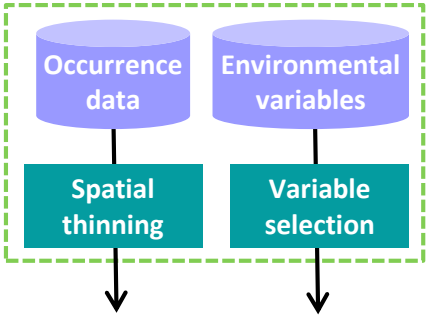
LUCCIA
Tree suitability map

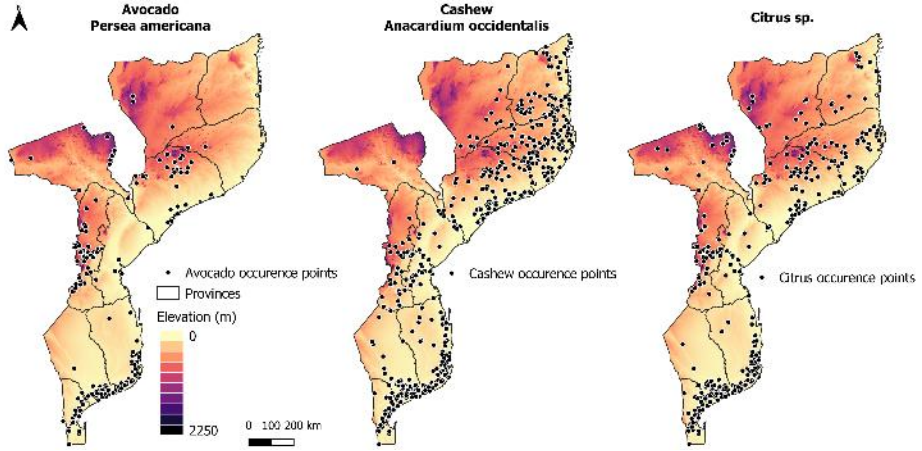
Methodology and first results

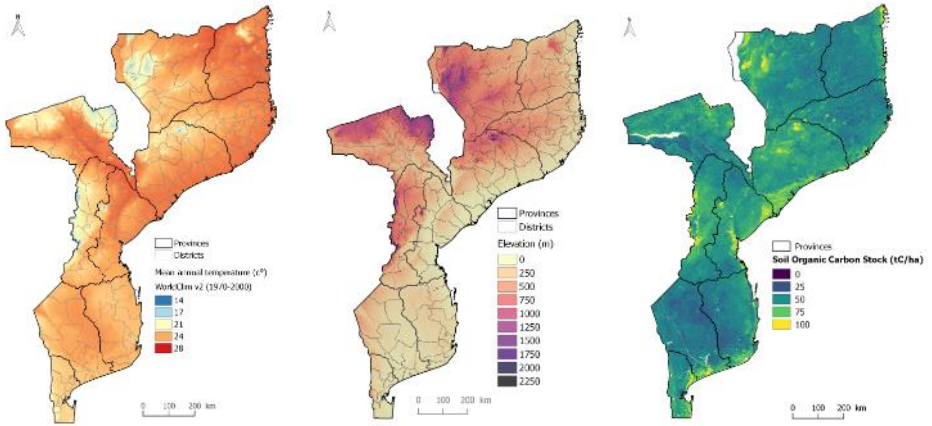
F. Montfort - Nitidae

Methodology
Species Distribution Model (SDM)

