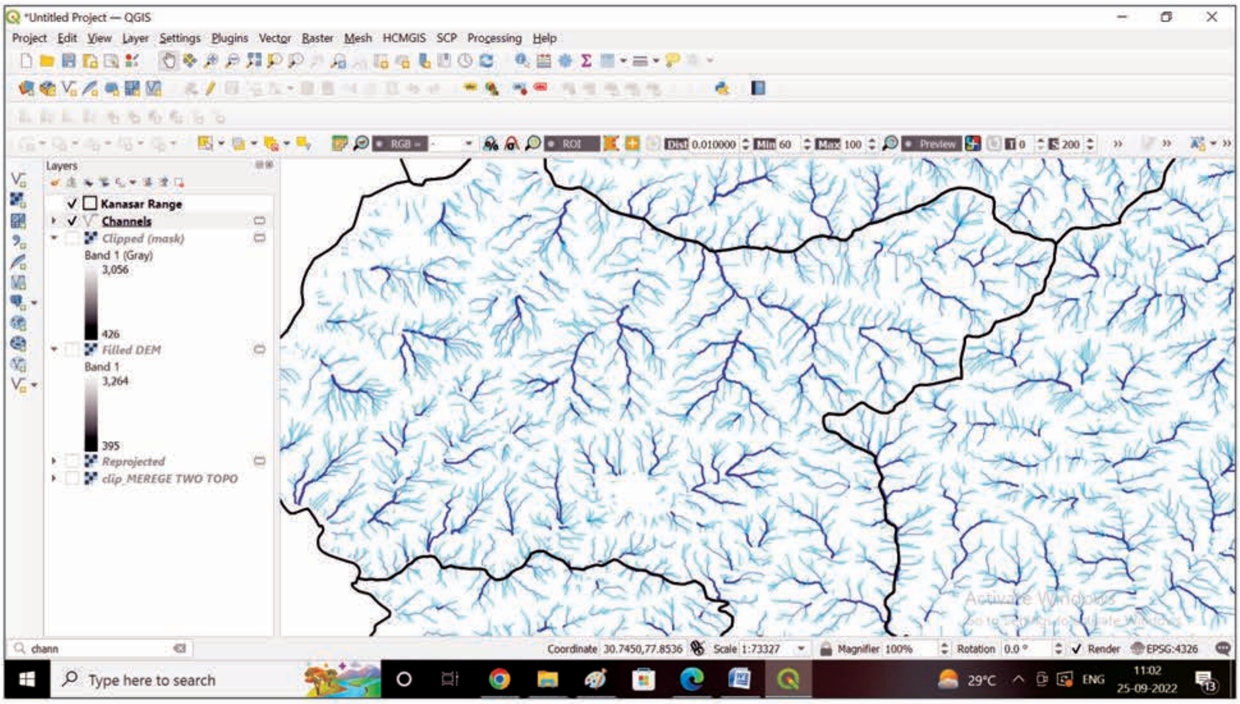
ENG
11:02
25-09-2022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Project Edit View Layer Settings Plugins Vector Raster Mesh HCMGIS SCP Processing Help
Layers
Kanasar Range
Channels
Clipped (mask)
Band 1 (Gray)
3,056
426
