



## Lake Tanganyika Project: Zambia National Site Characterisation and Catchment Management Design Workshop



### GIS training module – Lesson 8

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GLOBAL ENVIRONMENT FACILITY

#### Lake Tanganyika Regional Integrated Management Project

A United Nations Development Programme (UNDP) / Global Environmental Facility (GEF) project covering the Lake Tanganyika riparian countries, Burundi, the Democratic Republic of Congo, Tanzania and Zambia.

Training module created by Francis Oloo and Thomas Gumbricht, ICRAF

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## LESSON 8 – Present and future climate scenario, and modeling species suitability

### Lesson overview

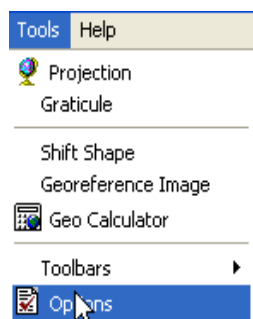
In this lesson you will learn about different using GIS for analyzing the present and a future climate scenario in DIVA-GIS. The climate data to be used is the worldclim data for present climate and a future scenario climate.

### Climate Data

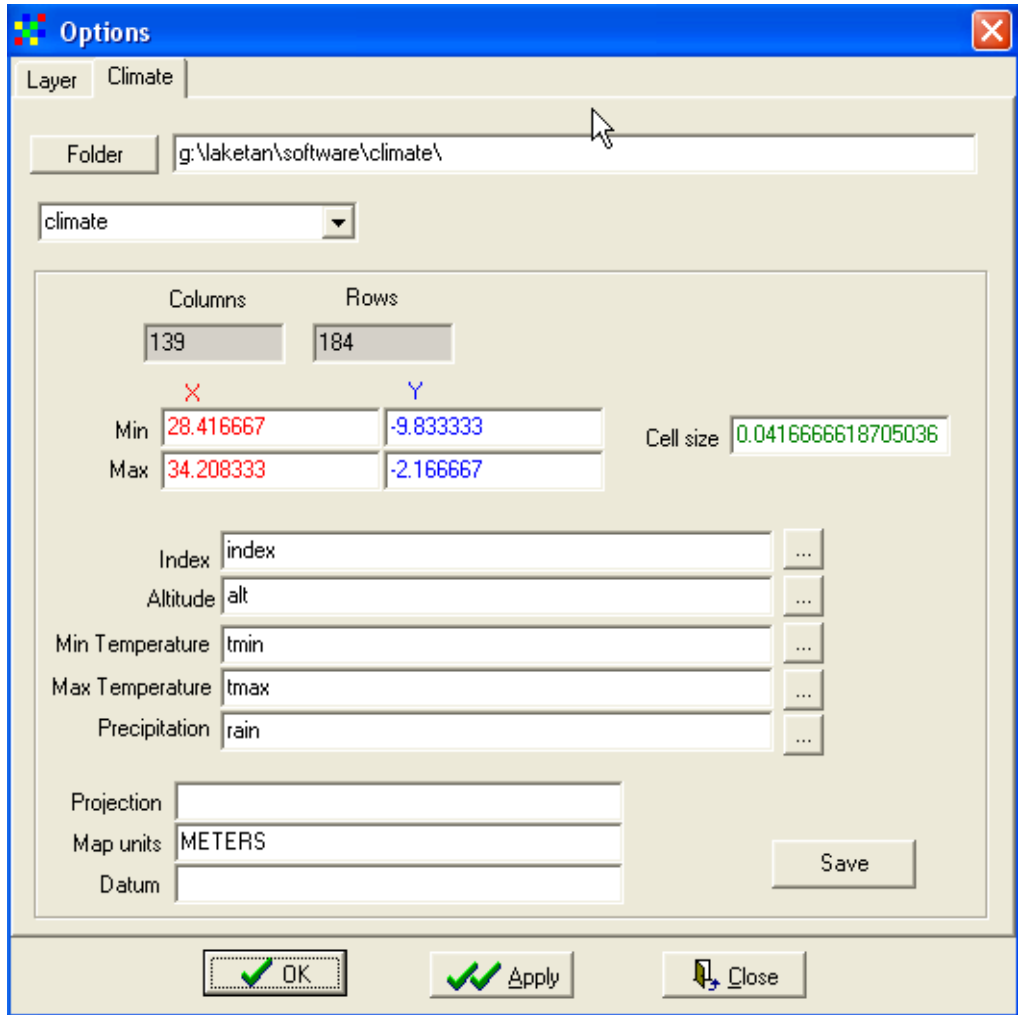
The world climate data can be downloaded freely from <http://www.diva-gis.org/climate>, the worldclim data is available in two sets, that is current (1950-1980) and future (2050). The spatial extent of this data is 10 minutes, 5 minutes and 2.5 minutes. The global 10 minute data is included in project dataset, and for the Lake Tanganyika Basin also the 2.5 minute is supplied.

