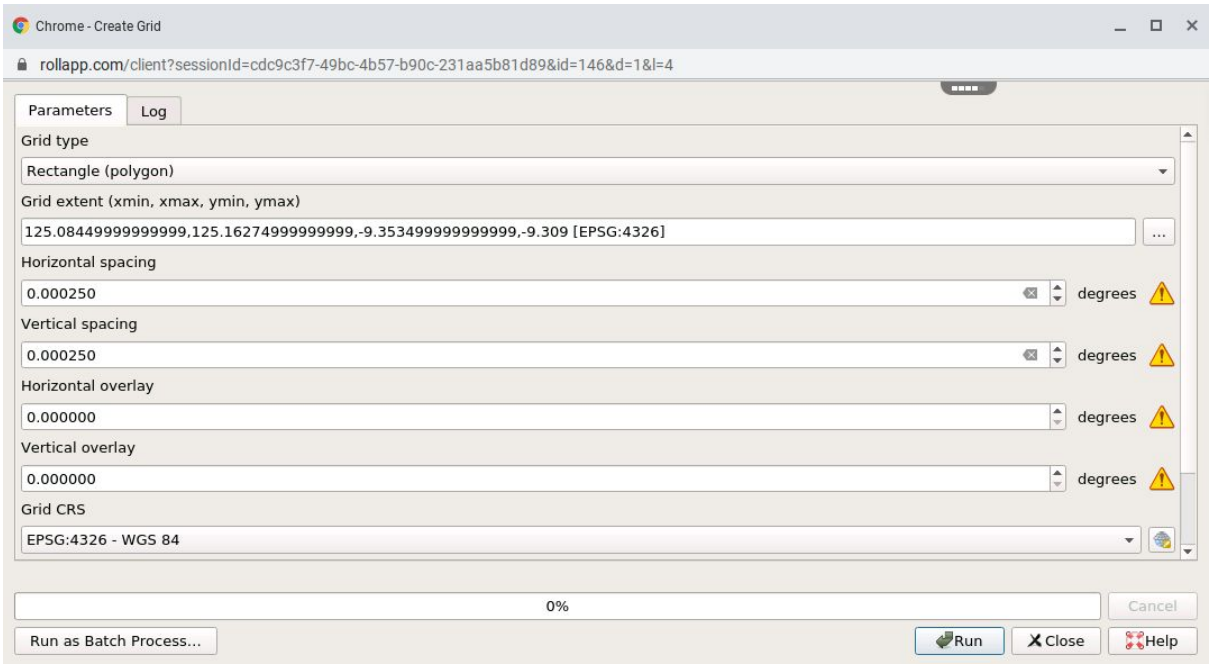
How to Develop Multi-Year Reforestation Maps

1. Plan the deforestation over a number of years. This example will use 10 years. It will also reforest the landscape in equal sized land strips.
    a. Strips serve our purpose for now: For reforestation areas that have the same conditions (soil, climate zone, species, etc.), the emissions outcomes for the reforestation are only dependent on the size of the reforested area not on the shape of the area.
    b. The approach below can also be used if the shape of the area does matter. The selection of such a shape is described below.

2. If you have not created a vector-grid of the project area yet, follow the steps below. Otherwise, use the existing vector grid and go to step 6 below.

3. Load the latest historical observation called year_clip.TIF

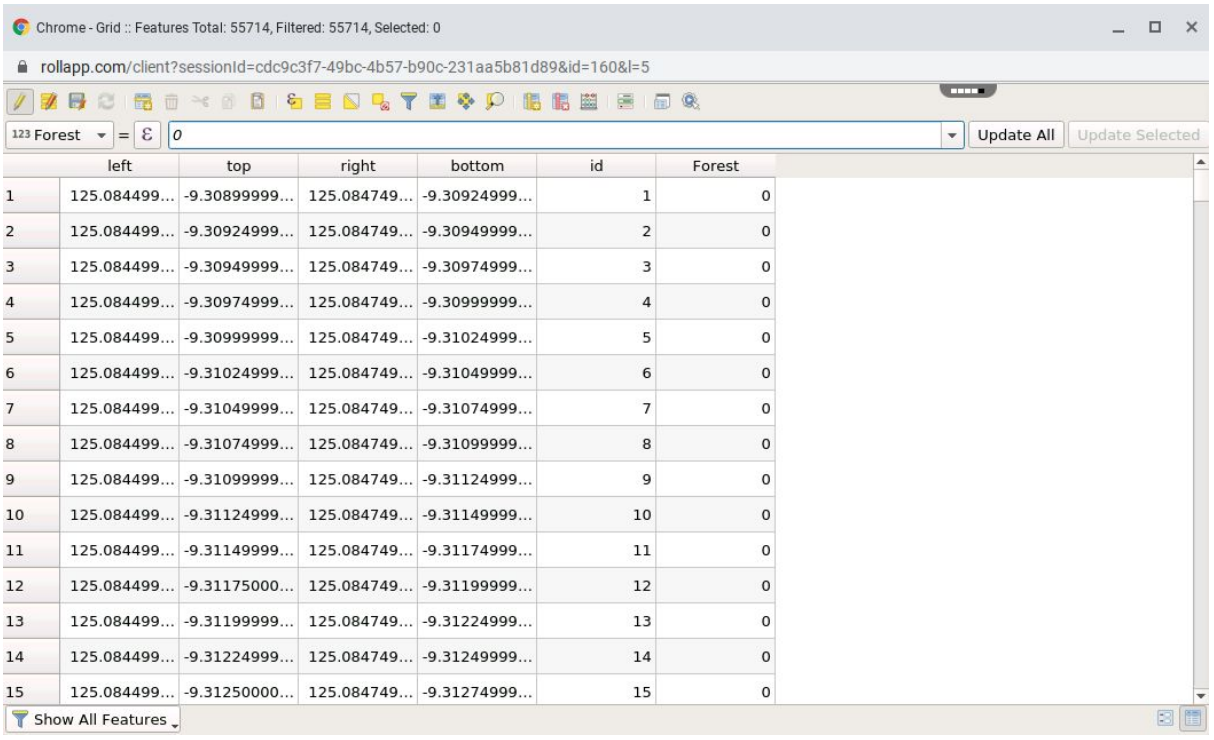
4. Click Processing > Toolbox > Vector Creation > Create Grid



