From NDVI to N application map (agriculture)

Lecture notes preparation - about conceptual framework

(Education purpose)

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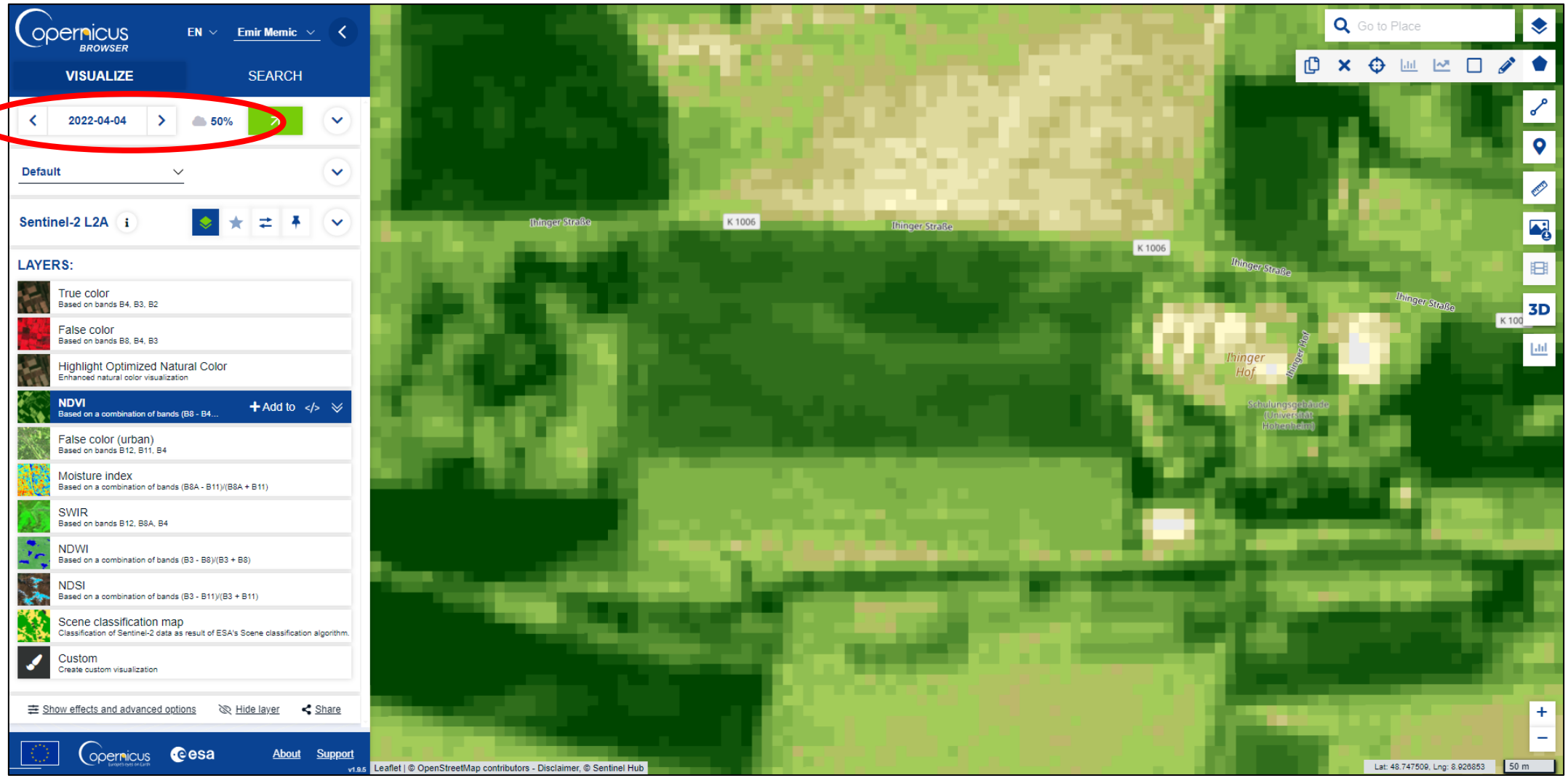
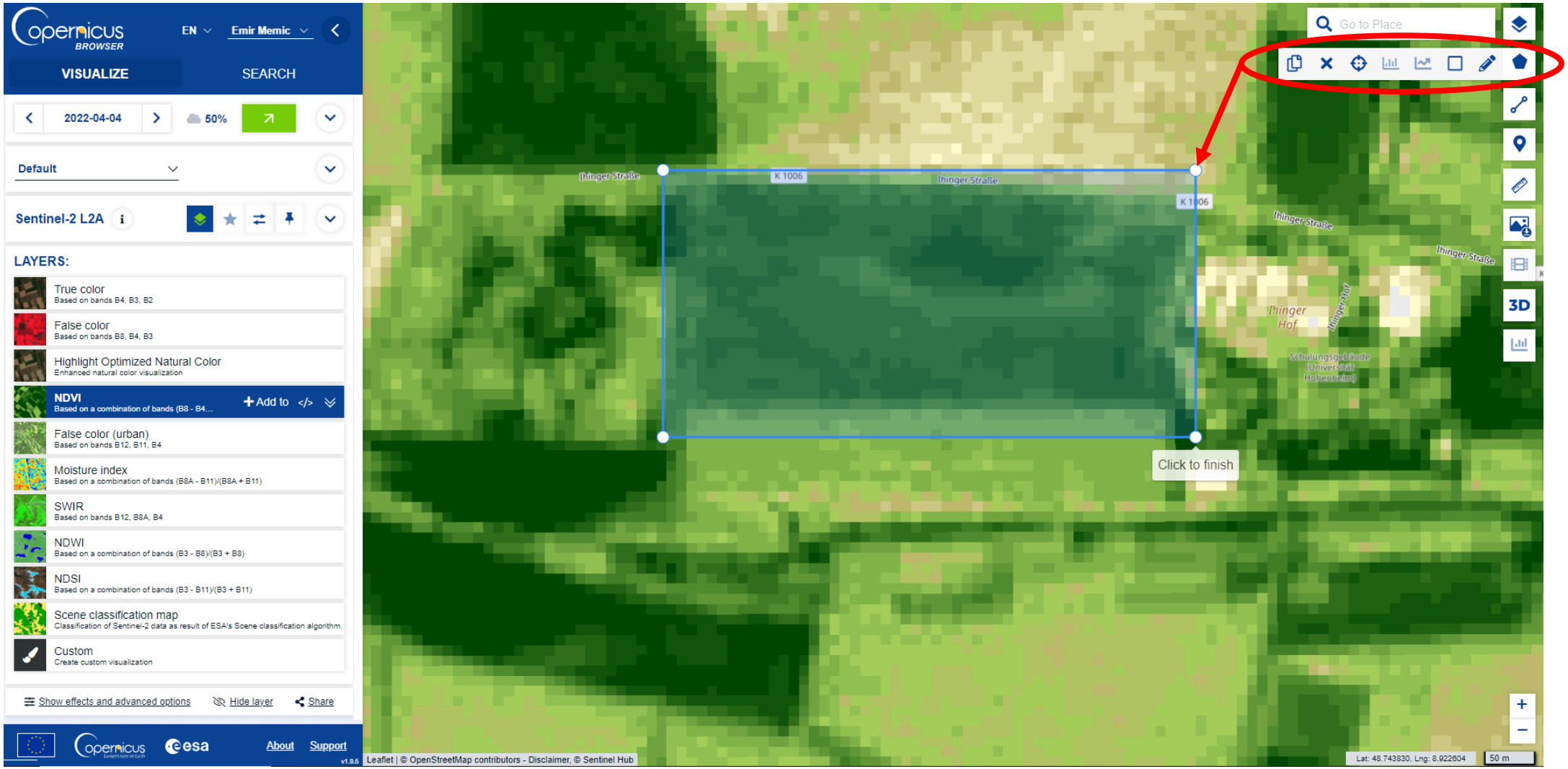
Outline

- Satellite images download – Copernicus Browser
  - Copernicus Data Space Ecosystem (CDSE), Modified Copernicus Sentinel data 2024 processed in Copernicus Browser. https://browser.dataspace.copernicus.eu/
- QGIS-based NDVI analysis and N prescription map processing
  - QGIS 2024. QGIS.org, Geographic Information System. QGIS Association. http://www.qgis.org
- Discussion

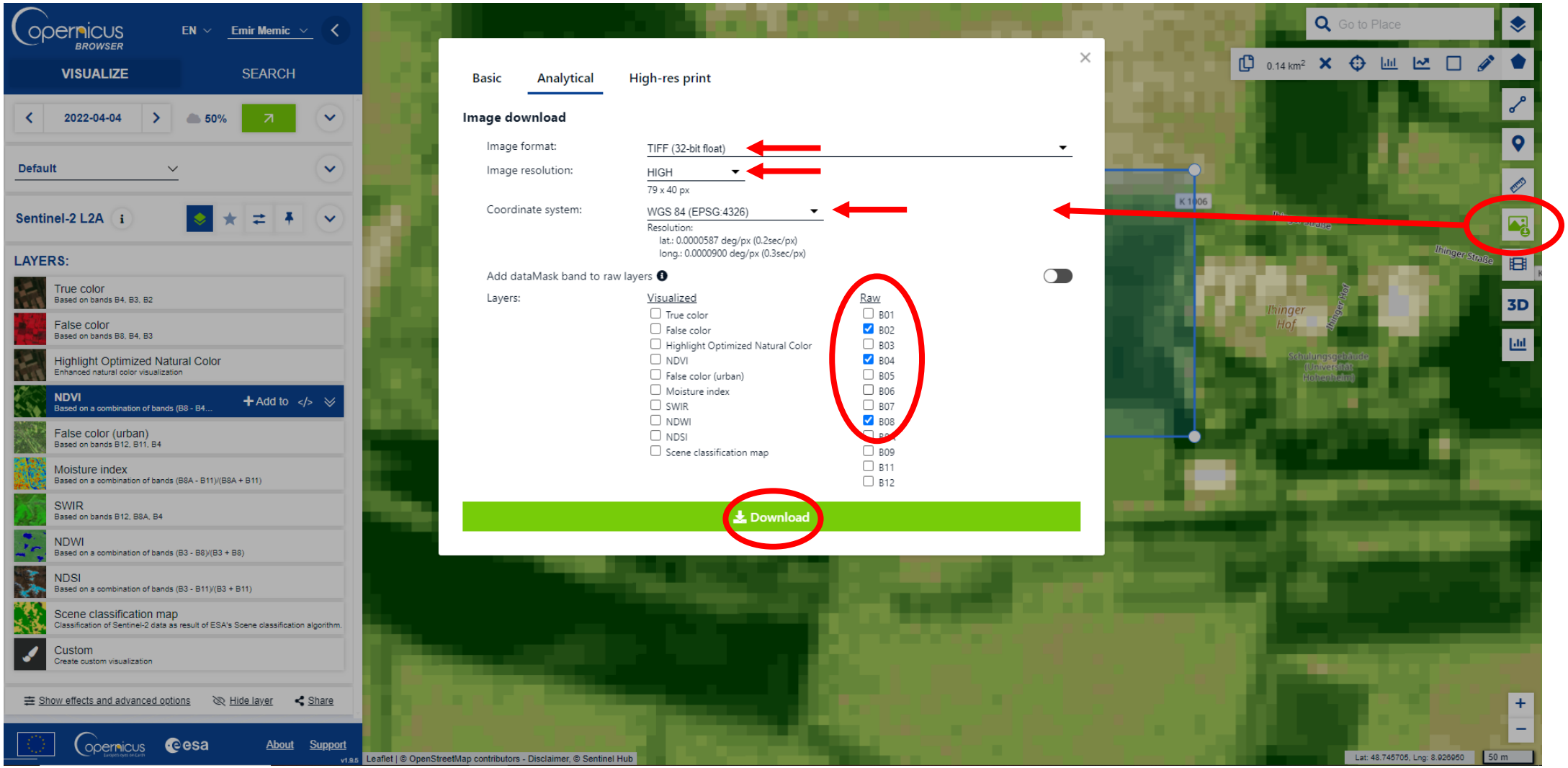
Acquiring satellite images via Copernicus Browser