### Selecting climate data to be used in DIVA-GIS


Before using the climate data function in DIVA-GIS, you must define the database in which the data is found by changing the options settings under the menu: Tools – Options.

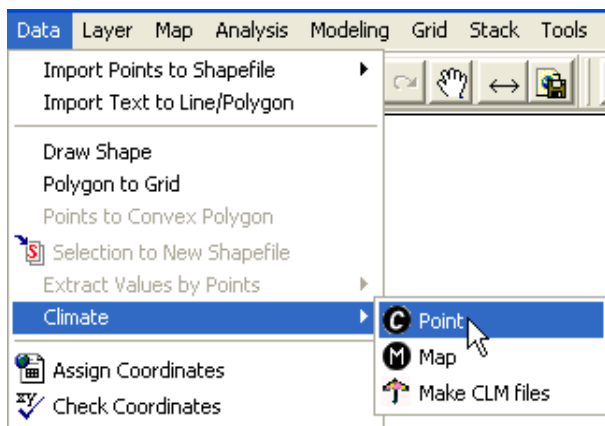


Click on the Options and in the resulting window, chose the climate option and define the folder (\\data\_spatial\\laketan\\climate) in which both the present and future scenario data for Lake tanganyika Basin are stored. The system will automatically read the other parameters of the climate data.

