Reclassifying and calculating raster data:

An application to landslide susceptibility mapping

Data Needed:

- Land cover (MODIS.tif)
- Soil (Soils_Madang_GCS.shp)
- DEM (SRTM90m.tif)

Plugin Needed:

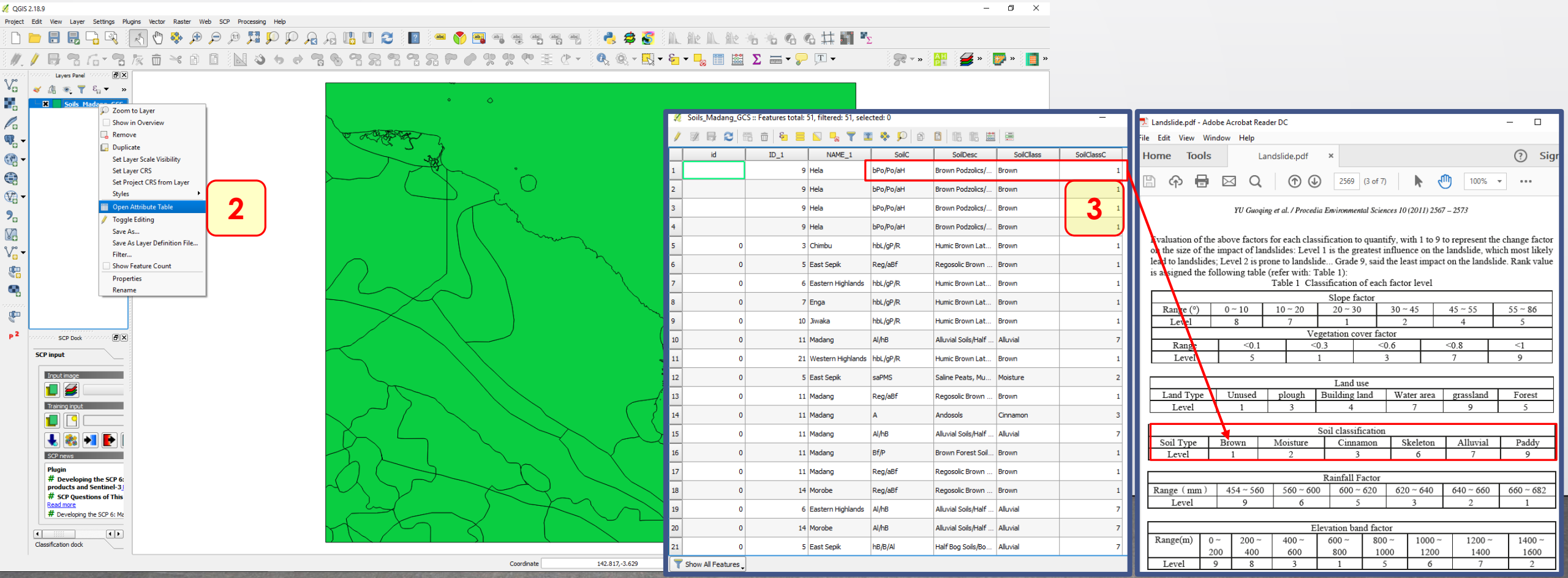
- Raster Terrain Analysis

Research Paper:

- Landslide Risk Analysis of Miyun Reservoir Area Based on RS and GIS

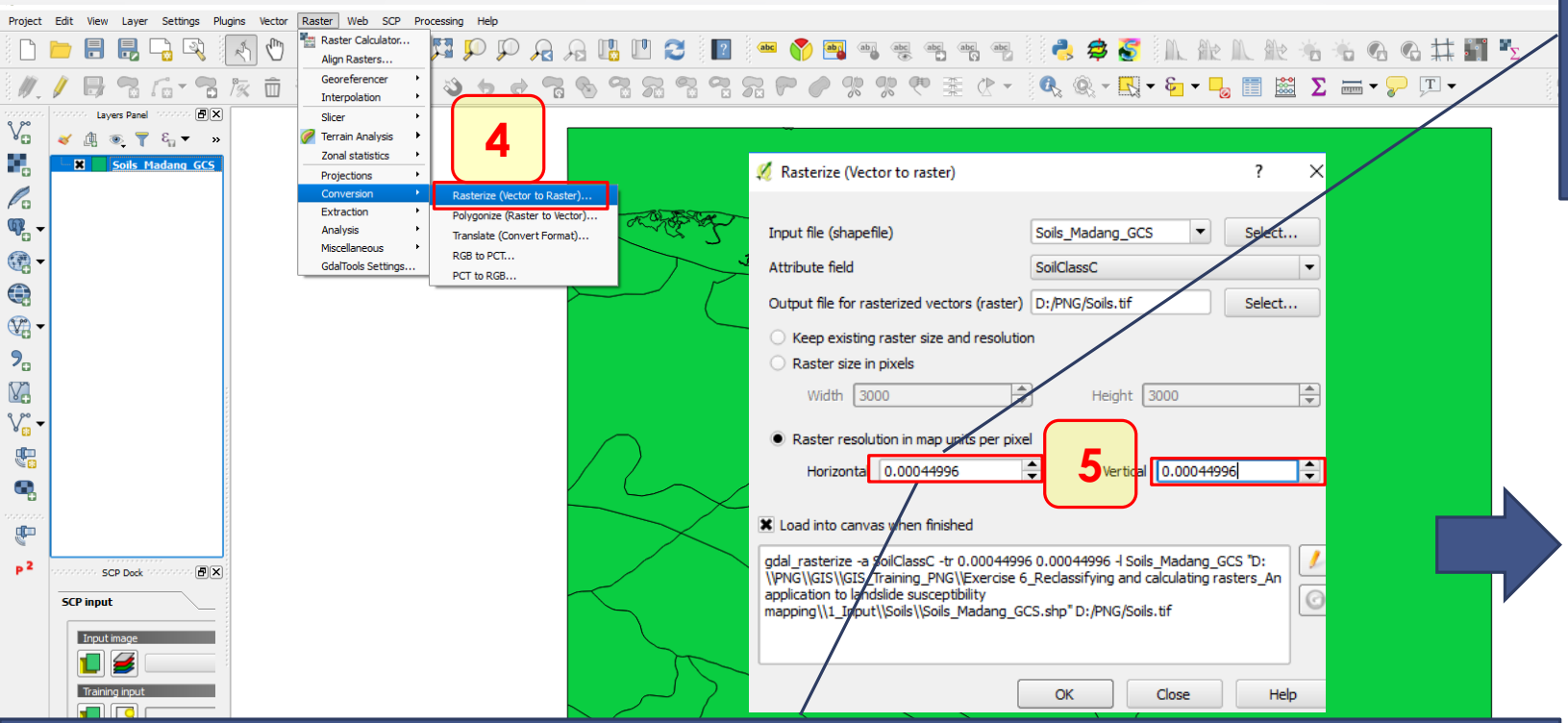
Yu, Yang, Tian, Zhang

1. Load all layers
2. Open attribute table of soil layer
3. Reclassify existing soil category to the required category



Convert vector to raster layer

4. Click Rasterize under Raster menu/Conversion
5. Define pixel resolution



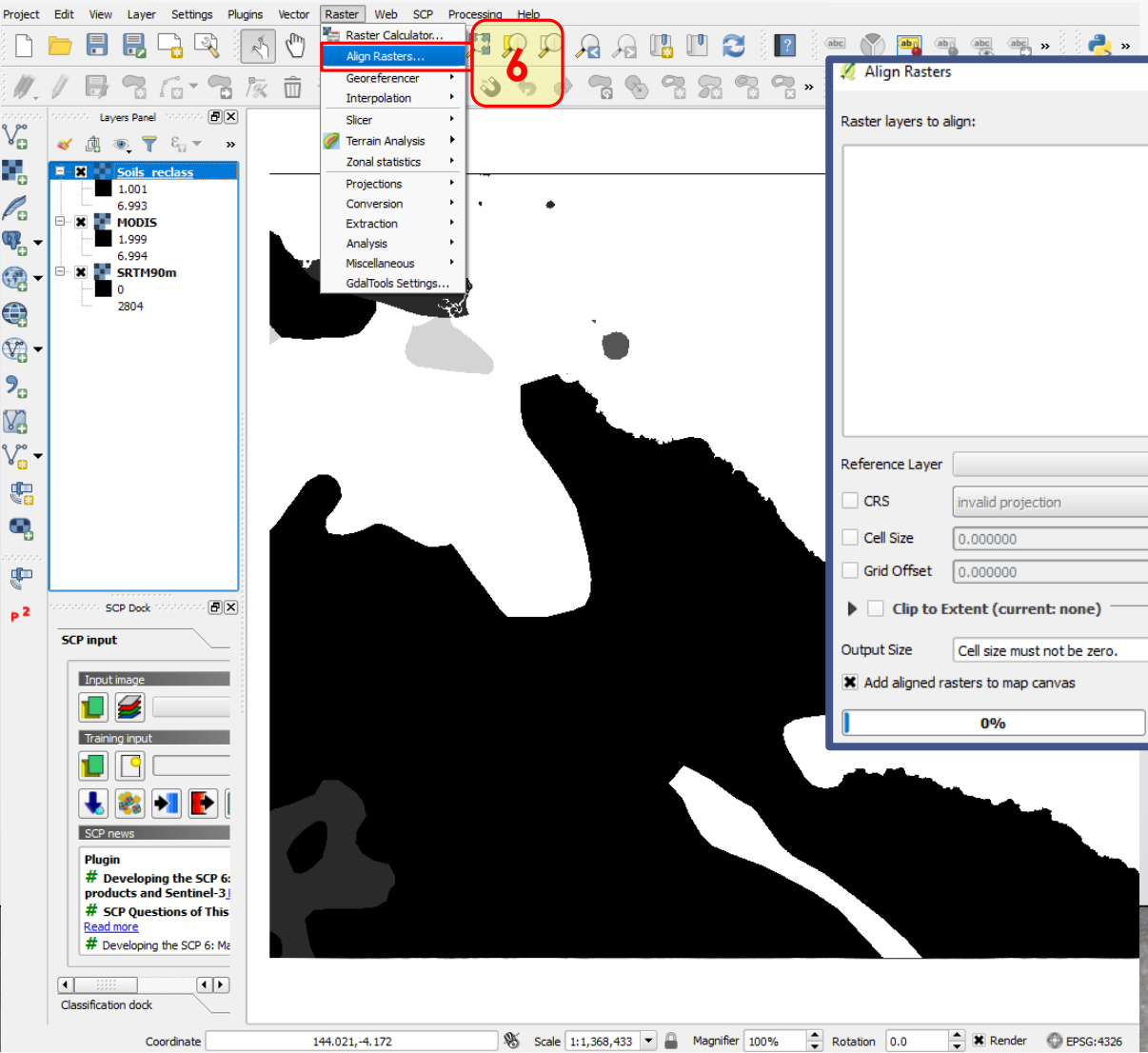
Raster resolution of 50 meters in terms of degrees is computed as follows:

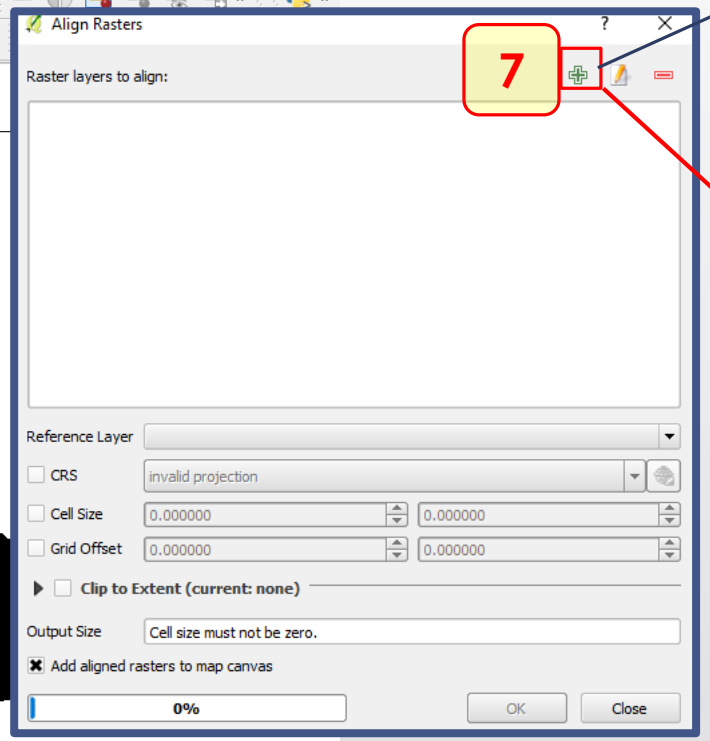
50/111120 = 0.00044996 degrees

When defining raster pixel resolution, value will depend on layer's coordinate system e.g. in terms of meters if using projected system, or in degrees if using geographic coordinate system (1 degree = 111120 meters)