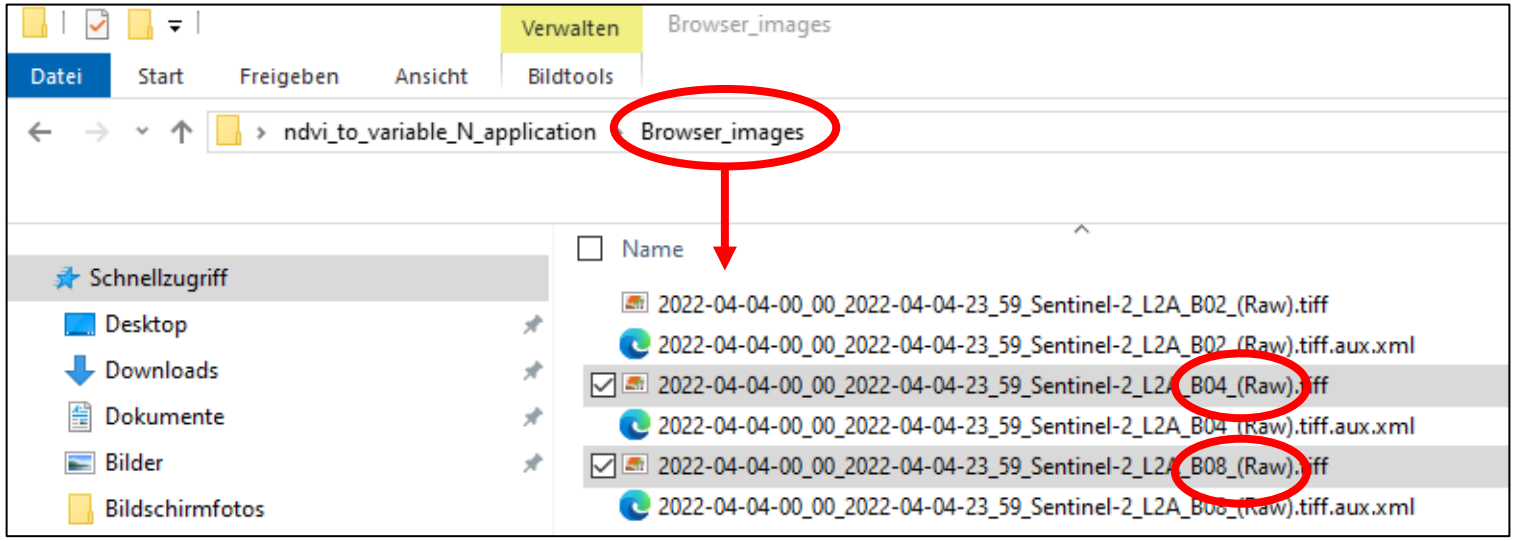
Delineating area of interest (polygon) for downloading



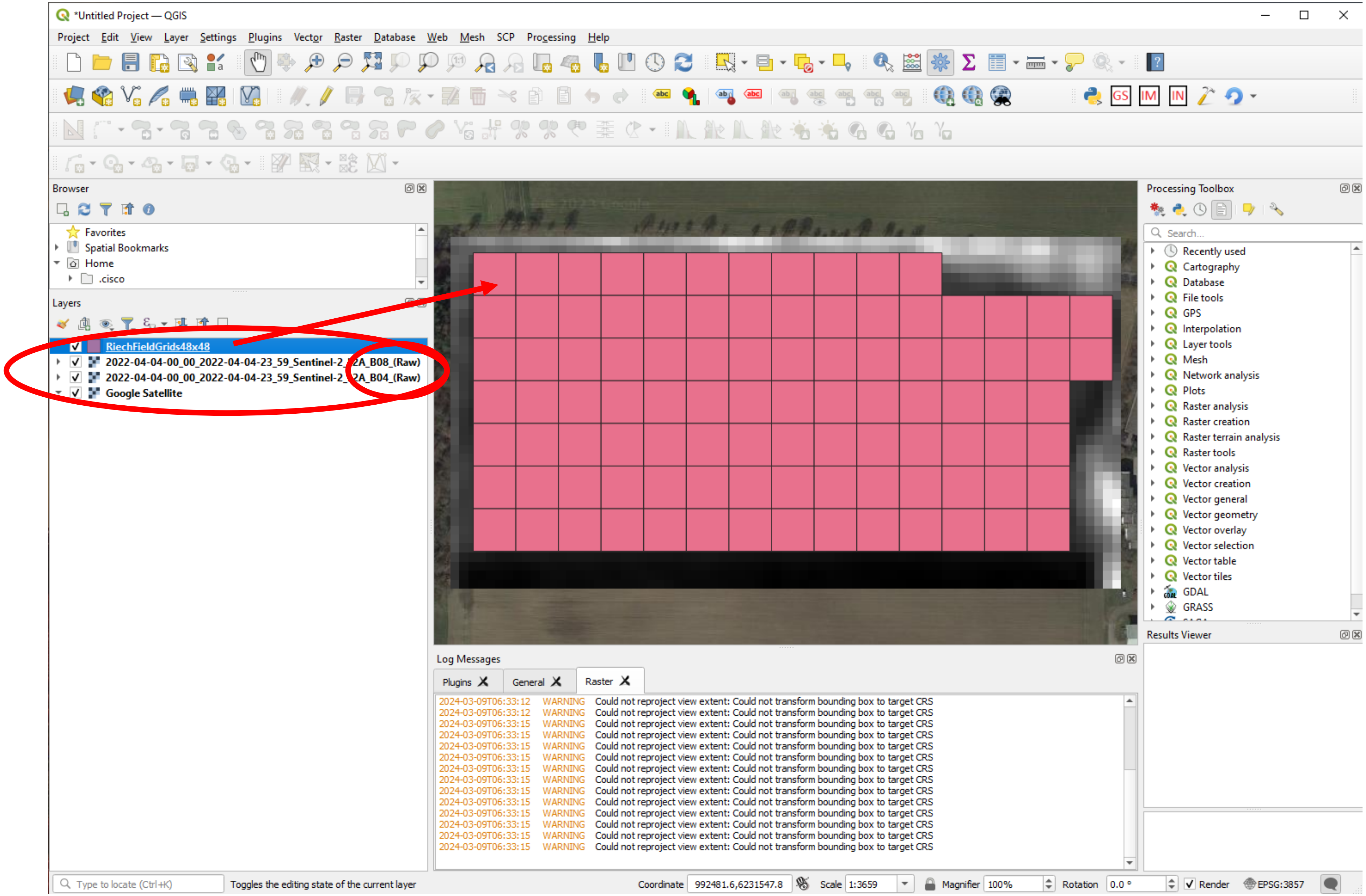
Downloading bands of interest – B02 (Blue), B04 (Red) and B08 (NIR)



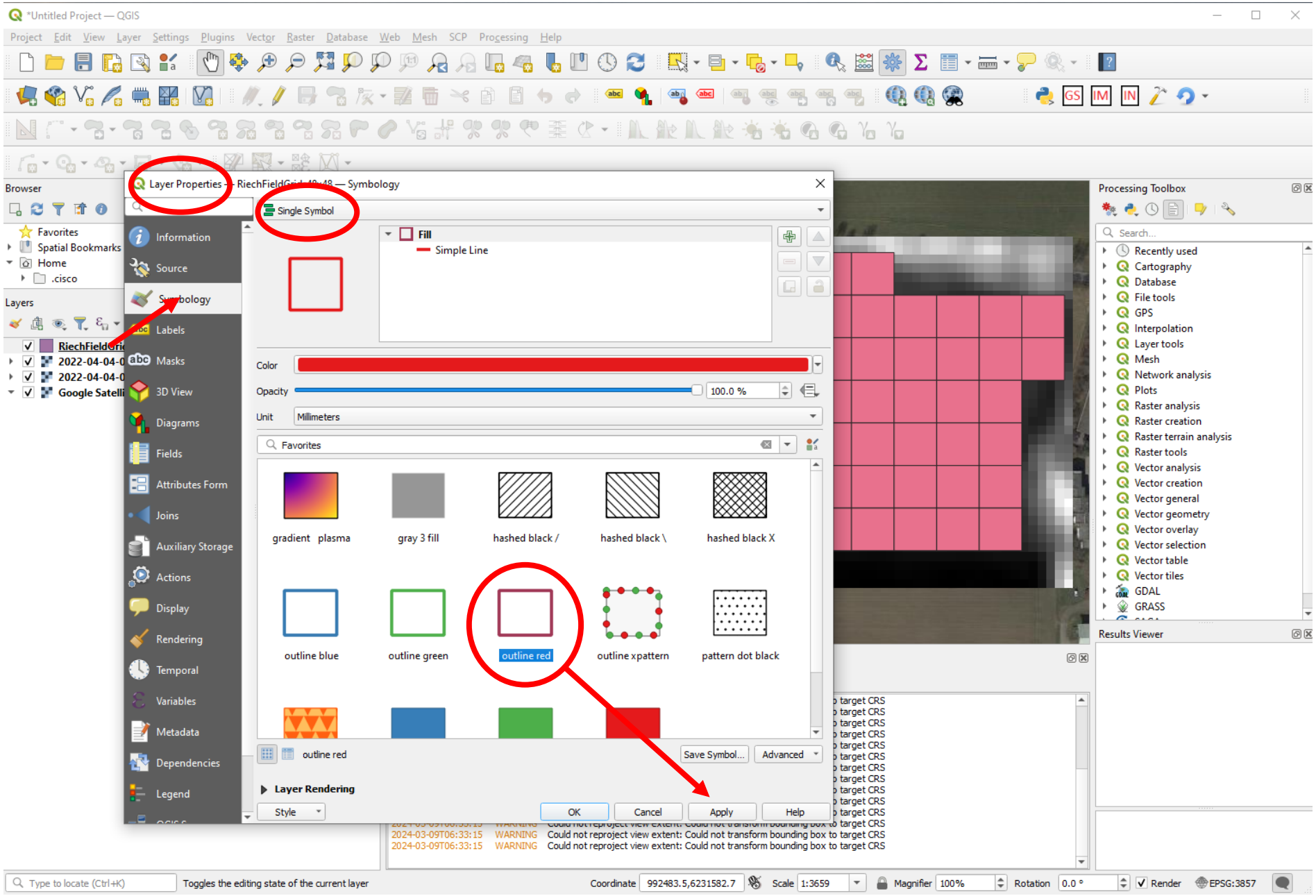
Downloaded and unzipped row data – for this example only B04 and B08 required for NDVI calculation



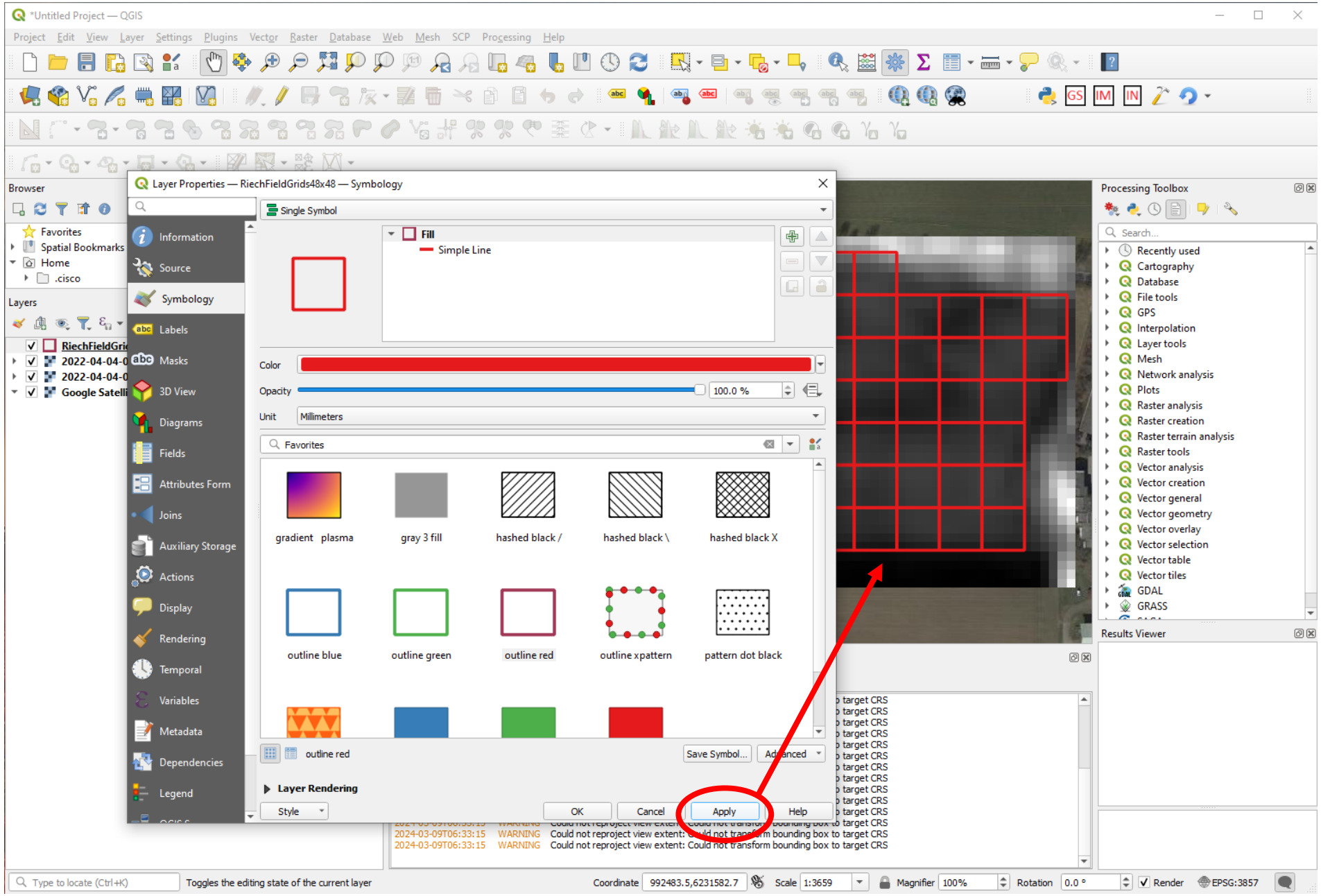
Uploading required data into QGIS (drag and drop): georeferenced images and raster grid of area of interest