    a. Create a vector grid
    b. Ensure at least one map of the area is uploaded onto the workspace (like 2018 East Timor forest cover)
    c. Search and select “Create Grid” under “vector creation” toolbox
    d. Grid type = Polygon
    e. Grid extent = “use layer extent” and select the forest cover 2018 map
    f. Horizontal spacing and vertical spacing are pixel size: i.e. 0.00025
    g. Horizontal and Vertical Overlay = 0.000000
    h. Grid CRS = Should automatically select same projection as the layer you chose for extent (should be EPSG:4326 – WGS 84)

i. Grid = >save as a file

5. Create a Forest feature in the grid

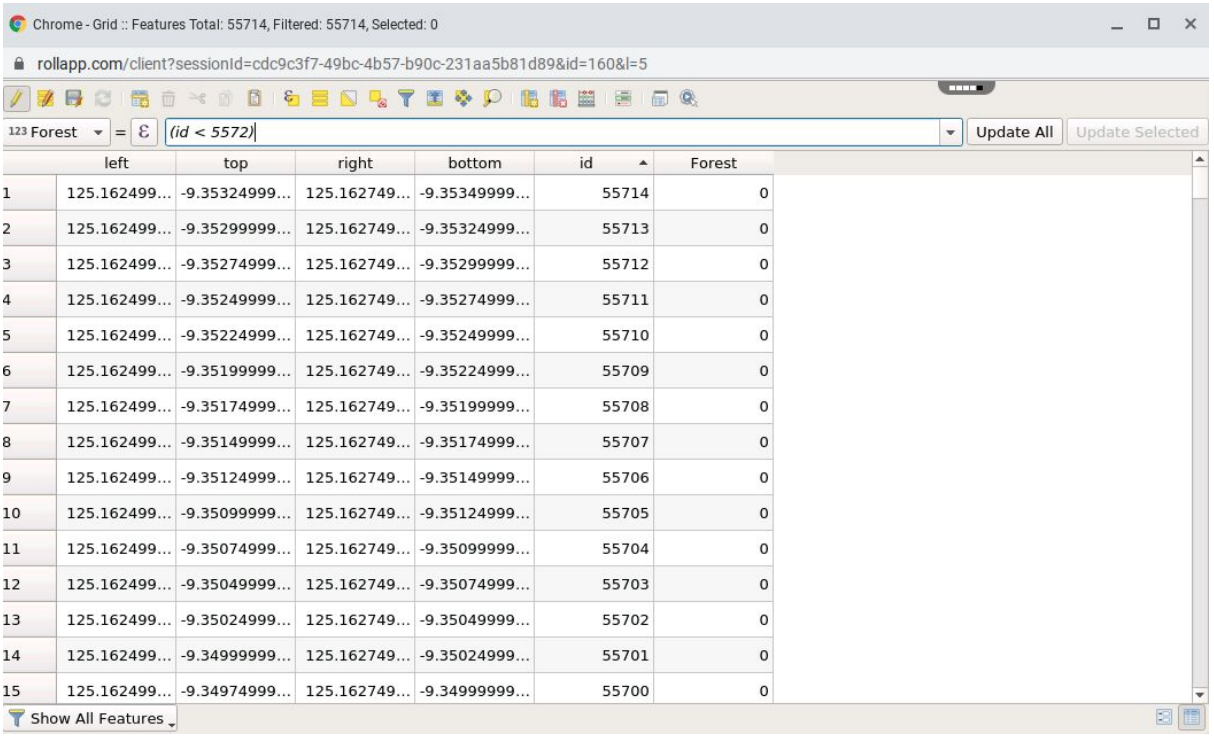


	left	top	right	bottom	id	Forest
1	125.084499...	-9.30899999...	125.084749...	-9.30924999...	1	0
2	125.084499...	-9.30924999...	125.084749...	-9.30949999...	2	0
3	125.084499...	-9.30949999...	125.084749...	-9.30974999...	3	0
4	125.084499...	-9.30974999...	125.084749...	-9.30999999...	4	0
5	125.084499...	-9.30999999...	125.084749...	-9.31024999...	5	0
6	125.084499...	-9.31024999...	125.084749...	-9.31049999...	6	0
7	125.084499...	-9.31049999...	125.084749...	-9.31074999...	7	0