Data collection and preparation







Occurrence data

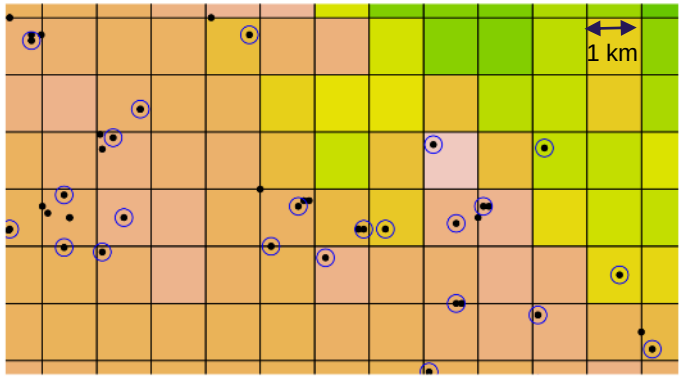
- **Number and references :**

Trees	Scientific names	Occurrences records	Occurrence records retained after spatial thinning (1km)	References
Acacia	Faidherbia albida	-	-	GBIF, 2023
Avocado	Persea americana	638	309	IAI, 2015
Cashew	Anacardium occidentalis	2236	885	IAI, 2015
Citrus	Citrus sp.	1036	500	IAI, 2015
Coconut	Cocos nucifera	1274	503	IAI, 2015
Coffee	Coffea sp.	-	-	GBIF, 2023
Eucalyptus	Eucalyptus sp.	-	-	Nitidae, 2018
Litchi	Litchi chinensis	15	8	IAI, 2015
Macadamia	Macadamia integrifolia	84	80	Zuza et al., 2021
Mango	Mangifera indica	3324	1234	IAI, 2015

- **Spatial thinning of species occurence data (1 km) :**

To avoid spatial sampling biases

-> Function thin, package R spThin



Environmental variables

Variables	Names	Description	Unit	Sources
Bioclimatic	Bio1	Annual Mean Temperature	^{o}C	CHELSA
	Bio2	Mean Diurnal Range (Mean of monthly)	^{o}C	
	Bio3	Isothermality (BIO2/BIO7) x 100	-	
	Bio4	Temperature Seasonality (standard deviation ×100)	-	
	Bio5	Max Temperature of Warmest Month	^{o}C	
	Bio6	Min Temperature of Coldest Month	^{o}C	
	Bio7	Temperature Annual Range (BIO5-BIO6)	^{o}C	
	Bio8	Mean Temperature of Wettest Quarter	^{o}C	
	Bio9	Mean Temperature of Driest Quarter	^{o}C	
	Bio10	Mean Temperature of Warmest Quarter	^{o}C	
	Bio11	Mean Temperature of Coldest Quarter	^{o}C	
	Bio12	Annual Precipitation	mm	
	Bio13	Precipitation of Wettest Month	mm	
	Bio14	Precipitation of Driest Month	mm	
	Bio15	Precipitation Seasonality (cv x 100)	-	
	Bio16	Precipitation of Wettest Quarter	mm	
	Bio17	Precipitation of Driest Quarter	mm	
	Bio18	Precipitation of Warmest Quarter	mm	
	Bio19	Precipitation of Coldest Quarter	mm	
Topographic	Elevation	Elevation	m	SRTM
	Slope	Slope	%	SRTM
Soil	Texture	Textural class (defined according to USDA system)	-	Africa Soil Grids
	SOC	Soil organic carbon content	g/kg	Africa Soil Grids
	BD	Bulk density of the soil fine earth	kg/m3	Africa Soil Grids

