USING GIS TO HELP INTEGRATE BIODIVERSITY AND ECOSYTEM SERVICES INTO REDD+ DECISION MAKING

STEP-BY-STEP TUTORIAL: EVALUATING THE IMPORTANCE OF FORESTS FOR SOIL STABILIZATION AND LIMITING SOIL EROSION, A SIMPLE APPROACH using QGIS 2.8

UN-REDD PROGRAMME

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Empowered lives. Resilient nations.

The UN-REDD Programme is the United Nations Collaborative initiative on Reducing Emissions from Deforestation and forest Degradation (REDD) in developing countries. The Programme was launched in September 2008 to assist developing countries prepare and implement national REDD+ strategies, and builds on the convening power and expertise of the Food and Agriculture Organization of the United Nations (FAO), the United Nations Development Programme (UNDP) and the United Nations Environment Programme (UNEP).

The United Nations Environment Programme World Conservation Monitoring Centre (UNEP-WCMC) is the specialist biodiversity assessment centre of the United Nations Environment Programme (UNEP), the world's foremost intergovernmental environmental organisation. The Centre has been in operation for over 30 years, combining scientific research with practical policy advice.

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We welcome comments on any errors or issues. Should readers wish to comment on this document, they are encouraged to get in touch via: ccb@unep-wcmc.org.

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Contents

1. Introduction

REDD+ has the potential to deliver multiple benefits beyond carbon. For example, it can promote biodiversity conservation and secure ecosystem services from forests such as water regulation, erosion control and non-timber forest products. Some of the potential benefits from REDD+, such as biodiversity conservation, can be enhanced through identifying areas where REDD+ actions might have the greatest impact using spatial analysis.

Open Source GIS software can be used to undertake spatial analysis of datasets of relevance to multiple benefits and environmental safeguards for REDD+. Open-source software is released under a license that allow software to be freely used, modified, and shared (http://opensource.org/licenses). Therefore, using open source software has great potential in building sustainable capacity and critical mass of experts with limited financial resources.

This tutorial provides a mapping methodology to evaluate the importance of forests for soil stabilization and limiting soil erosion, using a simple quantitative approach. In this example, importance is evaluated as a function of slope, rainfall and the presence of something important downstream that could be adversely affected by soil erosion, such as a dam or water body. For example, forests may play an important role in soil stabilization on steep slopes in areas of high rainfall, with important downstream activities that benefit from clear water such as population centres, hydroelectric plants and navigation routes. Such an analysis can be used to help answer questions such as:

- Where is forest loss likely to result in erosion and consequent sedimentation – and where is this important?
- Where might retaining or restoring forests in areas play an important role in retaining soil/reducing sedimentation?

The analysis is undertaken by using an overlay approach, where data on mean precipitation (annual or the average for a subset of particular months if just the wet season is used), slope, and dam catchment are generated and combined with forest data. The process involves generation of single layers with 3 classes (low medium and high) for mean precipitation and for slope. A binary layer is generated for the presence or absence of a dam catchment. These can then be combined additively. Since there are 3 classes for slope (1-3) , 3 classes for mean precipitation (1-3) and 2 for the presence or absence of a dam catchment (0-1) the resulting output has a maximum value of 8, and a minimum value of 2, and therefore 7 classes. These classes represent a low – high potential importance of forests for soil stabilization and limiting soil erosion. Highest values represent higher erosion impact in the absence or degradation of forests. No weighting is used in this approach – the relative importance of high precipitation is the same as that for steep slopes. This approach could be further refined for example by adding in additional layers such as soil type.

The analysis runs entirely from within QGIS but many of the processes are using SAGA (System for Automated Geoscientific Analyses) GIS tools. There may be occasions where a tool fails to run on a user’s computer so it may be necessary to run the process directly in SAGA. In case of this a quick overview of the SAGA GIS interface is provided in Annex 1.

2. The importance of forests for soil stabilization and limiting soil erosion

2.1. Data requirements

Download **void-filled** hydroSHEDS DEM data at 3 arc second resolution from:
http://hydrosheds.cr.usgs.gov/datadownload.php?reqdata=3demg

The 3 arc second data is served in 1-degree tiles; therefore more than 1 tile will be needed, depending on the size of the required study area.

A void-filled DEM has been modified to fill in areas of no-data (i.e. over large water bodies). The existence of no-data in a DEM causes significant problems for deriving hydrological products, which require continuous flow surfaces. Therefore, a void-filling procedure is applied to provide a continuous DEM for HydroSHEDS. A conditioned DEM has had a number of conditioning procedures applied to it (e.g. sink filling, stream burning, deepening of open water surfaces). The conditioning process alters the original DEM and may render it incorrect for applications other than deriving drainage directions.

******IMPORTANT*** when using HydroSHEDS data to undertake the analysis described below, a void-filled DEM must be used.***

- Download WorldClim **precipitation data** at 30 arc seconds from: http://www.worldclim.org/current as ESRI grid files. This data is available on large tiles or at global extent. The download for global precipitation data is around 700MB and consists of 12 global monthly data grids.

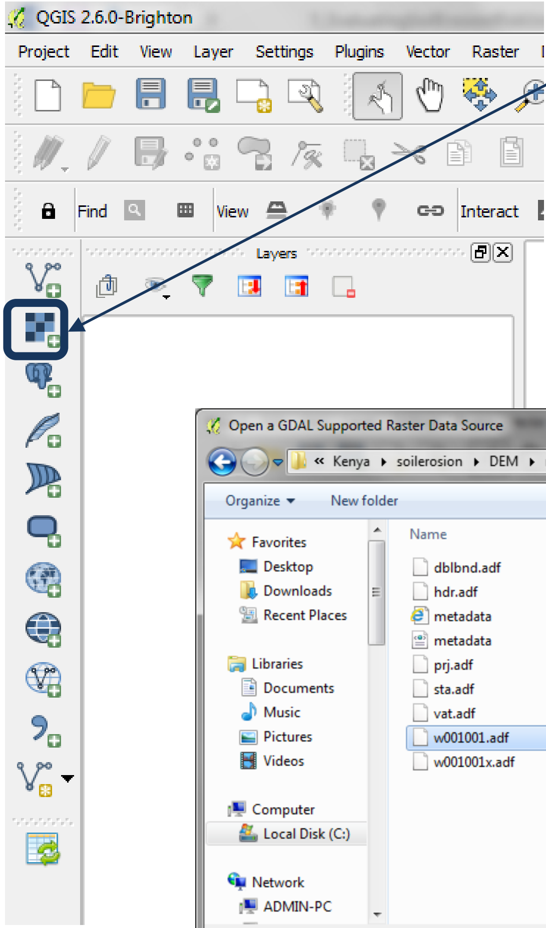
- Download **dams data** from: http://sedac.ciesin.columbia.edu/data/set/grand-v1-dams-rev01

The examples above are global data and can easily be substituted if better data are available.

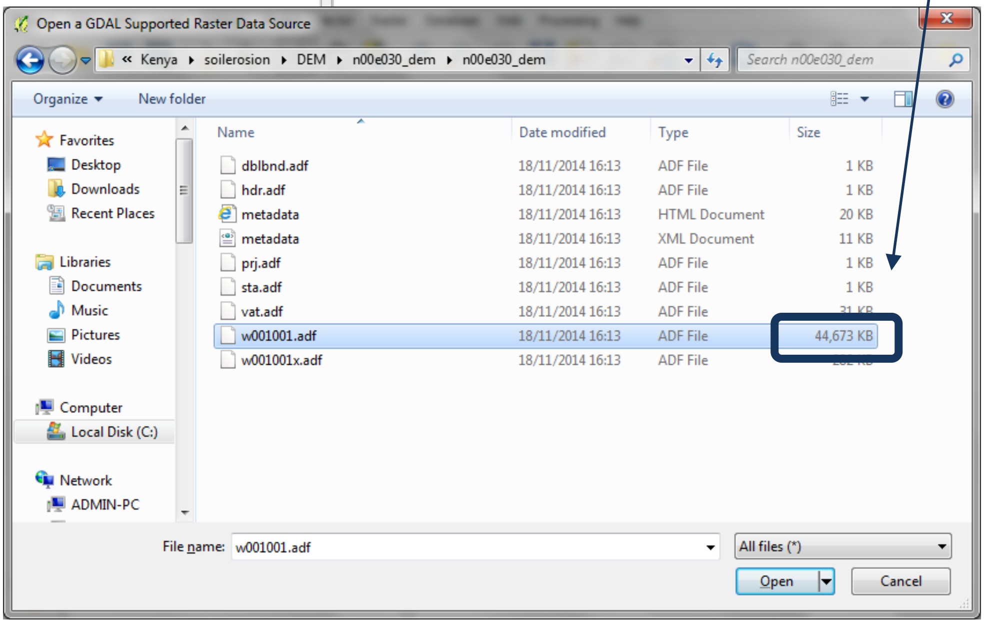
2.2. Prepare raster and vector data layers

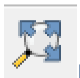
2.2.1. Merge DEM tiles into a single raster and clip to area of interest

This first step will be done using the GDAL merge function in QGIS. There are other ways to merge DEM tiles together but avoid using the SAGA merge function as there currently appears to be an error in the 'merge' which means that it does not combine the DEM tiles together properly (leaving a 1 pixel space between the tiles)

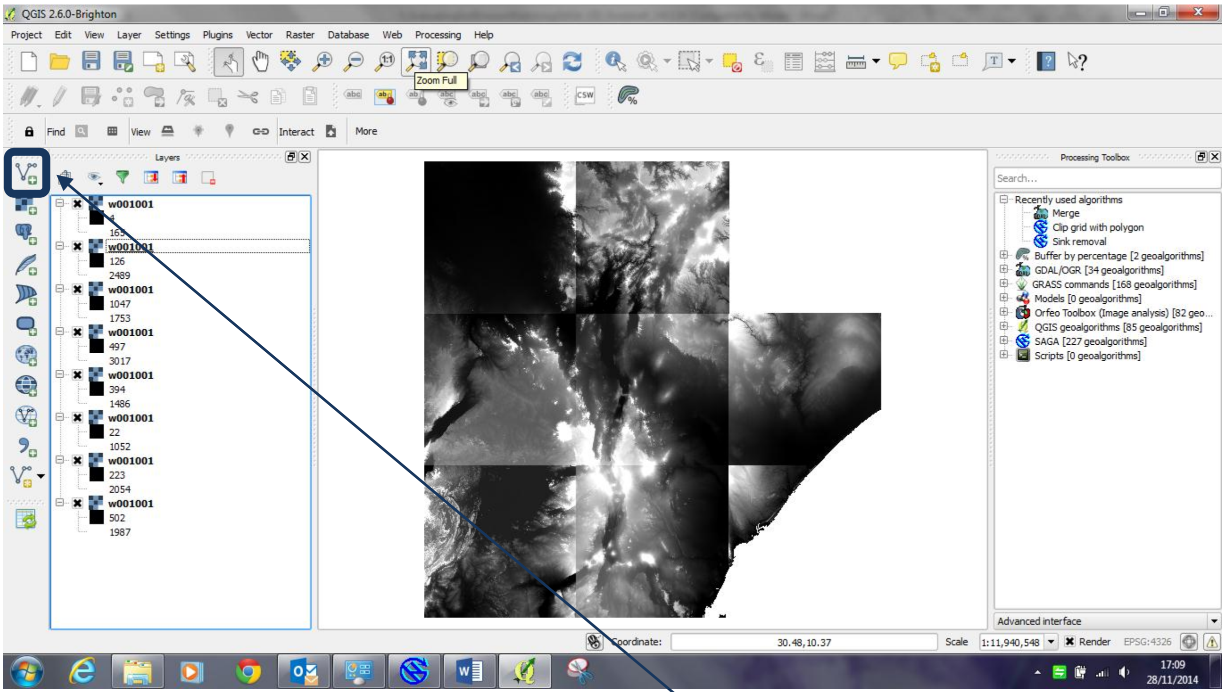


- **a.** Open QGIS
- **b.** Click on **the add raster data button**
- **c.** Navigate to the **hydrosheds void filled DEM folder** and add the first raster. These data are in ESRI ArcInfo Grid format so in order to load it into QGIS, navigate into the individual grid folder and pick the w001001.adf file (it is the file with the largest size)



- **d.** Click **Open** and the raster will appear in the table of contents
- **e.** Add the **other void-filled DEM raster datasets** to QGIS (that cover the area of interest) **following steps a to d.**
- **f.** Once all the data are added click on the Zoom to full  button.

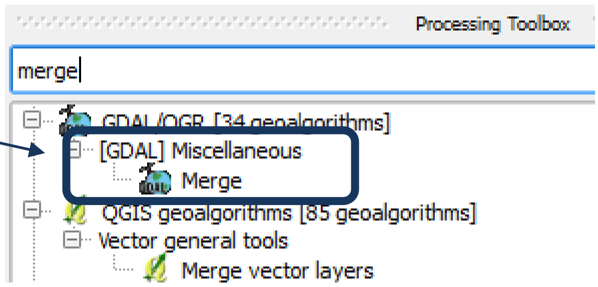
The map window should now show all the map tiles and look similar to the image below.



g. Next Add a **vector layer** to the QGIS project for the **area of interest** (e.g. country boundary), make sure it is in geographic projection (i.e. EPSG 4326) as it will be used to clip the DEM raster data which is in geographic.

(This is because QGIS cannot do any analyses with datasets if they are in different projections)

h. Next type **merge** in the **Processing toolbox** window to filter

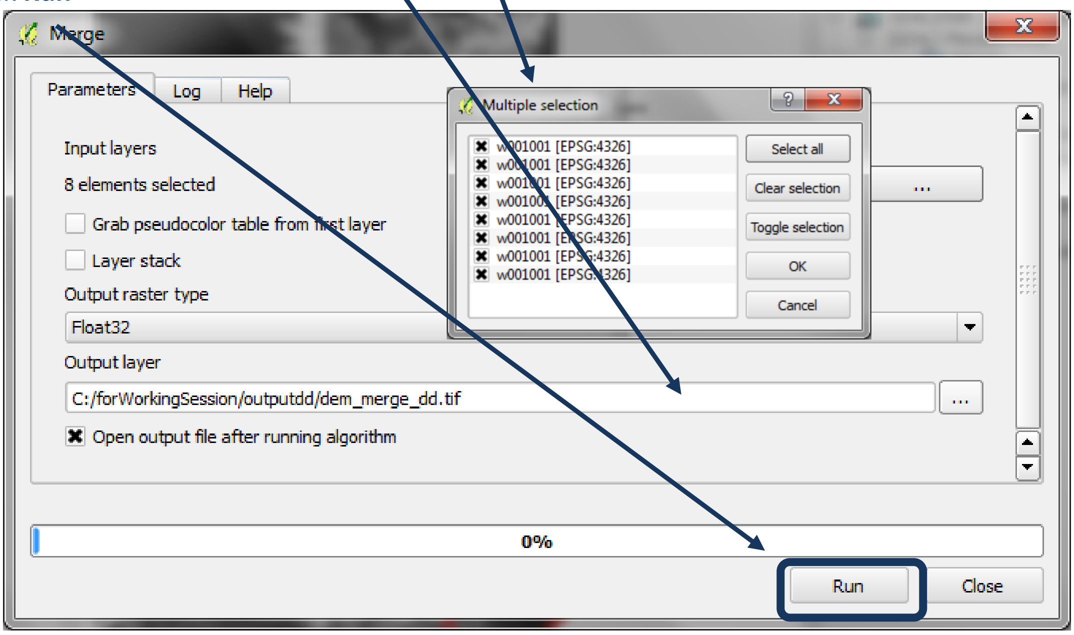


i. Double click on the **GDAL merge tool**

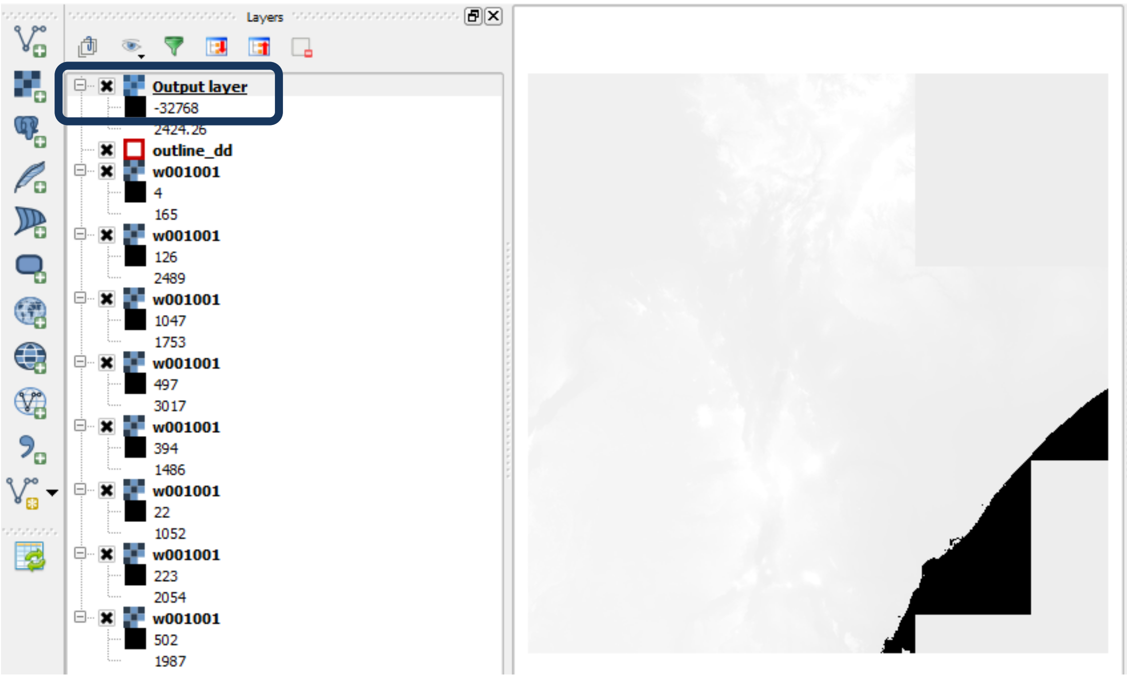
j. Click on the … next to iput layers and tick all the DEM tiles to merge.

k. Navigate to an output folder and save as a **new output layer e.g. dem_merge_dd.tif**

l. Click **Run**



m. The merged grid shows all the tiles together in a mosaic covering the full extent of the study area and is added to the table of contents called **output layer.** Don't worry that QGIS has not shaded it well at present.