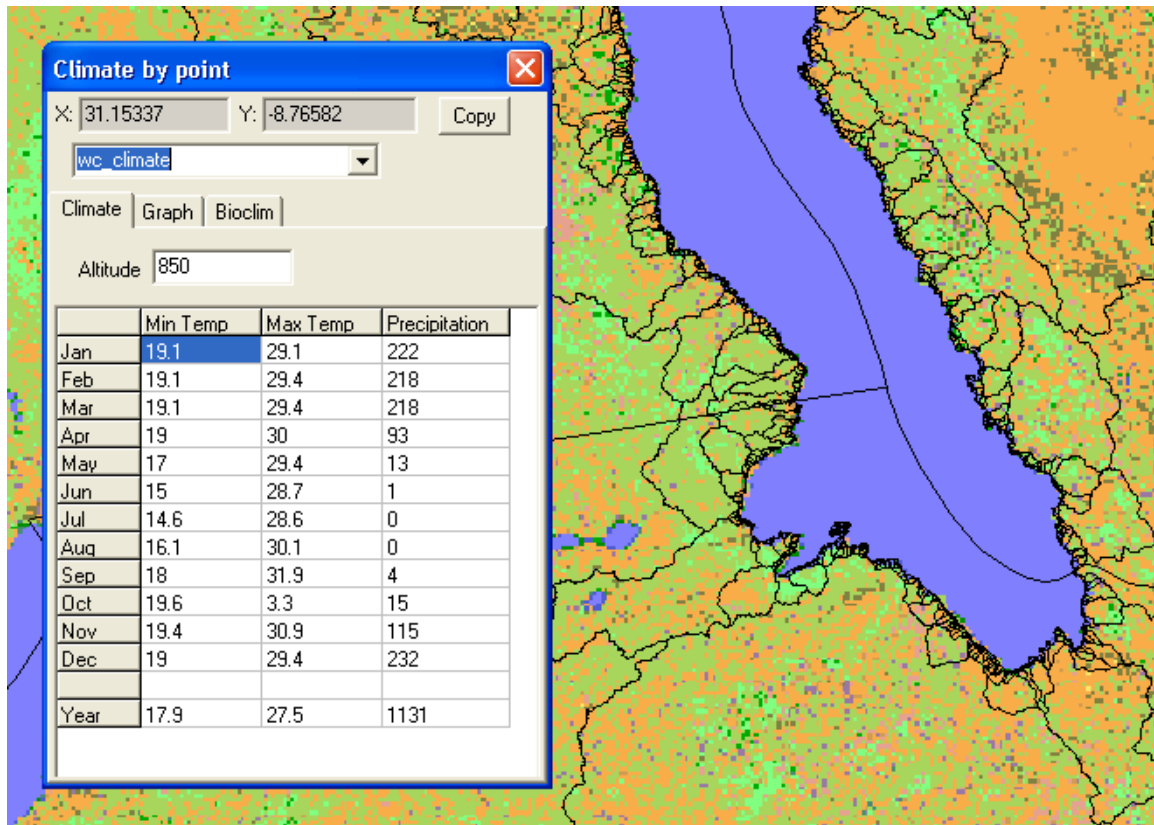


## Exploring present and future scenario climate

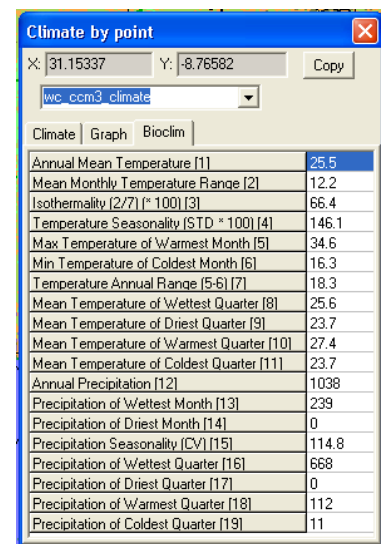
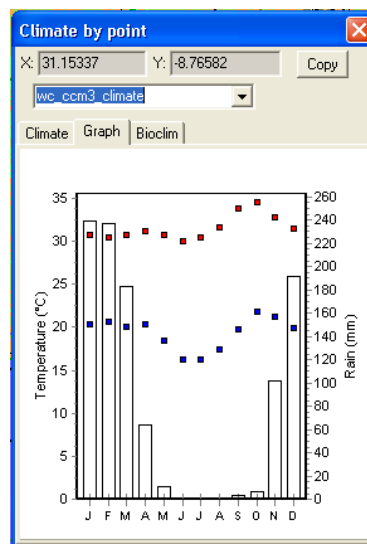
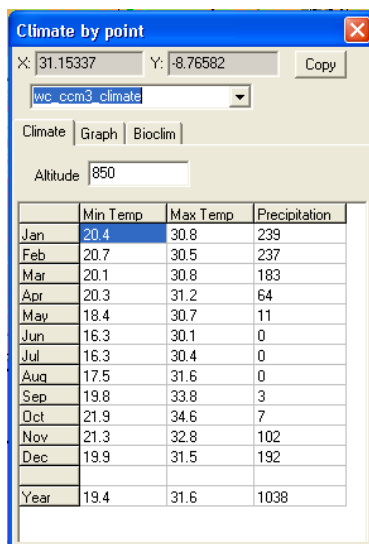
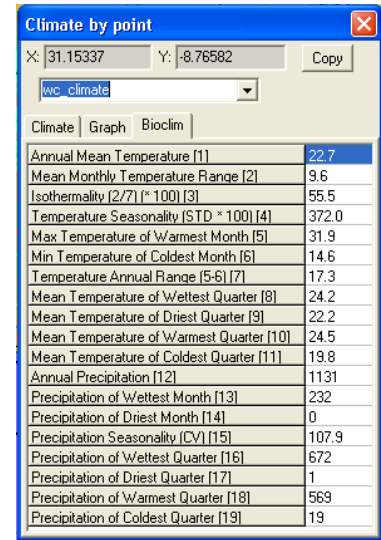
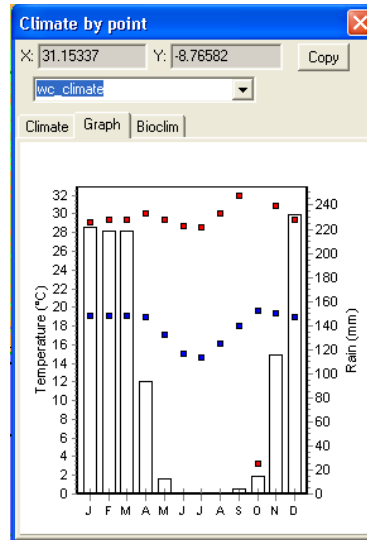
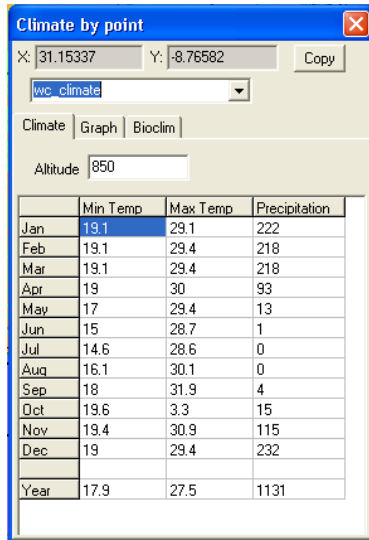
Before using the climate tool of DIVA-GIS you must add a map to use as backdrop, for example generalised\_borders.shp (\data\_spatial\laketan\mapdata\political\vector\). With a map added to your view, you can start exploring the climate tool. Select the data menu and in the resulting drop down list, select climate and then choose point, or click on the Climate point, , icon in the tool bar.




When you click in the map a window showing climate statistics for that point pops up. The window shows monthly and annual statistics for minimum temperature, maximum temperature and rainfall. There is one drop down menu and three tabs in the window, for Climate, Graph and Bioclim. The folder cliamte (that you chose under Option – Climate above) contain two climate datasets; wc\_climate showing the present (1950-1980) climate, and wc\_cc3\_cliamte showing the future climate (2050).




If you toggle the climate dataset in the drop-down menu, the Climate window will display the result for the selected climate dataset. Thus you can compare the present and projected future scenario for any point in the map. The tabled illustrations below show the present and future climate situation at the southern tip of Lake Tanganyika in Zambia. The last tab, bioclim, contains statistical data relevant for vegetation ecosystems and individual tree species. The way this statistics is calculated can be changed, and it can be used for modeling the suitability of the future climate for a range of species using the Ecocrop module of DIVA-GIS (see next section).