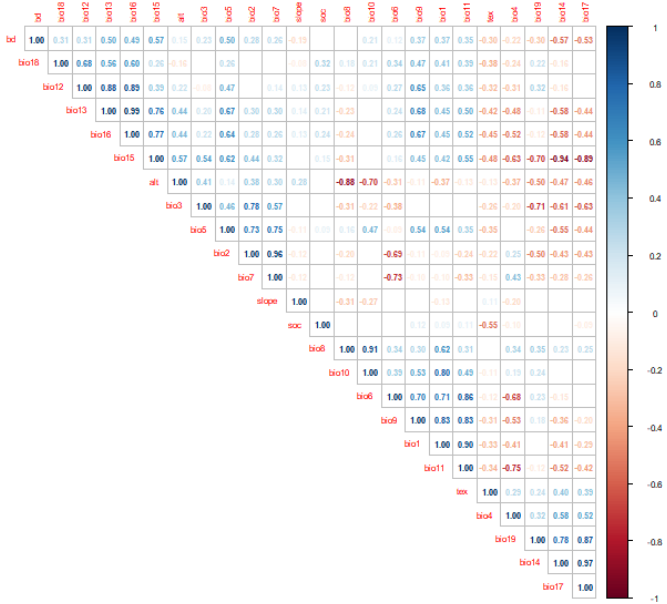
Data driven variable selection

Select the most important uncorrelated variables for each species

Data-driven variable selection : uses the information contained in the data to select the variable with the **highest explanatory value** among those that are **highly correlated (Pearson > 0.7).**

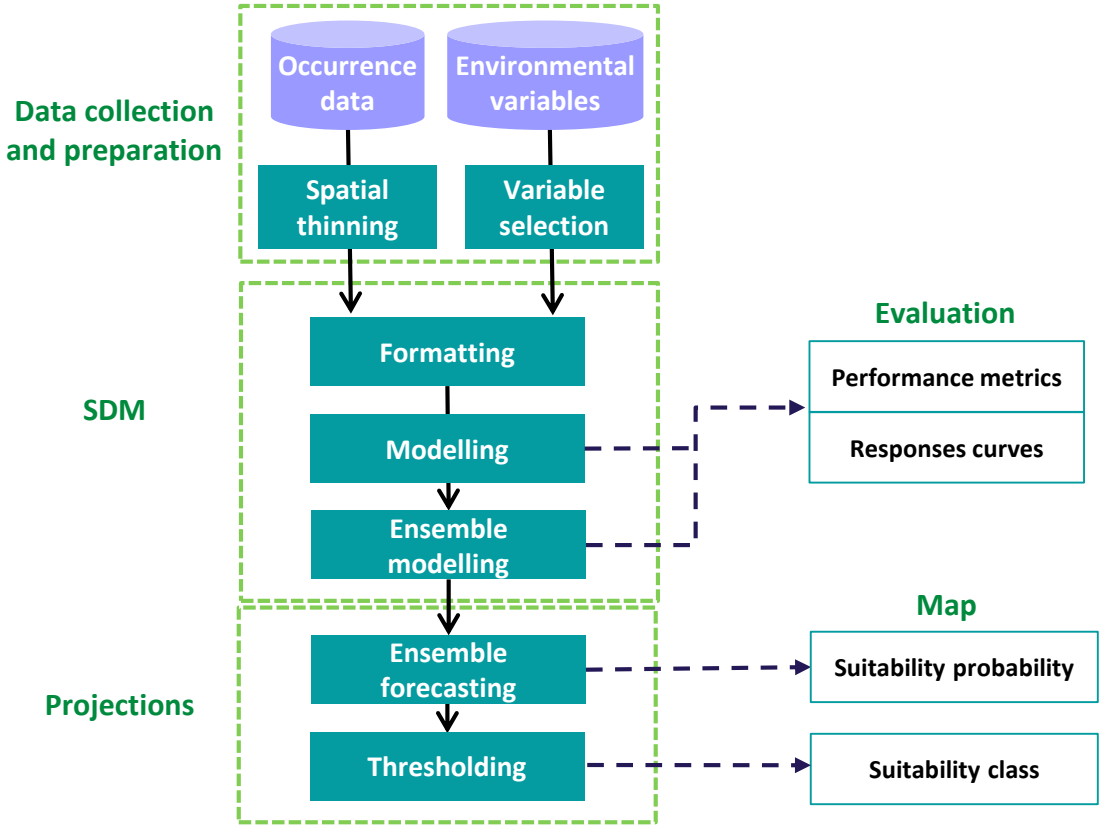
-> Function varSel, package R SDMtune

Variable correlation (Pearson)



Variable Selection

Methodology
Species Distribution Model (SDM)