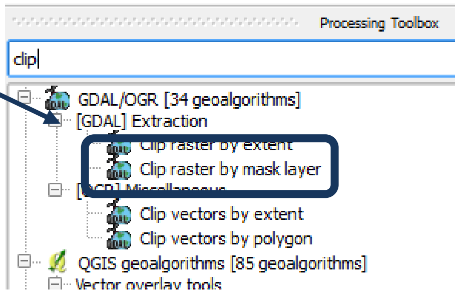


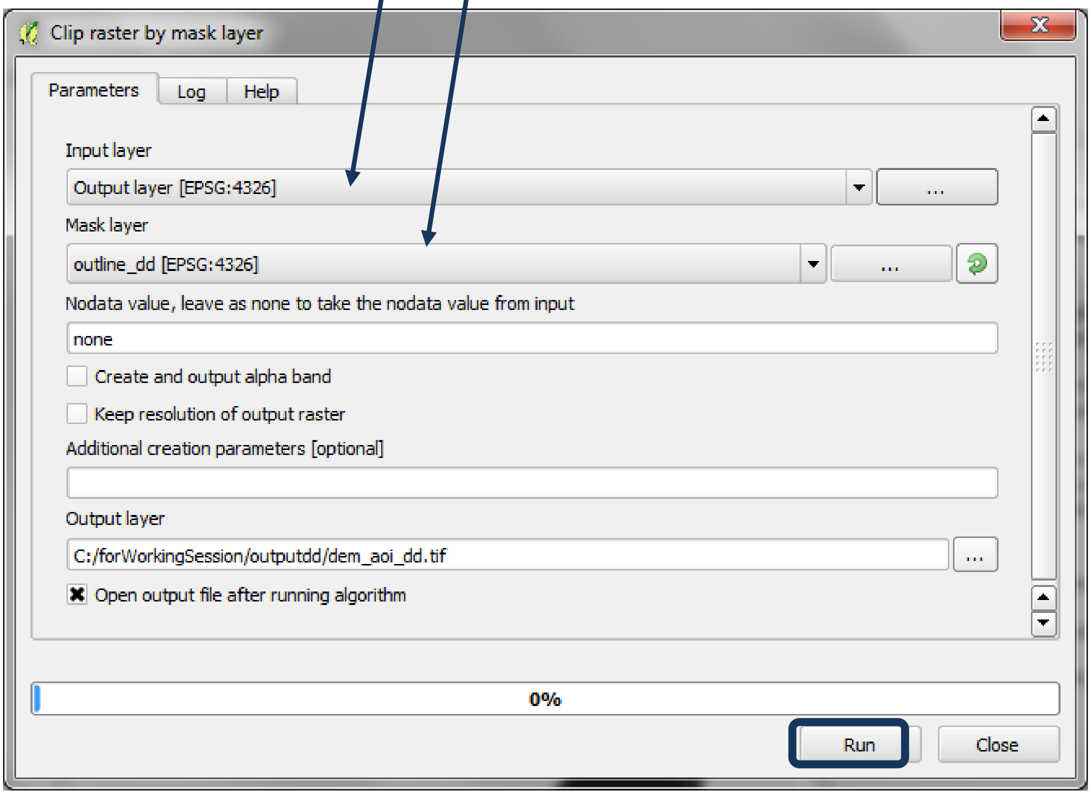
n. Next search for **clip** tools in the processing toolbox

o. Double click on **GDAL Clip raster by mask layer**

p. Set the **Input layer** to the **merged dem** created in the previous step **i.e. the one labelled Output layer** in the table of contents.

q. Set **Mask layer** to the **shapefiile of the area of interest** e.g. outline_dd in this example, the country boundary polygon

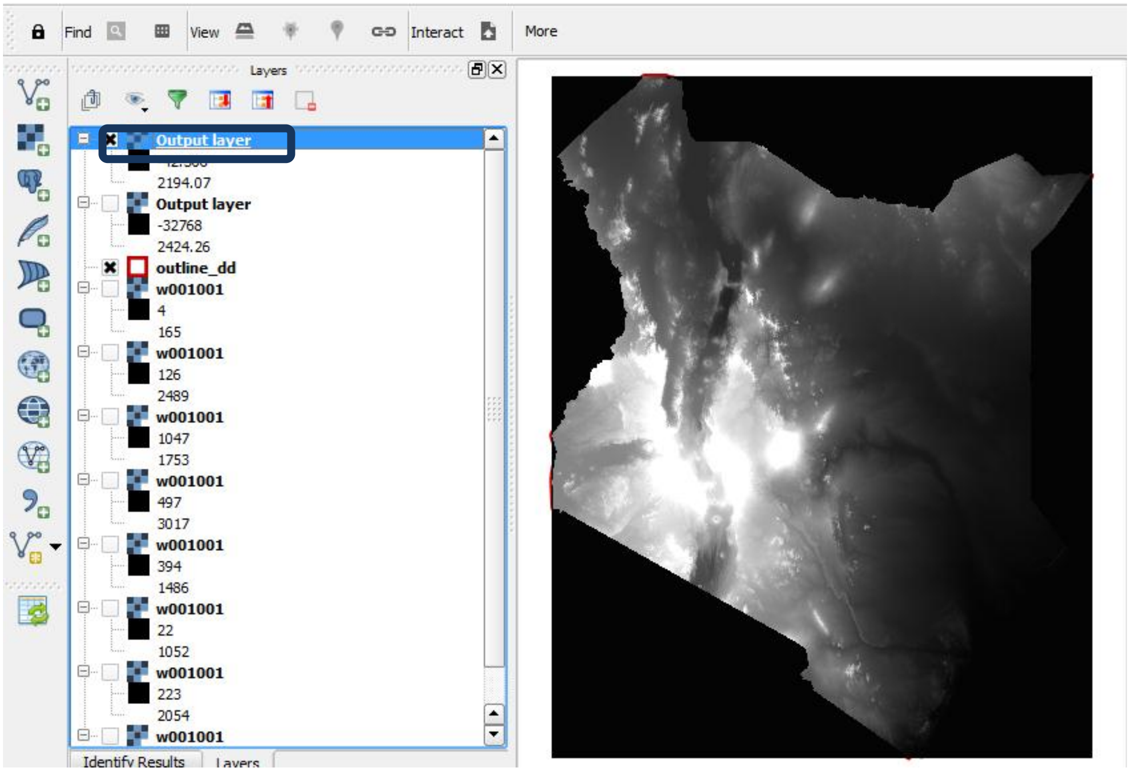




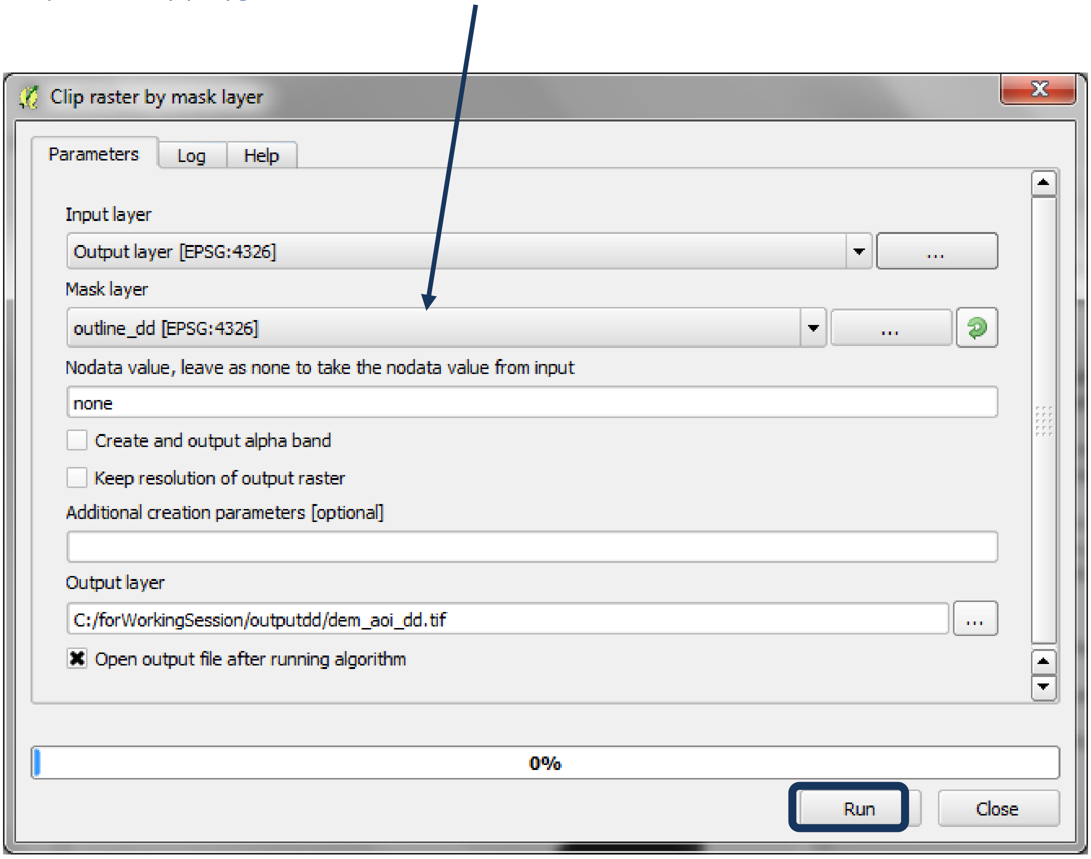
r. Navigate to an output folder and save as a new **Output layer** eg. **Dem_aoi_dd.tif** in this example.

s. Click **Run**

t. A **new Output layer is** added to the top of the table of contents. **Untick the other layers** and see that the new Output layer has been clipped to the area of interest



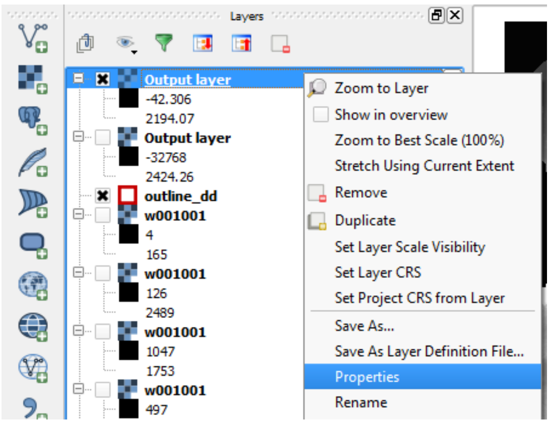
a. Set **Mask layer** to the **shapefiile of the area of interest** e.g. outline_dd in this example, the country boundary polygon

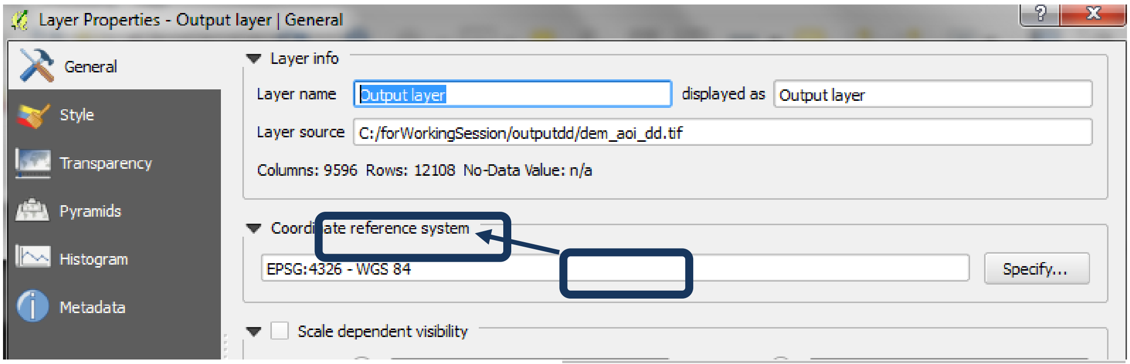


b. It is not very helpful that QGIS calls the output from the two tools Output layer so **right click** on 1st **Output layer>> datasets>> Properties**

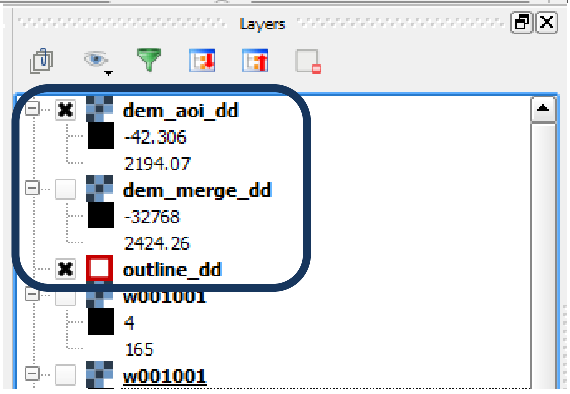
c. Change the **Layer name** from **Output layer** to the **name in the Layer source**. E.g. in this example **dem_aoi_dd**

d. Repeat for the 2nd Output layer





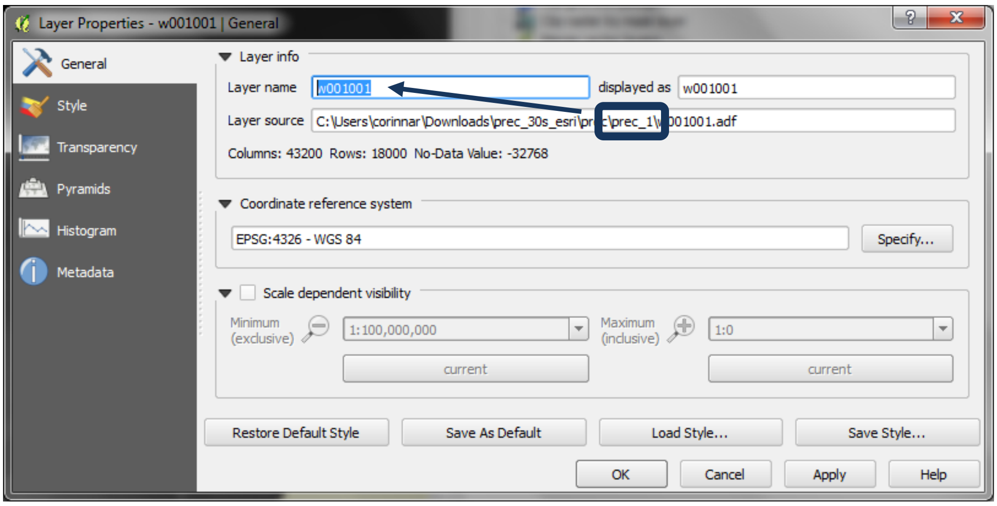
e. The table of contents should now look similar to the illustration right



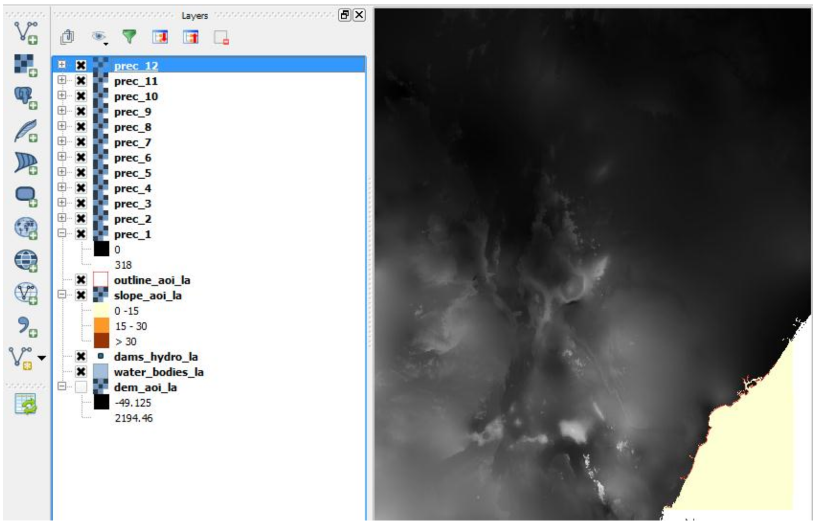
2.2.2. Add precipitation rasters to area of interest

a. Click on the Add Raster layer button and add the 12 monthly precipitation rasters to QGIS project

b. Right click on **each of the datasets>>properties** and click on the **General Tab, change the layer name** e.g. **prec_1.**

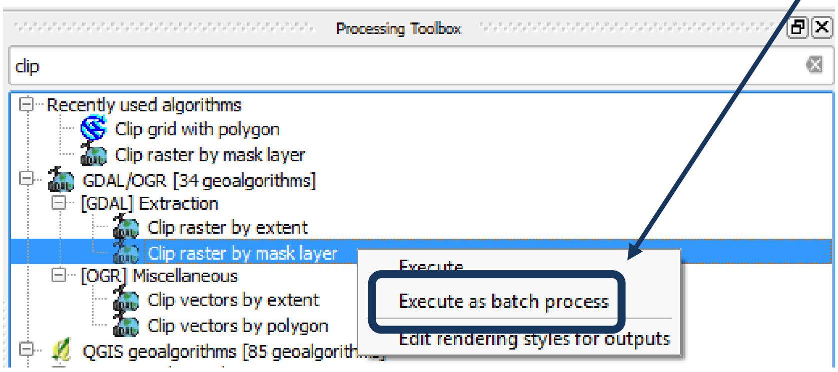


c. Do this for each of the 12 precipitation rasters. (Prec_1 represent January and prec_12 represents December)