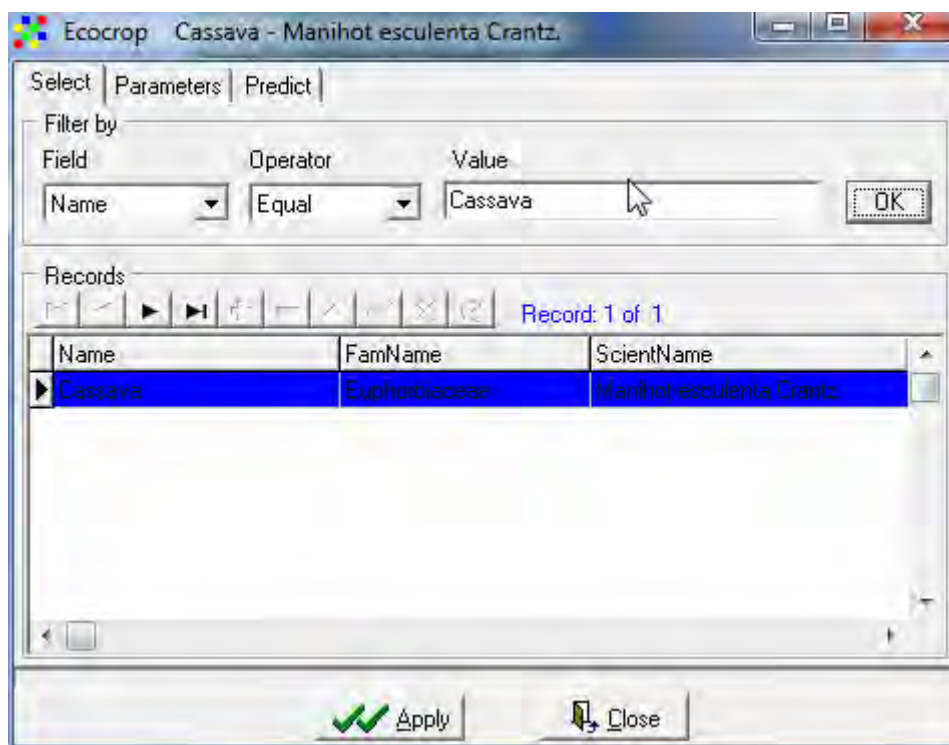


You can copy  the generated results for the climate variables, graphs and Bioclim variables onto your word document.

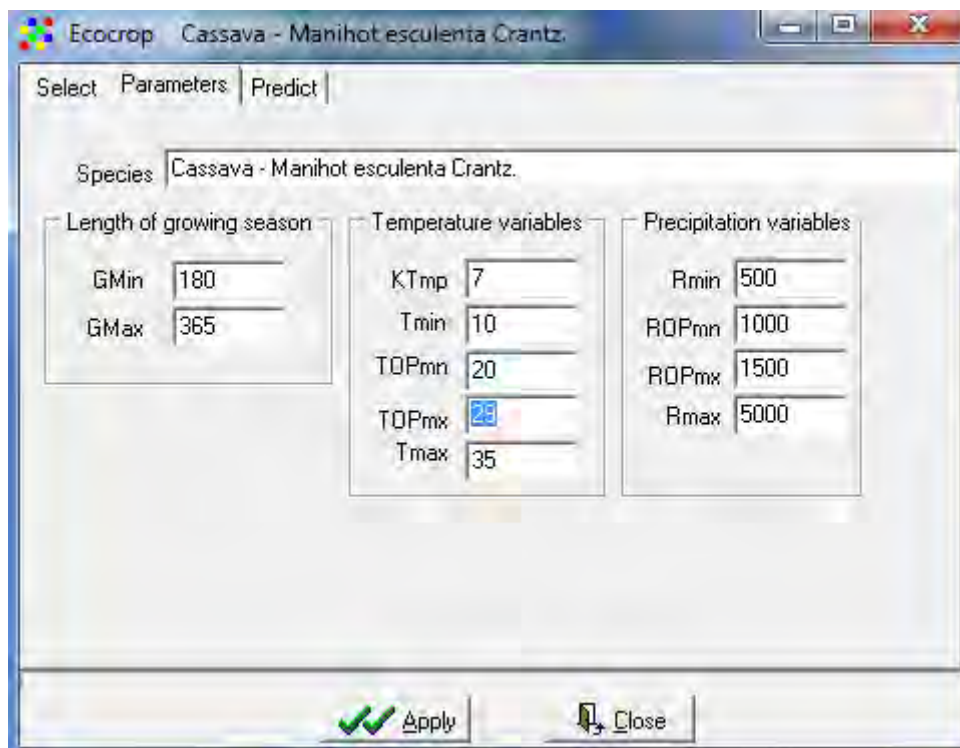
## Modeling climate suitability for trees and crops