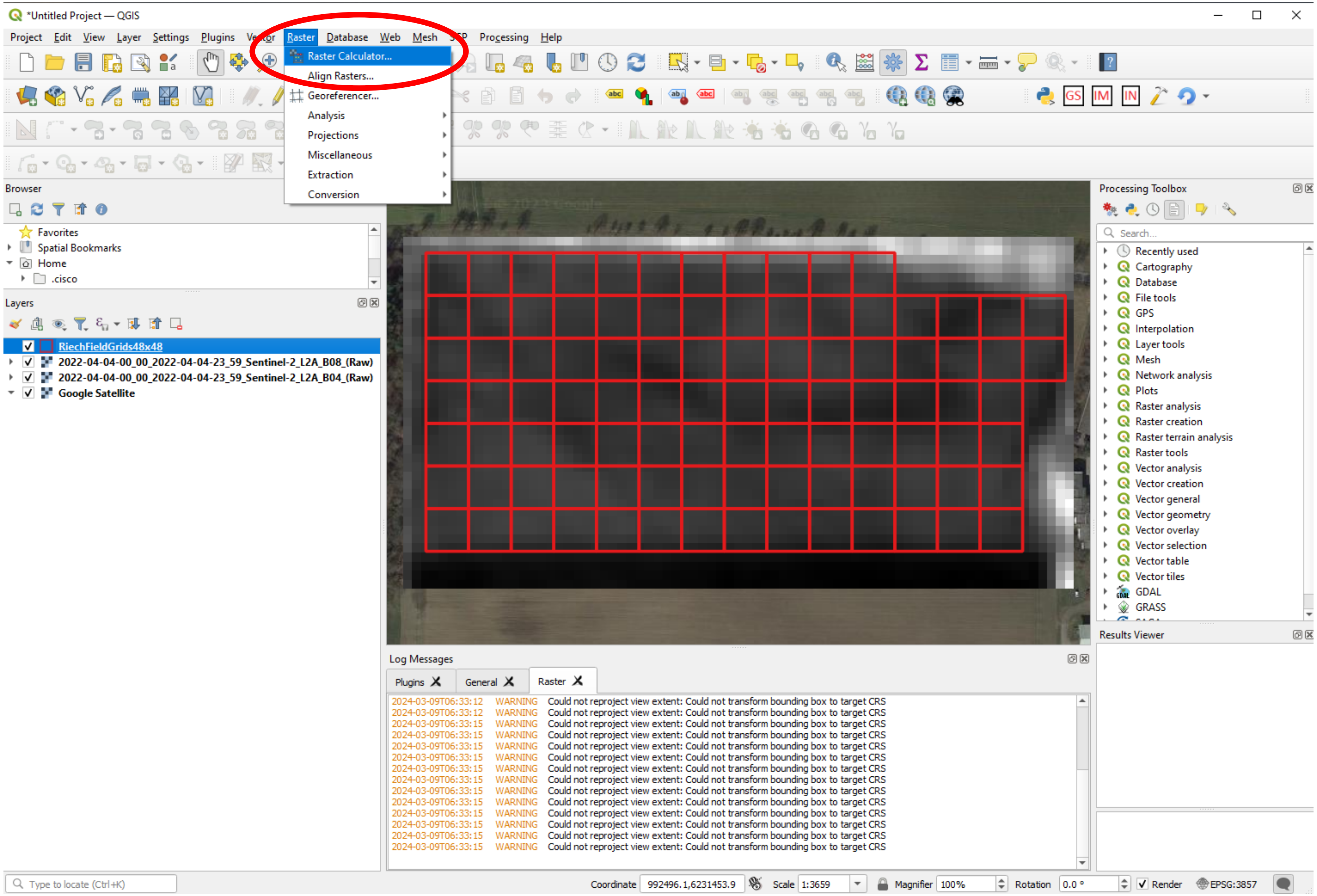
Modifying of the girds to get transparent background – Layer Properties -> Symbiology -> Single Symbol



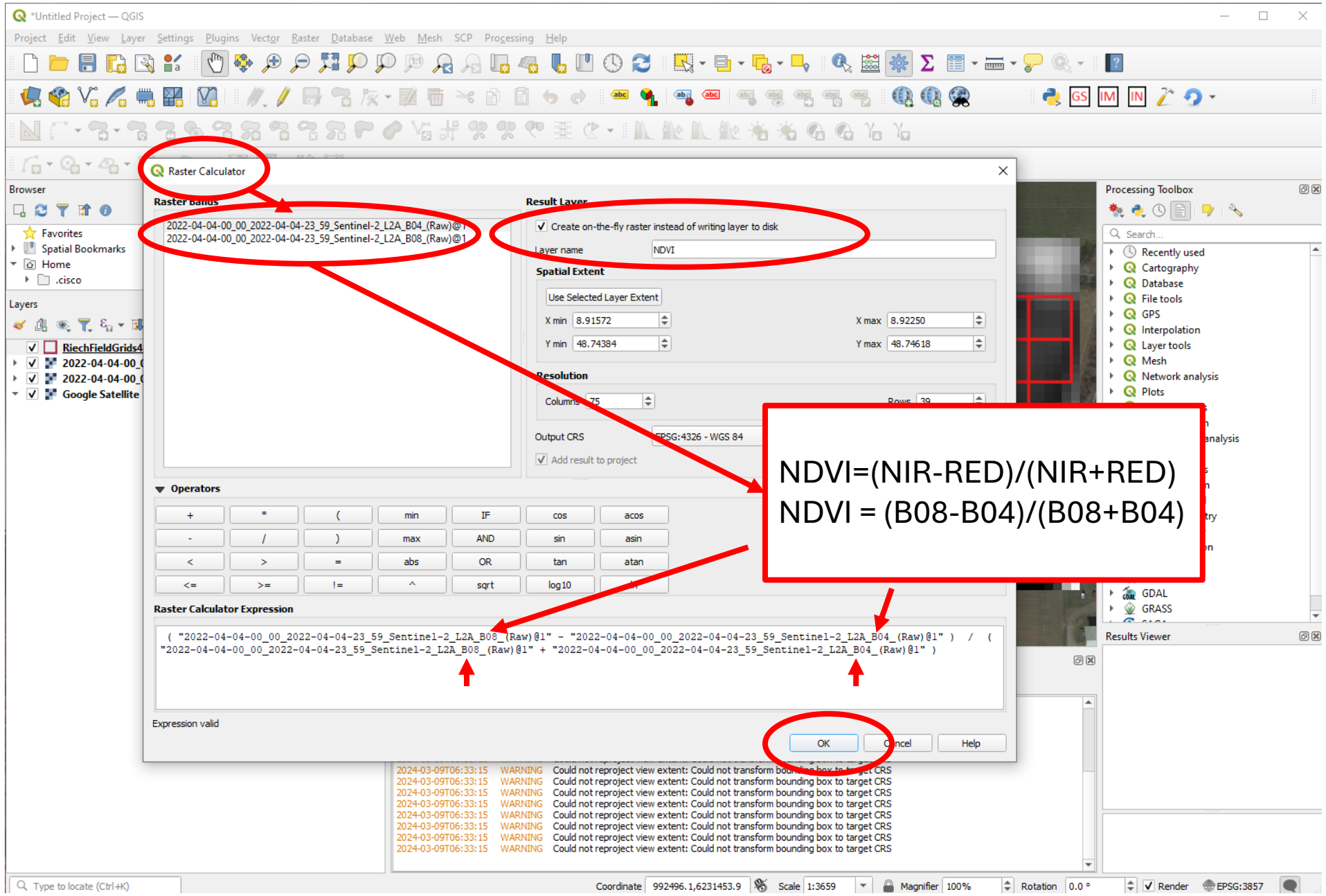
Modifying of the girds to get transparent background – when executed



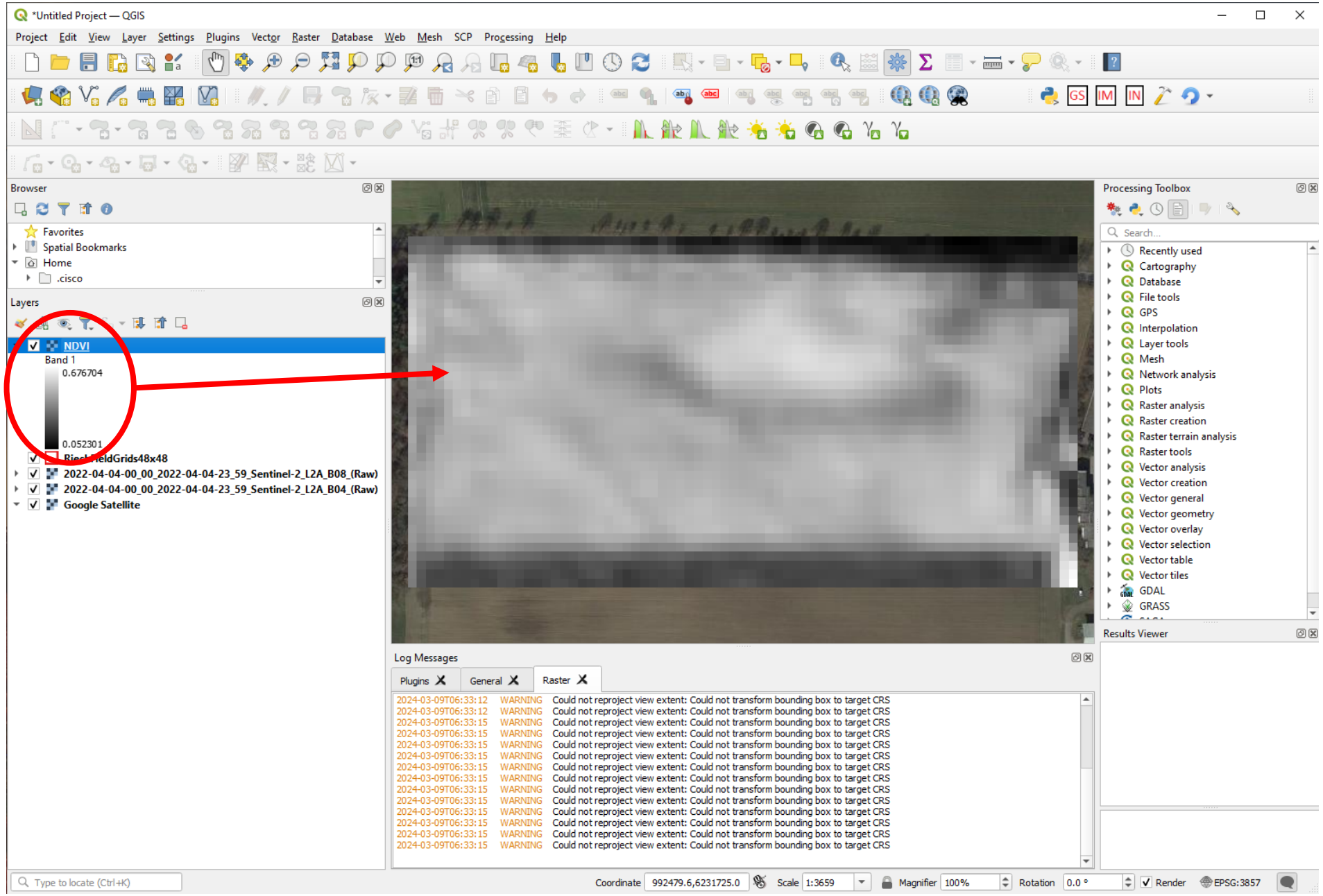
Calculating NDVI is conducted with Raster Calculator – Raster -> Raster Calculator