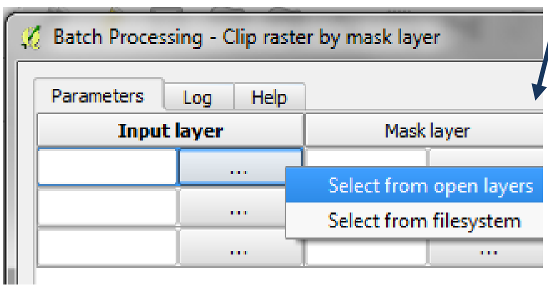


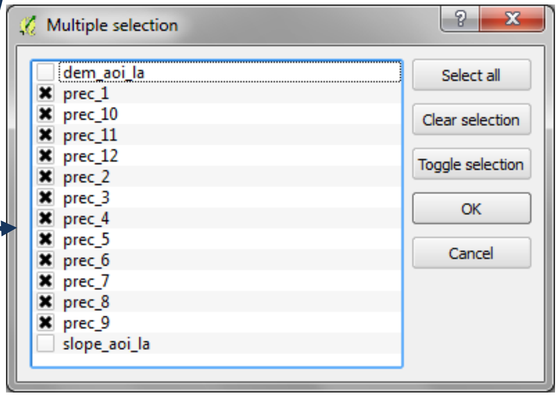
2.2.3. Batch clip monthly precipitation rasters

a. Right click click on **GDAL Clip raster by mask layer** and click **Execute as batch process**

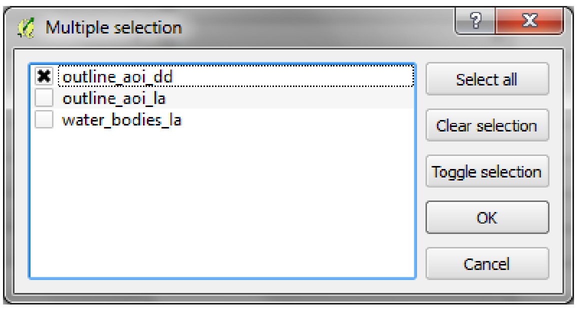


b. Click on the **...** in the first Input layer and click on **Select from open layers** and Select the 12 precipitation rasters





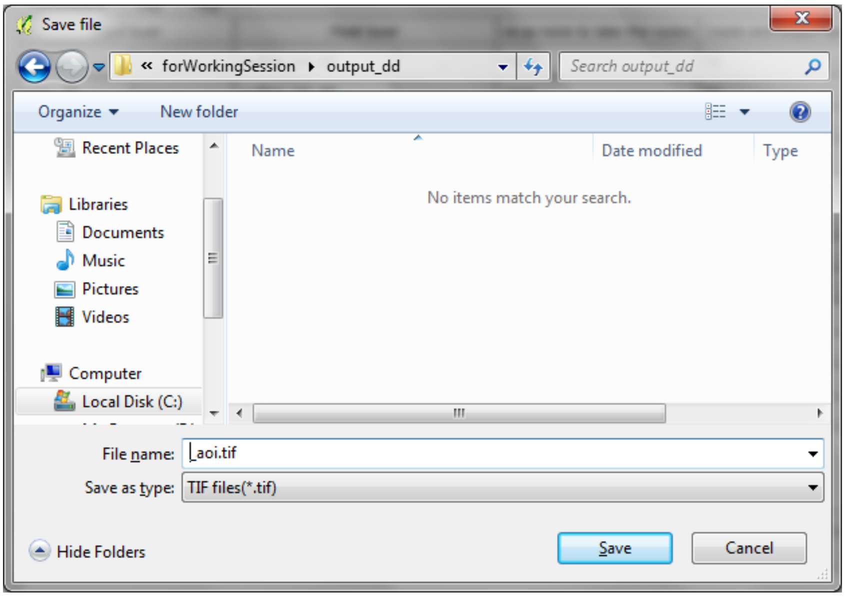
c. Click on the **...** in the first **Mask layer** and click on **select from open layers** and **Select the AOI shapefile** in geographic coordinate system. E.g. in this example **outline_aoi_dd**



d. Double click on **Column heading Mask Layer** to **auto-populate** the **outline_aoi_dd** down the column.

e. Click on the … in the first Output layer and navigate to an output folder and in the Filename type **_aoi.tif**

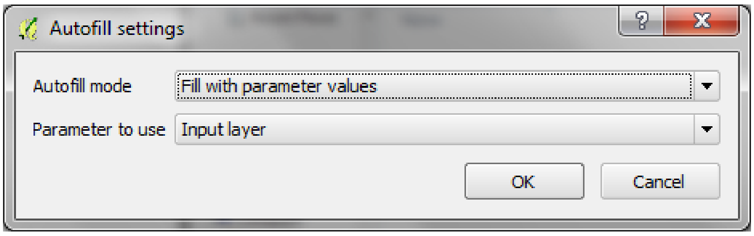
f. Click **Save**

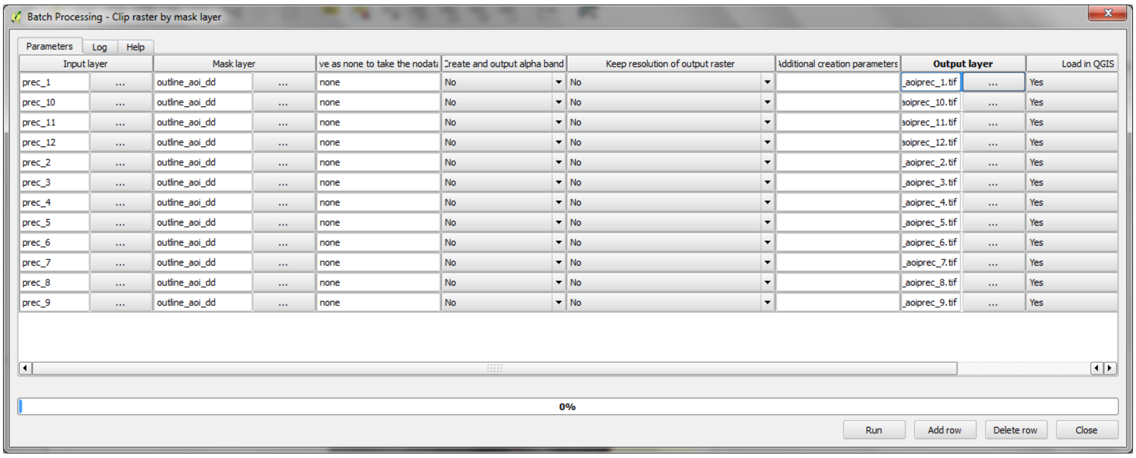


g. Click **Fill with parameter values** and select **Input layer** as **parameter to use**

h. Set the **Input layer** to the **merged dem** created in the previous step **i.e. the one labelled Output layer** in the table of contents.

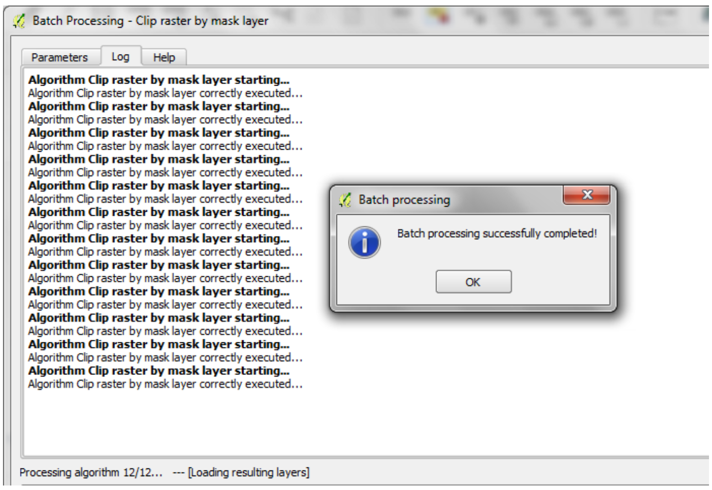
i. Click **OK**



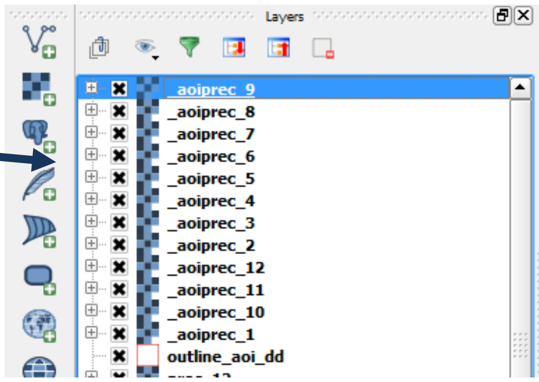


j. Click **Run** and the tool will run in batch mode.

k. Click **Ok and close** once complete



l. See that there are 12 datasets added to the table of contents all called "Output Layer". Right Click and goto properties on each of the datasets and rename them



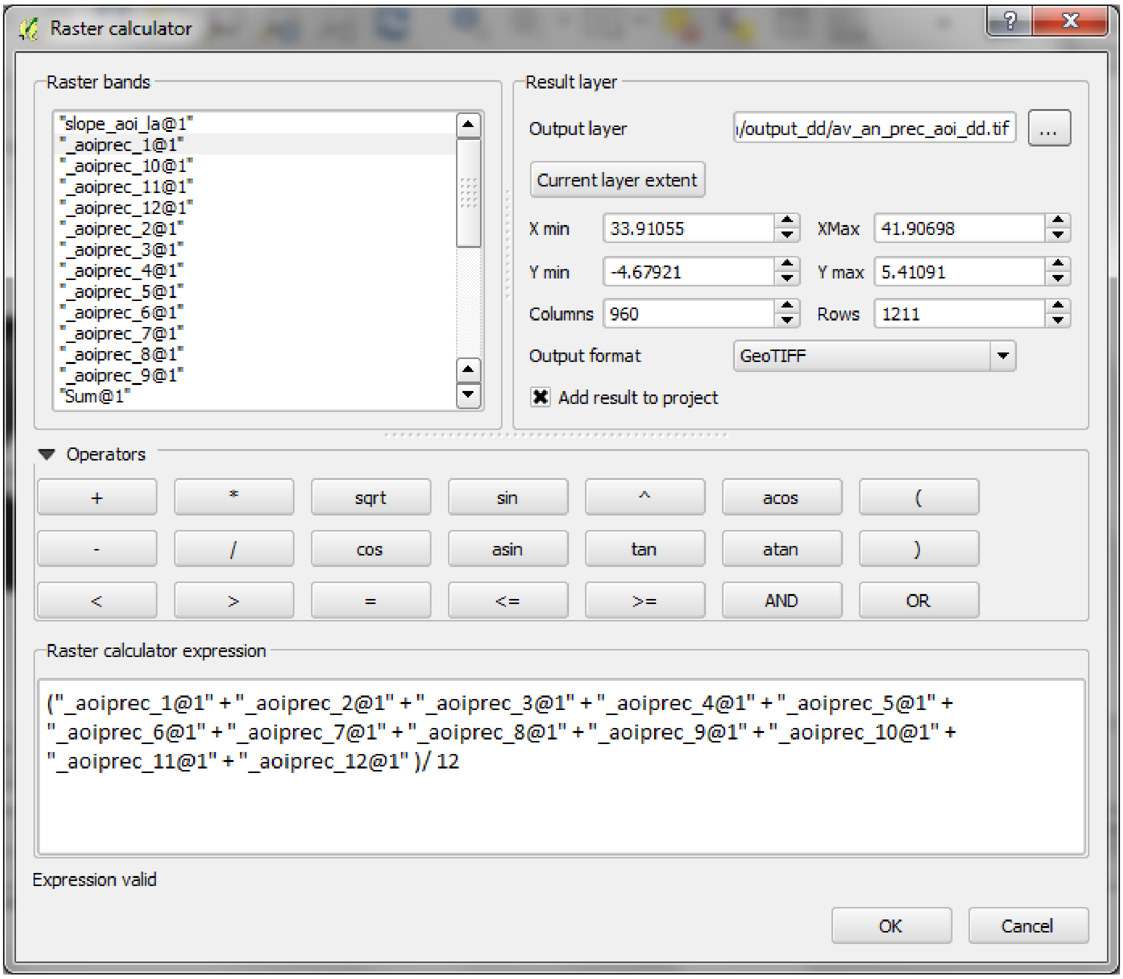
2.2.4. Calculate average annual precipitation

a. From the main menu click **Raster>>Raster Calculator**

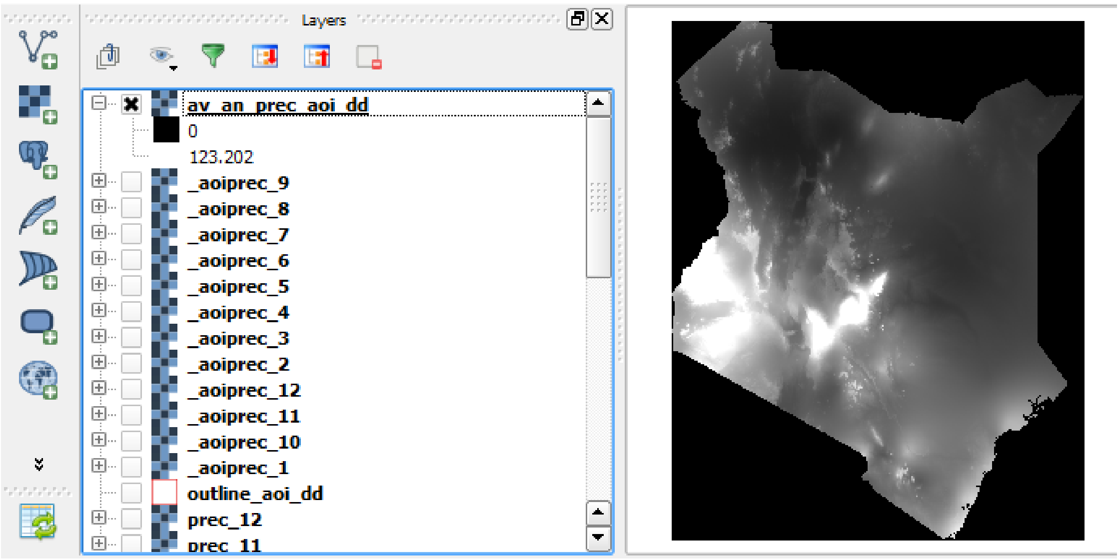
b. **In the expression box add the expression** ("_aoiprec_1@1" + "_aoiprec_2@1" + "_aoiprec_3@1" + "_aoiprec_4@1" + "_aoiprec_5@1" + "_aoiprec_6@1" + "_aoiprec_7@1" + "_aoiprec_8@1" + "_aoiprec_9@1" + "_aoiprec_10@1" + "_aoiprec_11@1" + "_aoiprec_12@1")/ 12

c. Navigate to an **output folder** and name the new raster **av_an_prec_aoi_dd.tif.**

d. **Click** on one of the **input precipitation layers** and click on the **current layer extent** to ensure the Raster Calculator is looking at the correct extent