With the climate data in order you can run the Ecocrop module, , available also via the menu: Modeling – ecocrop. The EcoCrop module predicts the adaptation (suitability) of a particular crop to a selected area

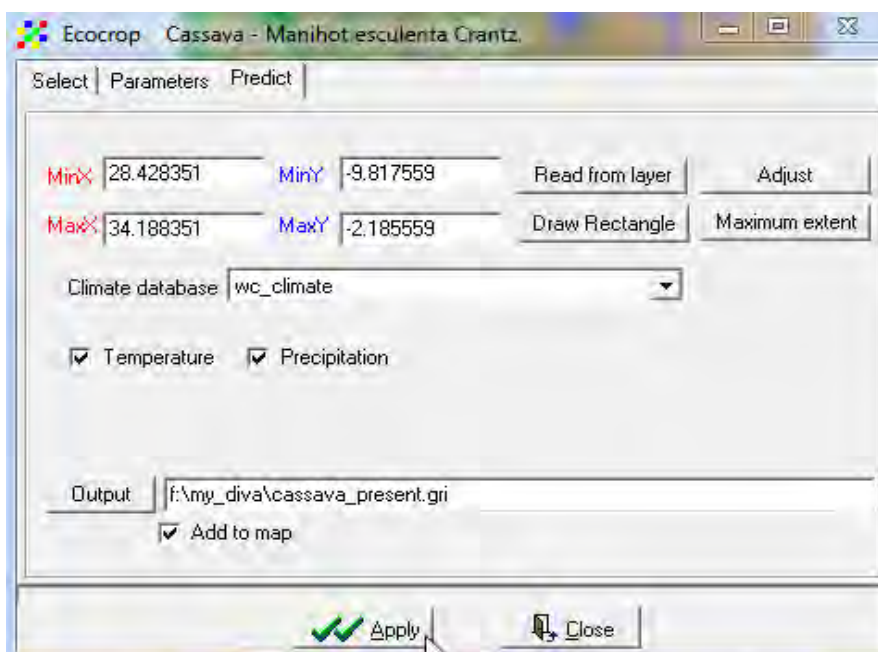
Start the ecocrop module. Under the select tab (opened by default when you started the ecocrop module) you can see the species available in the ecocrop database (at time of writing 1710 species). You can either use the database filter options (in the Filter by box) or just scroll through the listed species in the lower part of the window. As Cassava is a very common and important crop in the Lake Tanganyika, the lesson will use Cassava as an example. In the Filter by box click the Field drop down menu scroll to Name, and under the Operator scroll down to Equal and under Value type Cassava, and click OK in the Filter by box.



With cassava as the selected species, click on the Parameters tab and look at the database values defining the climate conditions for growing cassava. You can change the pre-defined values if you have knowledge about the species you are exploring. For instance the required length of growing season, the temperature range under which the specie thrives, or the rainfall (precipitation) range and optimum.