- Package R biomod2 : Ensemble Platform for Species Distribution Modeling

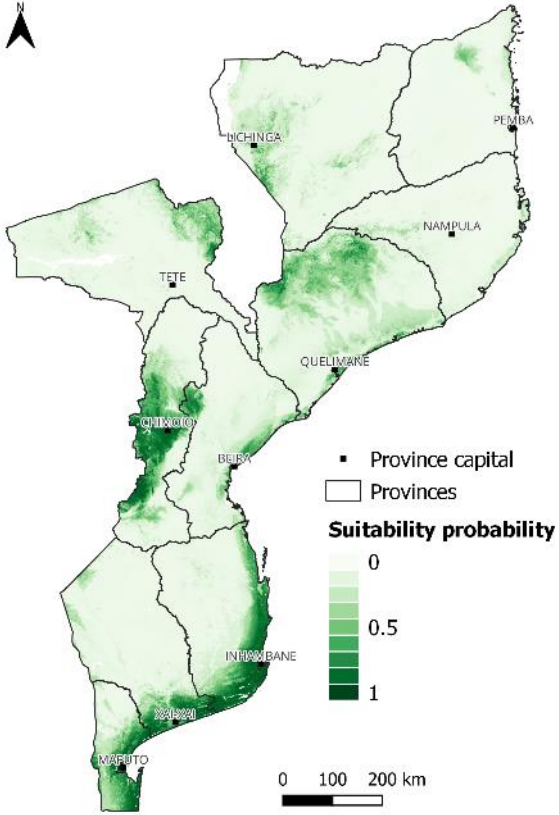
- 9 model algorithms :

ANN	Artificial Neural Network
CTA	Classification Tree Analysis
FDA	Flexible Discriminant Analysis
GAM	Generalised Additive Model
GBM	Generalised Boosting Model
GLM	Generalised Linear Model
MARS	Multiple Adaptive Regression Splines
MaxEnt	Maximum Entropy
RF	Random Forest

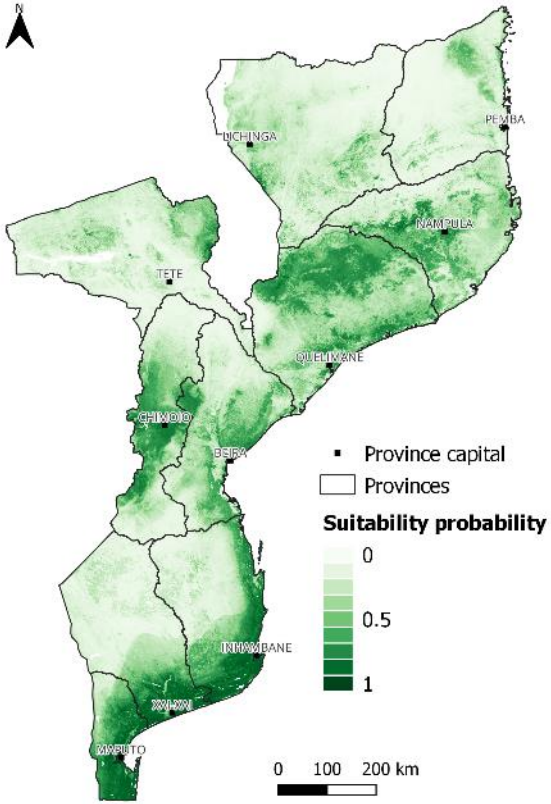
- Minimum scores below which single models will be excluded from the ensemble model building : TSS = 0.6