8	125.084499...	-9.31074999...	125.084749...	-9.31099999...	8	0
9	125.084499...	-9.31099999...	125.084749...	-9.31124999...	9	0
10	125.084499...	-9.31124999...	125.084749...	-9.31149999...	10	0
11	125.084499...	-9.31149999...	125.084749...	-9.31174999...	11	0
12	125.084499...	-9.31175000...	125.084749...	-9.31199999...	12	0
13	125.084499...	-9.31199999...	125.084749...	-9.31224999...	13	0
14	125.084499...	-9.31224999...	125.084749...	-9.31249999...	14	0
15	125.084499...	-9.31250000...	125.084749...	-9.31274999...	15	0

a. Right click the new grid in navigation bar on left > open attribute table
b. Toggle editing (click on pencil in corner)
c. Select “create field”
d. Name = Forest
e. Type = Whole number (integer) (and wait for it to load)
f. Type 0 into the expression area and “Update All” > This will make the whole grid = 0
g. Click edit button (little pencil) and save changes
h. Exit attribute table

6. Below two examples are shown: Reforestation by strips of % of total area (see point 7 below) and reforestation using exact shape of reforested area (see point 8 below).

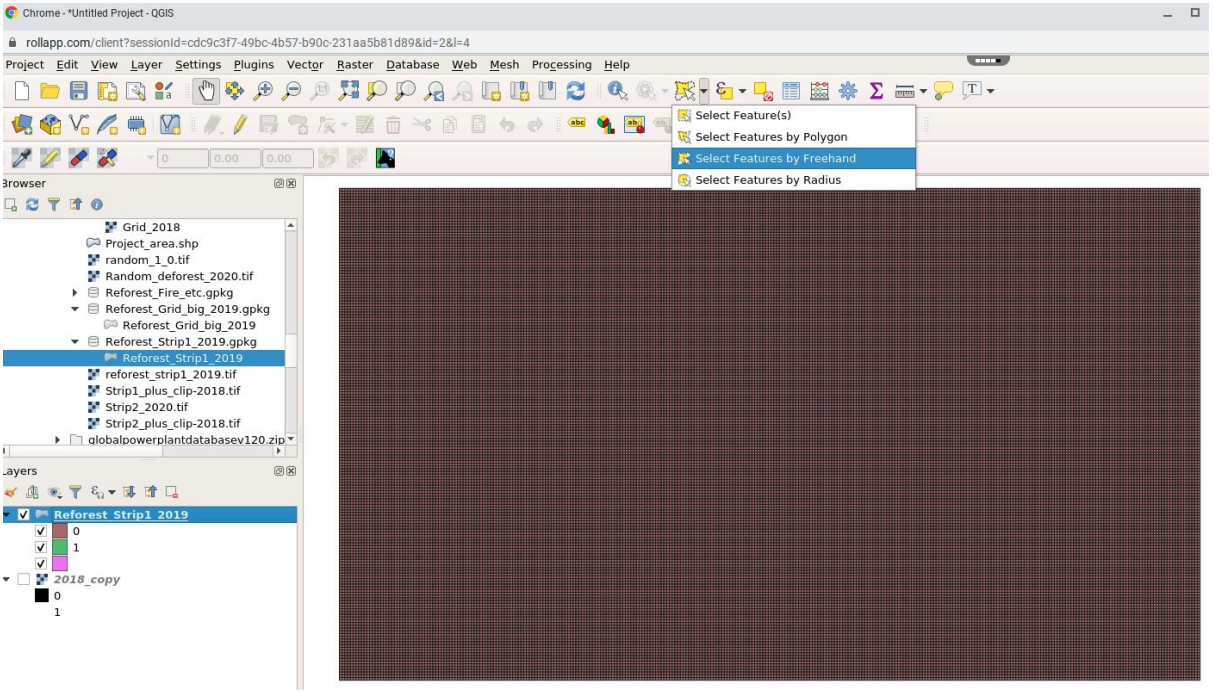
7. Select Reforestation Area using strips