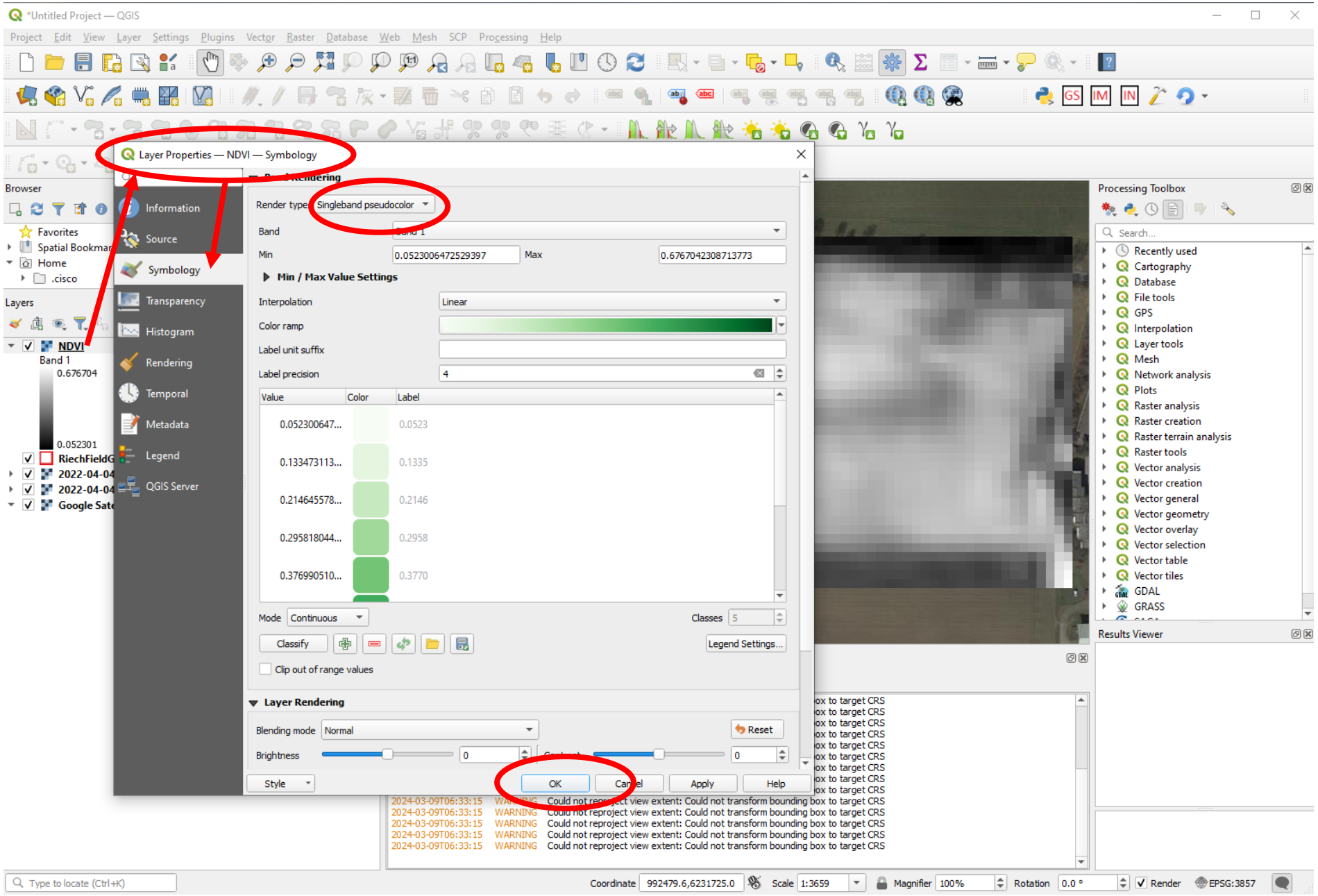
In Raster Calculator – minimum action required to calculate NDVI is indicated with red circles and arrows



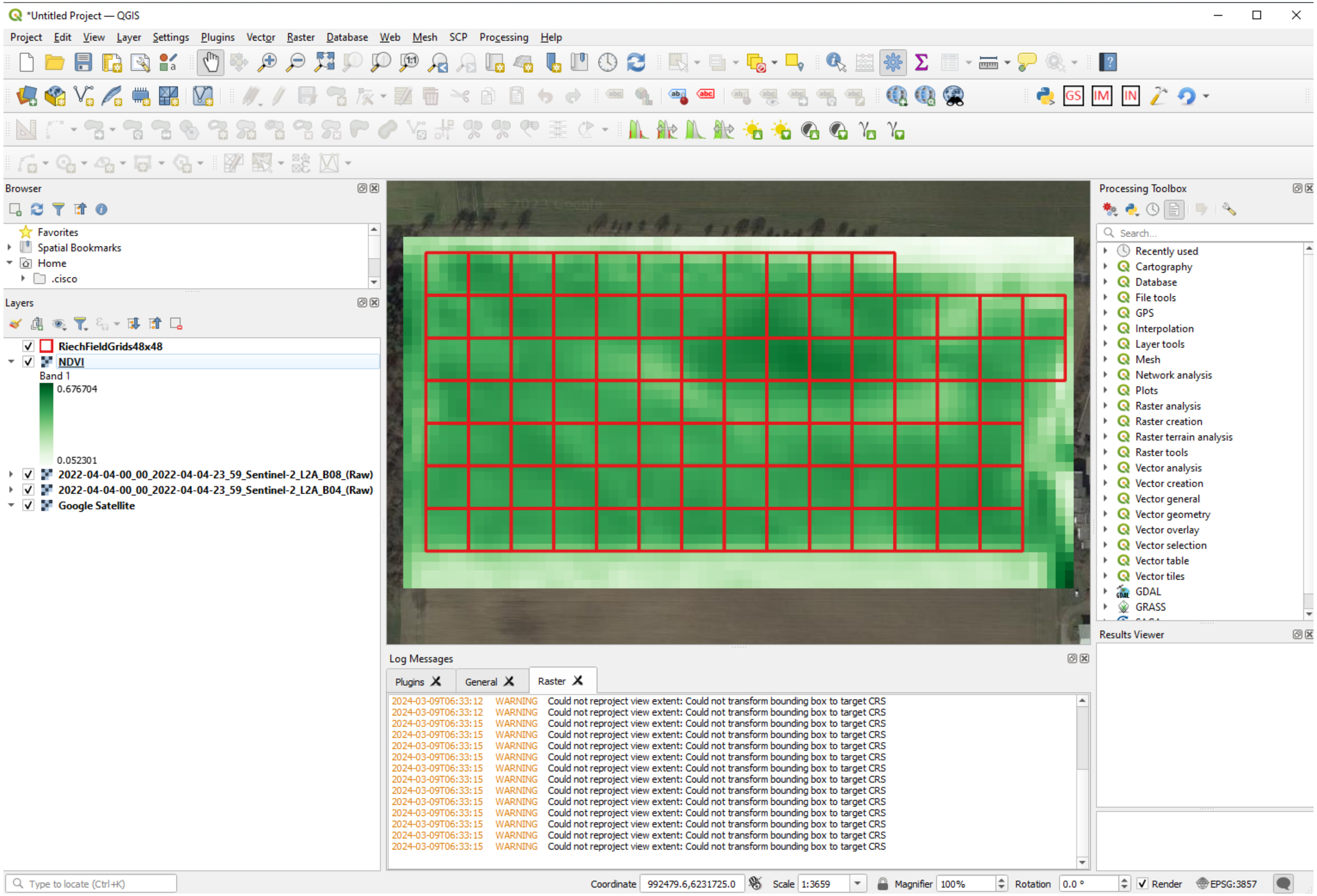
After Raster Calculator calculations are conducted a user gets NDVI layer in QGIS



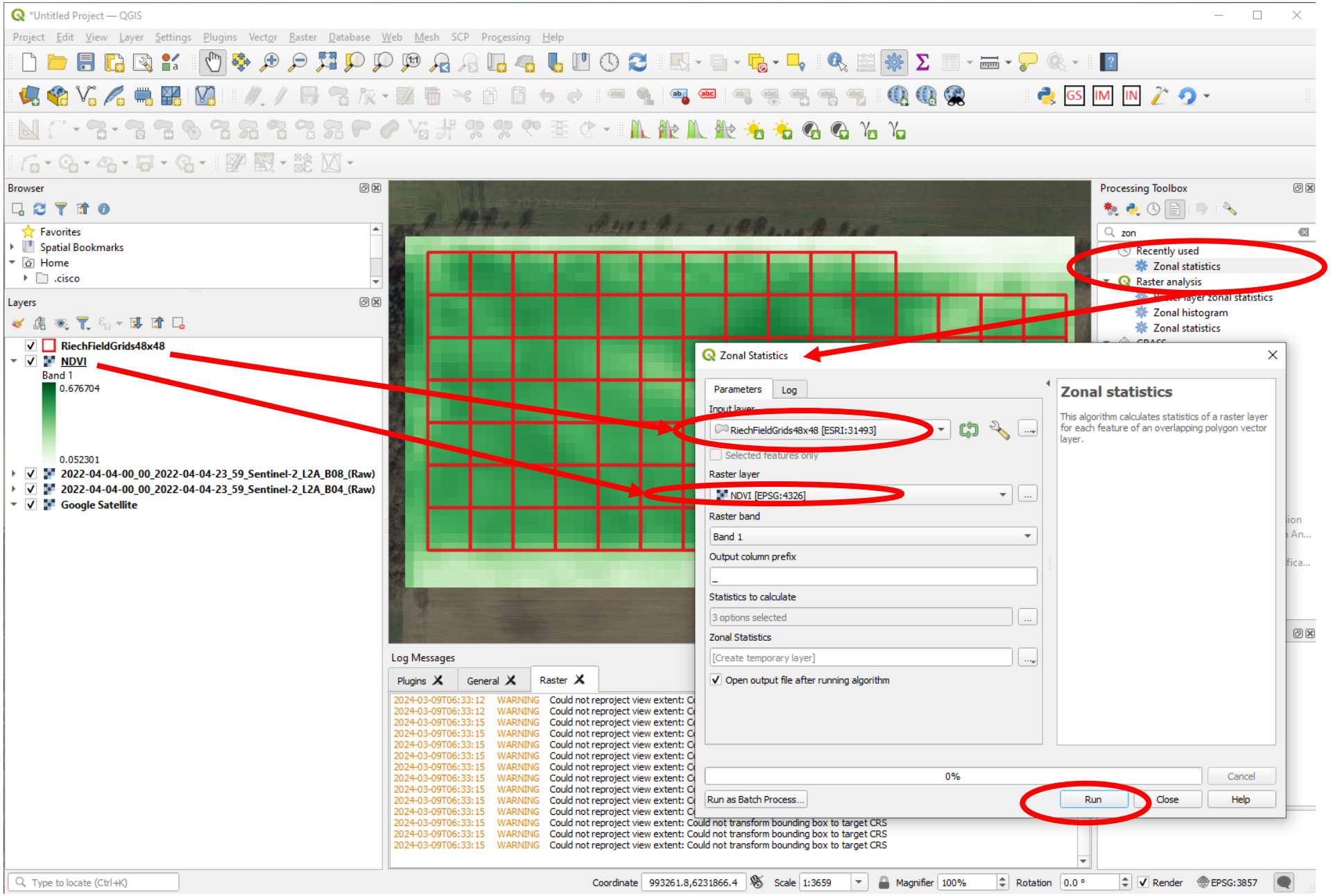
NDVI layer (in gray by default) can be changed to green – Layer Properties -> Symbiology -> Singleband Pseudocolor