First results
Suitability probability

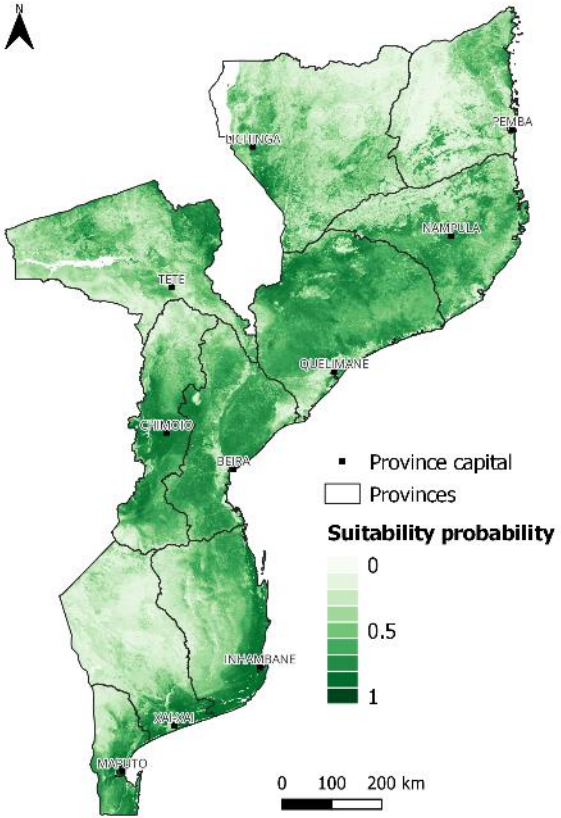
Current suitability map for Avocado tree