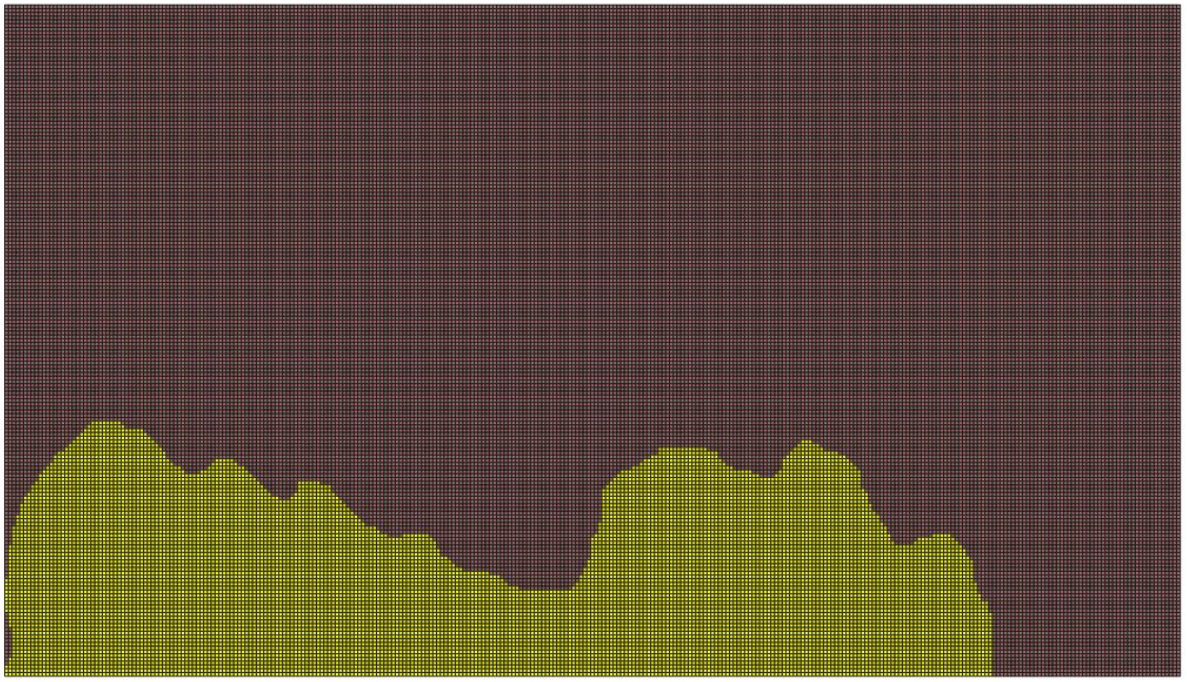
	left	top	right	bottom	id	Forest
1	125.162499...	-9.35324999...	125.162749...	-9.35349999...	55714	0
2	125.162499...	-9.35299999...	125.162749...	-9.35324999...	55713	0
3	125.162499...	-9.35274999...	125.162749...	-9.35299999...	55712	0
4	125.162499...	-9.35249999...	125.162749...	-9.35274999...	55711	0
5	125.162499...	-9.35224999...	125.162749...	-9.35249999...	55710	0
6	125.162499...	-9.35199999...	125.162749...	-9.35224999...	55709	0
7	125.162499...	-9.35174999...	125.162749...	-9.35199999...	55708	0
8	125.162499...	-9.35149999...	125.162749...	-9.35174999...	55707	0
9	125.162499...	-9.35124999...	125.162749...	-9.35149999...	55706	0
10	125.162499...	-9.35099999...	125.162749...	-9.35124999...	55705	0
11	125.162499...	-9.35074999...	125.162749...	-9.35099999...	55704	0
12	125.162499...	-9.35049999...	125.162749...	-9.35074999...	55703	0
13	125.162499...	-9.35024999...	125.162749...	-9.35049999...	55702	0
14	125.162499...	-9.34999999...	125.162749...	-9.35024999...	55701	0
15	125.162499...	-9.34974999...	125.162749...	-9.34999999...	55700	0

a. For a total reforestation over 10 years, 10 strips of 10% of the area need to be reforested. There are 55’714 pixels. So each year 5’571 pixels need to be reforested.
b. For the first 10% use the following expression in the calculation bar: (id < (5571 + 1) and click Update All
c. For the next 10% use the following expression in the calculation bar: (id < ((2 * 5571)+1)) and click Update All
d. Etc for 10 years

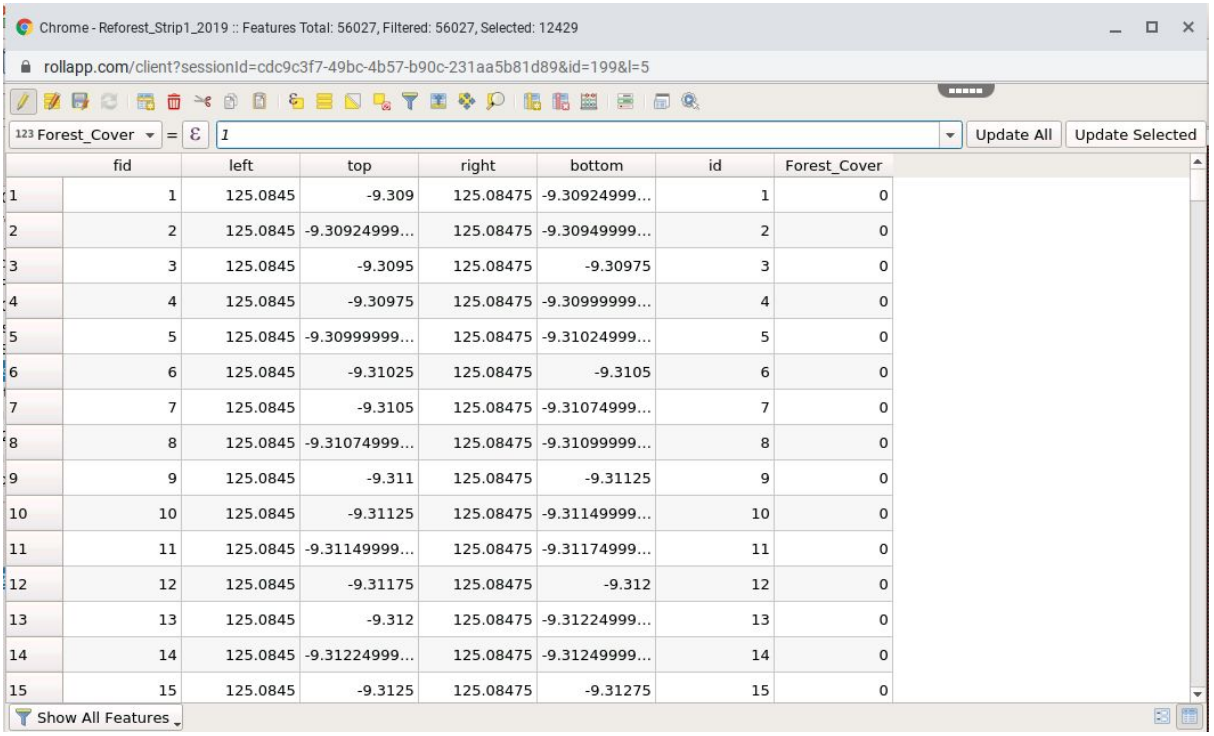
8. Select Reforestation using exact shape of reforested area:



a. Select “select features by freehand” in toolbar
b. Draw the reforested area

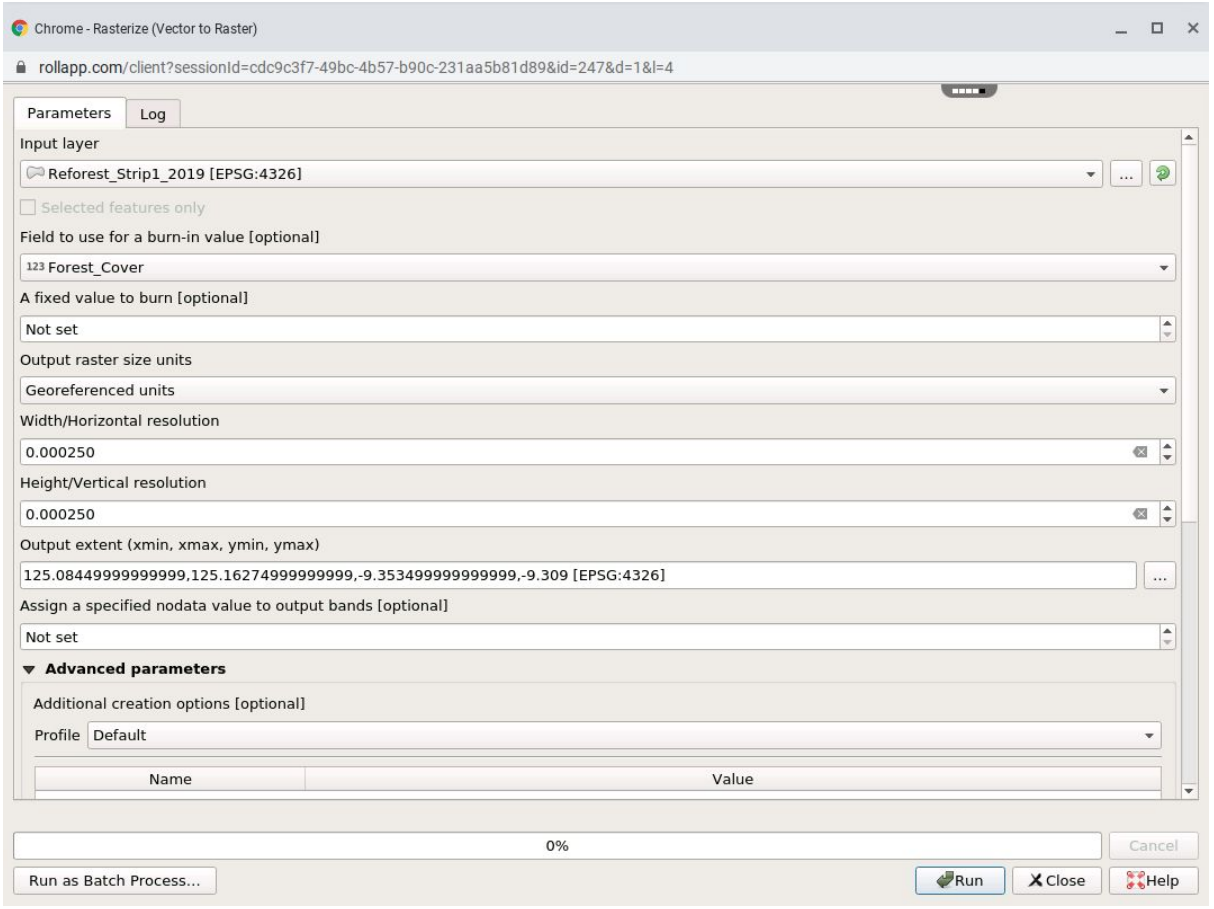


c. Open the Attributes Table > toggle to editing > enter 1 > click Update Selected