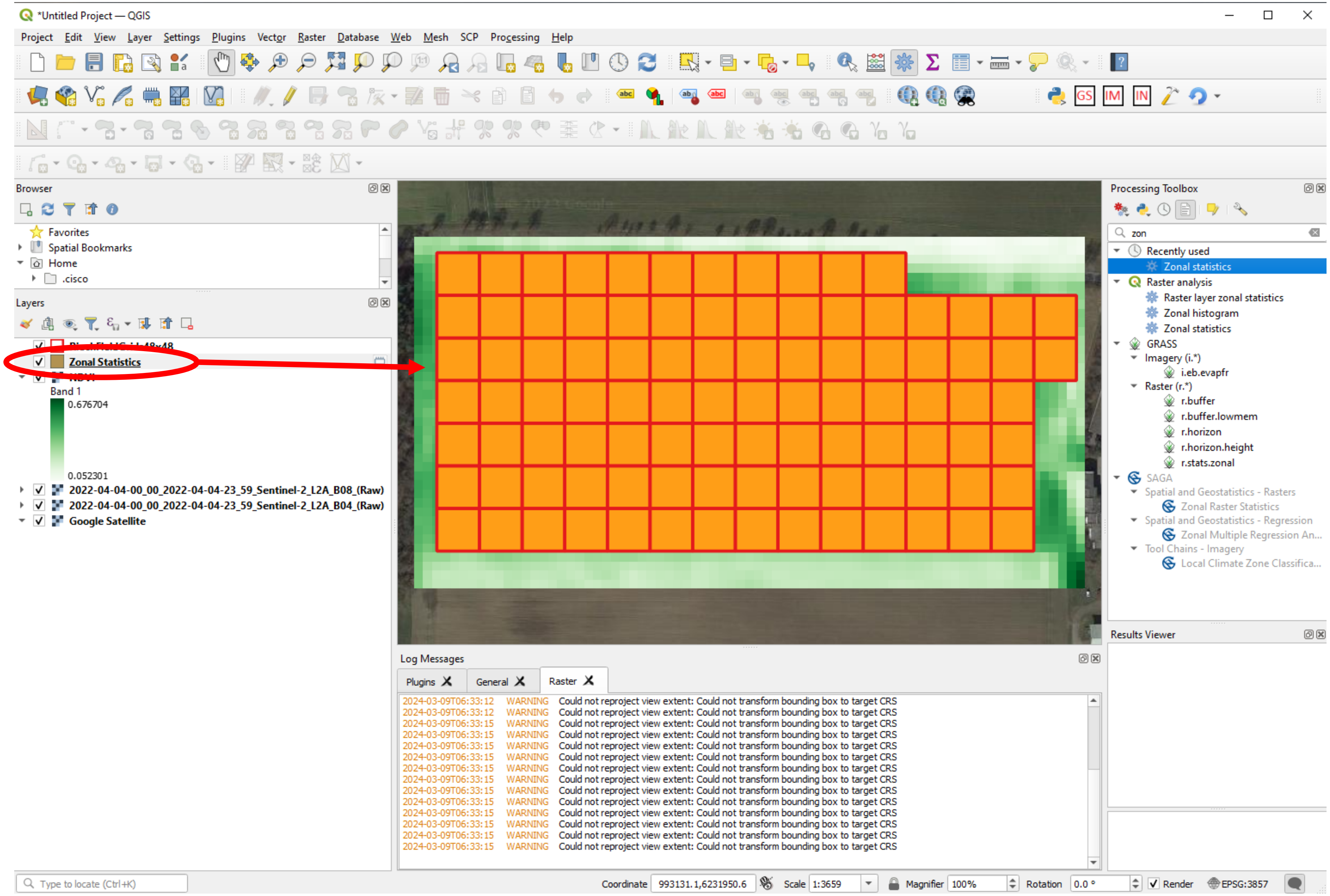
NDVI layer in green



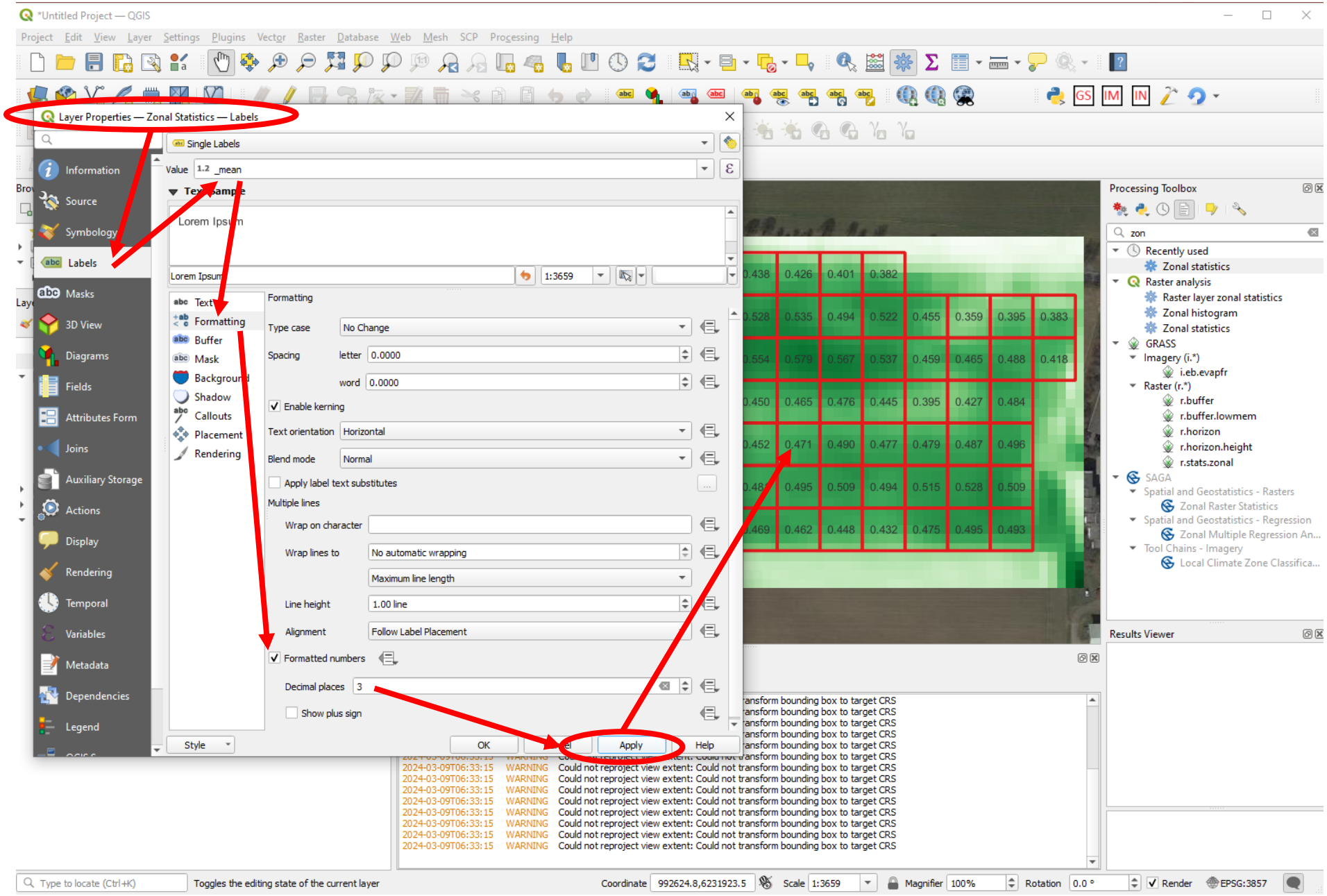
Calculating NDVI for each grid – based on Grid layer and NDVI layer with Zonal Statistics



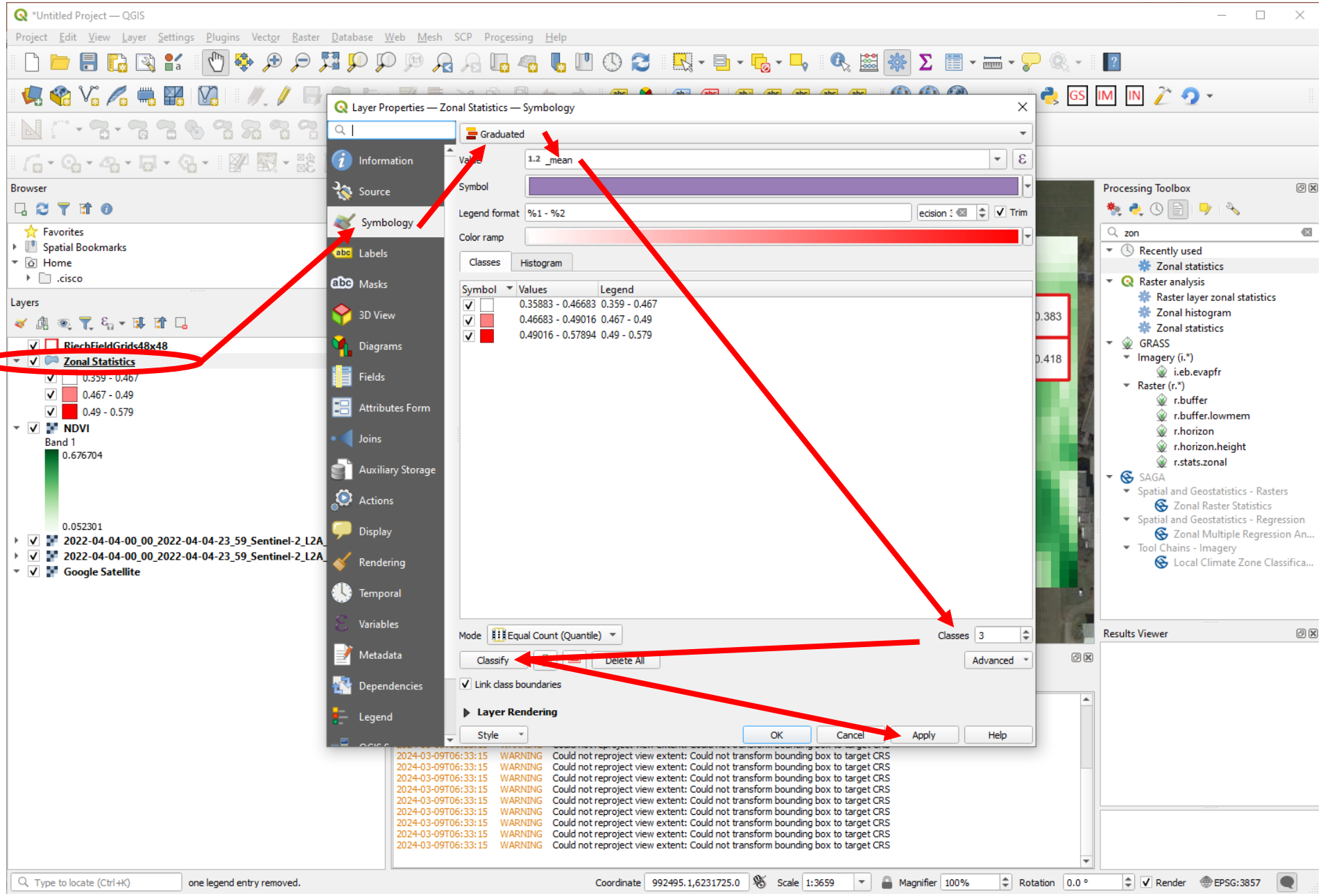
Zonal Statistics after execution produce Zonal Statistics (temporary layer)



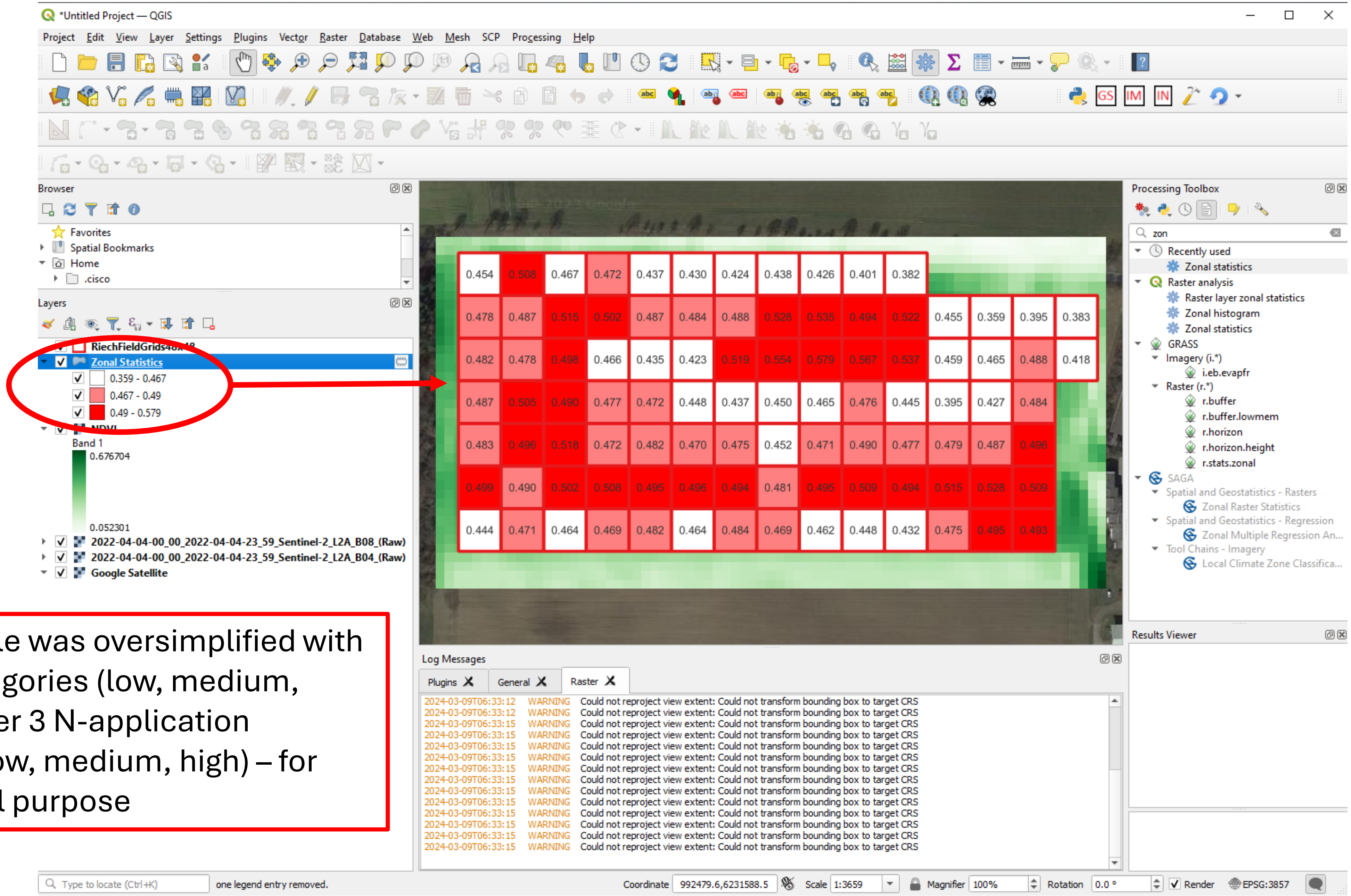
Zonal Statistics layer – to show NDVI for each grid – Layer Properties -> Labels -> Single Labels -> _mean (value select)