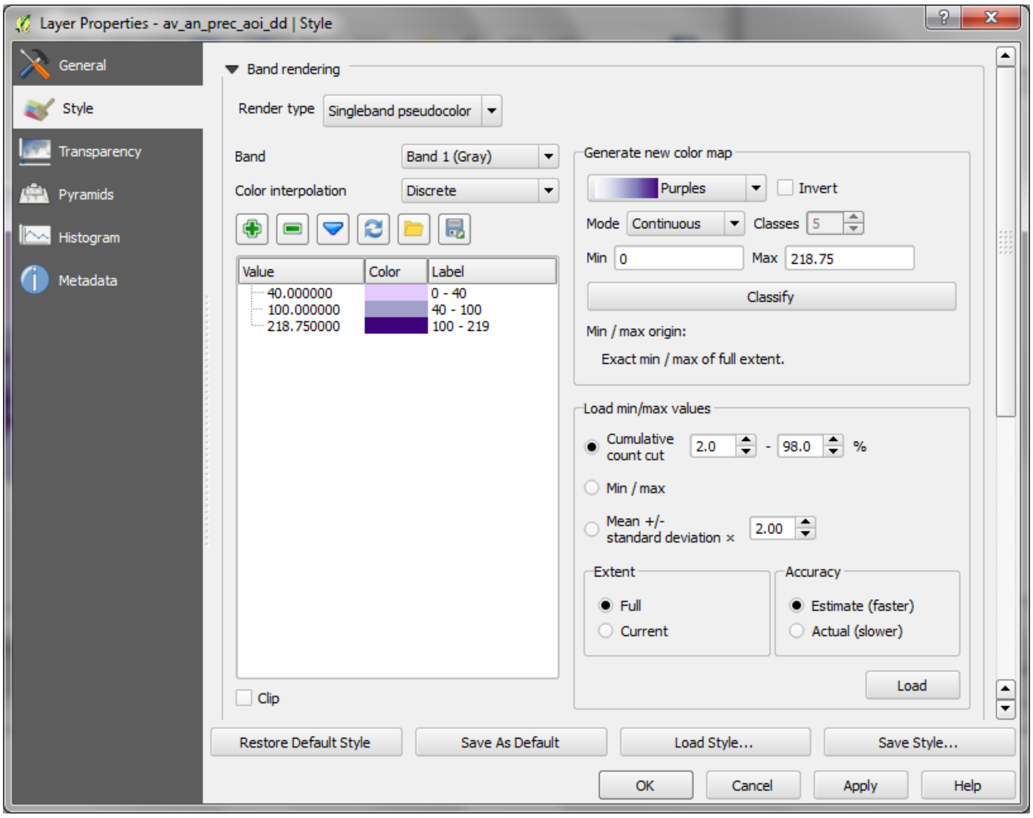
e. Click **OK**



2.2.1. Reclassify mean annual precipitation raster into 3 classes

a. Right click on the **average annual precipitation raster>>Properties**

b. Click on **Style**



c. Change **Render Type** to **Singleband Pseudocolor**

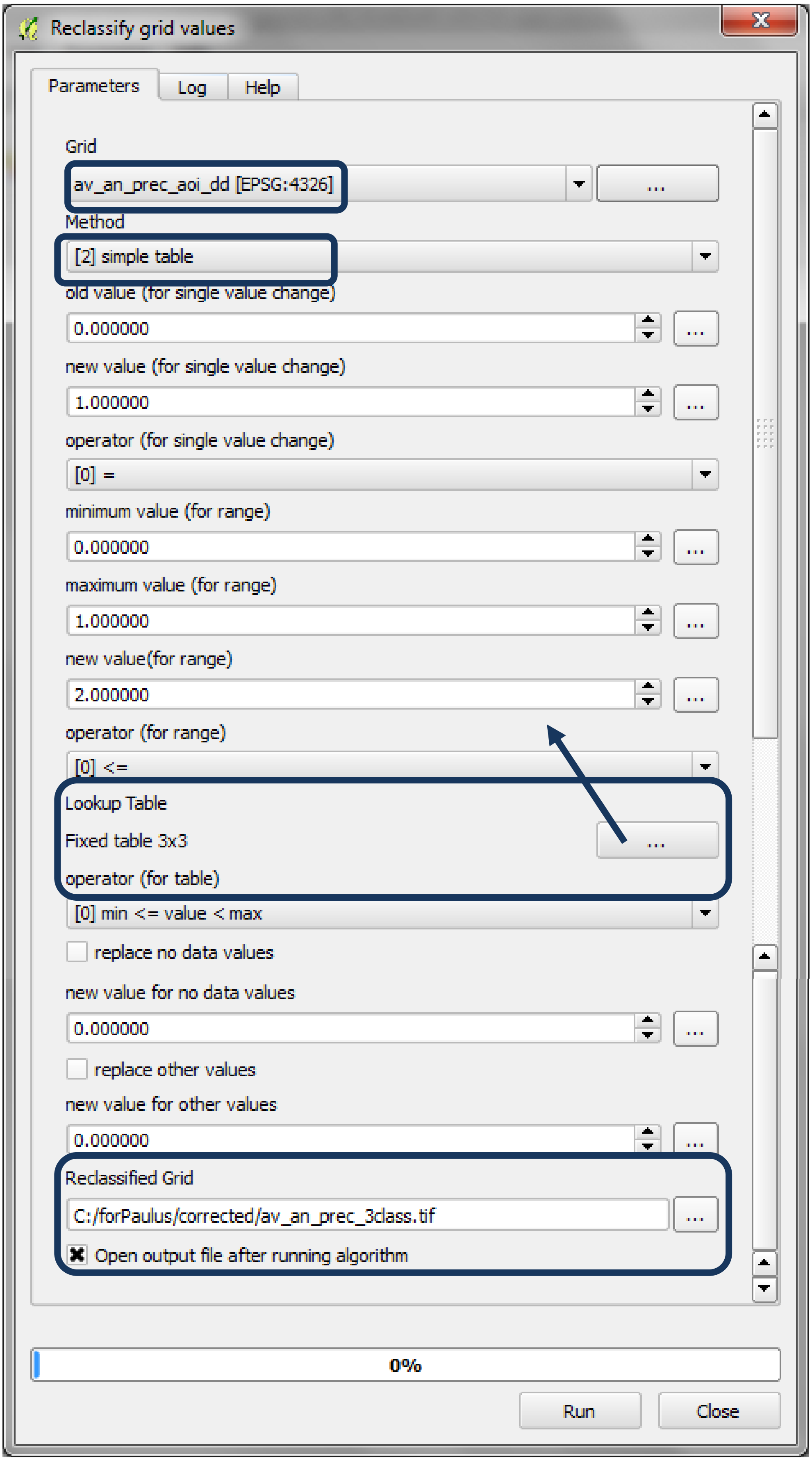
d. Change Mode to **Equal Interval**

e. Change color interpolation to Discrete

f. Change Load min/max values to Min/max and Extent to Full and Actual (slower)

g. Click Load

h. **Click Classify and** then M**anually change the Values and labels** to appropriate class breaks for low medium and high precipitation
i. **Click OK.** This visualized the class breaks on screen
j. Now run the **Reclassify grid values** tool to **reclass the values to 1, 2 and 3.**



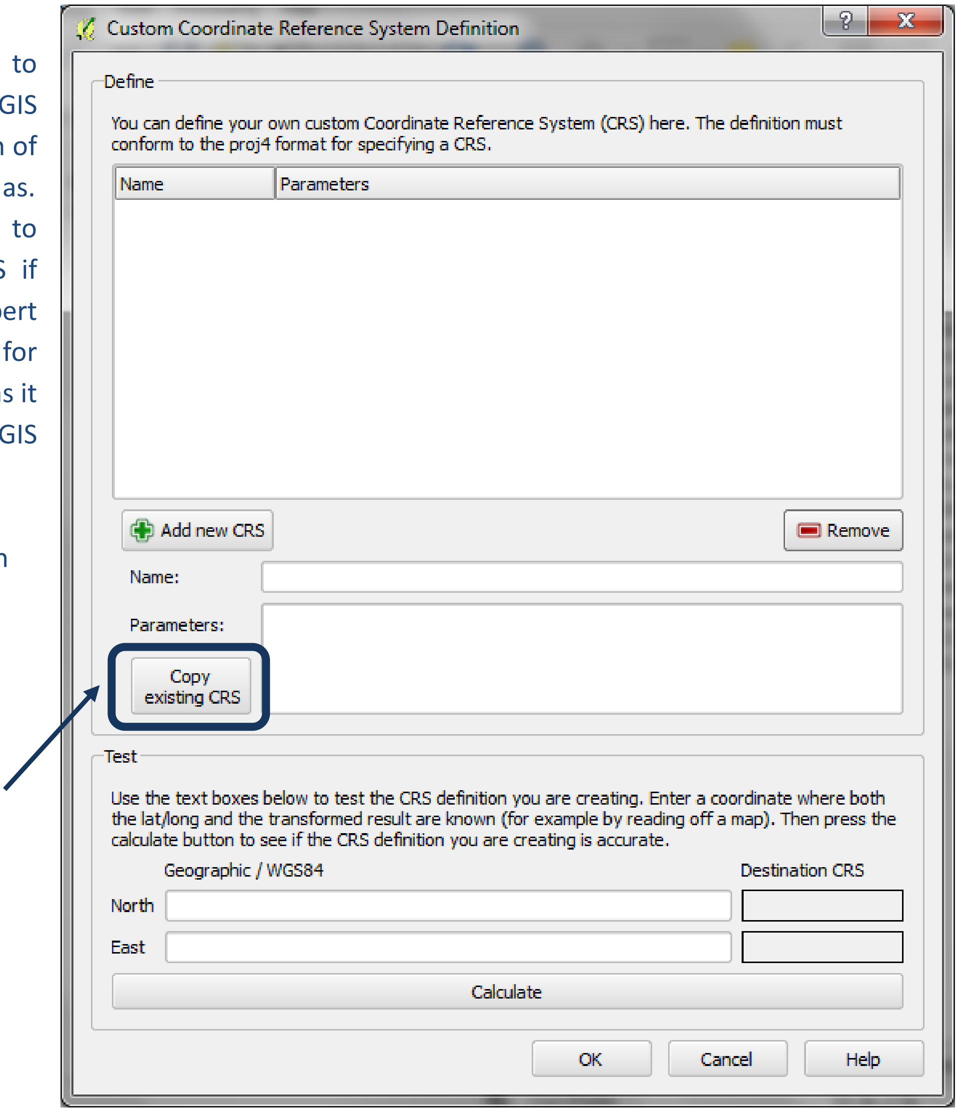
2.2.2. Project raster layers from geographic coordinate system to a projected CRS

It is important to now save the data in a projected coordinate system (such as lambert azimuthal equal area projection (with a Centre latitude and Centre longitude as the centre of the area of interest). The dataset cannot be left in geographic EPSG 4326 as the units of the data for the next processing steps need to be in meters.

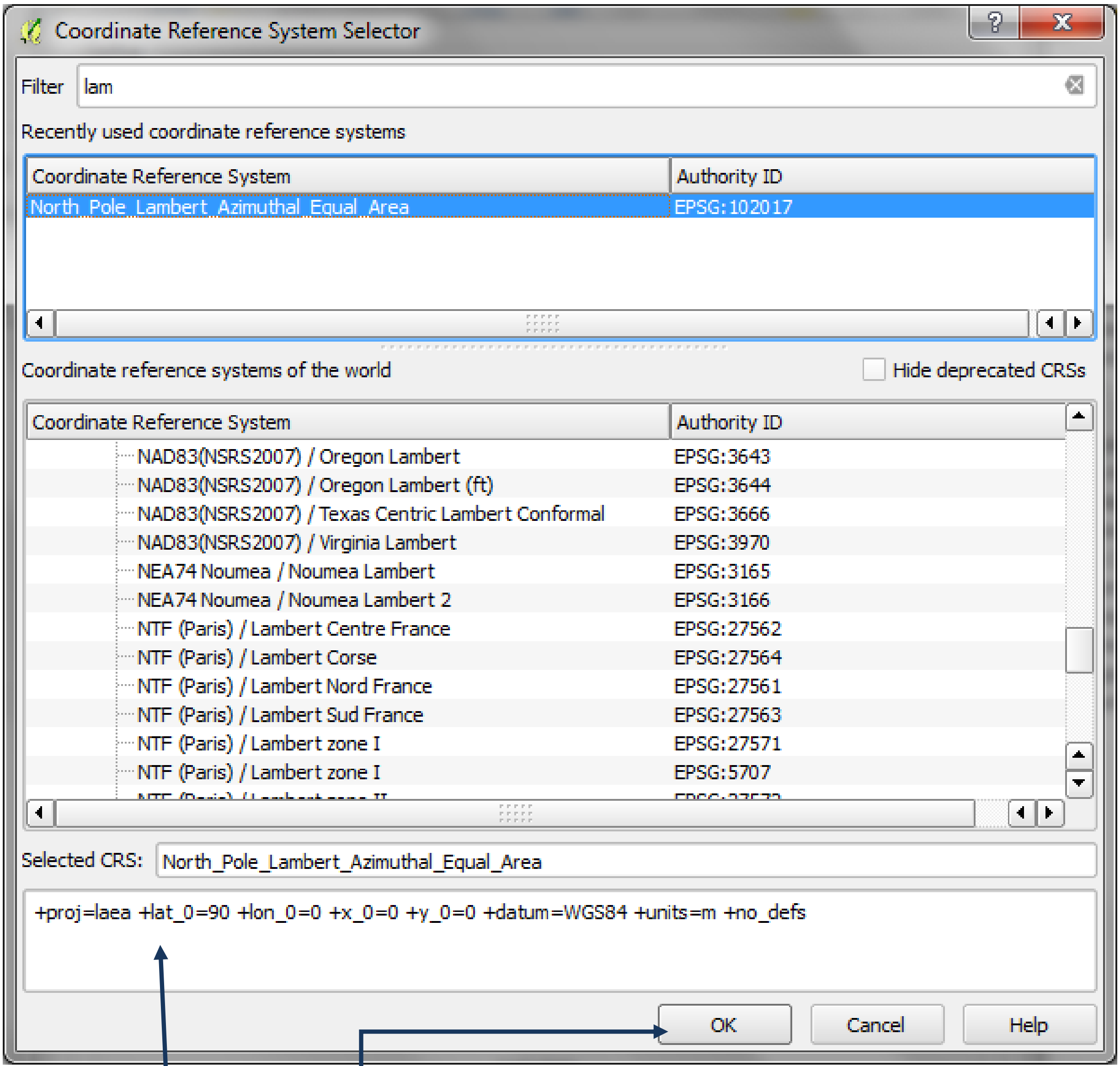
The easiest way to project the data in QGIS is to rightclick on each of the datasets and save as. First you may need to create a custom CRS if you are using lambert azimuthal equal area for your area of interest as it is not one of the QGIS default projections.

a. From the main menu click on **Settings>> custom CRS**

b. Click on **Copy existing CRS**



c. To create a **custom lambert azimuthal equal area** CRS for example, filter by typing lambert in the filter box. See that there is an existing lambert azimuthal equal area projection for the North Pole that can be modified.

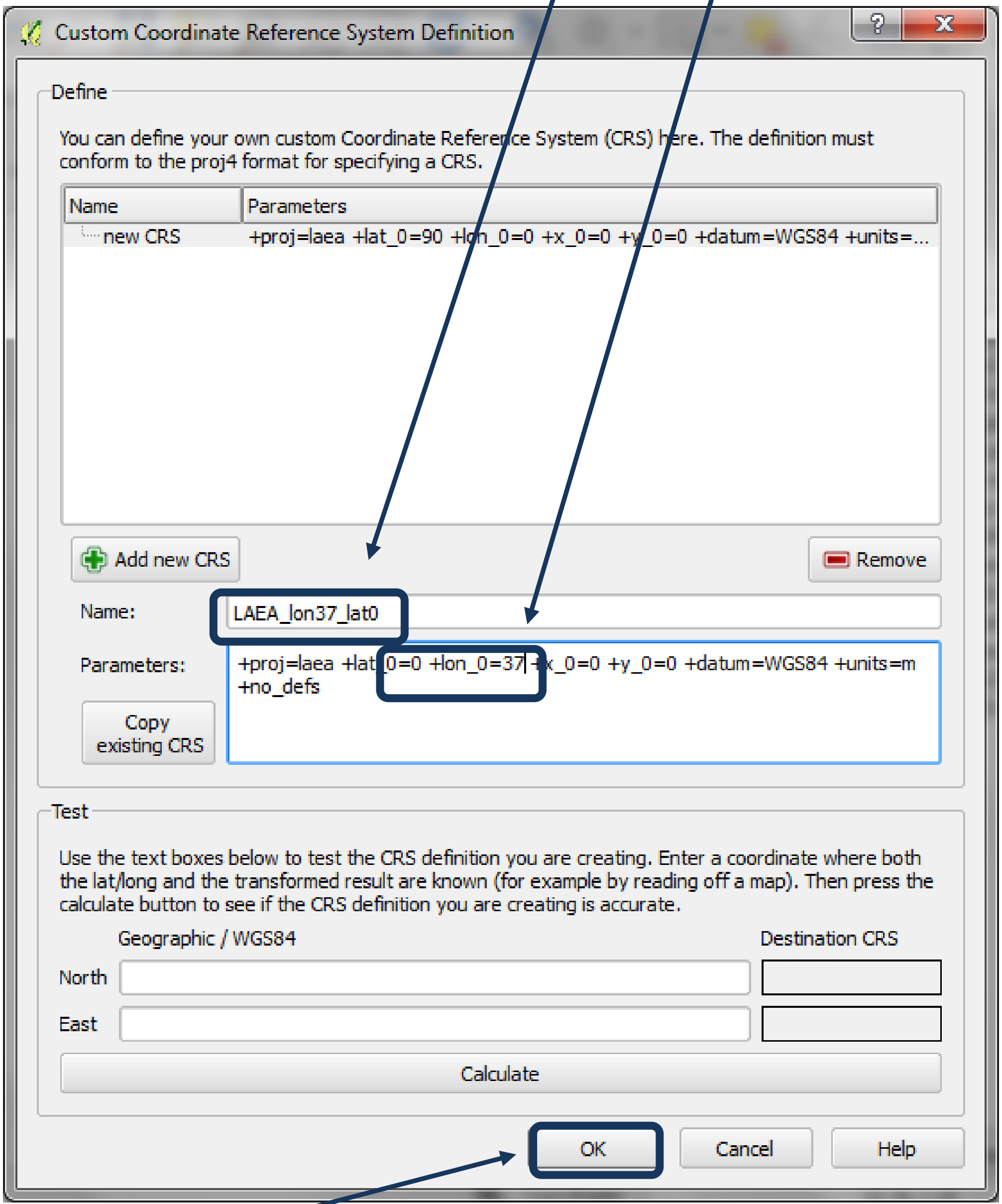


d. In the bottom panel you can see the syntax for the projection

e. Click **OK**

f. Change the name from new CRS e.g. in this example to **LAEA_lon37_lat0** as the centre lon and lat of the area of interest is 37 and 0

g. In the Parameters box change the **+lat_0=90 +lon_0=0** to **+lat_0=0 +lon_0=37** in this example



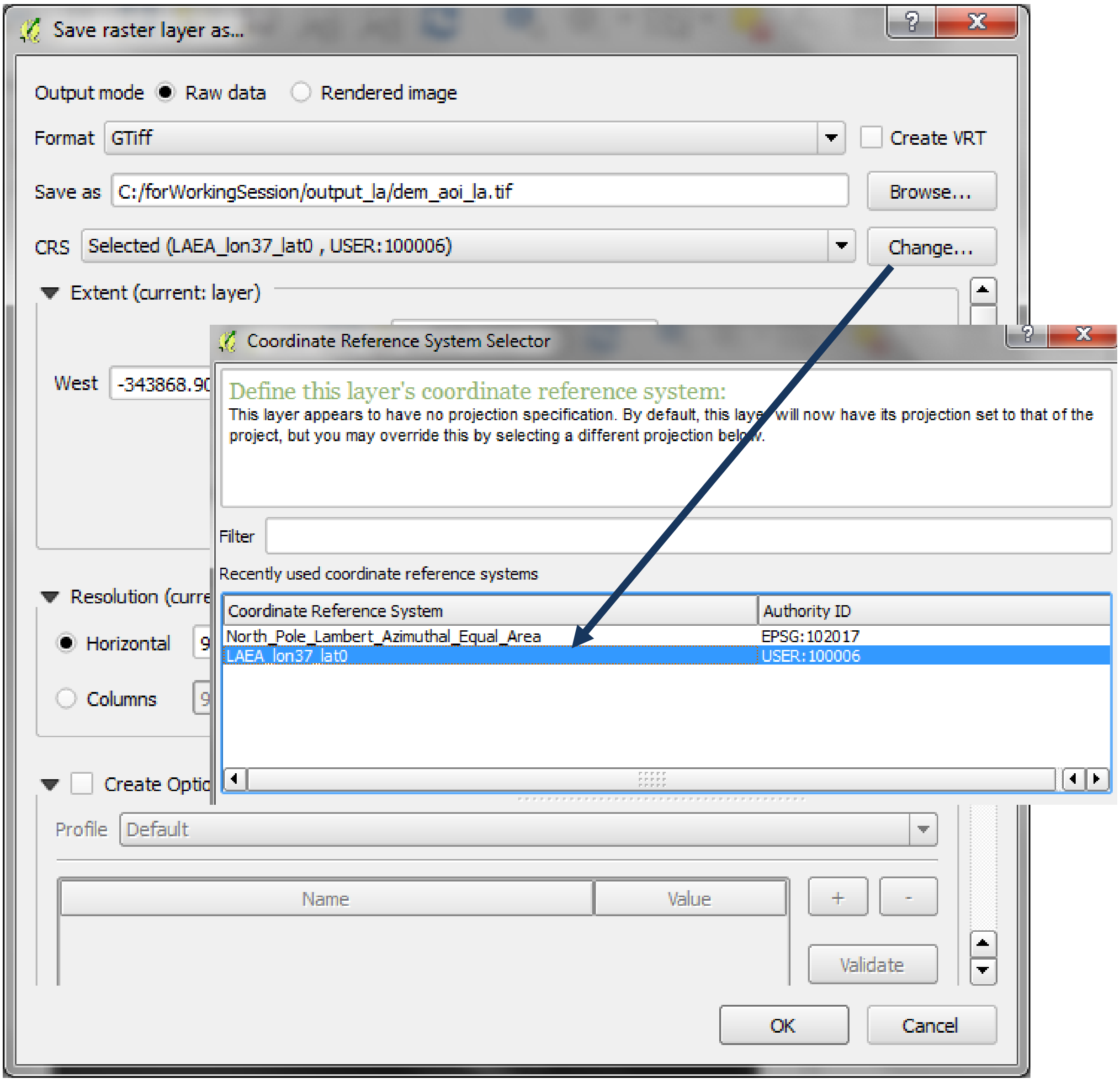
h. Click **OK**

i. Next **right click** on the DEM that has been clipped to the aoi. i.e. in this example **dem_aoi_dd**

j. **Set Format to GTiff**

k. Click on **Browse** and chose a folder to save to and save **dem_aoi_la.tif** for example.