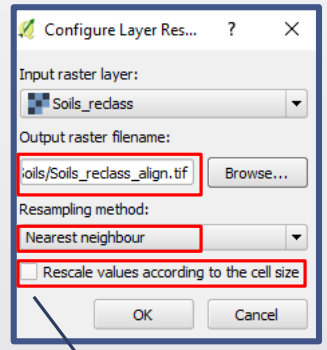
Align raster layers to standardize extent and resolution

6. Click Align Rasters





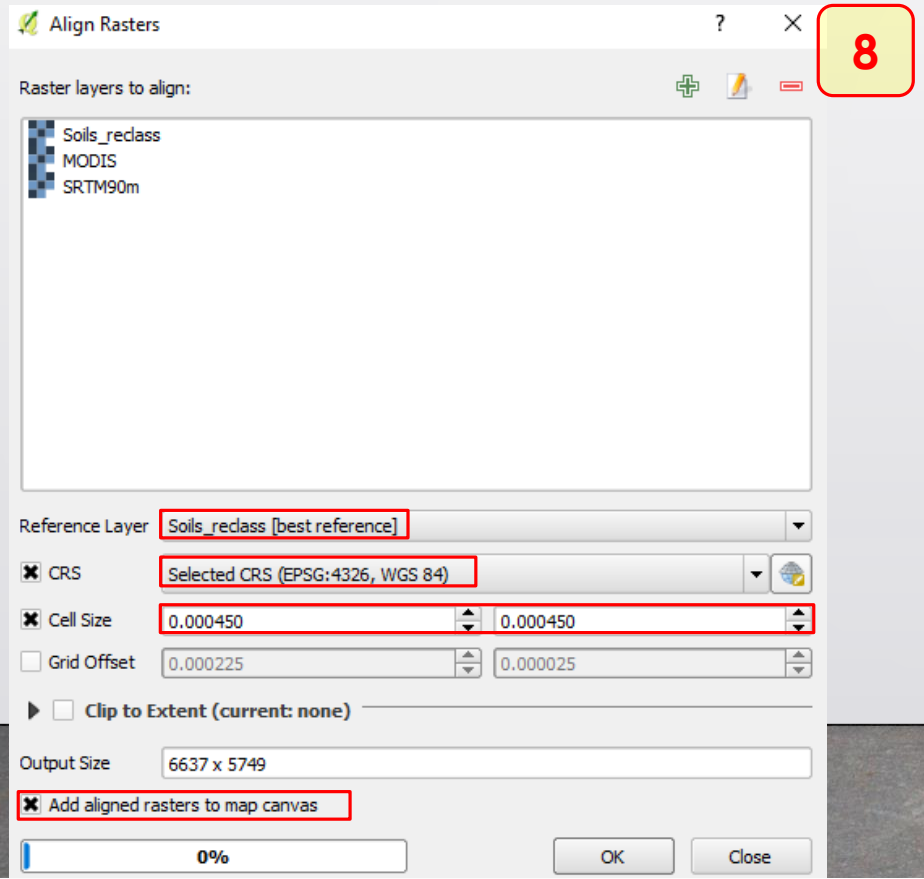
7. One by one, add each layer (e.g. MODIS.tif, Soils_reclass.tif, SRTM90m.tif) and save to new filename (newly adjusted raster)