Filled DEM
Band 1
3,264
395
Reprojected
clip_MEREGE TWO TOPO
chann
Coordinate 30.7450,77.8536
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ENG
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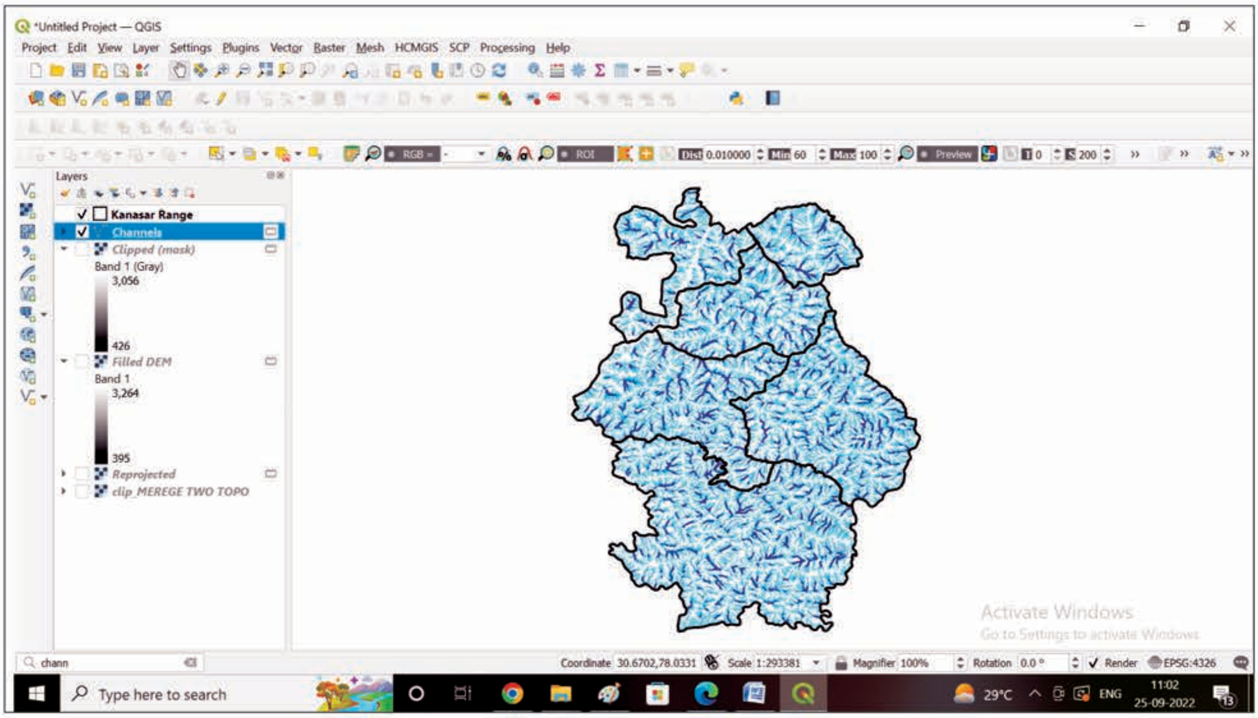