l. For the CRS click on **Change and pick the Lamber azimuthal equal area projection you created in the previous step**



m. Then click **OK** and **OK** to close both windows

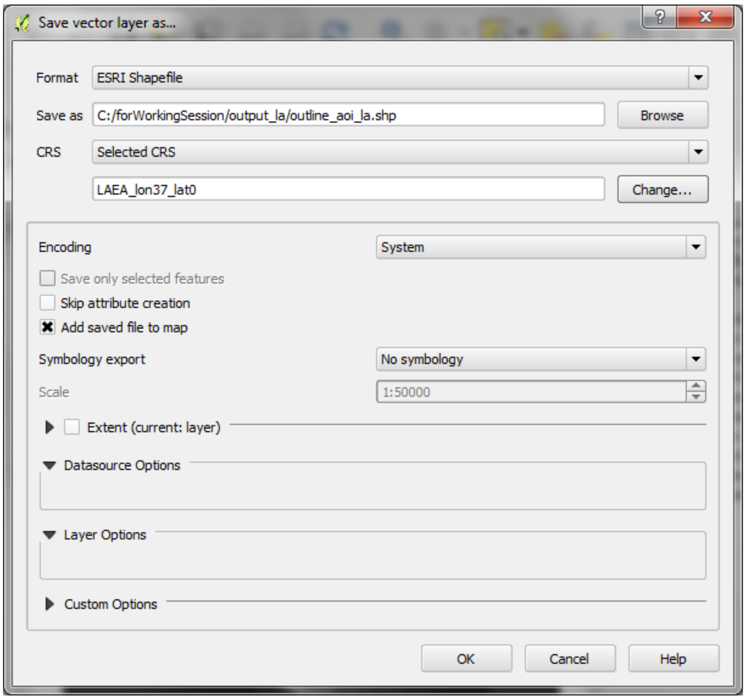
n. The new dataset is not automatically added to the project so click on Add Raster dataset button and add the clipped and projected dem to the project i.e. **dem_aoi_la.tif**

o. Repeat **steps l – n** for saving the **3-class average annual precipitation raster** in the projected CRS

2.2.3. Save vector layers from geographic coordinate system to a projected CRS

p. Next Right click on each vetor layer and save the vector layers from geographic to lambert azimuthal equal area projection.

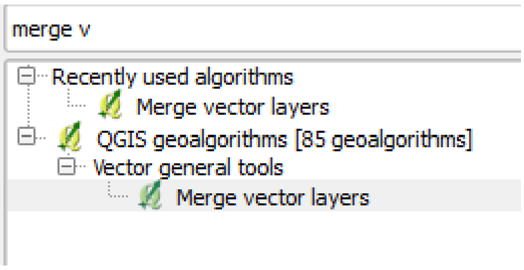
q. Save the area of interest vector layer e.g**. outline_dd** in this example and save as e.g. **outline_aoi_la.shp**



r. Save the project. From the main menu Click on **File>>Project>>Save project>>**

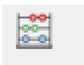
s. Navigate to an output folder and save as e.g. soilerosion.qgs

t. Add lakes and dam points into QGIS and save these also in the same Lambert Azimuthal Equal Area projection. If dam points are in multiple shapefiles use the Merge Vector layers tool in the processing toolbox



u. Right click on the **Dam points >>open attribute table**

v. In the attribute table window click on the editing button 

w. Click on the  **calculator button**

x. **Create a new field** e.g. called **ID**
And in the **expression** box type **$rownum**

y. **Click OK**

z. Repeat steps **s-w** for the **water bodies** shapefile

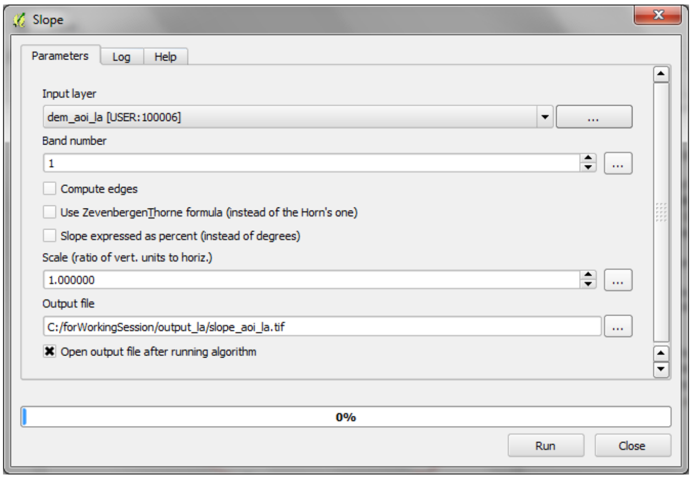
The Geographic layers can now be removed from the QGIS project so that just the _la ones remain

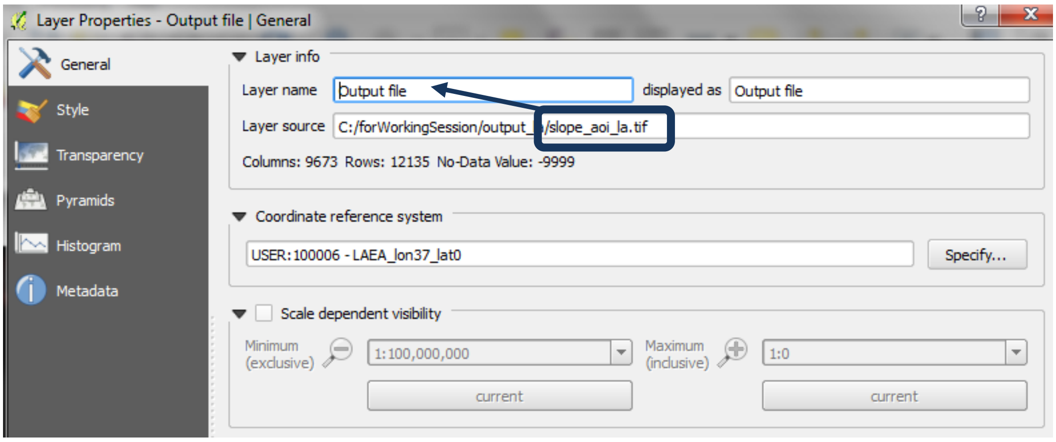
2.2.4. Generate slope from projected DEM

Run the GDAL Slope tool

a. The output layer that is added to QGIS defaults to the name **Output file** in the table of contents
Right Click on **Output file >>Properties**

b. Change the **Layer name** from **Output file** to be the same as the **Layer source** i.e. **slope_aoi_la**



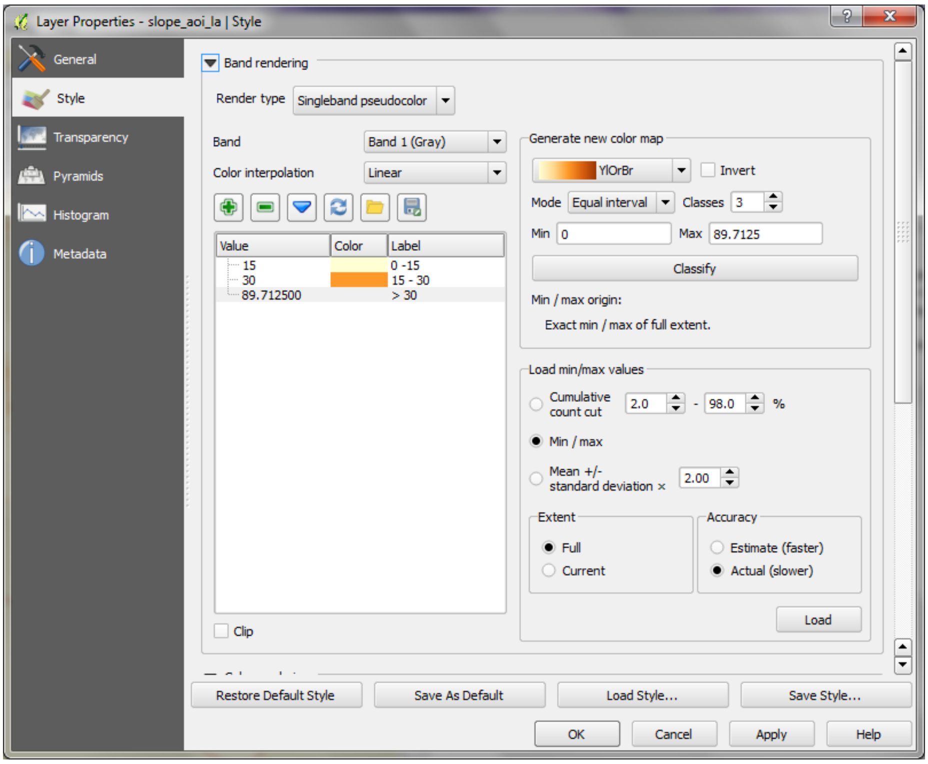


c. Click **OK**

2.2.5. Reclassify slope into 3 classes

k. Right click on the slope **raster >>Properties**

l. Click on **Style**



m. Change **Render Type** to **Singleband Pseudocolor**

n. Change Mode to **Equal Interval**

o. Change color interpolation to Discrete

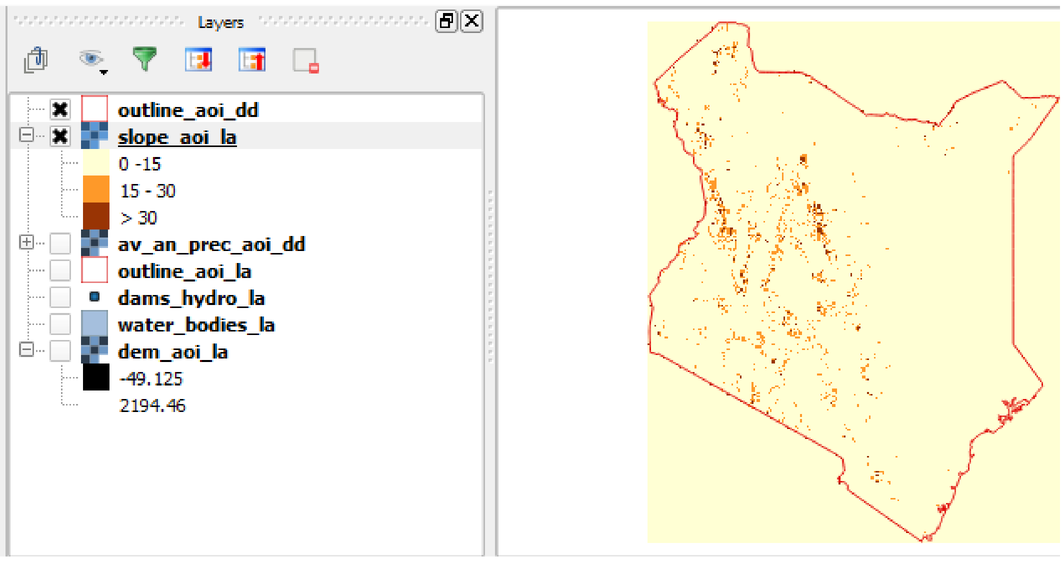
p. Change Load min/max values to Min/max and Extent to Full and Actual (slower)

q. Click Load

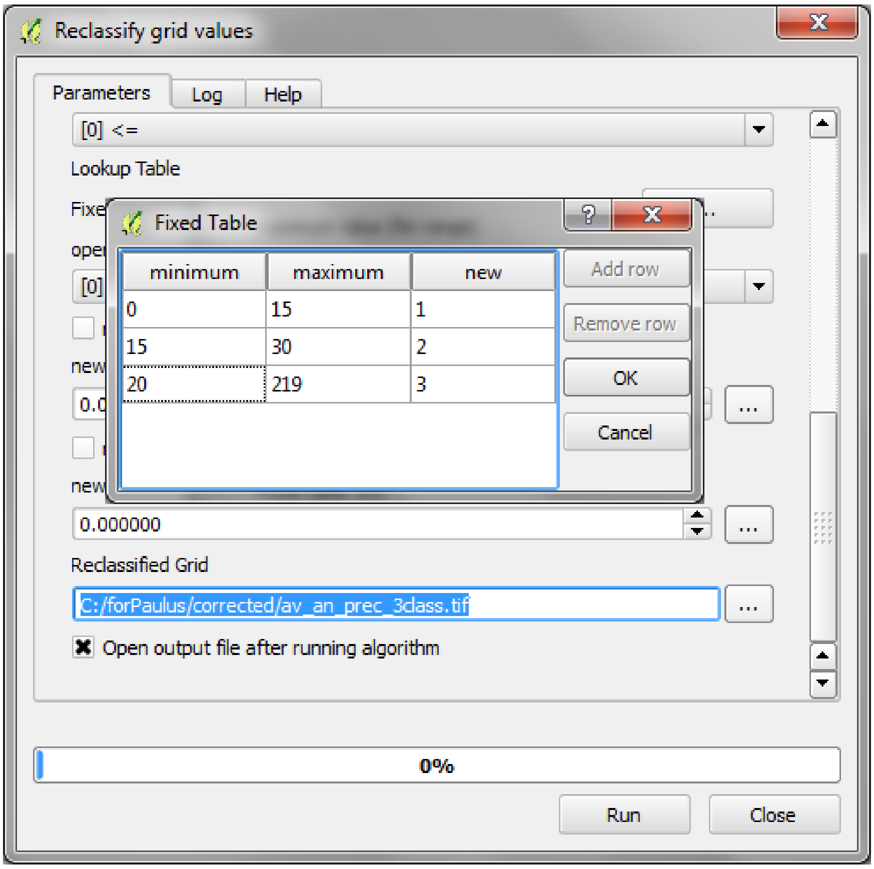
r. Click Classify

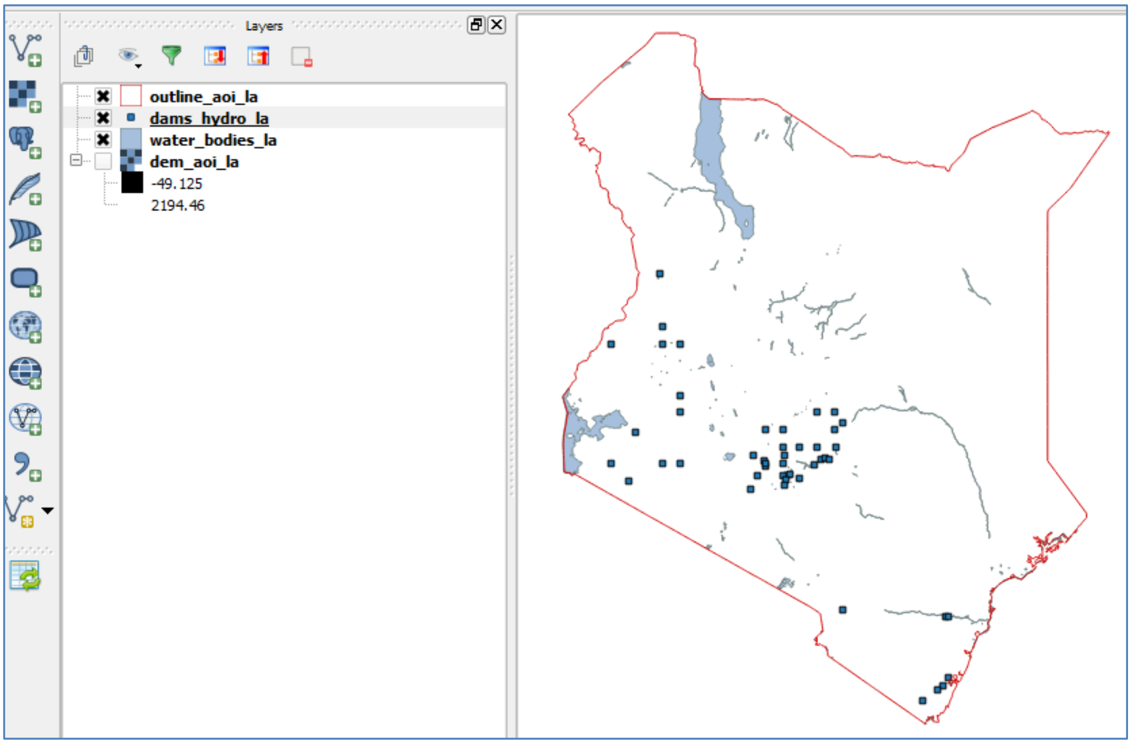
s. Manually change the Values and labels to appropriate class breaks for low medium and high slope

t. Click OK



u. Once you are happy with the class breaks use the **Reclassify Grid values tool** to create a 3 class slope raster. Chose to reclass by look-up-table