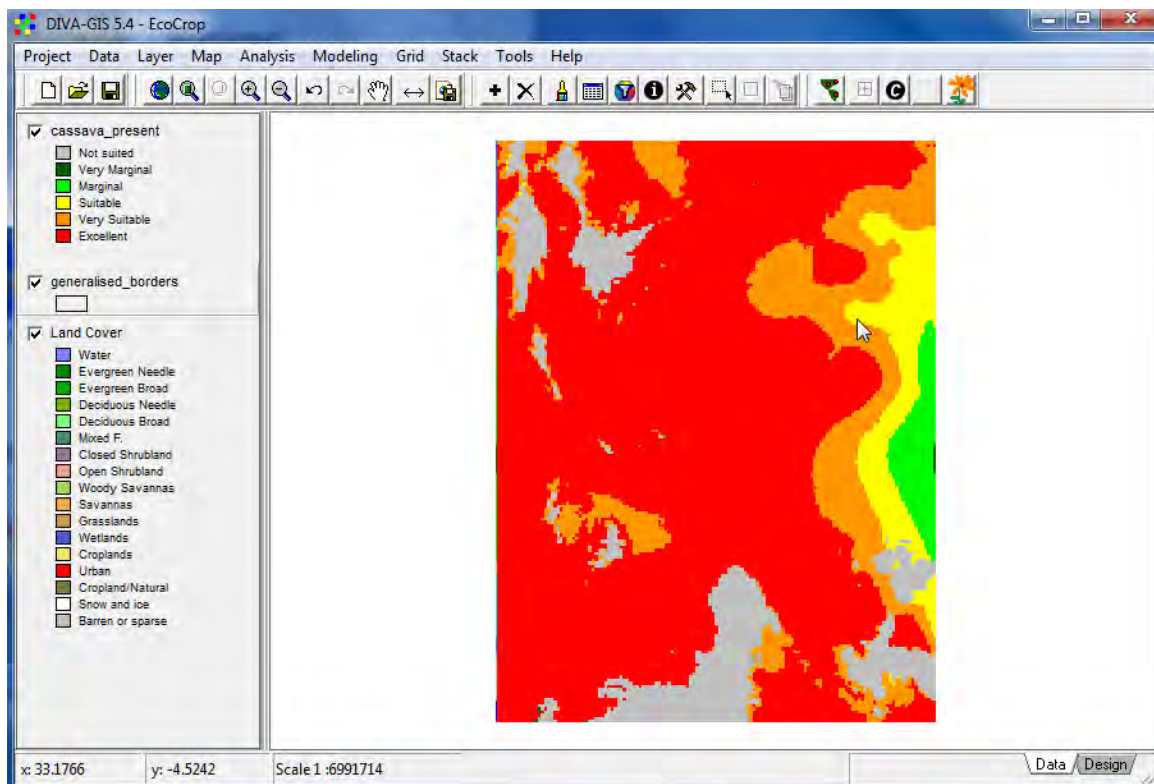


Click the predict tab, make sure that the selected layer in the view has the extent of the area you are interested in and click on Read from layer to ensure that your analysis is within this region. Select the appropriate climate database, that is `wc_climate` for present climate and `wc_ccm3_climate` for future climate. Define your output file name, in the case of cassava for instance `Cassava_present` and click Apply to do the suitability analysis for the selected species.



The ecocrop model generates a map showing the climatic suitability of growing the species (cassava) as a map.

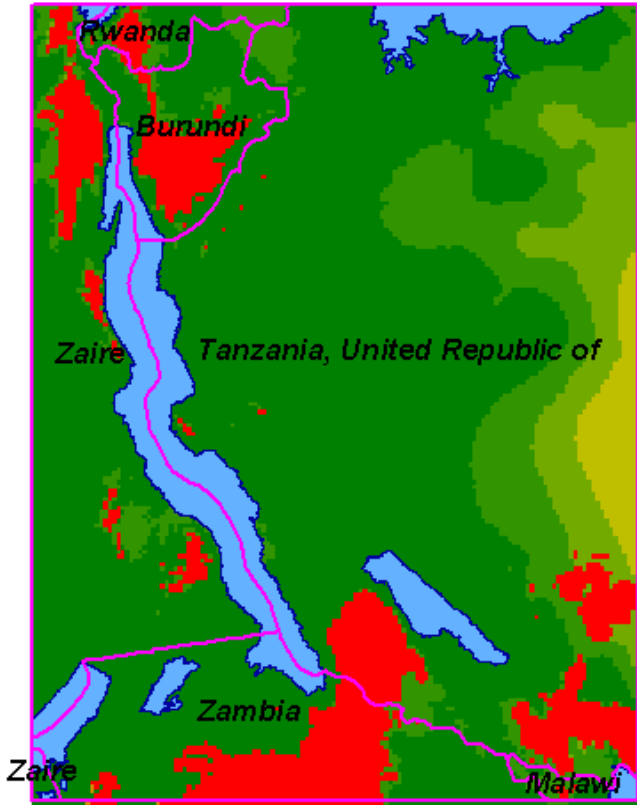
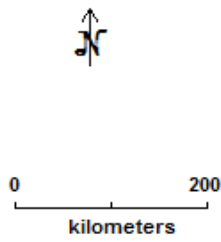