	fid	left	top	right	bottom	id	Forest_Cover
1	1	125.0845	-9.309	125.08475	-9.30924999...	1	0
2	2	125.0845	-9.30924999...	125.08475	-9.30949999...	2	0
3	3	125.0845	-9.3095	125.08475	-9.30975	3	0
4	4	125.0845	-9.30975	125.08475	-9.30999999...	4	0
5	5	125.0845	-9.30999999...	125.08475	-9.31024999...	5	0
6	6	125.0845	-9.31025	125.08475	-9.3105	6	0
7	7	125.0845	-9.3105	125.08475	-9.31074999...	7	0
8	8	125.0845	-9.31074999...	125.08475	-9.31099999...	8	0
9	9	125.0845	-9.311	125.08475	-9.31125	9	0
10	10	125.0845	-9.31125	125.08475	-9.31149999...	10	0
11	11	125.0845	-9.31149999...	125.08475	-9.31174999...	11	0
12	12	125.0845	-9.31175	125.08475	-9.312	12	0
13	13	125.0845	-9.312	125.08475	-9.31224999...	13	0
14	14	125.0845	-9.31224999...	125.08475	-9.31249999...	14	0
15	15	125.0845	-9.3125	125.08475	-9.31275	15	0

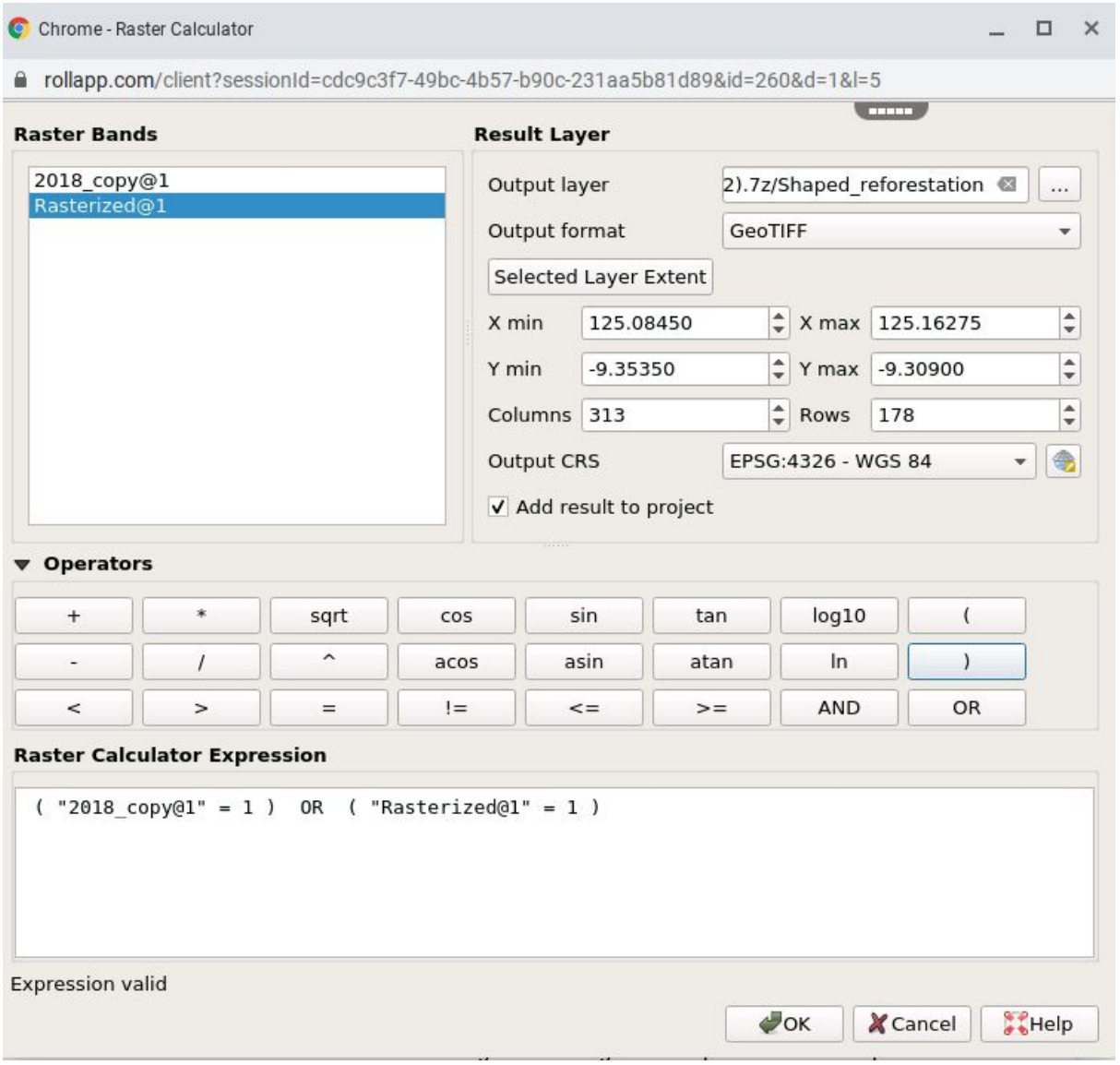
9. Transfer Vector Grid to TIFF Raster Toolbar>Raster>Conversion>Rasterize