Zonal Statistics layer – create 3 NDVI categories – Symbiology -> Graduated -> _mean -> Classes (3) -> Classify

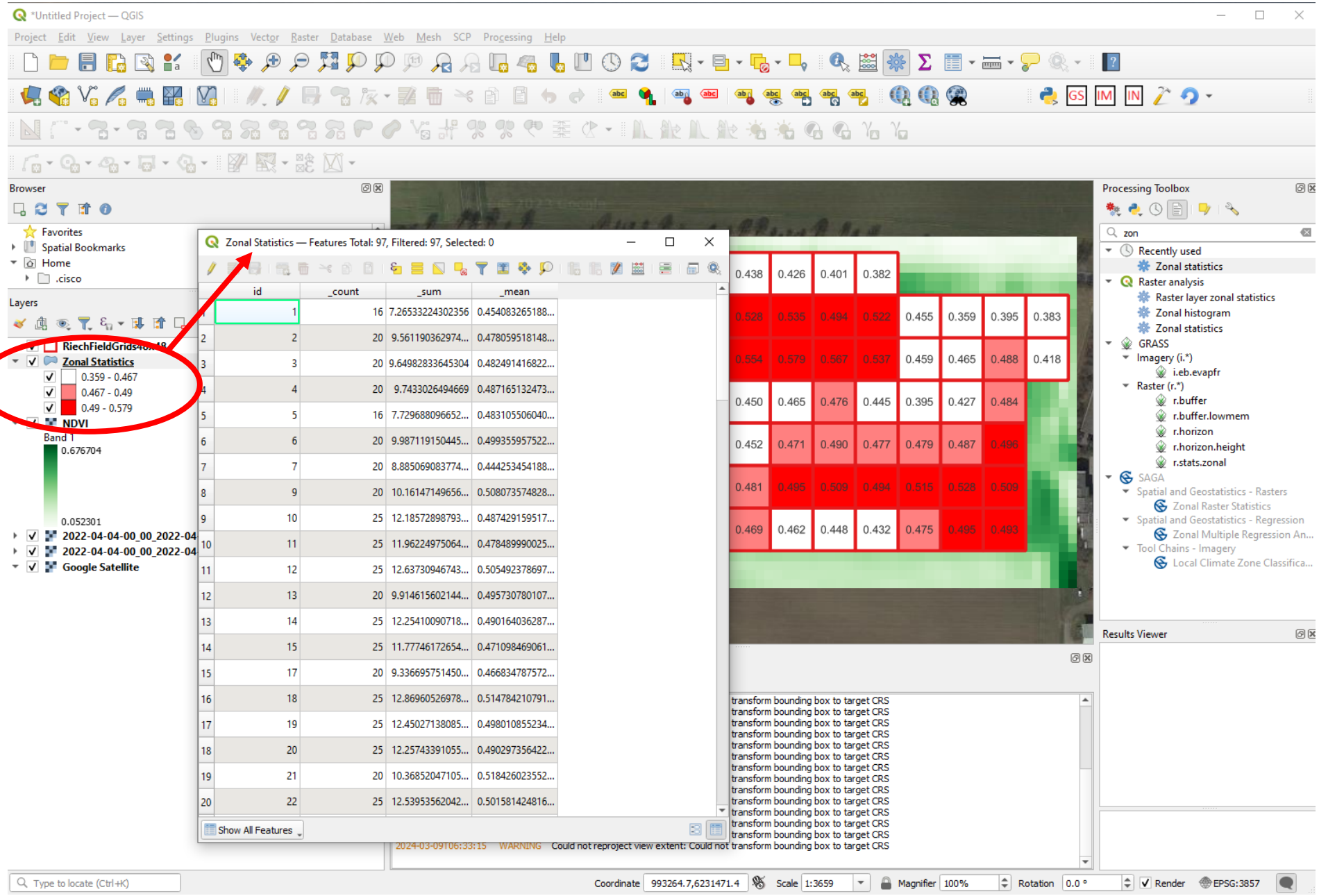


Zonal Statistics layer – setup of previous slide when executed will produce heat map of index variability (3 categories)

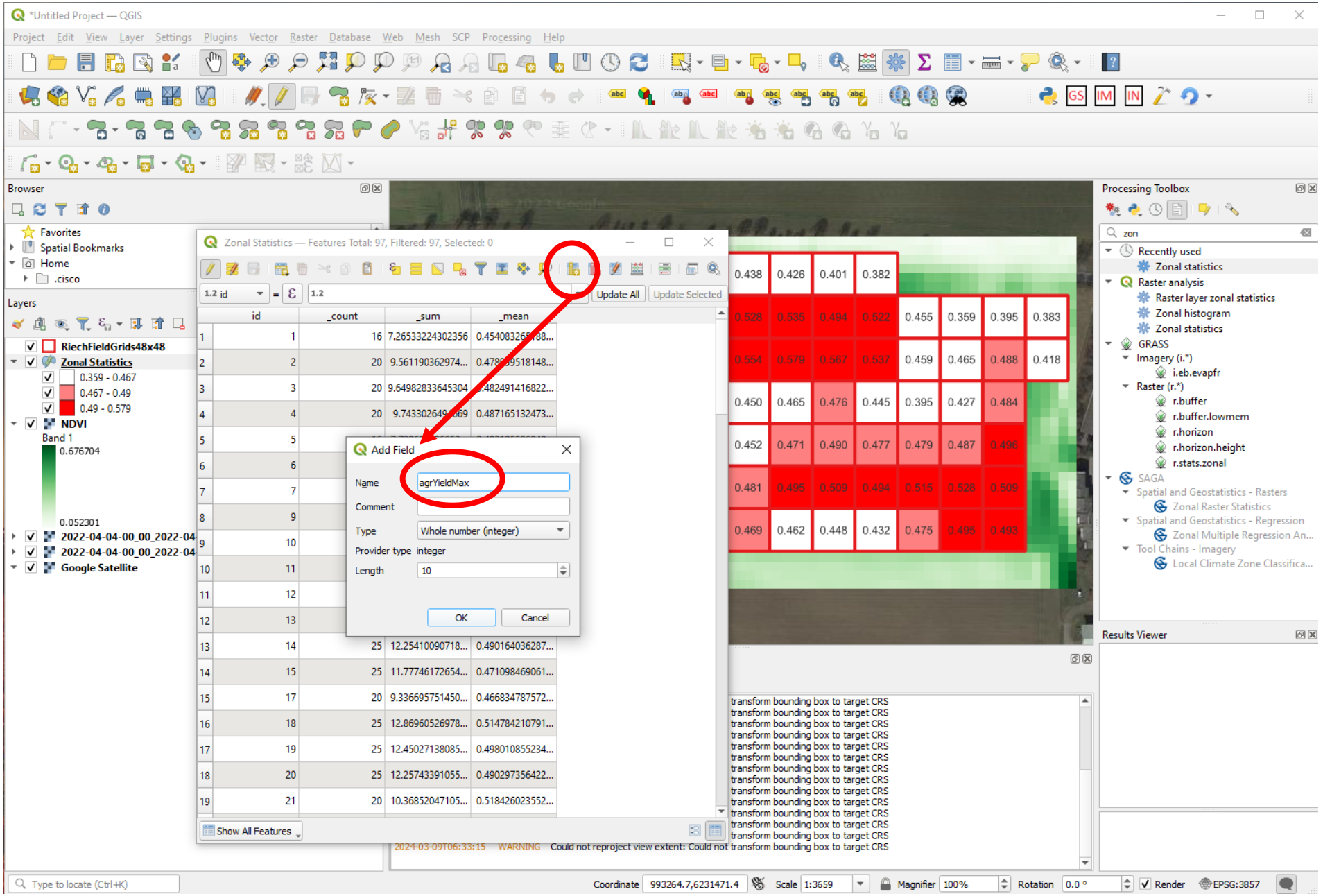


This example was oversimplified with 3 NDVI categories (low, medium, high) for later 3 N-application amounts (low, medium, high) – for educational purpose

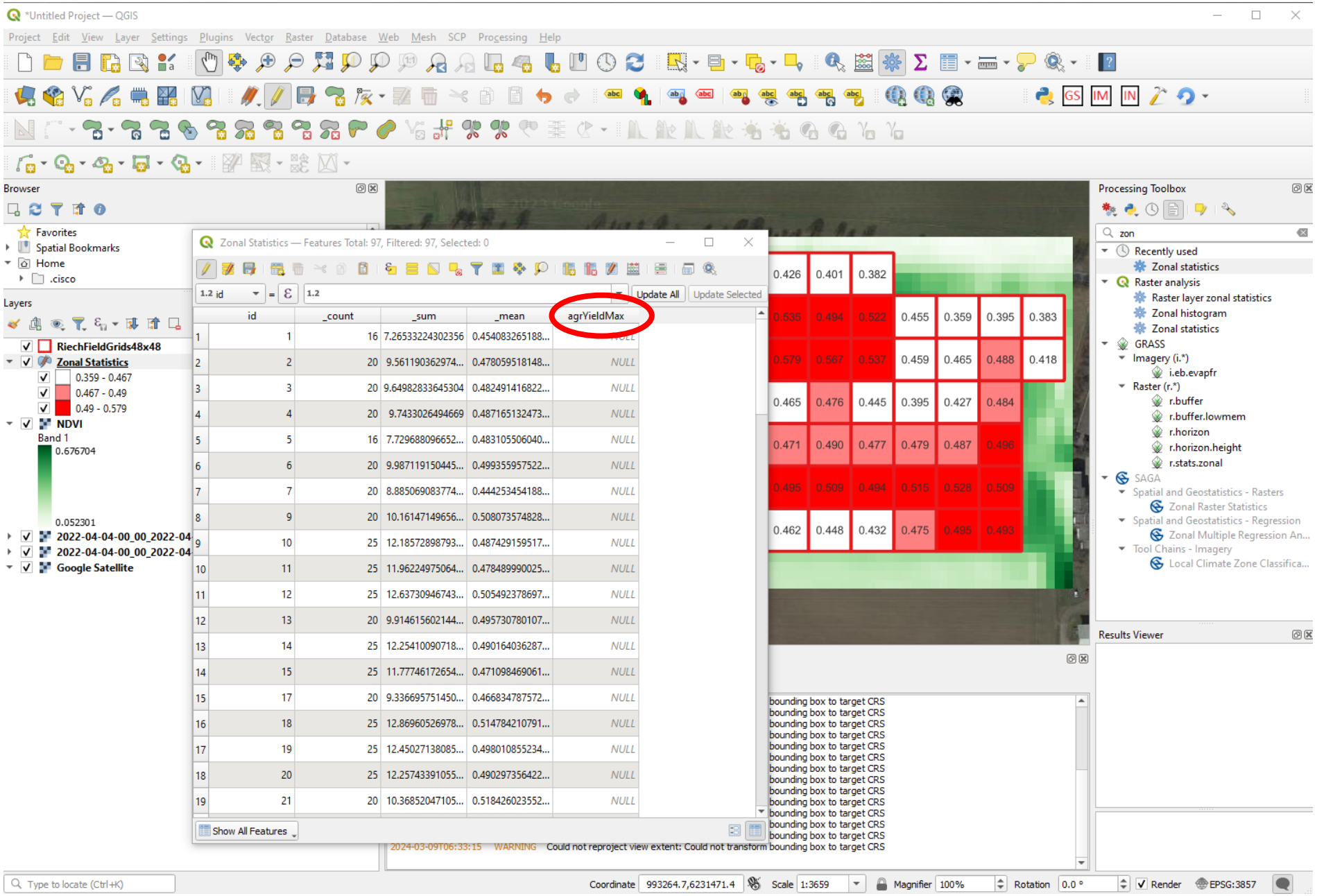
Zonal Statistics layer – Properties -> Open Attribute Table (shows statistics for each grid, including number of pixels per grid – count)