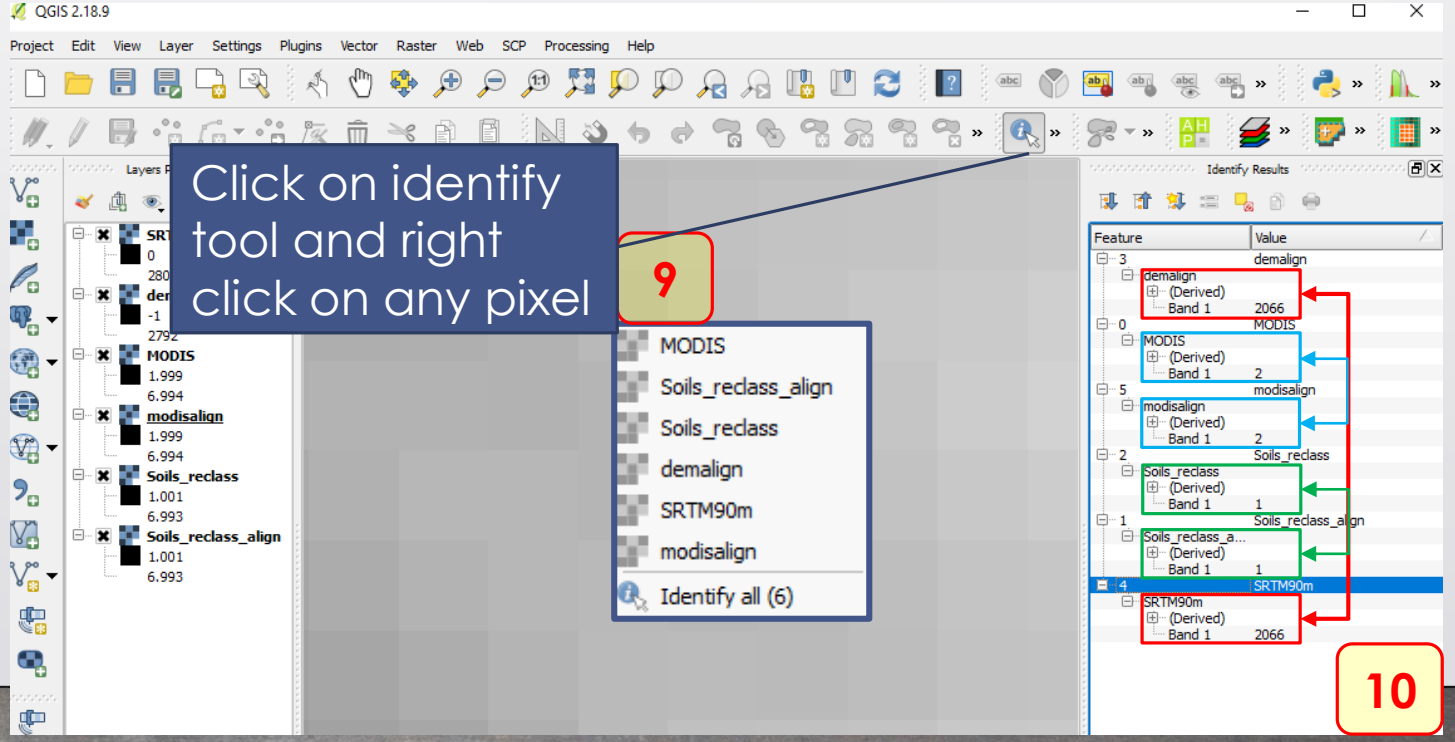


Note: Don't tick

Align raster layers to standardize extent and resolution

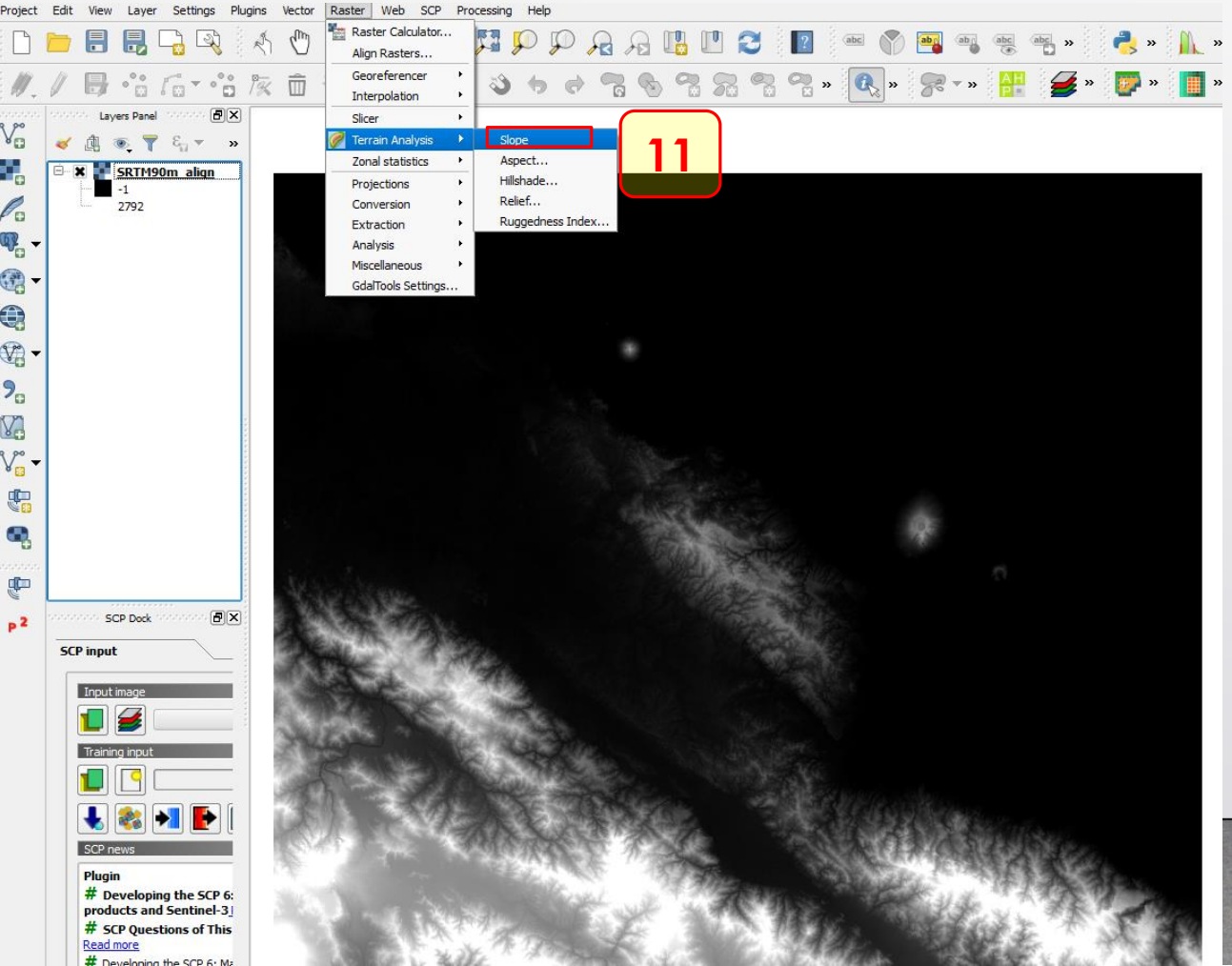
8. Set parameters
9. Click on identify tool and right click on a pixel
10. Check that pairs of original and aligned raster layers have the same values

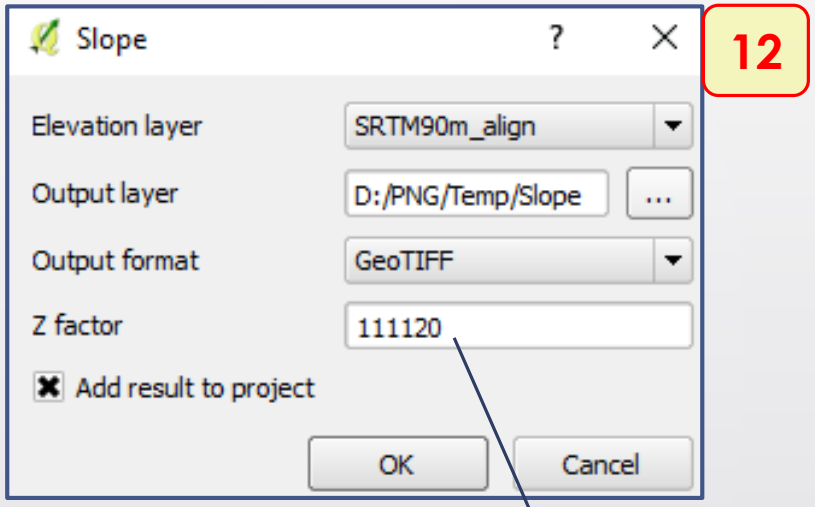




Generating slope

11. Select Terrain Analysis/Slope under Raster menu
12. Define Z factor





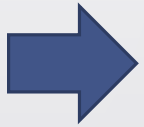
Note:

- Z factor is 1 when units of x,y,z are the same e.g. if layer is using projected coordinate system (all units of x,y,z are in meters) then z factor is 1
- If layer is using geographic coordinate system (GCS) wherein x (longitude) and y (latitude) are in degrees, while z is usually in meters, then conversion between degrees to meters is necessary and defined in z factor.
- 1 degree is approximately 111120 meters

Image reclassification

1	2	2	3	5
2	3	3	4	6
1	1	1	1	7
2	2	3	8	9
1	2	3	3	3

Old	New
1-3	1
4-6	2
7-9	3

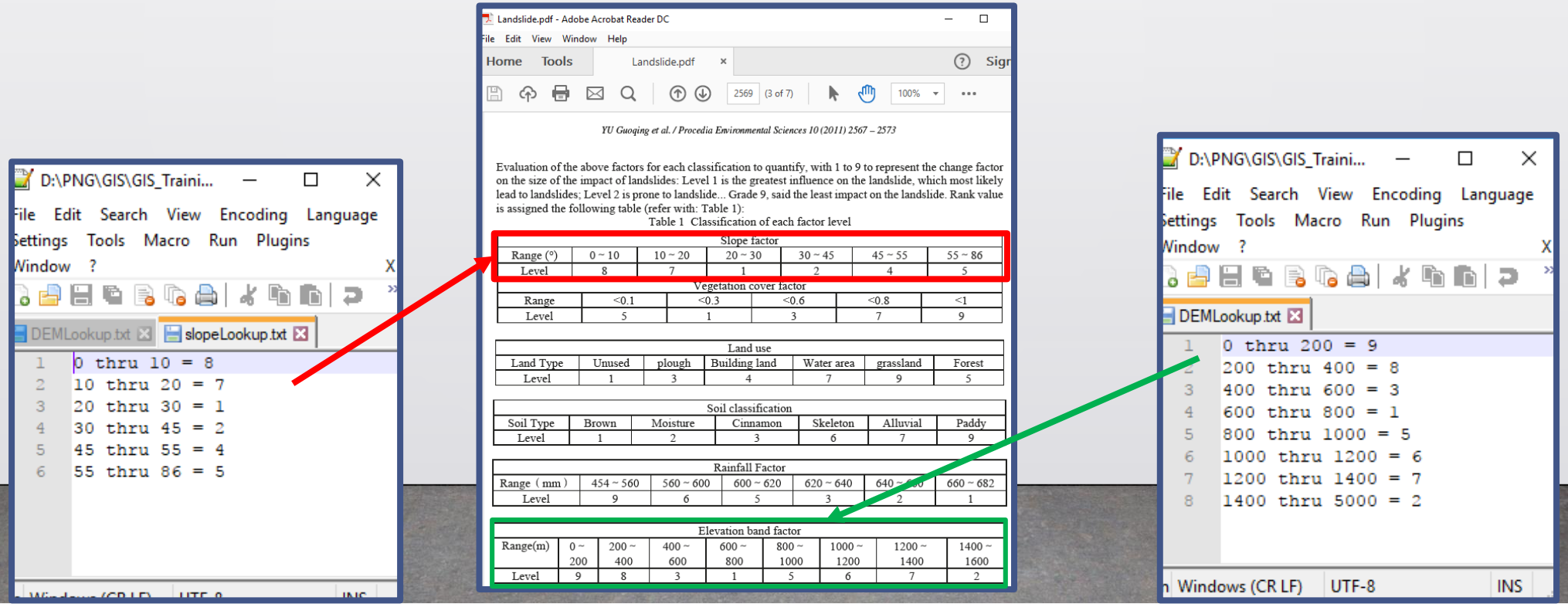


1	1	1	1	2
1	1	1	2	2
1	1	1	1	3
1	1	1	3	3