Current suitability map for Lemon tree

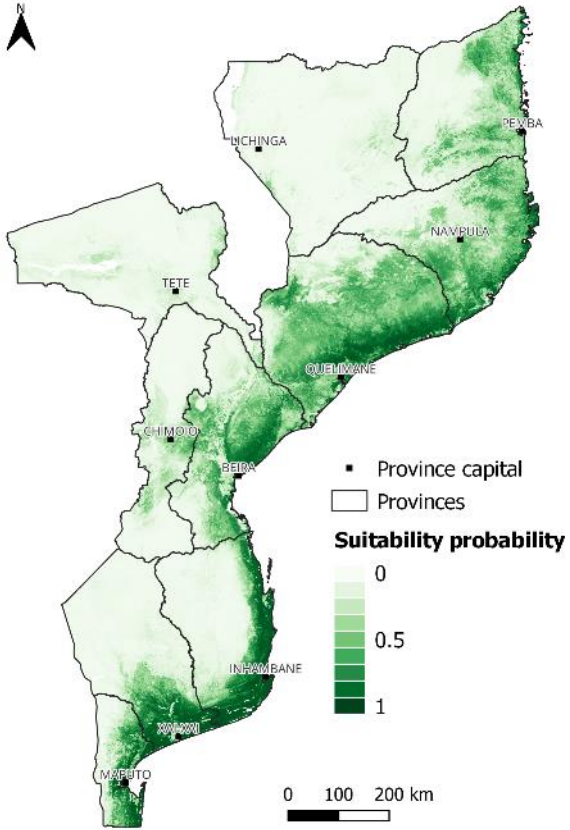


Current suitability map for Mango tree

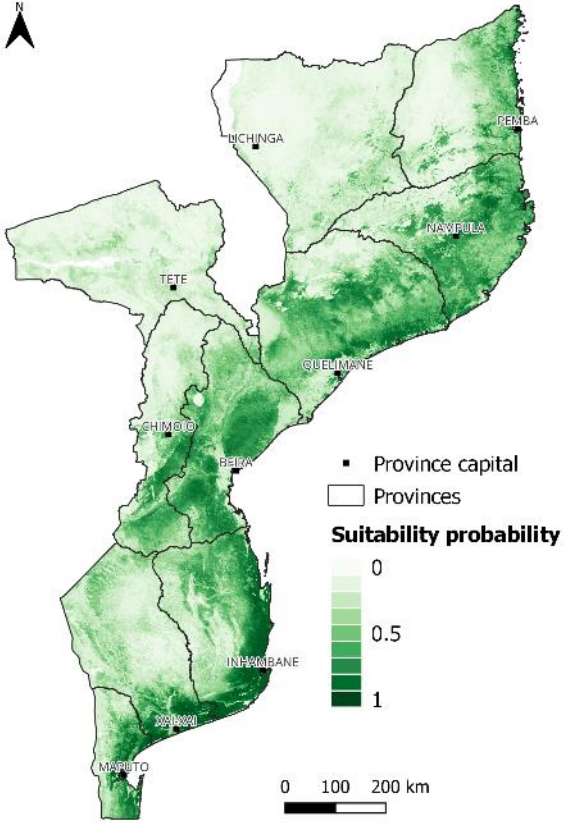


First results
Suitability probability

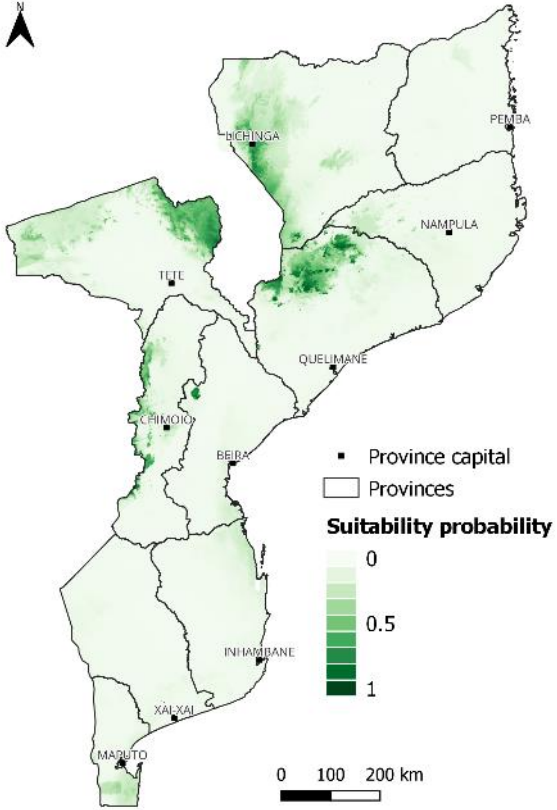
Current suitability map for Coconuts tree



Current suitability map for Cashew tree



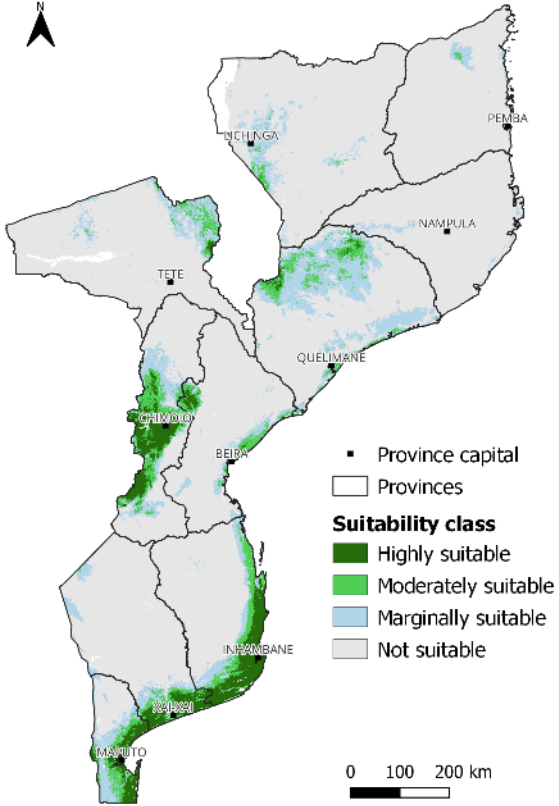
Current suitability map for Macadamia tree