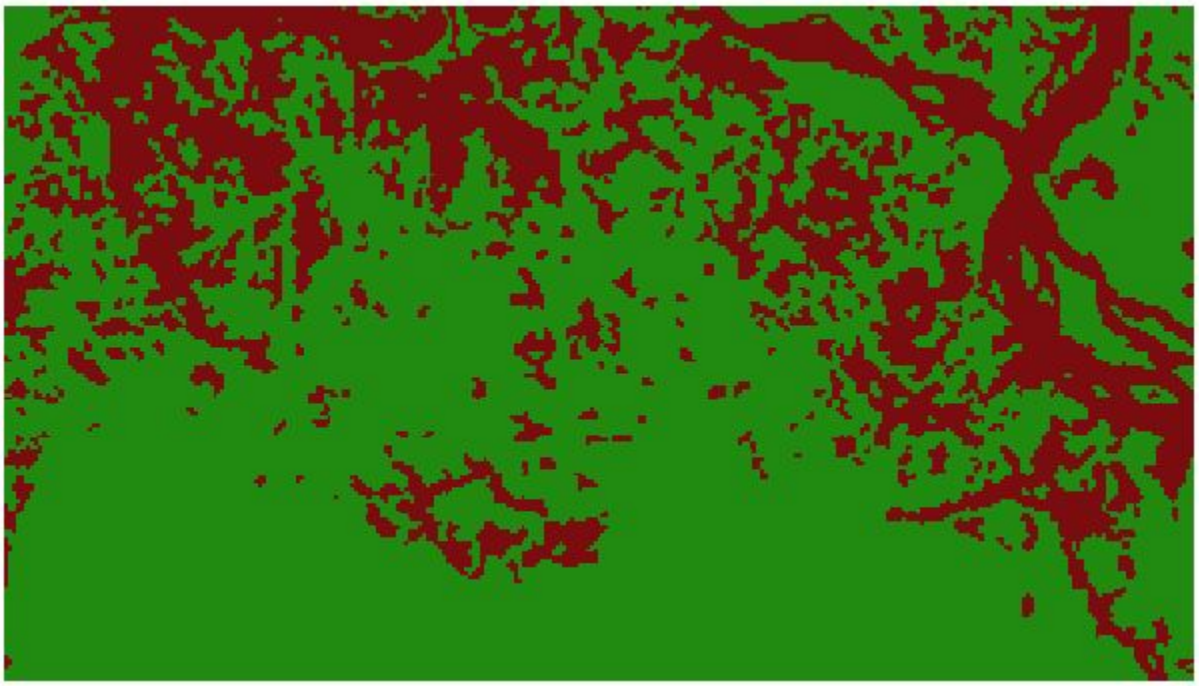
a. Input layer = your grid

b. Field to use as burn in value = Forest (or Forest_Cover or whatever you named the reforested area.)
c. Use fixed value to burn = click delete and “Not Set” should appear as the value
d. Raster size units = georeferenced units
e. Resolution is same pixel size i.e. 0.00025
f. Output extent is the same as original TIFF map e.g. 2018_clip.tif
g. Nodata value should be “Not Set”
h. Click Run

10. Combine reforested raster with the existing situation: There are two possible scenarios:
    a. Either the deforestation starts immediately and the latest historical map is used. In this case that is the map of 2018. This is the example that is used below.
    b. Or the deforestation only starts after a few years and the BAU scenario has to be applied until the reforestation starts. In that case, the existing situation is the BAU of the year before reforestation starts. For example, 5 years BAU until 2023. Reforestation starts in 2024. So the BAU map of 2023 is used to combine with the reforestation map.
11. Here the explanation uses option a. above i.e. 2018_clip.tif but the option b. is exactly the same just using a different base map. This example is provided starting at point 13 below.
12. Click from top menu: Raster > Raster Calculator