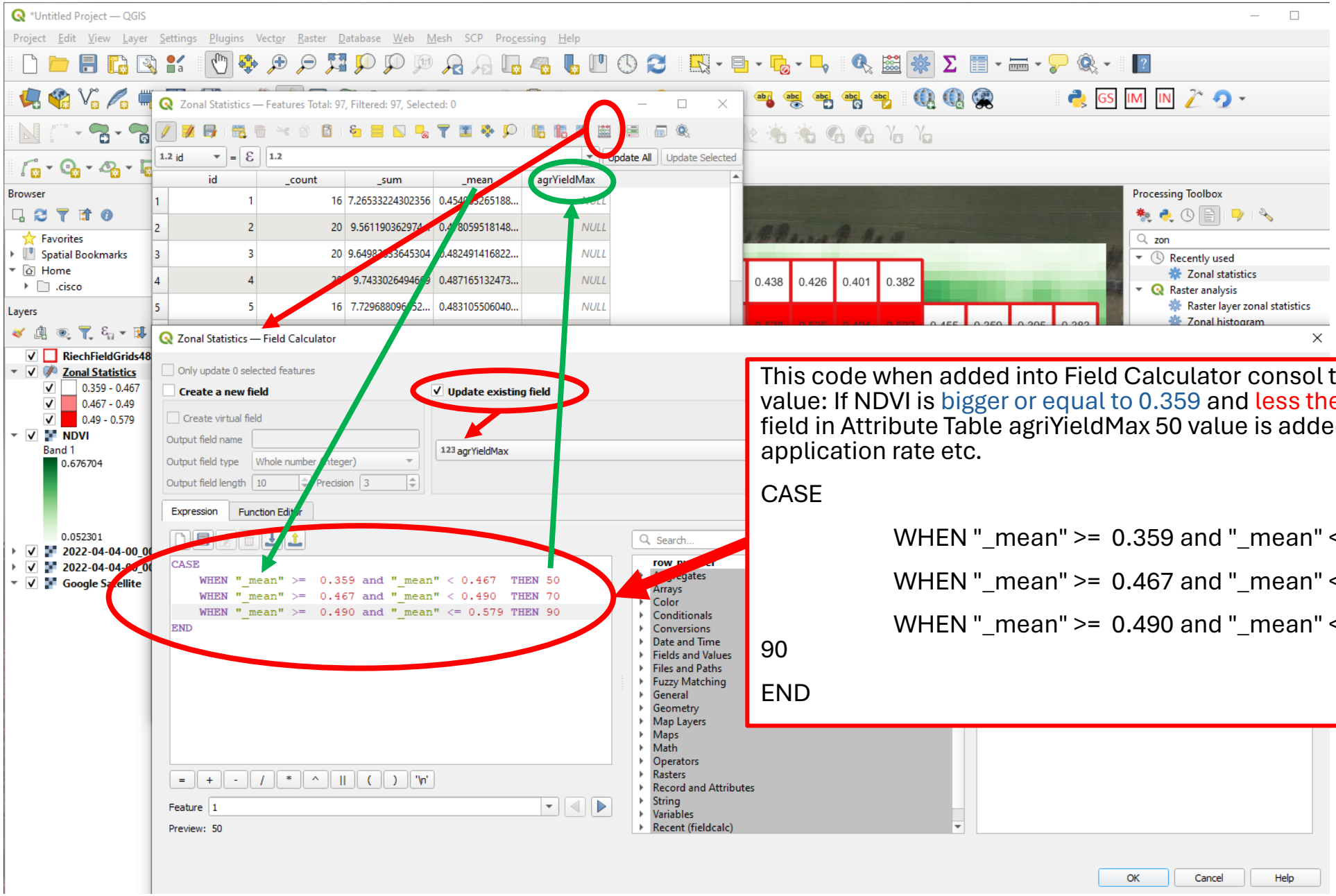
Zonal Statistics layer –Attribute Table tool -> Add Field (will create a place holder to populate later with corresponding N application kg)



Zonal Statistics layer –Attribute Table – new field added: agrYieldMax



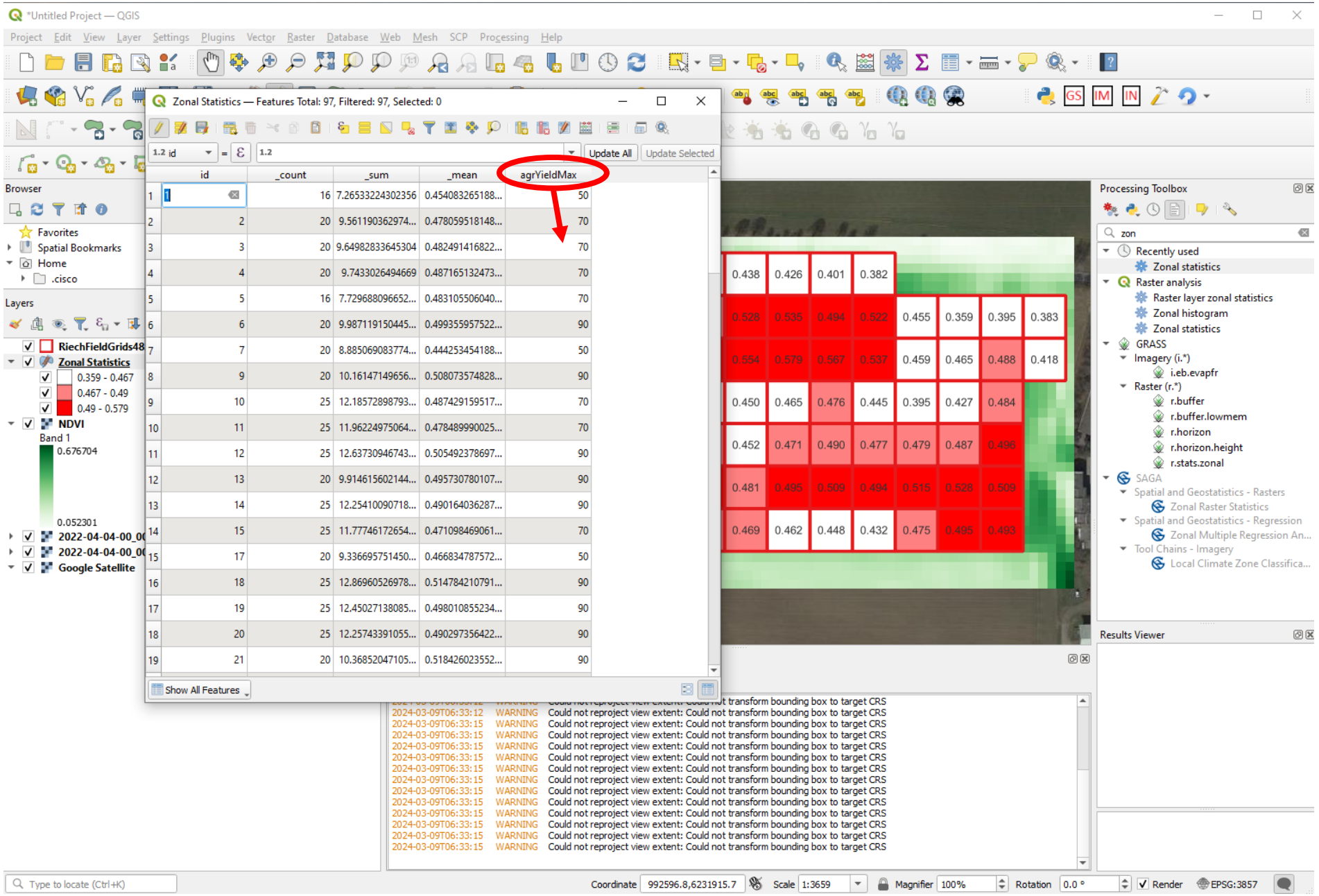
Zonal Statistics layer –Attribute Table – Field Calculator setup – based on the grid NDVI value the grid is allocated N application value (kg)



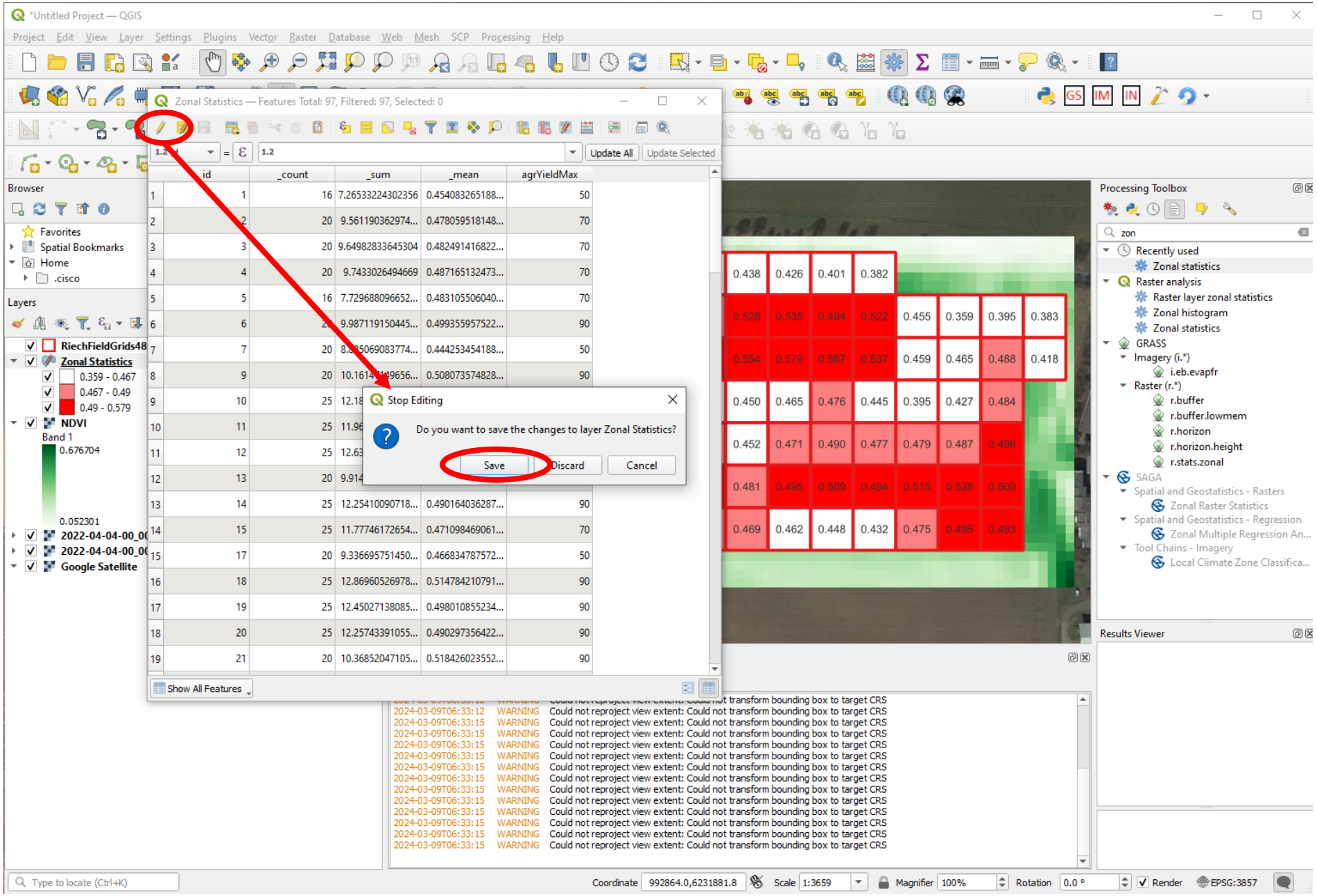
This code when added into Field Calculator consol to allocate N kg value: If NDVI is bigger or equal to 0.359 and less then 0.467 in the field in Attribute Table agriYieldMax 50 value is added. 50 -> low N application rate etc.

```
CASE
        WHEN "_mean" >=  0.359 and "_mean" < 0.467  THEN 50
        WHEN "_mean" >=  0.467 and "_mean" < 0.490  THEN 70
        WHEN "_mean" >=  0.490 and "_mean" <= 0.579 THEN
90
END
```