Symbolize the resulting suitability layer and create a map layout. Repeat the same procedure and change the climate database `wc_ccm3_climate` to generate the future suitability of the selected crop. You can now compare the present suitability of your selected species, with the suitability under a scenario of future climate change. In the case of cassava the suitability is shifted. Projected increases in temperature and lower rainfalls pushes the suitability of cassava towards the north-west. The eastern part of the Lake Tanganyika Basin becomes too dry for cassava, whereas the higher temperatures will make the highlands in the west more suitable for cassava.

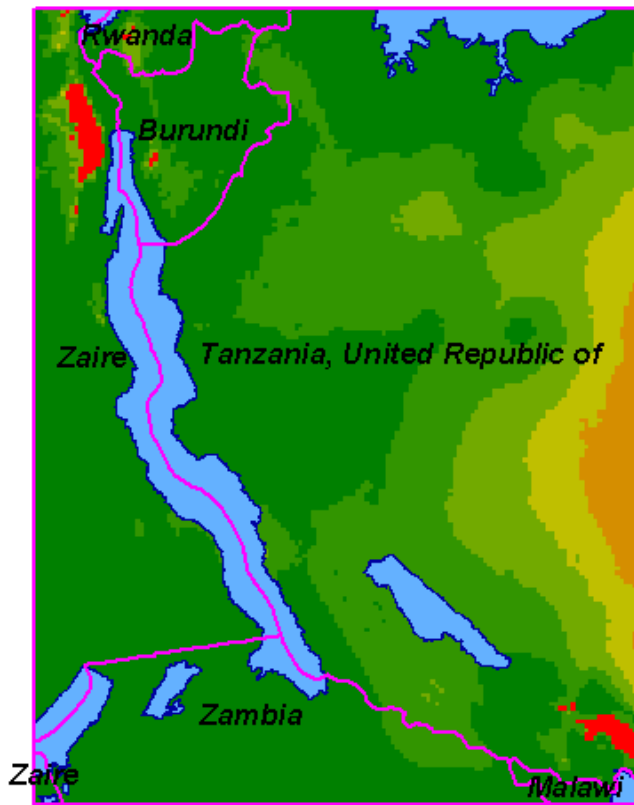
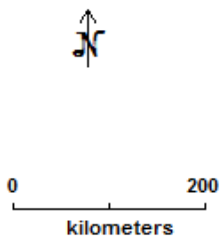
### Present Cassava Suitability

- Country Borders
- Lakes
- Present Cassava Suitability
  - Not suited
  - Very Marginal
  - Marginal
  - Suitable
  - Very Suitable
  - Excellent



### Future Cassava Suitability

- Country Borders
- Lakes
- Future Cassava Suitability
  - Not suited
  - Very Marginal
  - Marginal
  - Suitable
  - Very Suitable
  - Excellent





**Try it on your own – model present and future climate suitability of a selected tree**

Select an agroforestry species in your study area and use the ecocrop module to map the present suitability and the future suitability for that species, and design the two suitability maps.