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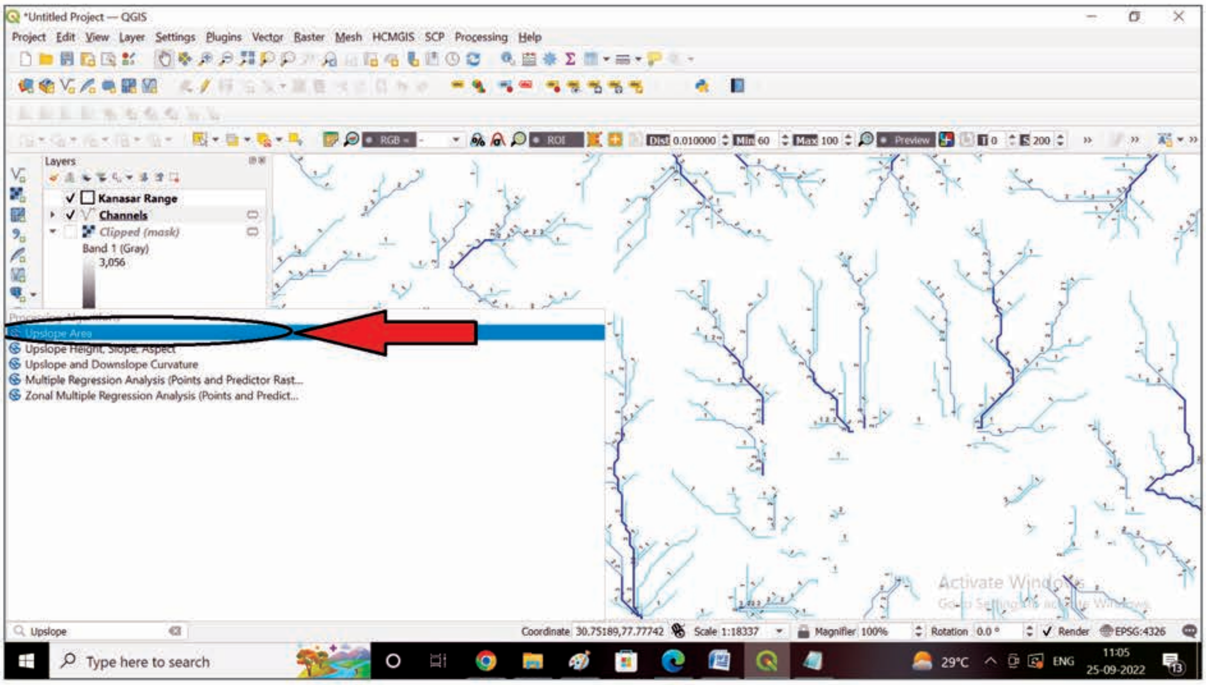
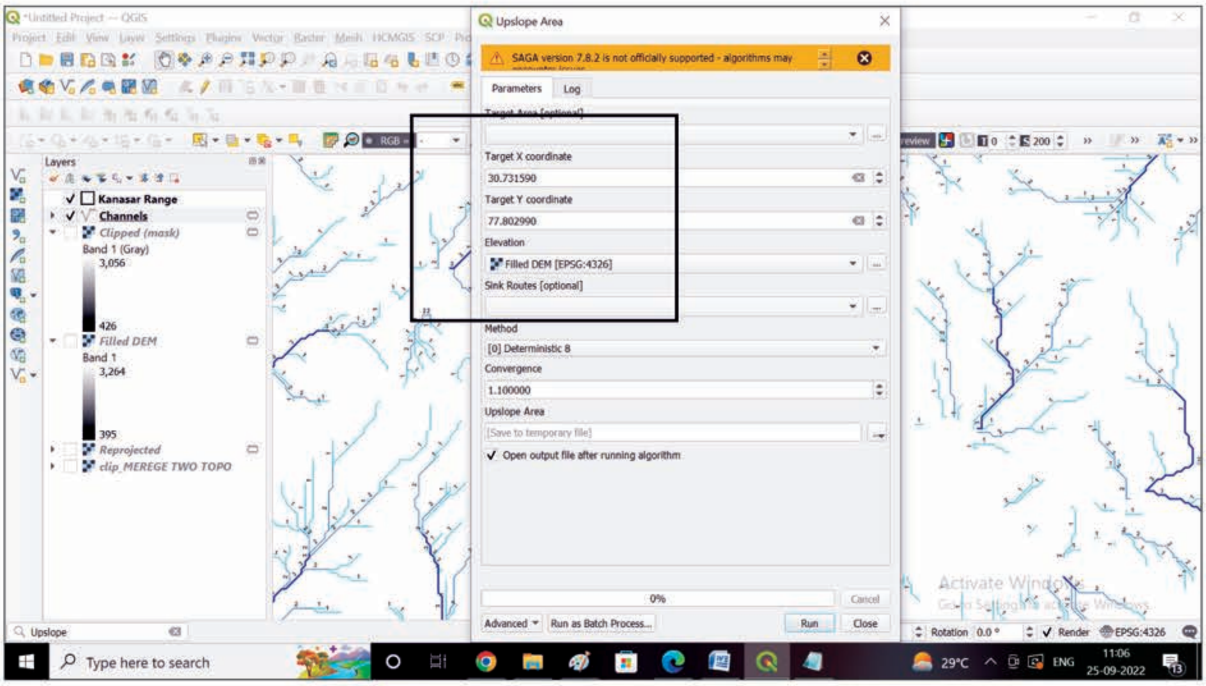
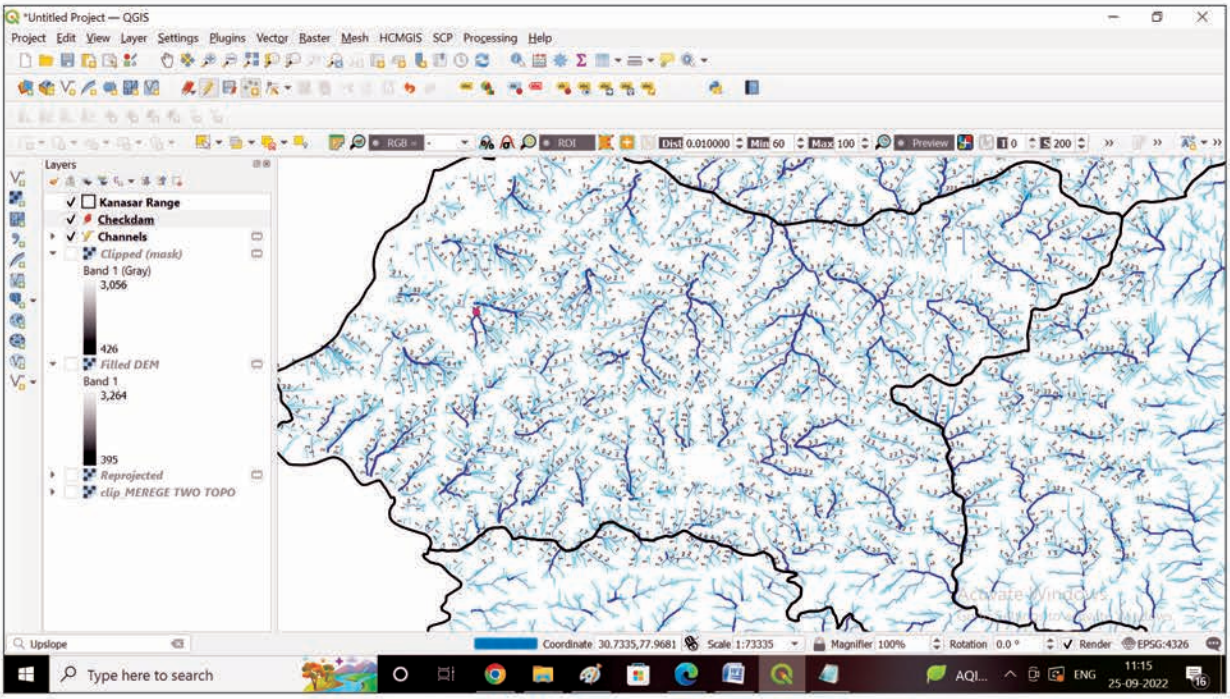
Project Edit View Layer Settings Plugins Vector Raster Mesh HCMGIS SCP Processing Help
Layers
Kanasar Range
Channels
Clipped (mask)
Band 1 (Gray)
3,056
426
Filled DEM
Band 1
3,264
395
Reprojected
clip_MEREGE TWO TOPO
Activate Windows
Go to Settings to activate Windows
chann
Coordinate 30.6702,78.0331
Scale 1:293381
Magnifier 100%
Rotation 0.0 °
Render
EPSG:4326
Type here to search
29°C
ENG
11:02
25-09-2022