1	1	1	1	1

Reclassifying rasters

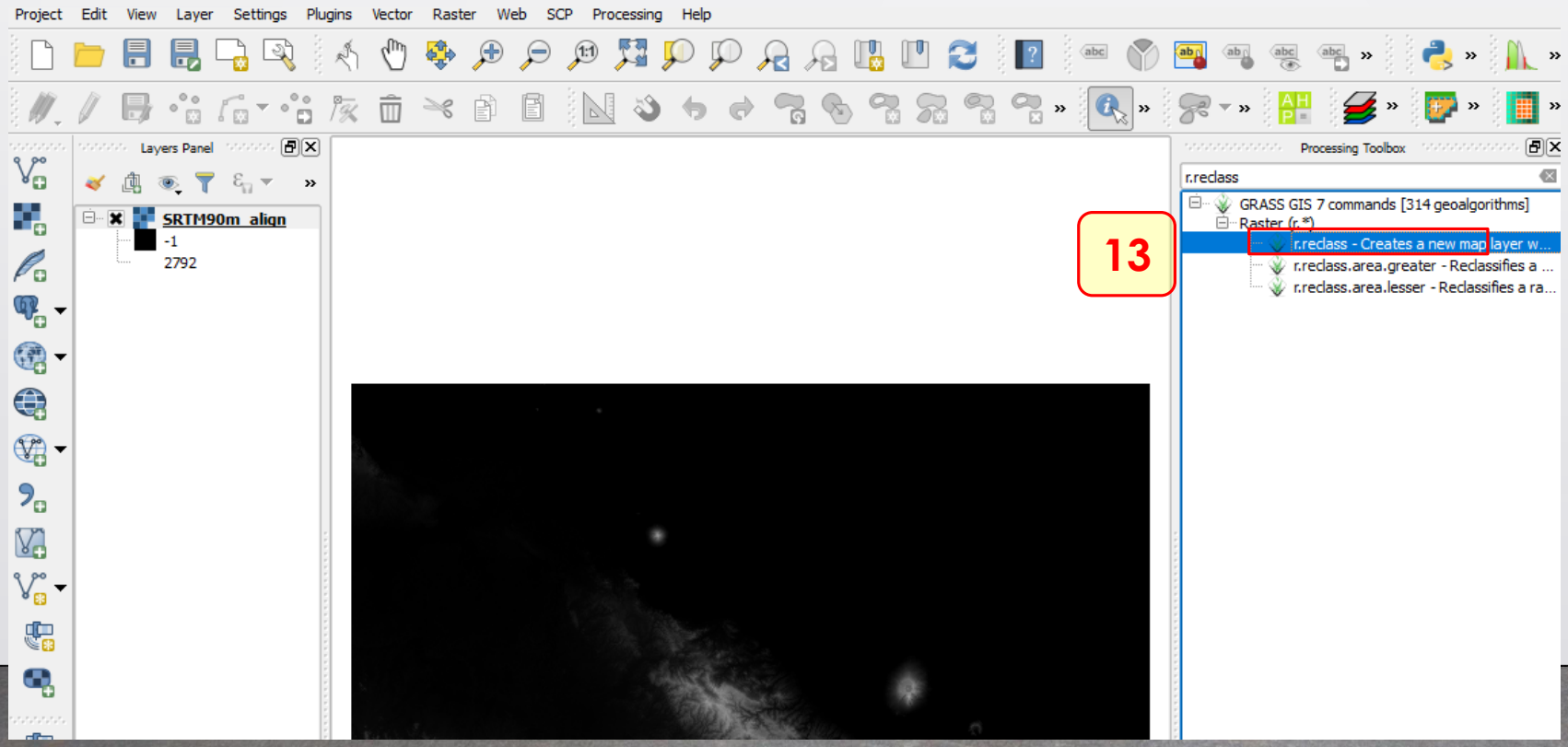
For each raster reclassify according to the required range of categories (usually based on existing paper or expert advice)

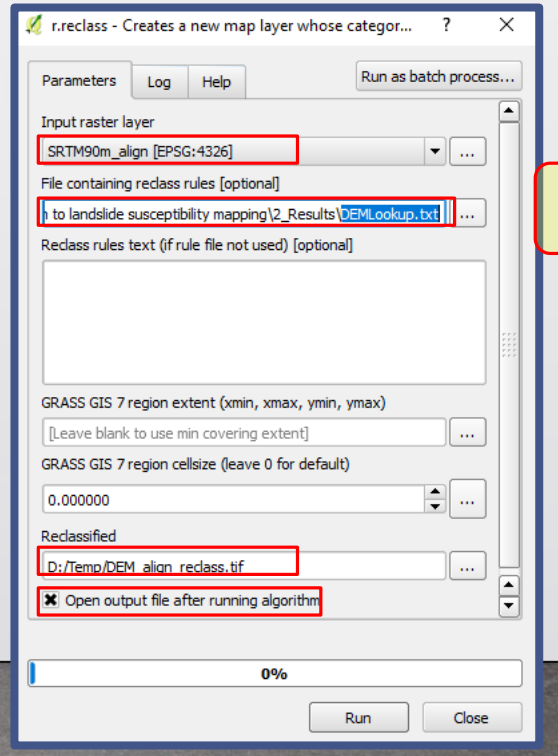
13. Prepare lookup table in notepad for slope and elevation (table should conform to required range of categories)



Reclassifying rasters

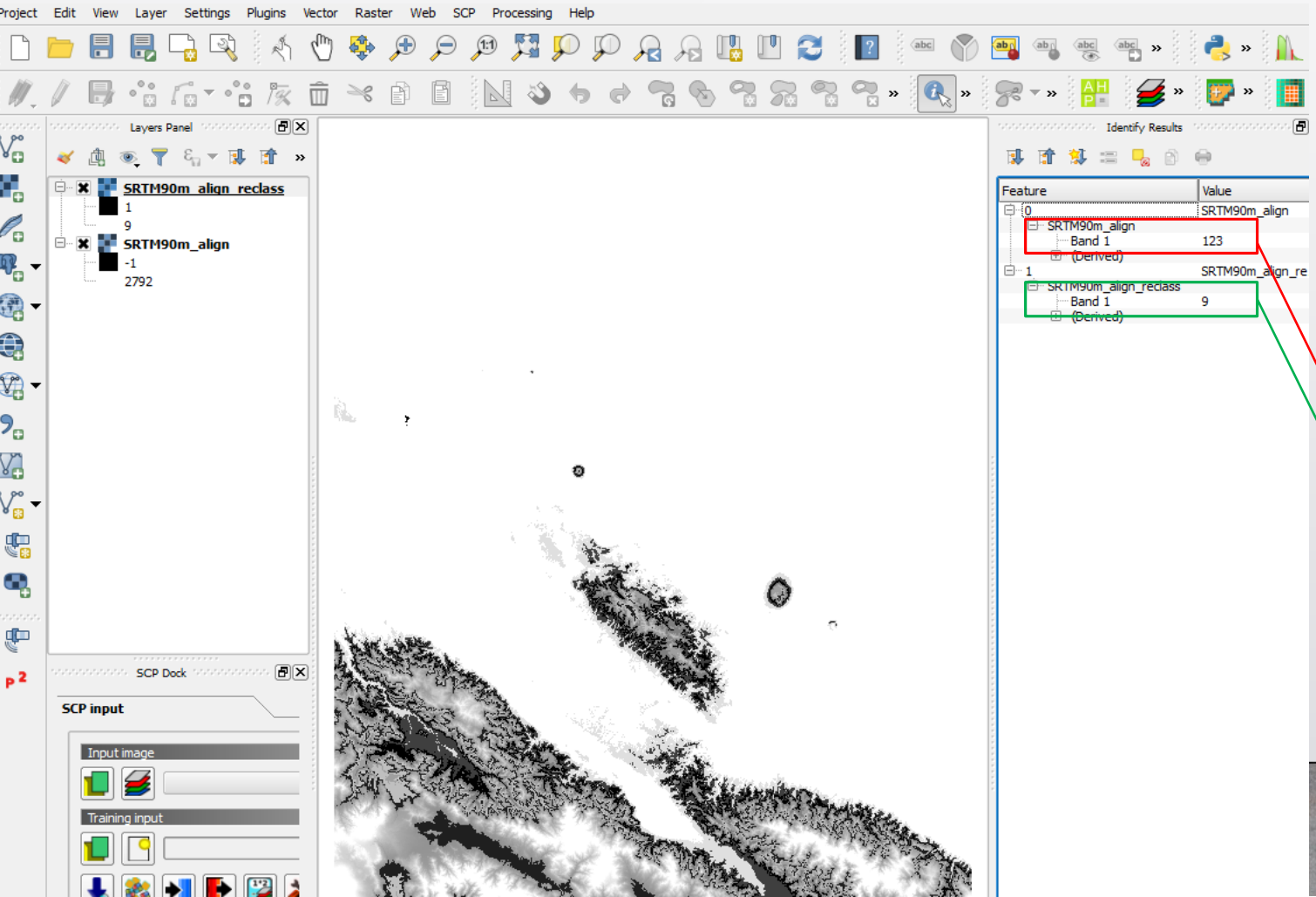
13. Select Toolbox under Processing menu, search r.reclass
14. In dialog box, select DEMLookup.txt when reclassifying elevation and slopeLookup.txt when reclassifying slope