2.3. Running hydrological analysis steps

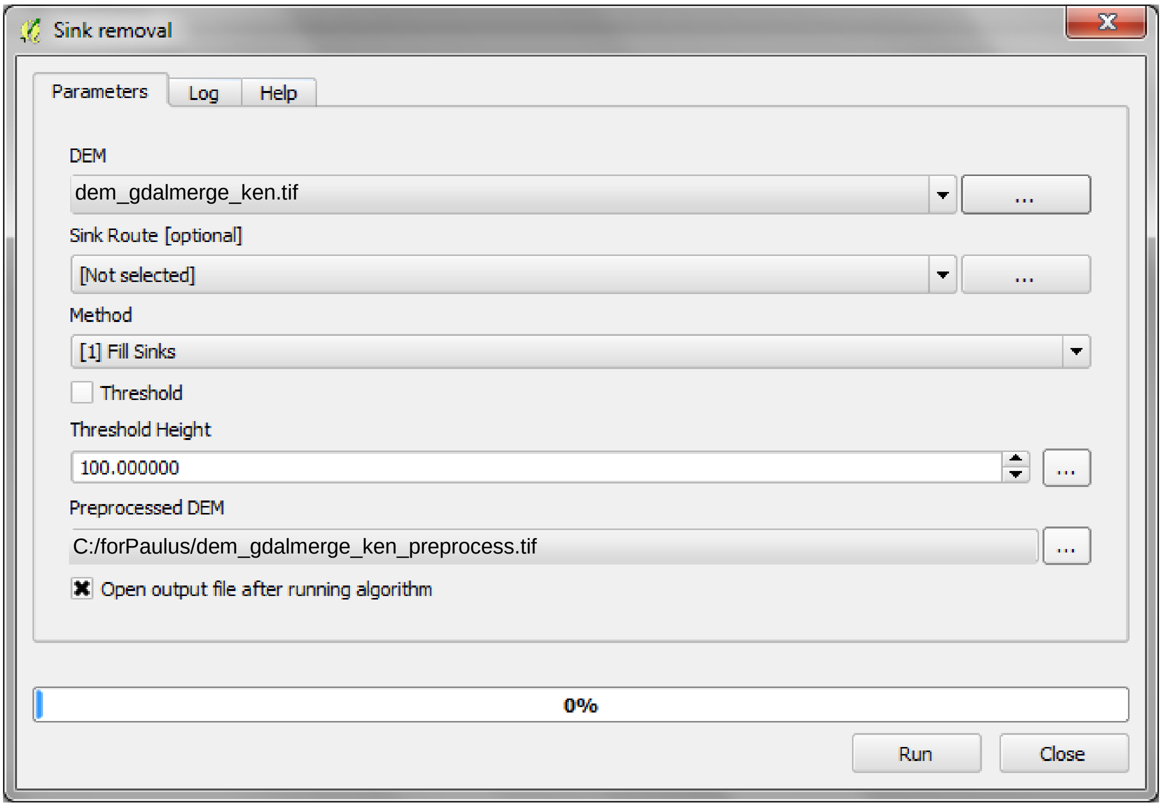
2.3.1. Fill the projected DEM and generate hydrological datasets

The next steps generate hydrological datasets from the **dem_aoi_la** DEM file.

********IMPORTANT: IF RUNNING IN A TRAINING/WORKING SESSION SKIP, prepare steps a-f below in advance prior to session. THIS PROCESS IT CAN TAKE 12 hours or more to run at a country scale*******

a. Search for Sink Removal in processing toolbox

b. Double click on **Sink Removal**



c. Set the **DEM** for the merged dem which has been clipped to the area of interest e.g. **dem_gdalmerge_ken.tif** in this example

d. Leave **Sink Route** as **Not Set**

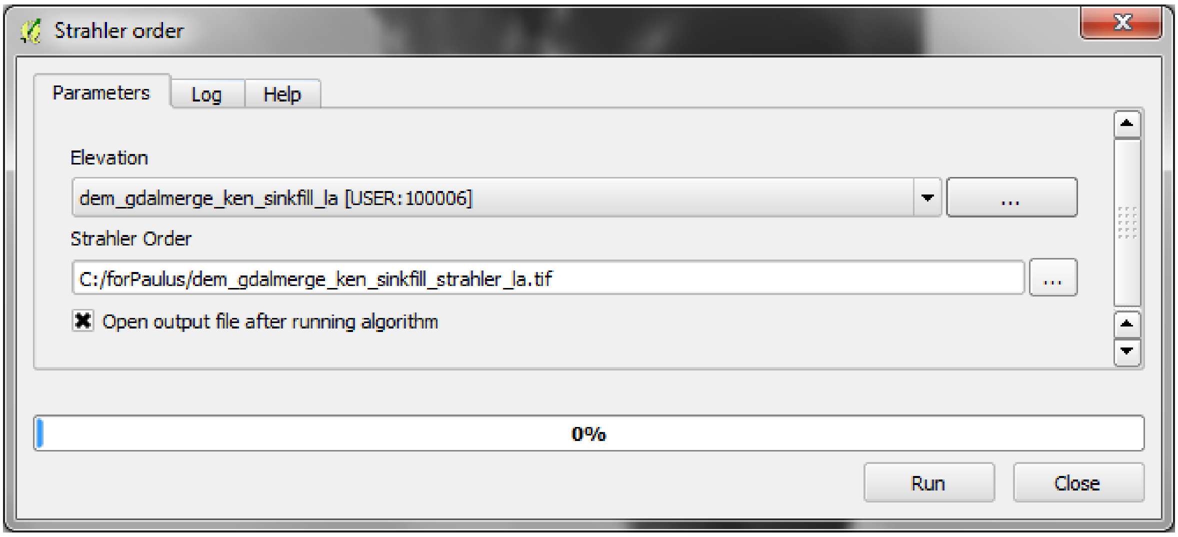
e. Set the Preprocessed DEM so that the **sink fill**ing does not make changes that will overwrite the original DEM

f. Leave Method as **Fill Sinks**

g. **Rename** the DEM to reflect that the sink filling has occurred. E.g. in this example **dem_gdalmerge_ken_sinkfilled_la.tif**

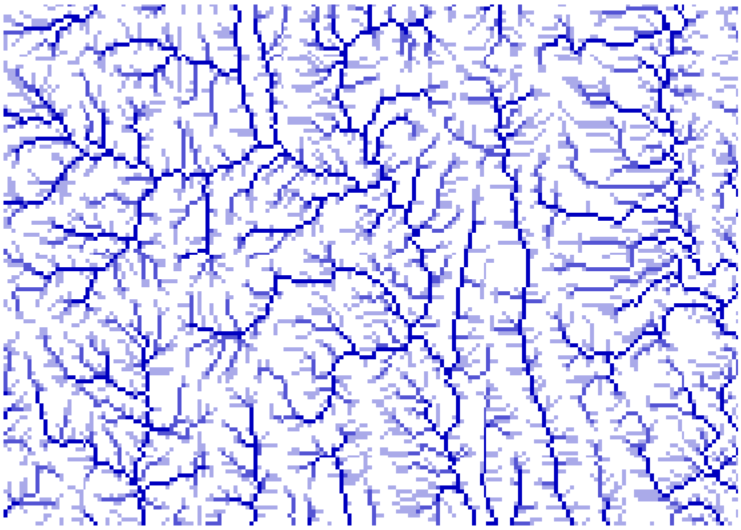
2.3.1. Generate stream order raster from sink filled DEM

a. Search for the **Strahler order tool** in the processsing toolbox and double click to run the tool
b. Set the Elevation to be the **sink-filled DEM**. The sinkfilled version necessary for correct generation of the stream orders.



You may get an error when running this is run, in which case you will need to split the sink illed DEM into two smaller sections run this step on the two section seperately

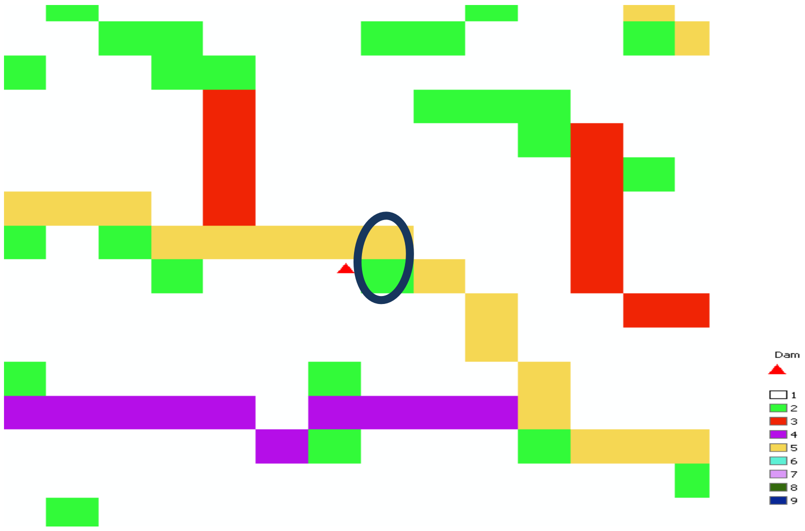
a. Check it looks correct (it should look similar to the illustration to the right)



2.3.2. Buffer Dam points to overlap with Stream orders and convert to raster

Next the Dam points need to overlap the stream order lines generated from the DEM. The points will be converted to Raster and expanded to ensure they overlap correctly (otherwise the catchments created later on will generate incorrectly)

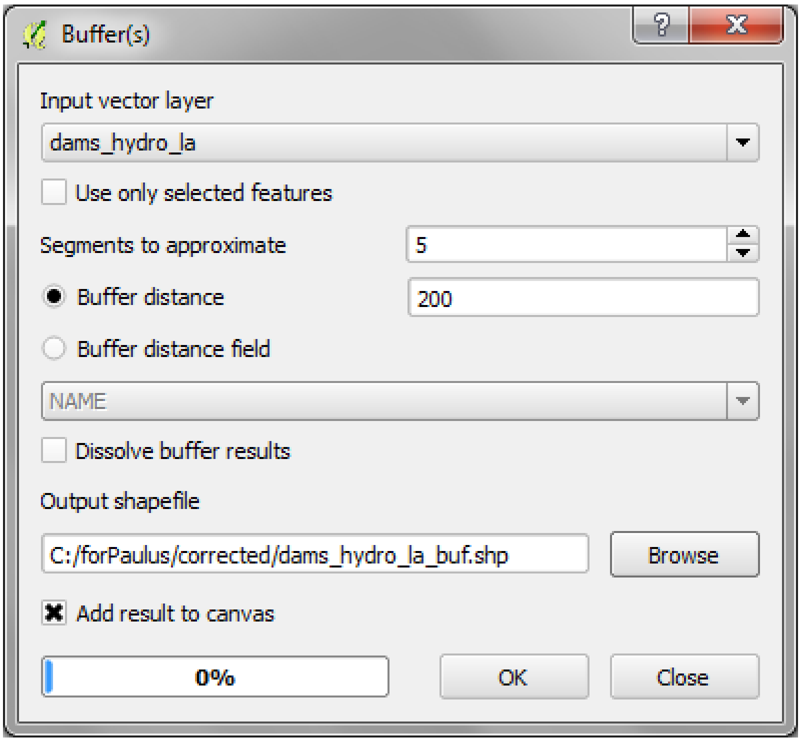
Illustration of dam points and Stream order lines:-



It is very important that the dams fit the closest stream of the highest order – i.e. in the figure (above), the point when converted to raster should overlap the yellow square, not the green one – or the upstream catchments will not be generated correctly – they will be too small.

a. Zoom in on the Dam points and see how closely they fall on the Stream order raster. Decide on how much to buffer the point by. E.g. as the DEM cells are 92m suggest to try 200m The points need to fall exactly on the nearest high order stream (as in the diagram above).

b. From the main menu click **Vector>>GeoprocessingTools>>Buffer(s)**



c. Set the shapes to the projected dam points

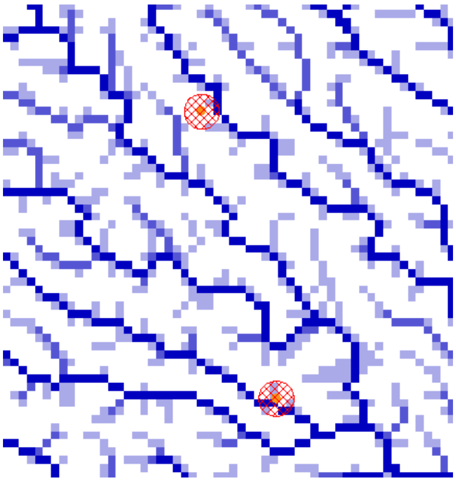
d. Select **Buffer** distance

e. Set **Buffer Distance** to **fixed value e.g. 200**

f. Set **an output shapefile.**

g. Click Okay to run

h. **Right click** on the **Buffers** and **add to the Strahler orders map**. Check to see if the buffer size is appropriate

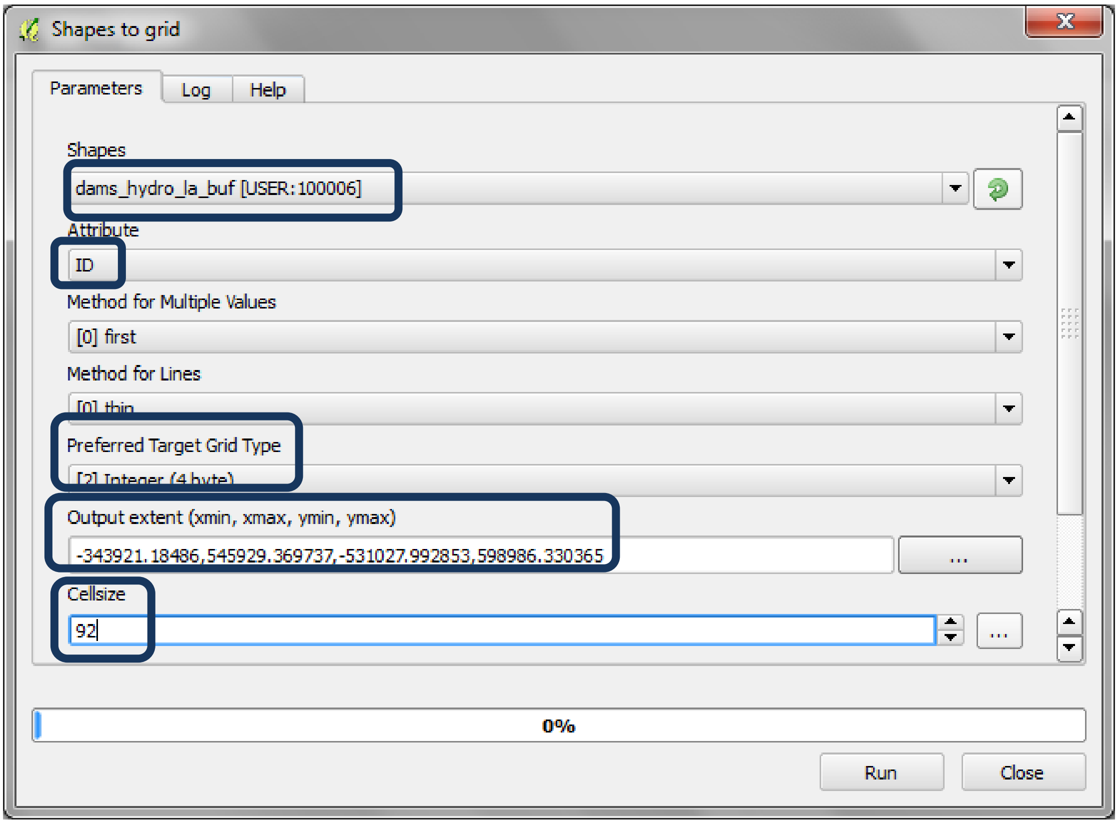


i. Next search for the **Shapes to Grid tool or GDAL rasterize (vector to raster) to and** and use it to convert the **dams buffers shapefile** to a raster

j. Set **Shapes** to The buffered dams

k. Set **Attribute** to **ID**

l. **Set Preferred Target Grid Type** to **Integer (4 Byte)**



m. Set **the output extent to the same as the sink filled DEM i.e. dem_ken_sinkfilled_la**