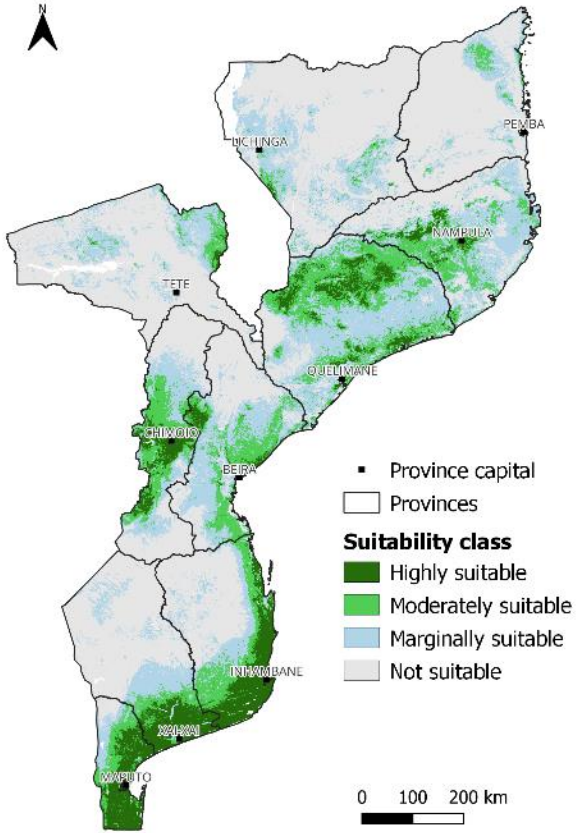
First results
Suitability class

Probability	Class name
0 - 0.25	Not suitable
0.25 - 0.5	Marginally suitable
0.5 - 0.75	Moderately suitable
0.75 - 1	Highly suitable

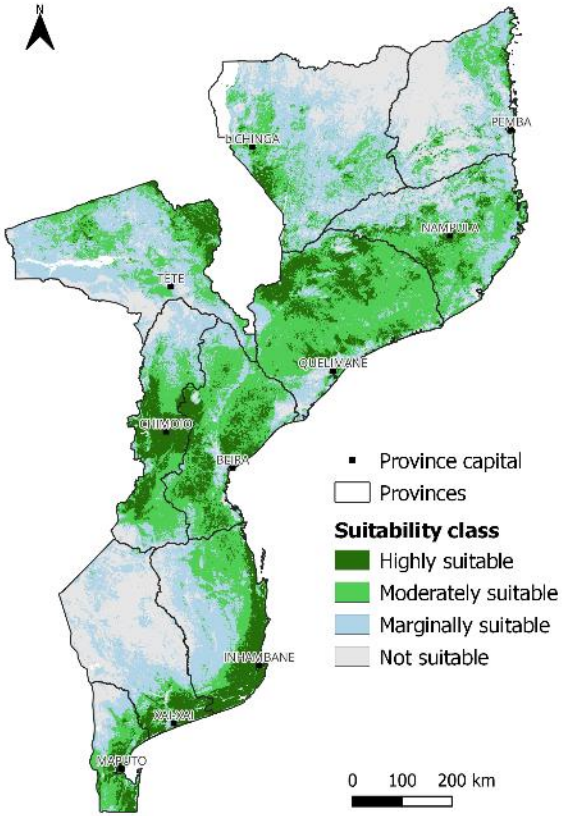
Current suitability map for Avocado tree