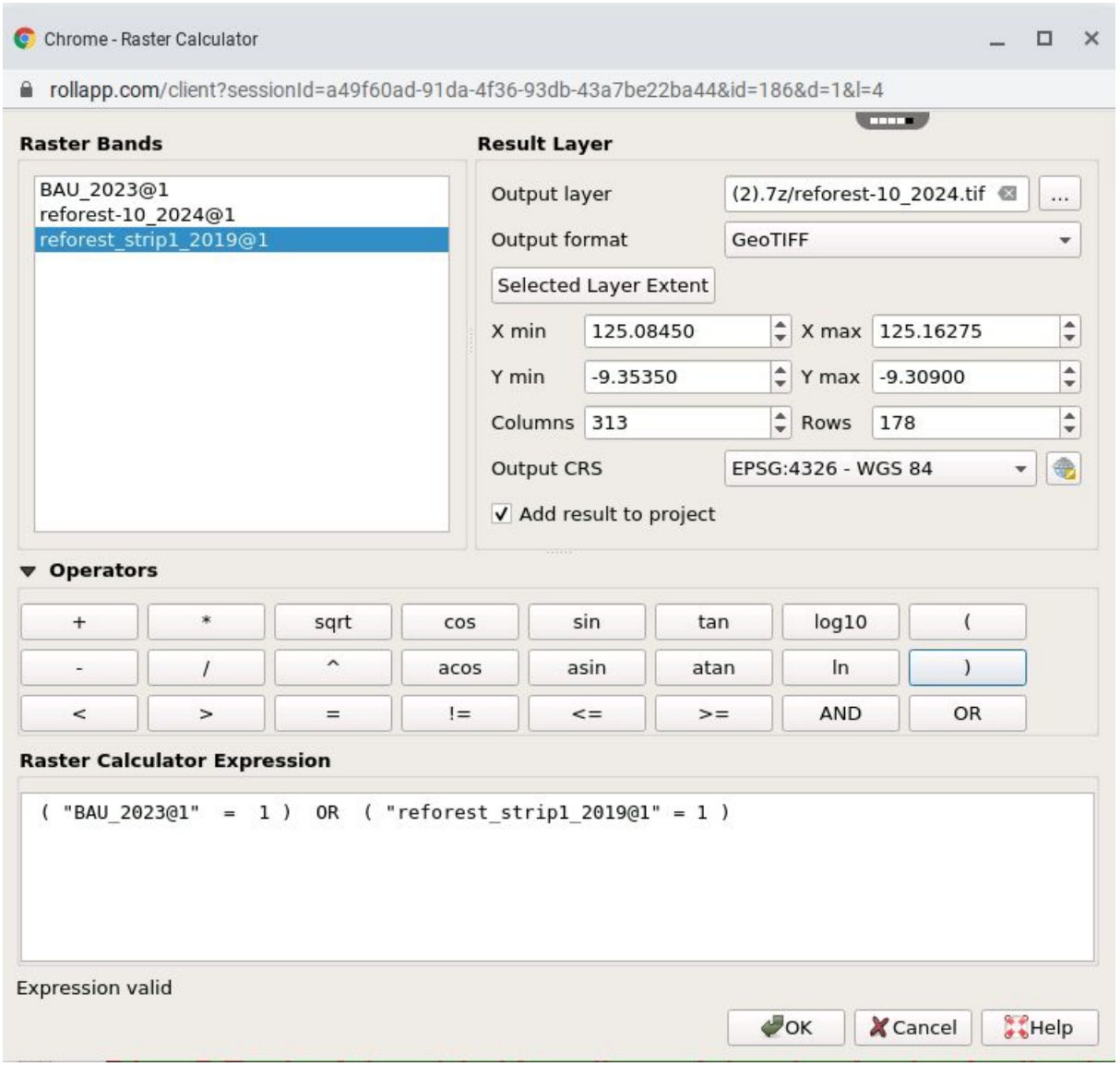
13. The result looks like this



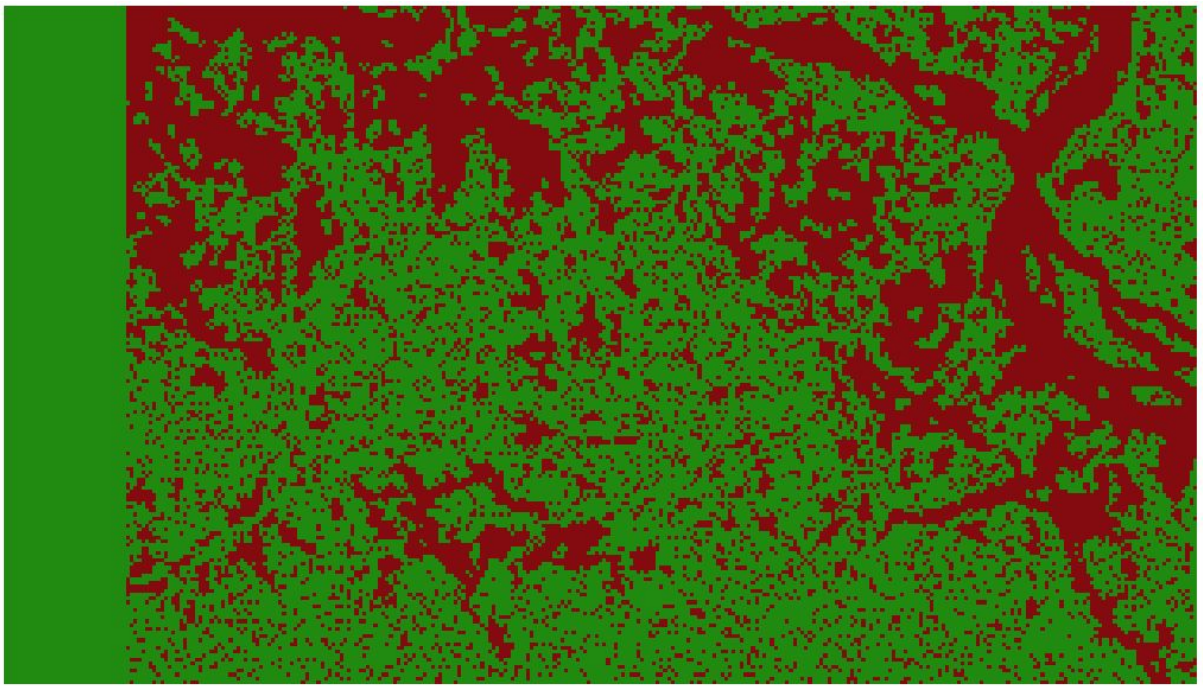
14. Repeat for each of the 10 years

15. Below an example is provided for a strip reforestation starting The same process is followed as above.
16. Make a strip of 10% forested as explained in point 6 above.
17. Rasterize this vector grid as explained in point 8 above.

18. Combine it with the existing situation as explained in point 11 above. Here we will use the BAU map of 2023.



19. The resulting map looks like this:



20. Repeat for each of the 10 years