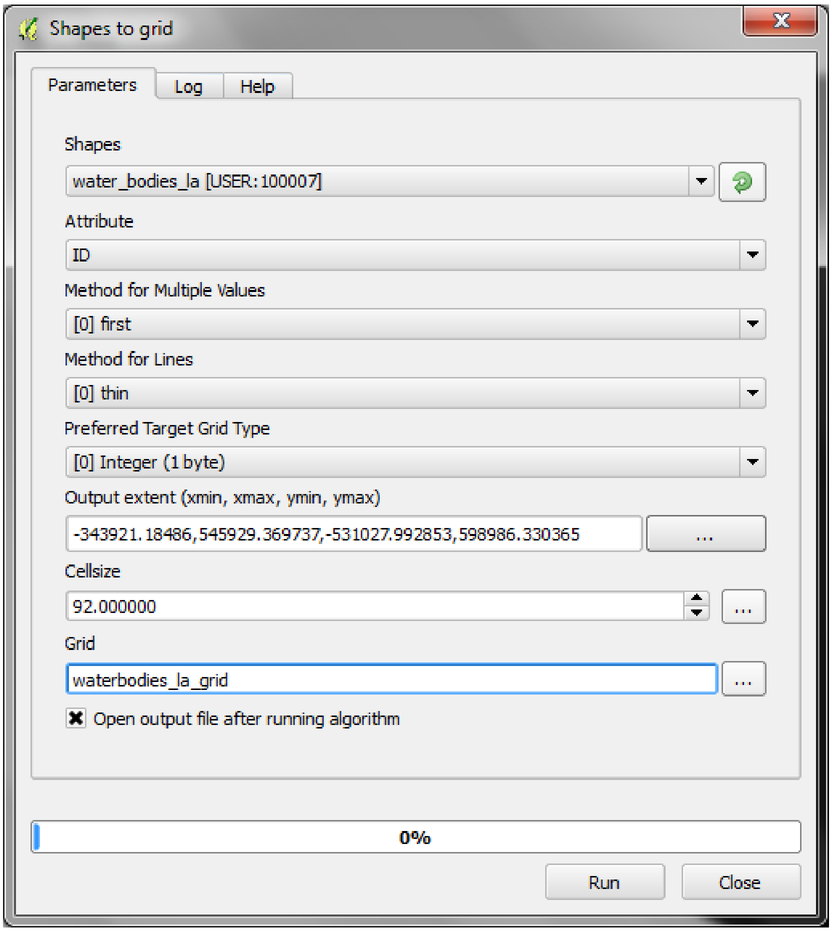
n. **Set the Cellsize to 92 (make sure this is the exact cellsize used for the sinkfilled dem)**

o. **Navigate** to the **output folder** and the the new output grid a **name e.g. dambufgrid.tif**

p. Click **Run**

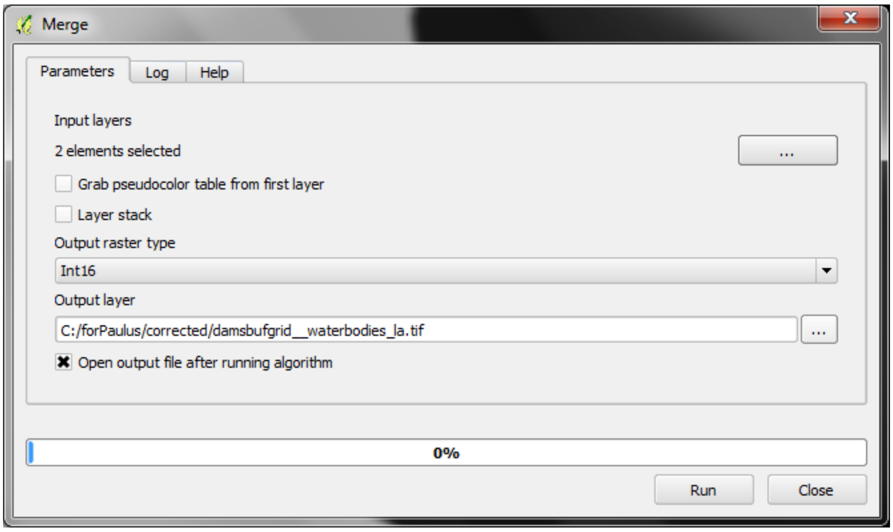
q. The output added to the display is called '**Grid'** rename it to **damsbufgrid_la.tif**

r. Repeat steps **i to 0** to convert the water bodies shapefile to Raster



2.3.3. Merge Dam and water bodies rasters into a single raster

a. Search for **Merge** in the processing toolbox and Double click on the **GDAL: Merge** Use it to mosaic the Dam and water bodies into a single raster.



b. Select the **Input layers** i.e. Dams and water bodies rasters

c. Set the raster output type to int16

d. Give the dataset a new name

e. Click **RUN**

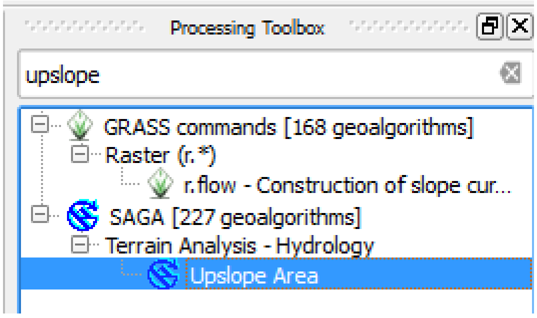
f. Rename the Merged **Grid** to **damsbufgrid__waterbodies_la**

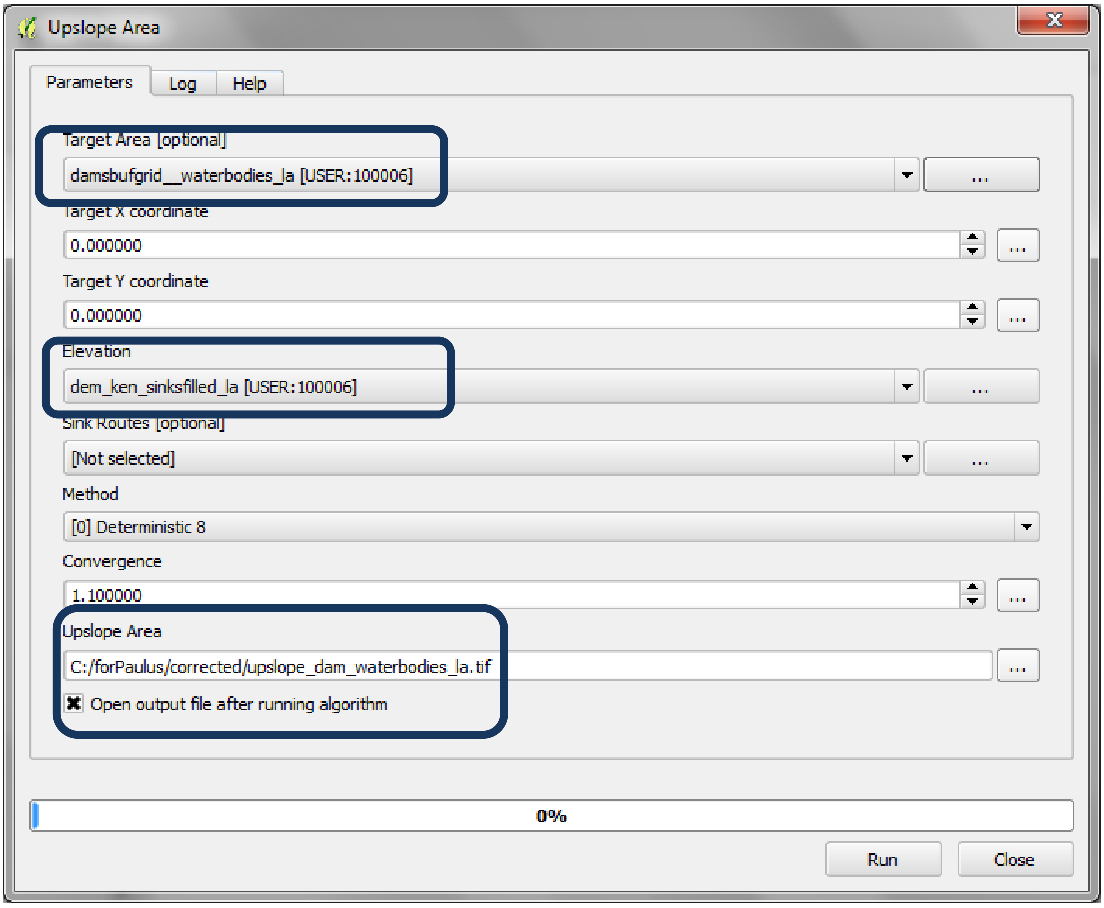
2.3.4. Generate upstream catchments of dams and water bodies

The next step will generates upstream catchments of dams and/or water bodies by determining the contributing area above a set of dam and water body cells (i.e. the upstream catchment of dams and lakes)

a. Search for upslope in the geoprocessing toolbox.

b. Double click on Upslope Area located in the **Terrain Analysis – Hydrology** tools



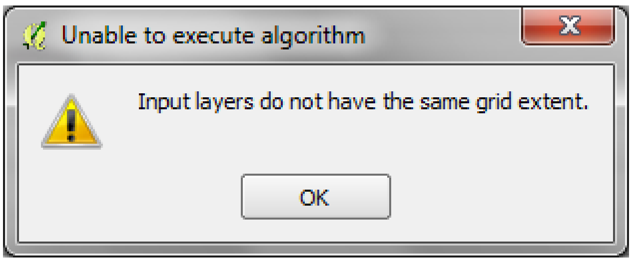


c. Set the **Target Area** to be the **Merged Dams and water bodies** raster

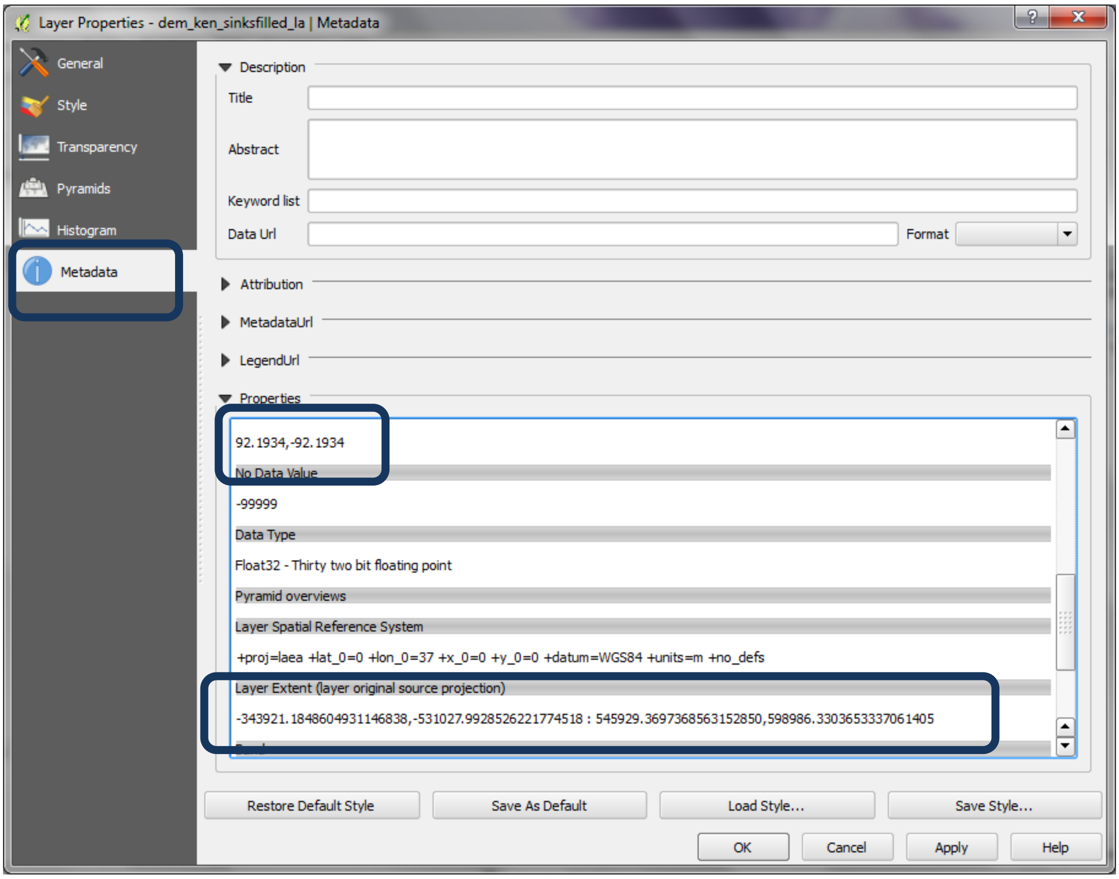
d. Set the **Elevation** to be the **Sink filled DEM**

e. Navigate to an output folder and save the **Upslope Area** raster to a new name

If you get the following message you need to change the grid extent of the Merged water bodies and dam

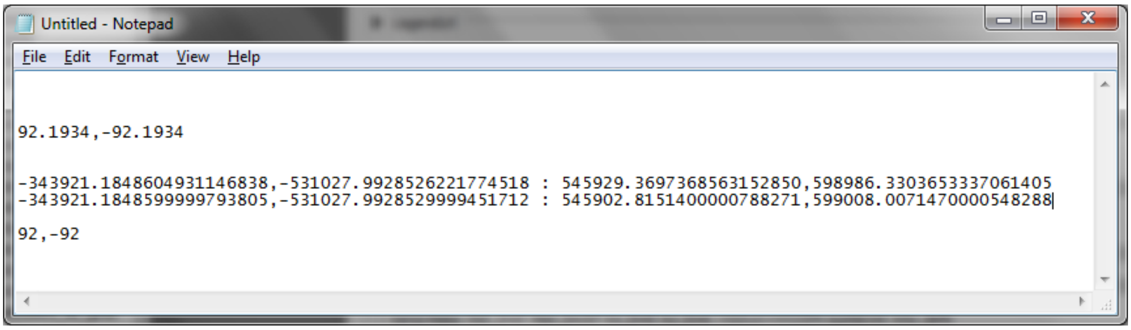


f. Right click on the **Sink filled DEM** and click on the **Metadata tab**.



g. Check the cellsize and extent and copy them into a notepad. Do the same for the combined waterbodies and dams raster

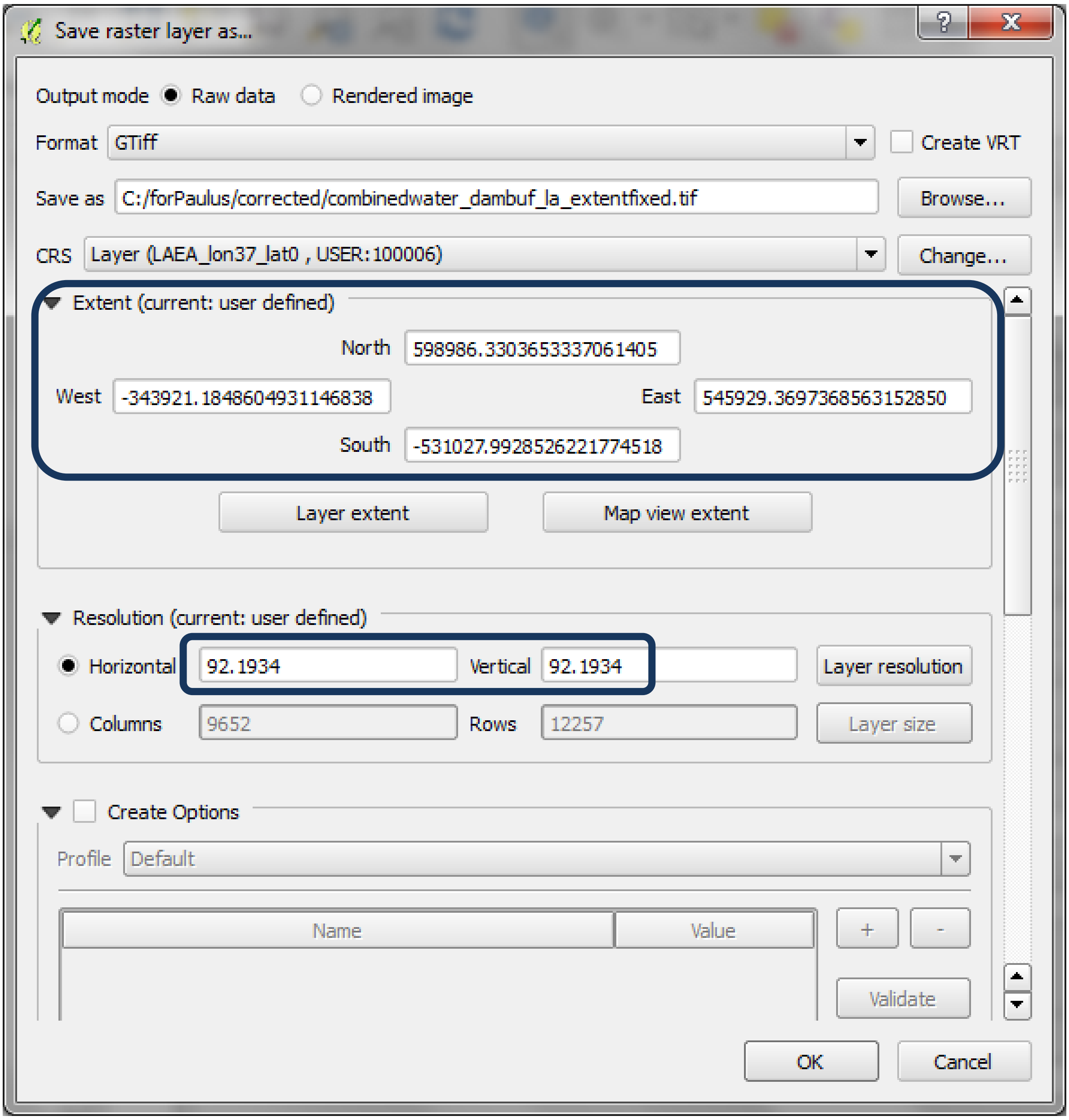
h. Notice in this example there are some differences in cellsize and extent



i. Right click on the **dams and waterbodies** raster and **click save as**

j. For the extent change it so it mataches itentically with the sinkfilled dem

k. Change the Cellsize so it matches identically with the sinkfilled dem



l. Click OK

m. Add the new raster (**combinedwater_dambuf_la_extentfixed**) to the QGIS session

n. Now return to **step a** try and run the analysis using this file. This time it should work