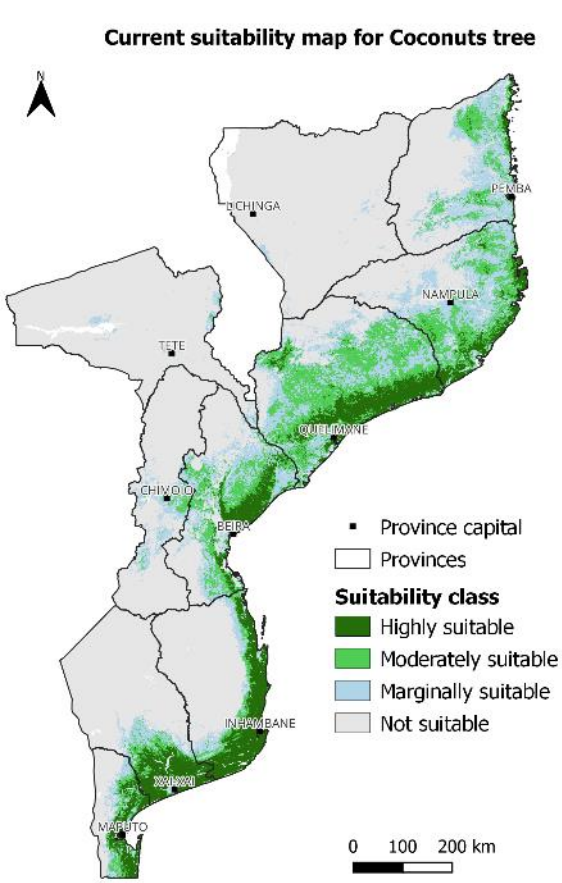
Current suitability map for Lemon tree

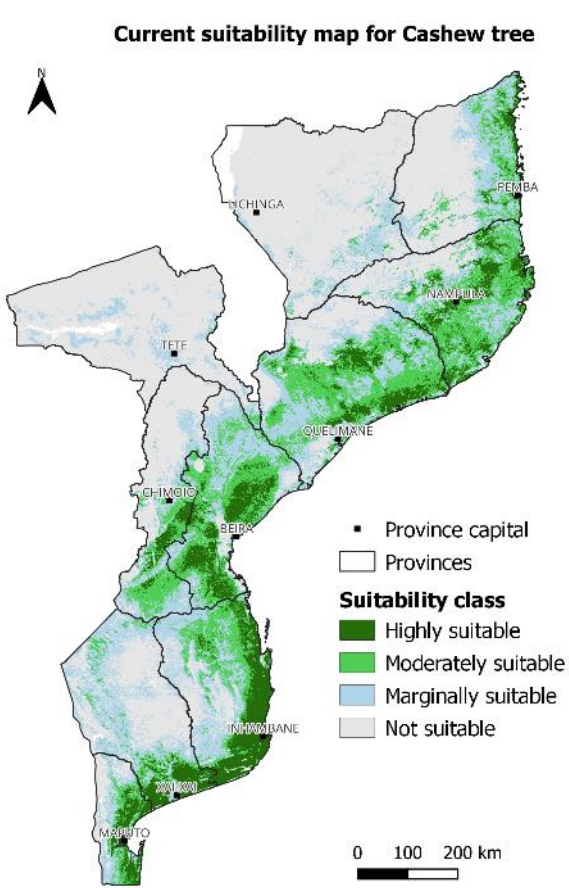


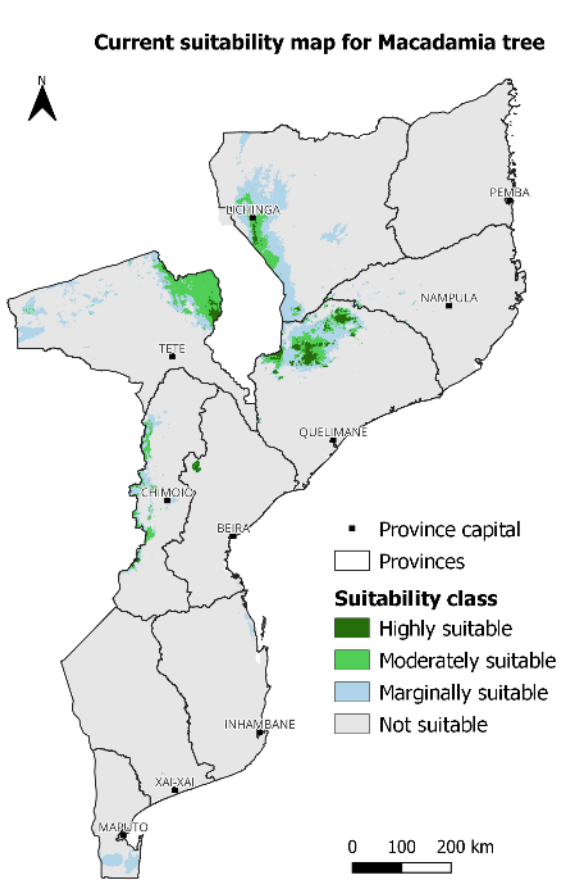
Current suitability map for Mango tree



First results
Suitability class







First results
Suitability class