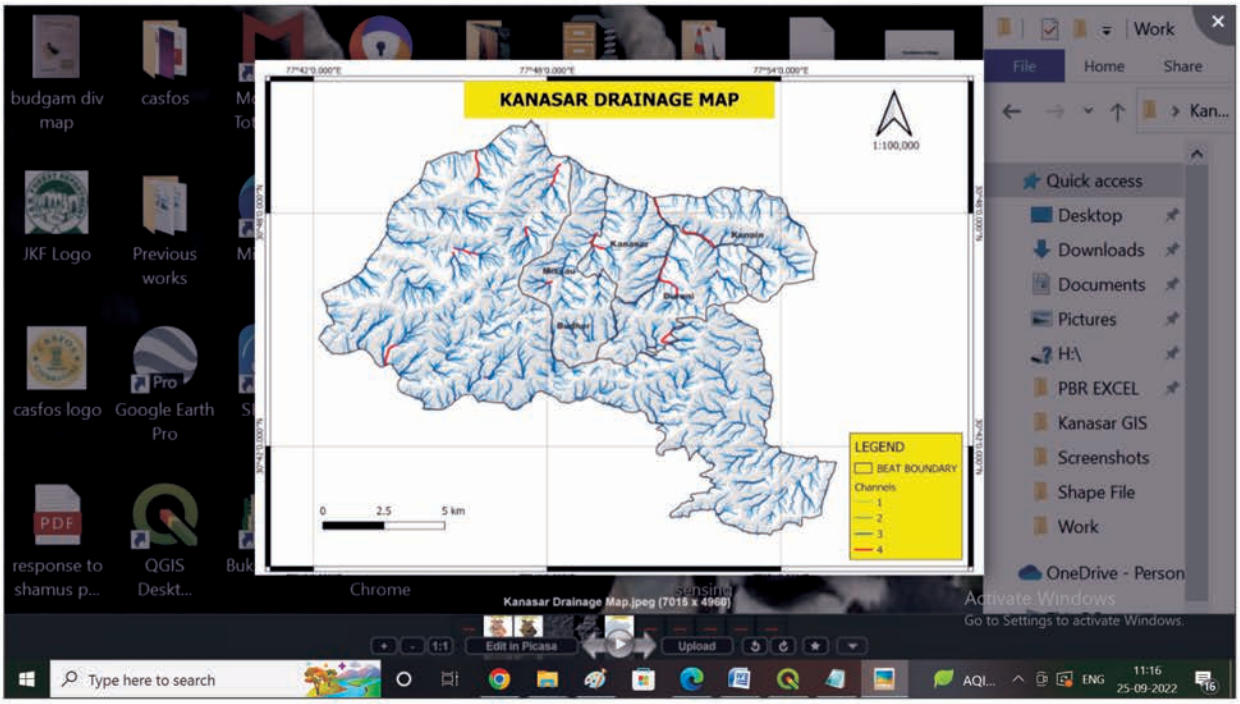
Step 7: You may calculate the Catchment area of any point by using 'Upslope area' tool by giving the coordinates of that point.