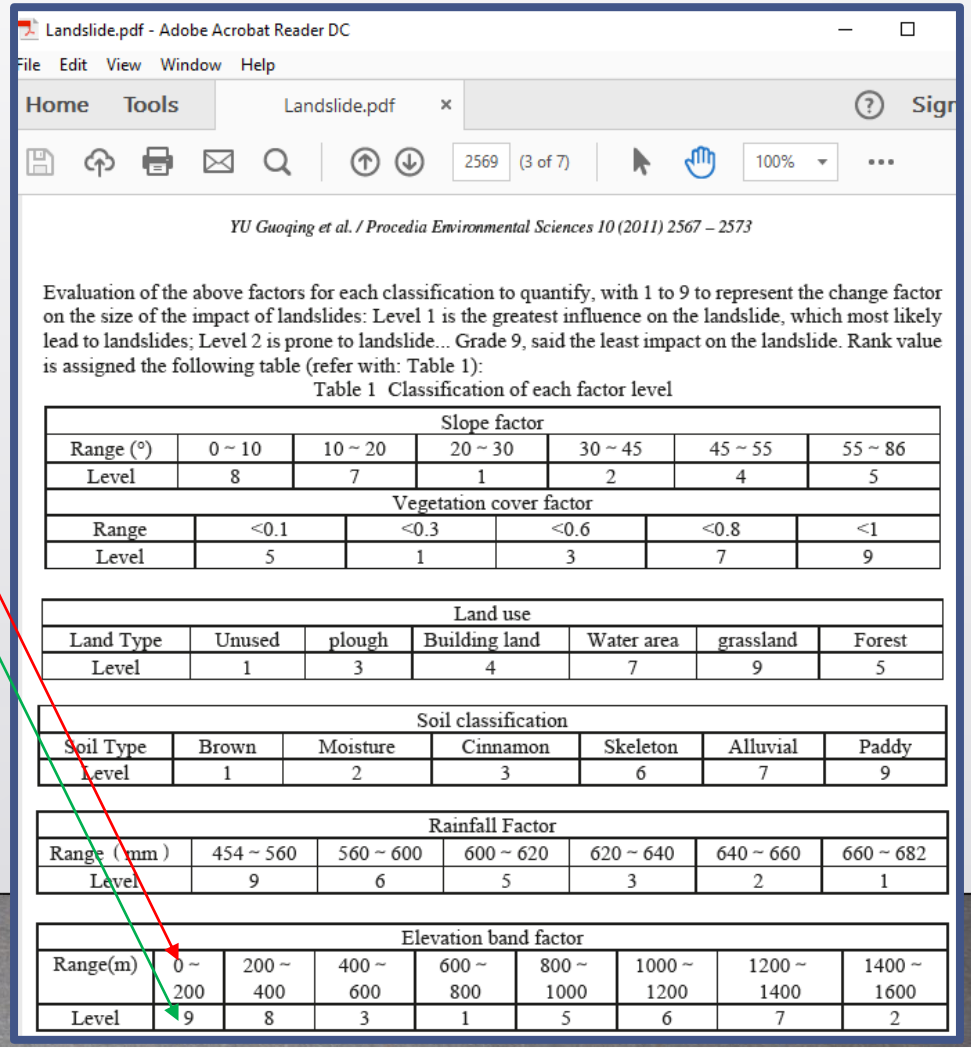




Reclassifying rasters

15. Using identify tool, check whether the rasters have been reclassified correctly





Slope factor						
Range (°)	0 ~ 10	10 ~ 20	20 ~ 30	30 ~ 45	45 ~ 55	55 ~ 86
Level	8	7	1	2	4	5

Vegetation cover factor					
Range	<0.1	<0.3	<0.6	<0.8	<1
Level	5	1	3	7	9

Land use						
Land Type	Unused	plough	Building land	Water area	grassland	Forest
Level	1	3	4	7	9	5

