**README LAND SUITABILITY MAPS AND SEASONAL FORECASTS ANGOLA**

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**Date: 20 October 2021**

This README serves as a guideline for the use and further development of the Land Suitability scripts that were developed within the Mavo Diami project in Angola, first by Alexander Kaune and later refined by Reinier Koster. This README provides information on the data that is required/used, the scripts that were developed by Alex and refined later by Reinier and any information/data that is necessary to run the scripts and produce the maps.

## Data

### GIS data

The LS scripts use quite some GIS data from different sources. For the LS maps in Angola, Table 1 shows the datasets that were used. It could very well be possible that better datasets exist at the moment.

Table 1 Datasets used for LS assessment for Mavo Diami

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Parameter | Source | link | Spat. Res.  [m] | Temp.Res.  [d] | From | To | Used for |
| Daily rainfall | CHRIPS | [\\QNAP01](file:///\\QNAP01) | 5000 | 1 | 1/1/1987 | 12/31/2017 | LS |
| Elevation | SRTM | <https://dwtkns.com/srtm30m/> | 30 | - | - | - | LS |
| NDVI | MODIS | <https://lpdaacsvc.cr.usgs.gov/appeears/task/area> | 250 | 16 | 2/18/2002 | 1/1/2018 | LS |
| ETRef | Earth2Observe | <http://www.earth2observe.eu> | 10000 | 1 | 1/1/1998 | 12/31/2012 | LS |
| Soi Nutrient Content (P, K) | SoilGrids | https://www.isric.org/explore/isric-soil-data-hub | 250 | - | - | - | LS |
| Soil Hydraulic Properties (Ksat, WCavaiL) | HiHydroSoil | HHS v2.0 data was used which can be downloaded from the website. | 250 | - | - | - | LS |
| Temperature  (tavg, tmin, tmax) | ERA5 | Data available on WonderWoman (ask Sonu or Jack) | 30000 | 1 | 1/1/2000 | 12/31/2017 | LS |
| Seasonal forecast Rainfall and Temperature | WeatherImpact | API | 9000 | Monthly max, min, med of average value | Every month | 5 months ahead | Seasonal Forecast |

### Other data

Additional data(sets) that was (were) used to produce the LS maps is (are) presented in Table 1.

Table 1 Additional data(sets) used for LS assessment for Mavo Diami

|  |  |  |
| --- | --- | --- |
| Parameter | Source | Value  [m] |
| Kc | FAO/expert knowledge (Alex Kaune) |  |
| Lapse rate Temperature | Other projects | -0.065 ®C/m |
| Cropping calendar | Local knowledge (Matteo Tonini) |  |

## Folder structure

The project files are located on the WonderWoman PC in:

**“G:\MavoDiamiPortals\Dropbox (FutureWater)\FW\_VH-RK”**

**This is still the dropbox account or Reinier**

The folder structure is as follows:

1. Main folders
   1. 01\_Data containing input data as presented in Table 1
   2. 02\_GIS any relevant GIS files like province and commune boundaries
   3. 03\_R\_Scripts: The R-scripts that were developed for the project.
   4. 04\_Results: Results of the LS and Seasonal Forecast assessment on Province and Commune level
   5. 05\_Temp: temp folder

Graphical user interface, text, application

Description automatically generated

1. 01\_Data

Graphical user interface, text, application

Description automatically generated

1. 02\_GIS
   1. The Harvest dataset contains crop yield etc. for several different crops in Angola. It could be used to validate LS results.

Text

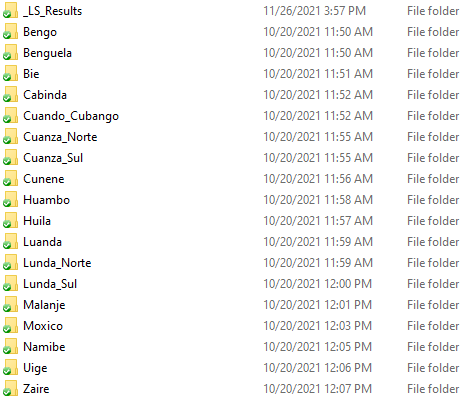
Description automatically generated with low confidence

1. 03\_R\_scripts

Graphical user interface, application

Description automatically generated

1. 04\_Results



## Workflow

The workflow to obtain the LS and Seasonal Forecast consists of 4 steps:

1. Download the data and store it in 01\_Data. This has been done already for all the data, so this step can be skipped. Only exemption is:
   1. Seasonal Forecast data 🡪 This requires monthly download from the WI API. There is a script called “*01\_Download\_Seasonal\_forecast\_WI\_API.R*” in the Helper functions folder that can do this.
      1. A task scheduler should be implemented to make this an automated process
2. Produce required input data for LS and Seasonal Forecast data (scripts: 01 – 03)
   1. Resample data to required resolution (scripts 01)
   2. Calculate percentiles for rainfall and temperature (scripts 02)
   3. Calculate limits for specific parameters
      1. This part uses the ***Parameters.csv***file. If you want to change the limits just change them in this csv file.

Table

Description automatically generated

* + 1. It also contains the weight of each parameter, which is used to calculate the LS results. The higher the weight, the more important it is in the final LS calculation.

1. Produce LS maps (scripts 04)
   1. This part uses the ***Cropping\_callender.csv.*** It contains data about crops, kc values, growing season etc. It also contains the maximum (T\_upper) and minimum (T\_Base) temperatures between which plant growth is possible (or not stressed) for each crop. It also contains weights for each growing month. For example, it is more important in month 1 that the conditions are good than the last month of the growing season, since the emerging crops are more vulnerable to stress. These weigths are indicated with “*w\_x*” with x being the month of the growing season.

Scatter chart

Description automatically generated

* 1. These scripts produce LS maps for each province by calculating a weighted average of all the resampled data from the previous step and the weights indicated in “***Parameters.csv***”

1. Produce Seasonal Forecasts (Helper Functions: “*01\_Download\_Seasonal\_forecast\_WI\_API.R*” and script 05).
   1. **The Helper File stills needs to be improved 🡪 check this.**

## Future use

For the future, it is possible that re-running the scripts becomes necessary. There are several options possible:

1. **Generate a completely new dataset** using new and better data / spatial or temporal resolution / additional parameters / other country. If so, the following procedure applies:
   1. To generate completely new LS results from scratch, one should basically run the “*000\_Run\_All.R”* script completely. A few thinks to check in the 000\_Run\_All script:
      1. Check directories (otherwise results will be overwritten)
      2. Make sure the “switch” is put to 1 (switch)
      3. Check resolution (res)
      4. Check local projection (Local\_proj)
      5. Check percentiles (T\_perc / P\_perc) bo be generated and their corresponding names
2. **Add additional crops to the analysis**. This requires only the scrips from 04 (and 05 is Seasonal Forecasts are needed immediately, otherwise this will be done when the 05 scrips have a Task Scheduler).
   1. To only run scripts 04, set the “switch” parameter in *000\_Run\_All.R* to 1 and run this script.
3. **Create new seasonal forecasts**. This only requires running the Helper Function script and scrip 05.
   1. To only run scripts 05, set the “switch” parameter in *000\_Run\_All.R* to 2 and run this script.
      1. When a Task Scheduler is implemented, this could be automated.