Step 8: Make a final Map.





Keywords

Watershed: The watershed is natural hydrological unit that covers a specific aerial expanse of land surface from which the rainfall runoff flows to a defined drain, channel, stream or river at any particular point.

GLOSSARY

Aspect: Compass direction that a terrain surface or topographic slope faces.

Atmospheric window: A range of wavelengths above which there is relatively little absorption of radiation by atmospheric gases.

Attribute table: The table displaying information on features of a selected layer.

Colour Ramp: It is a series of continuous or discrete colours that can be applied to raster or vector data values.

Comma separated value(.csv) file: It is a delimited text file which uses comma to separate values.

Contour: Line joining the points of equal elevation (value) in a raster.

Co-ordinate Reference System: In this system, 3-dimensional surface is projected in 2 dimensions to locate geographical entity. This can be local, regional or global.

Digital Elevation Model (DEM): DEM is a Raster image; each pixel in DEM refers to the surface elevation. It is again subdivided into- Digital Terrain Model and Digital Surface Model.

Emissivity: Emissivity of a material is the relative ability of its surface to emit heat by radiation. The value ranges from 0 to 1; a blackbody has an emissivity of 1 and that of a perfect reflector or whitebody is 0.

Georeferencing: Referencing the toposheets and images etc. to Ground co-ordinates using Ground control points which are collected by GPS or GISS.

Greyscale: It is a function which converts a multiband image into a single-band greyscale image.

Hill shade: It is the hypothetical illumination of a surface determined by illumination value of each cell in a raster.

ISODATA: Iterative Self-Organizing Data Analysis Techniques. The algorithm which allows the clusters to merge or split depending upon their similarity or standard deviations respectively.

Layer: It is the representation of geographical dataset in any digital map.

Line data: It represents linear features. Example- Forest roads, Fire line, Inspection path etc.

Metadata: It is the information about data. Example- Map Projection, Co-ordinate system, scale etc.

NDVI: The index used to measure the condition of vegetation by quantifying the difference between Near Infra-Red and Red.

Point data: It represents non-adjacent features and abstract/ discrete data points. Example- Firepoints, Administrative Headquarters, Waterholes etc.

Polygon data: It is used to represent and define enclosed areas or areas having a well-defined boundary. Example- Forest area, Plantation area, Water body etc.

Projected CRS: In this system, the location is identified by x, y co-ordinates on rectangular grid with origin at the Centre of the grid.

Raster: It is row and column of cells. Each cell contains value and information. Example- Satellite imageries, Digitized toposheets etc.

Reflectance: The proportion of incident electromagnetic radiation that is reflected by a surface.

Region of Interest (ROI): The subset of an image or a dataset which is identified for a particular purpose.

Scattering: It is the redirection of electromagnetic radiations by suspended particles in the atmosphere.

Slope: It is the degree of inclination or steepness of a surface.

Supervised Classification: In this, the user supervises the pixel classification process by defining the training sets using Region of Interest (ROI).

Unsupervised Classification: It is a computer automated pixel classification based on spectral similarity.

Vector Geoprocessing tools: These are used to make a query using multiple criteria, various vector Geoprocessing tools like Clip, Buffer, Dissolve etc. are used.

Vector: It represents real world features in the form of Point, Line and Polygon. It has length, shape and direction and is defined by co-ordinates.

Bibliography

·Anji Reddy., M. 2016, Remote Sensing and Geographical Information Systems.
John R. Jensen, Remote Sensing of the Environment- An Earth Resource Perspective.

·BasudebBhatta, Remote Sensing and GIS.

·Pandian M., Nandhini R. Forest Canopy Density and ASTER DEM based study for Dense Forest Investigation using Remote Sensing and GIS Techniques. International Journal of Research in Environment Science and Technology 2016; 6(1): 1-4.

·https://www.un-spider.org/advisory-support/recommended-practices/recommended-practice-burn-severity/Step-by-Step/QGIS

·https://www.researchgate.net/publication/344584263_FreeOpen_Access_Geospatial_Data_and_Tools_for_Forest_Resources_Management

·http://dst-iget.in/assets/pdf/tutorial/saga.pdf

·http://dstiget.in/assets/pdf/tutorial/IGET_RS_007_Unsupervised_Classification.pdf

Authors Page

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Abhishek Kumar Rai, Officer Trainee of SFS 2020-2022 batch at CASFOS, Coimbatore belongs to the State of Uttar Pradesh and a graduate in Electronics and Communications Engineering (B. E.). Learning QGIS was a wonderful experience which will be very helpful in my career ahead.

N. Suresh Kumar, State Forest Service Officer Trainee of 2020-2022 batch at CASFOS, Coimbatore belongs to the State of Tamil Nadu, who holds Bachelor's Degree in Mechanical Engineering (B. E.). Indeed a great pleasure to work for this QGIS book for Forest Management.

Danish Khan, Officer Trainee of SFS 2020-2022 batch at CASFOS, Coimbatore belongs to the State of Jammu & Kashmir, who is a post graduate in Chemistry (M.Sc.) from University of Kashmir, Srinagar. QGIS for Forest Management will be very useful to forest officers/officials and forestry students in future.

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