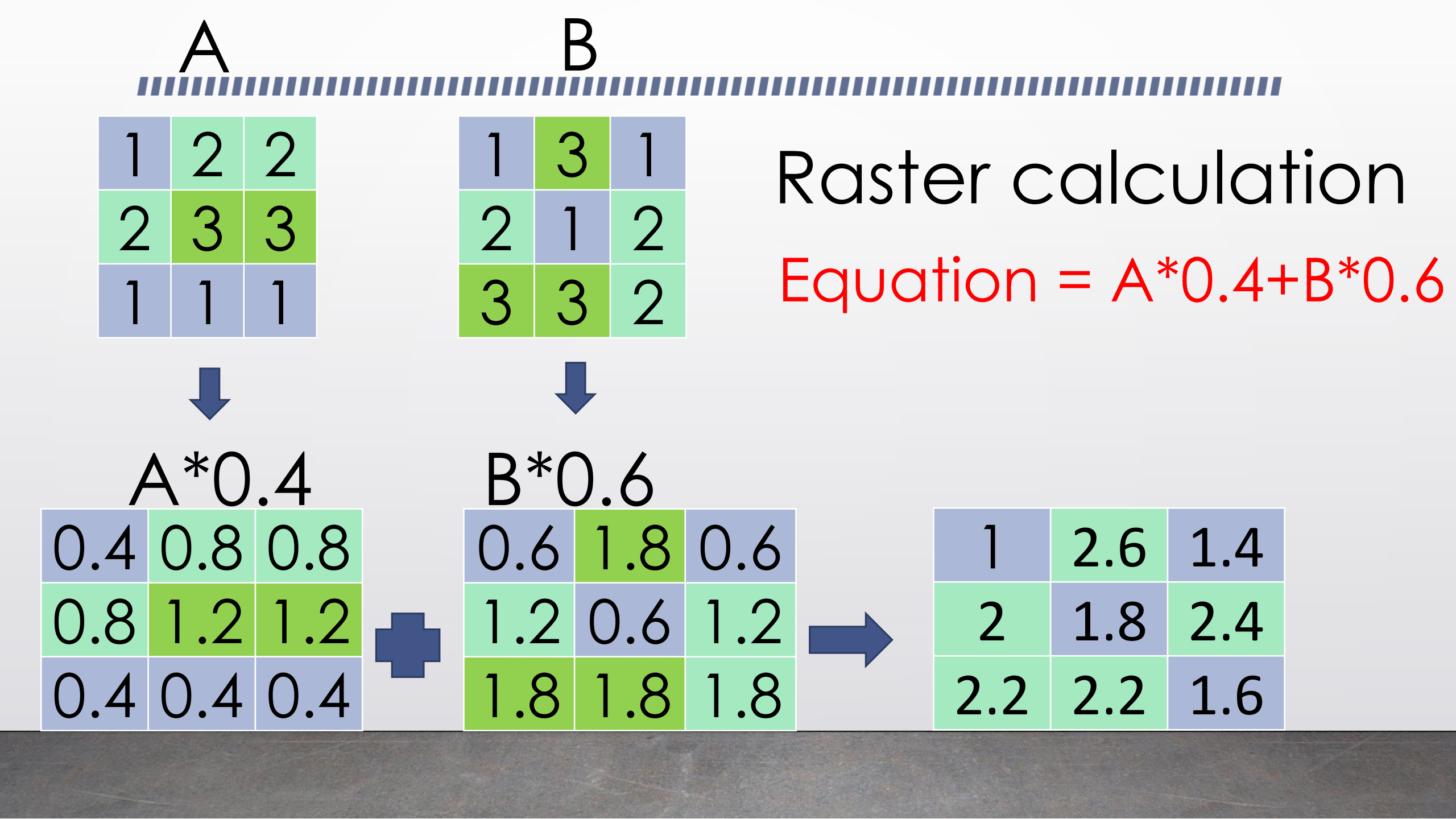
Soil classification						
Soil Type	Brown	Moisture	Cinnamon	Skeleton	Alluvial	Paddy
Level	1	2	3	6	7	9

Rainfall Factor						
Range (mm)	454 ~ 560	560 ~ 600	600 ~ 620	620 ~ 640	640 ~ 660	660 ~ 682
Level	9	6	5	3	2	1

Elevation band factor								
Range(m)	0 ~ 200	200 ~ 400	400 ~ 600	600 ~ 800	800 ~ 1000	1000 ~ 1200	1200 ~ 1400	1400 ~ 1600
Level	9	8	3	1	5	6	7	2

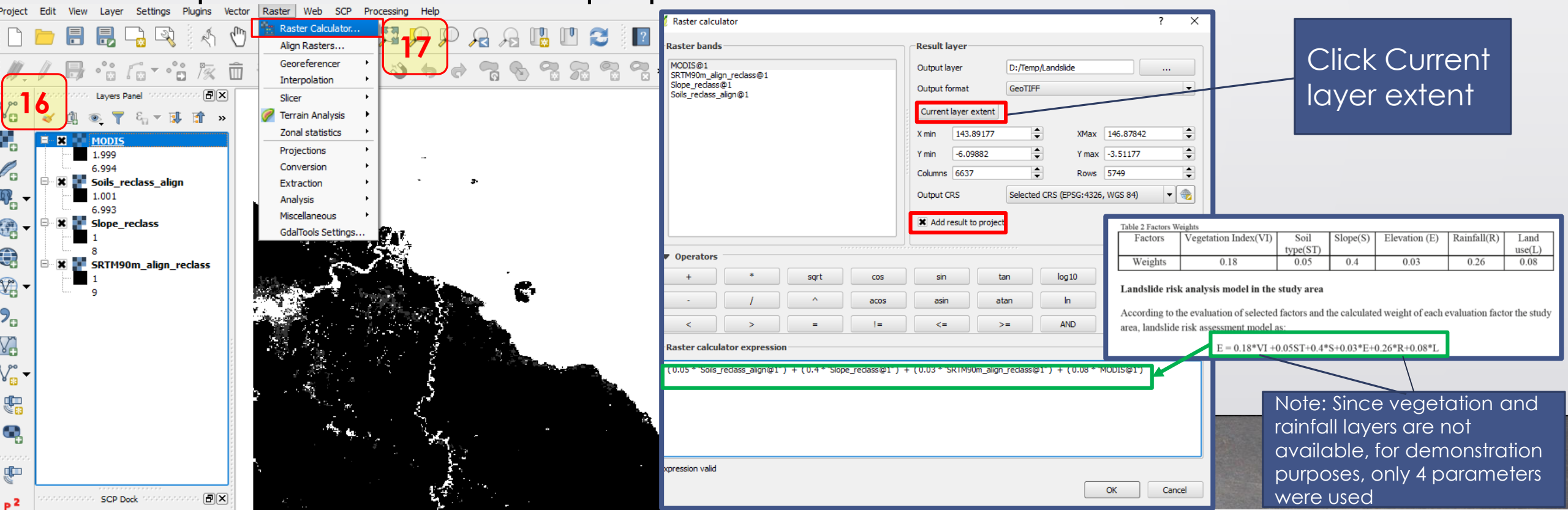
Raster calculation

Equation = A*0.4+B*0.6



Calculating rasters

16. Load all aligned and reclassified rasters that will be used to calculate landslide susceptibility equation e.g. DEM, slope, landcover, soil
17. Select Raster Calculator under raster menu and input equation based on paper



Thank you