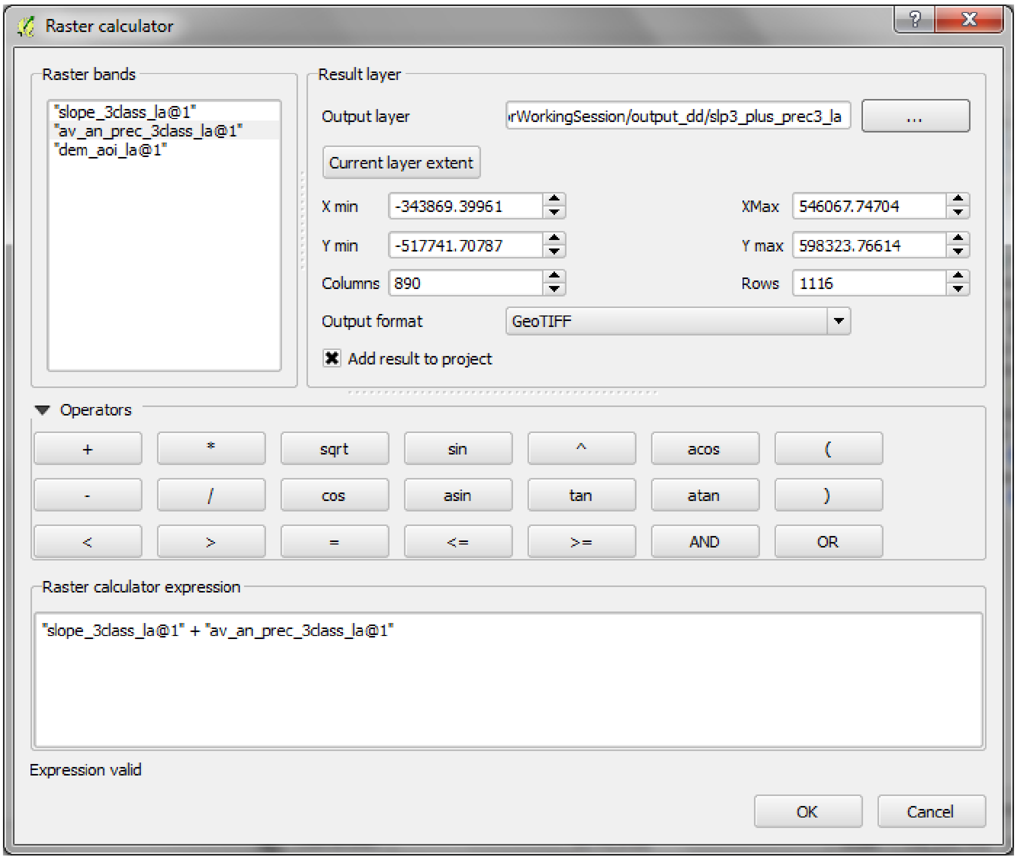
2.4. Combine outputs to create importance of forests for limiting soil erosion layer

2.4.1. Sum the slope and precipitation raster and clip to forest extent

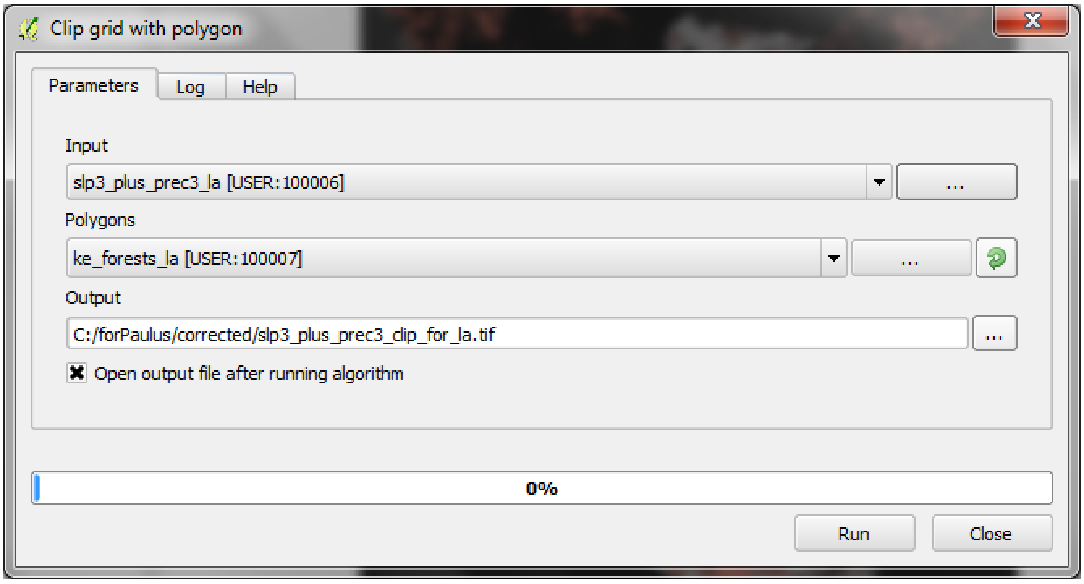
a. From the Raster menu >> Raster calculator

b. Add an expression to Sum the 3class slope and 3 class precipitation rasters

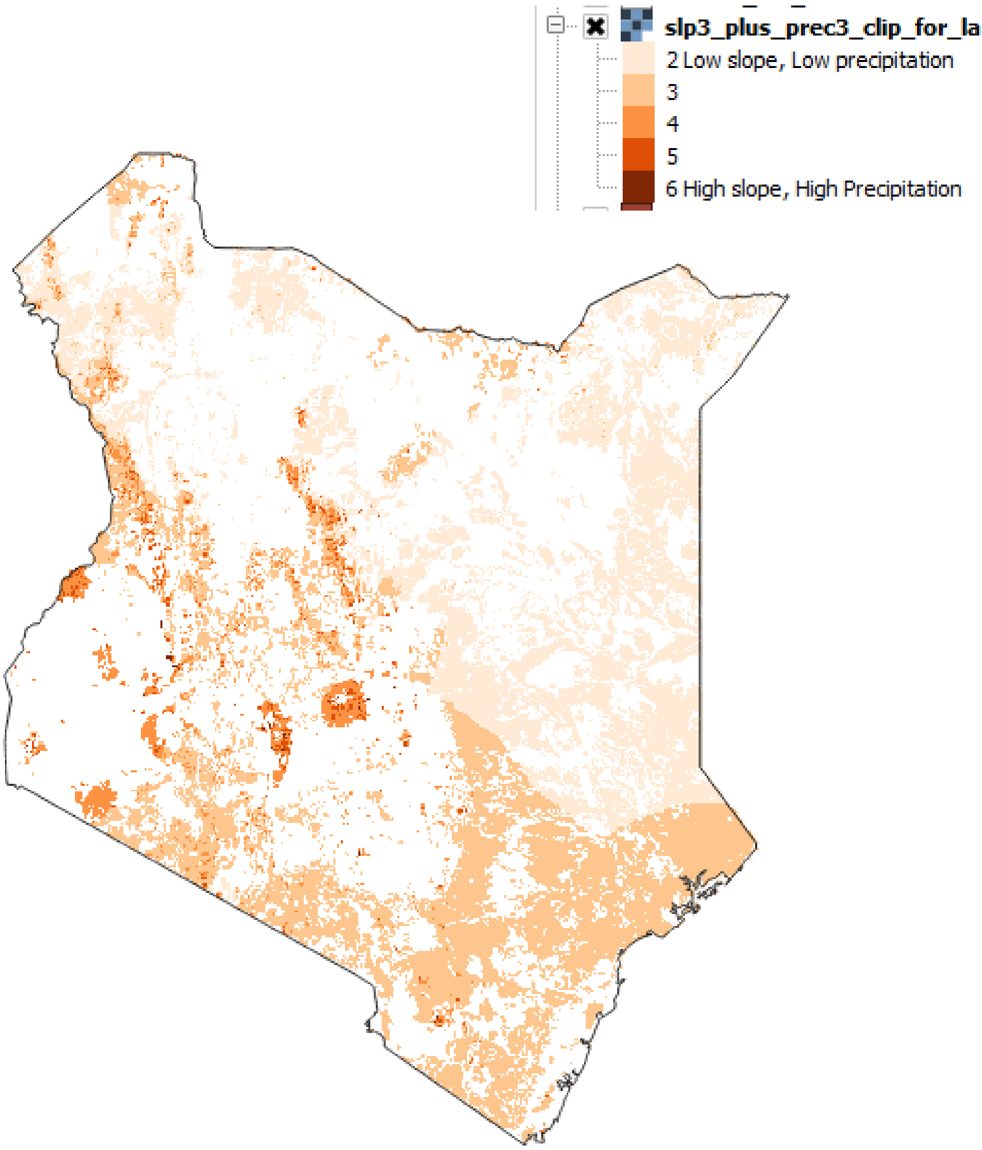
c. "slope_3class_la@1" + "slp3_plus_prec3_la@1"



d. Clip the result of the above sum of the slope and precipitation to forest extent



e. The result should be a raster with a minimum of 2 and a maximum of 6



2.4.2. Combined Slope and Precipitation rasters with upstream catchments

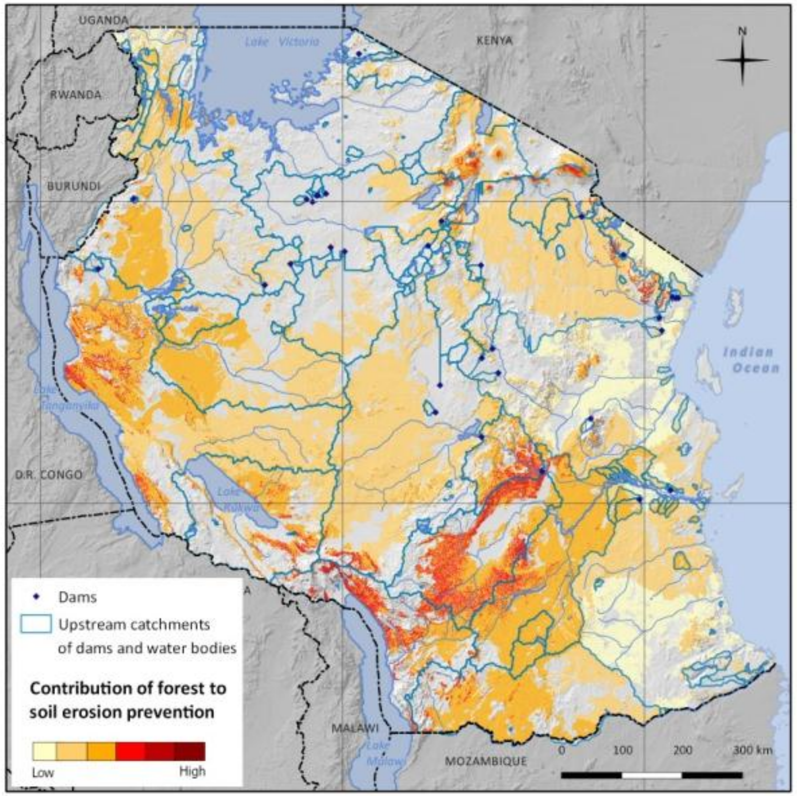
The next step will be to clip combined slope and precipitation layer with the upslope catchment area. You can then display this subset in the same values (2 – 6) but using a different colour ramp.

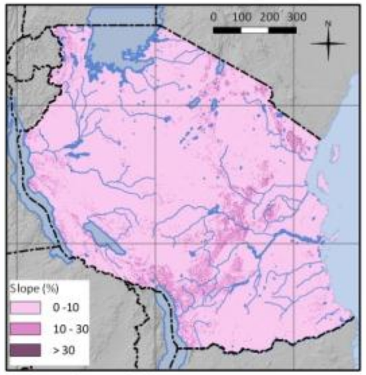
In discussion you may chose to combine the data together in different ways.
You may also want to use other water related point or polygon data in addition to the dam/hydro points and water bodies

Example map for Tanzania

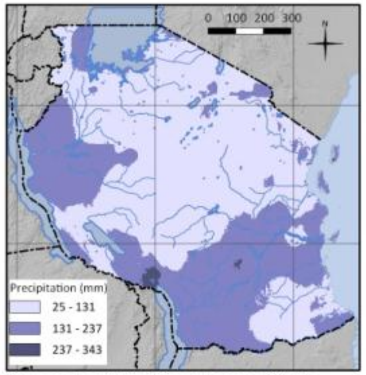
Map 12: Importance of forests for limiting soil erosion

This map shows areas where forests are particularly important for limiting soil erosion that might cause sedimentation problems for dams in Tanzania. The methodology is based on four parameters: slope, precipitation, locations of dams and water bodies and their catchments, and forest.

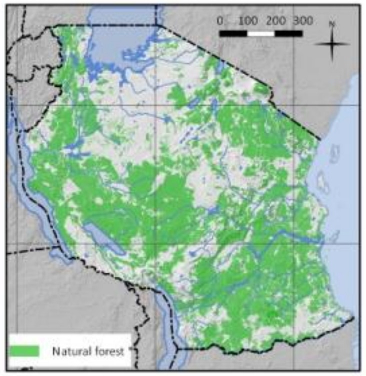




3 slope classes (%)

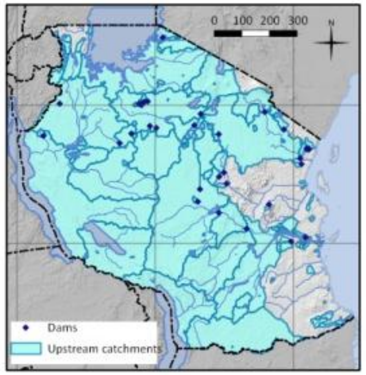


Average precipitation for rainy season (March, April, May, November, December and January)



Natural forest extent*

* Defined according to the national forest definition to include the following land cover classes: montane and lowland forest, open and closed woodland, mangroves, thickets and bushlands.



Upstream catchments of dams and water bodies

Map projection: WGS84 / UTM Zone 36S. Map prepared by Tanzanian Forest Service (TFS), UNEP-WCMC, FAO, Sokoine University of Agriculture (SUA) and Forestry Training Institute (FTI). Date: May 2013.

Data Sources:

Natural forest and water bodies: NAFORMA. 2013. NAFORMA land-use / land-cover Map 2010.

Dams: Dr. Mark Mulligan, Department of Geography, Kings College, London.

Slope: generated from Lehner, B., Verdin, K., Jarvis, A. 2008: New global hydrography derived from spaceborne elevation data. Eos, Transactions American Geophysical Union, 89 (10) (2008) 93-94. Journal Article.

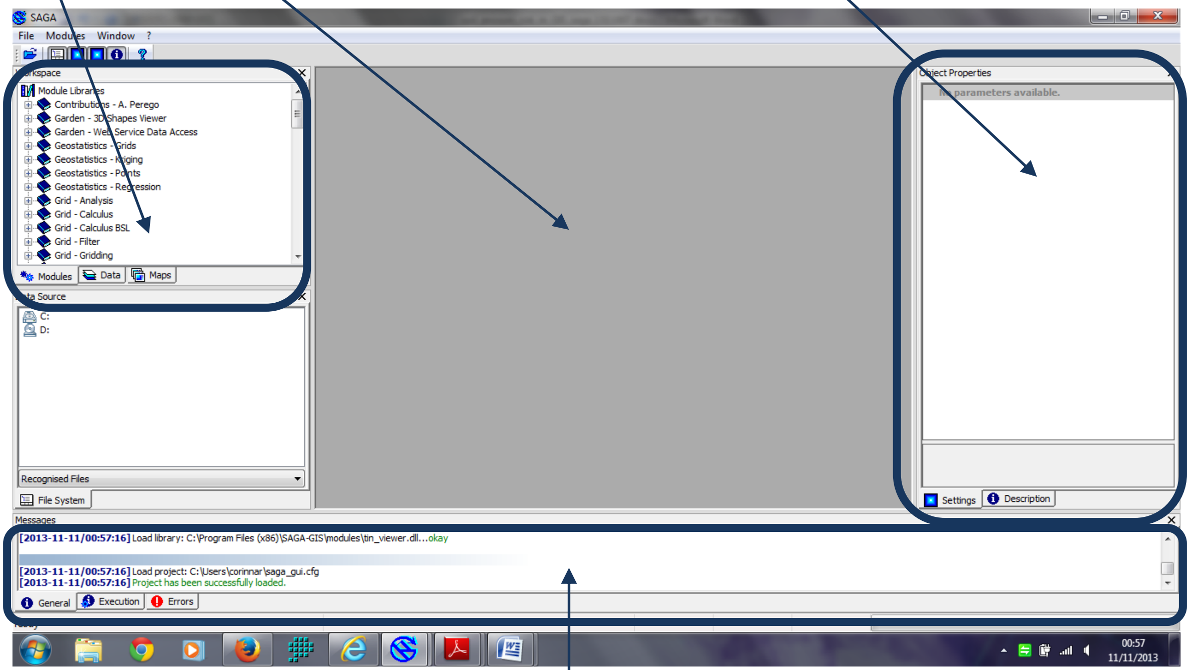
Precipitation: Hijmans, R.J., S.E. Cameron, J.L. Parra, P.G. Jones and A. 2005. Jarvis. Very high resolution interpolated climate surfaces for global land areas. International Journal of Climatology 25 (2005): 1965-1978. Journal Article.

Annex 1: Introduction to SAGA

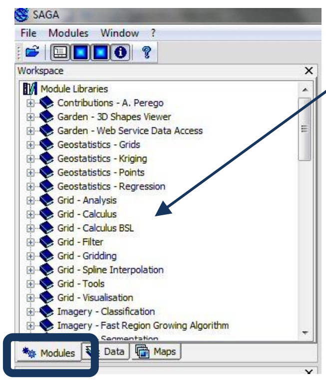
SAGA (System for Automated Geoscientific Analyses) is an open source GIS software that runs under Windows and Linux operating systems. One of Its strengths is that it has a wealth of easy to use spatial algorithms which run quickly and efficiently. SAGA algorithms can be accessed through the SEXTANTE plugin in QGIS 1.8, however at the time of writing this tutorial some of the tools failed to run in QGIS.

Many of SAGA's tools can run from within QGIS but there may be occasions where a tool fails to run or there are additional tools that can only be run from within SAGA. The screen grabs below provide a quick overview of the SAGA interface to help new users to SAGA orientate themselves with the layout.

On opening SAGA the user is presented with the Graphical User Interface below. On the Left there are 3 tabs (Modules, Data and Maps) and on the right **Object Properties**. In the middle is the area where graphics will be displayed (e.g. a map or chart).

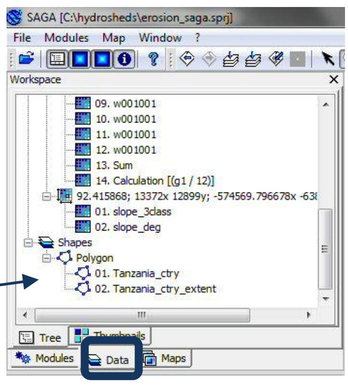


The two bottom sections show error messages and the progress of an algorithm when it is running.



a. Click on **Modules** to display the list of the algorithms. The algorithms are grouped and can be expanded by clicking the '+'

b. Click on **Data Tab** to see the data that has been added into the current SAGA project



c. Click on the **Maps** tab to see the map displays that have been created