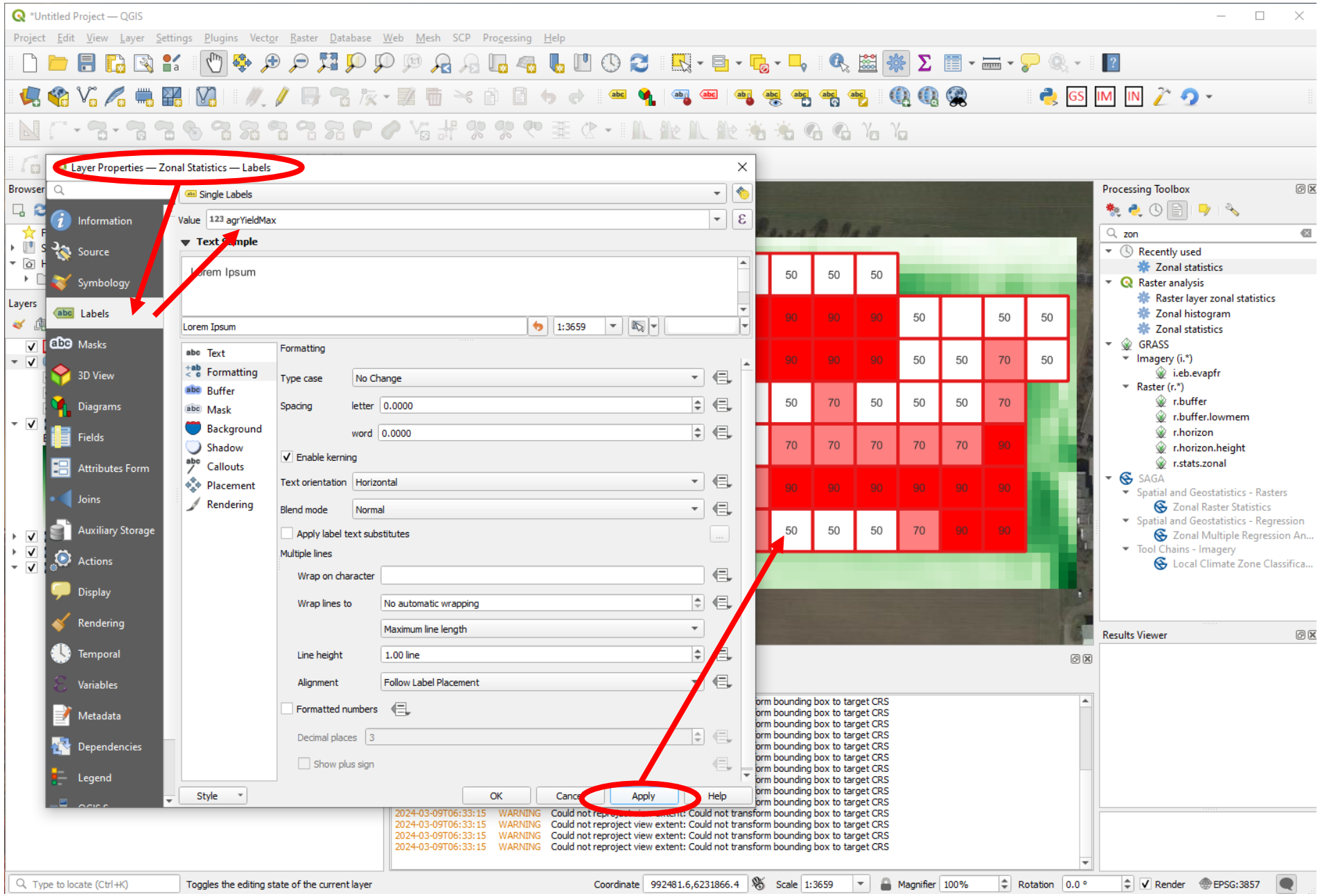
Zonal Statistics layer – based on grid NDVI values and categories the N-application values are allocated



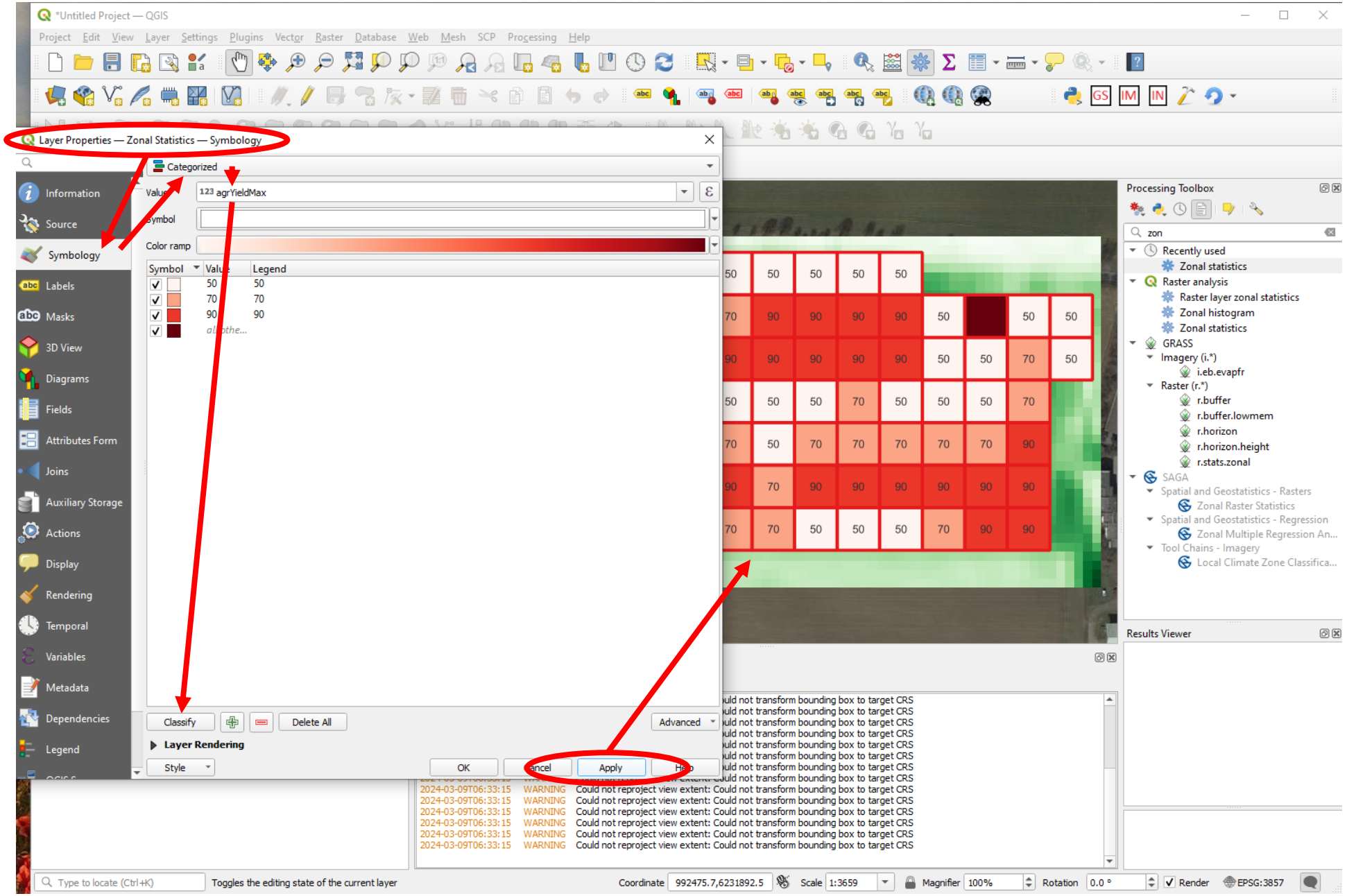
Zonal Statistics layer – based on grid NDVI values and categories the N-application values are allocated – stop editing and save!



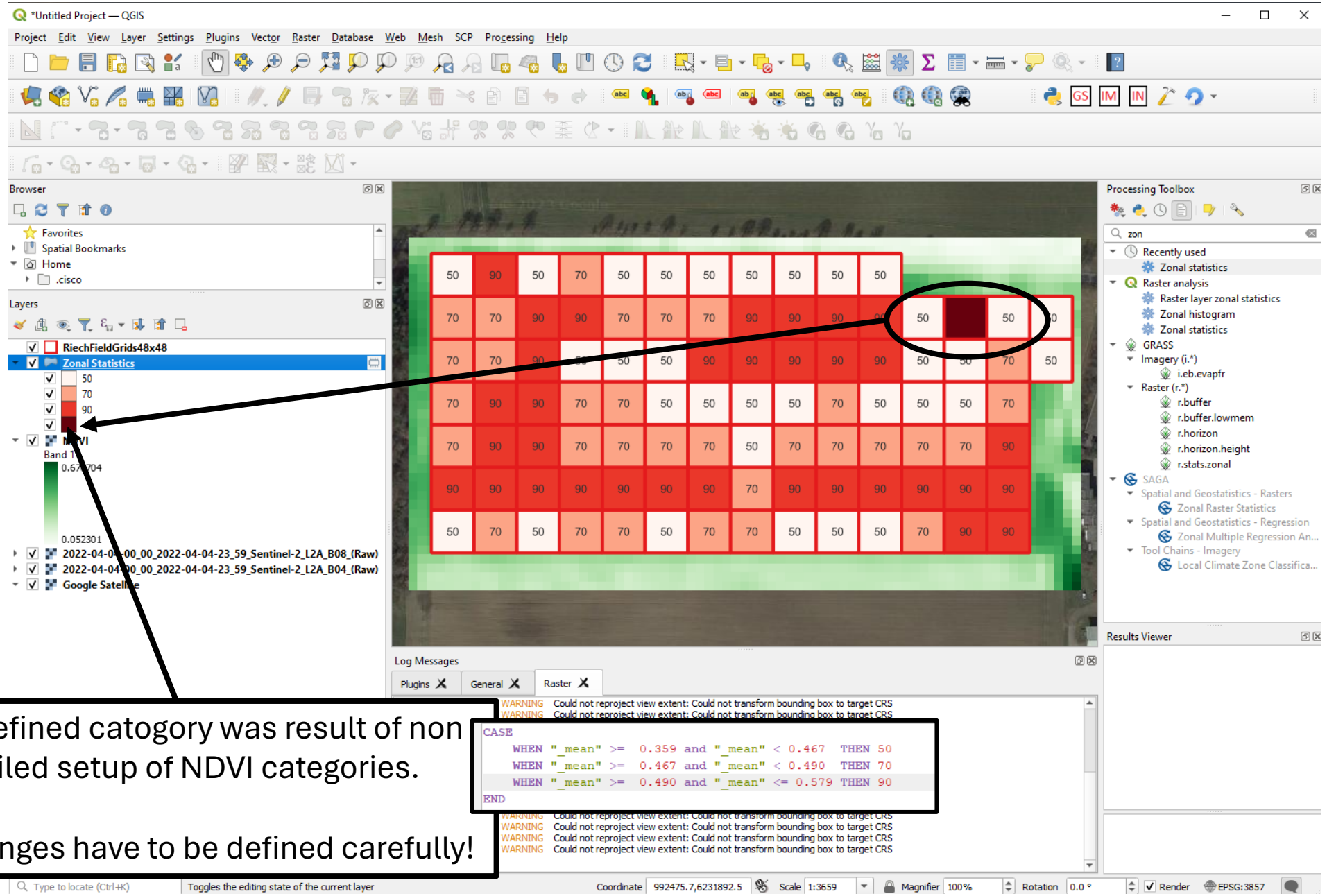
Zonal Statistics layer – Labels -> Single Labels -> agrYieldMax (value) - > will N application values to each corresponding grid



Zonal Statistics layer – Symbiology -> Categorized -> agrYieldMax -> Classify



Zonal Statistics layer – N application mat generated!



None defined catogory was result of non detailed setup of NDVI categories.

These ranges have to be defined carefully!

Discussion