

Selecting Useful Tree Species: potential natural distribution maps and species distribution models

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The Right Trees for the Right Place

A. Trees for Products



fruit



firewood



medicine



income



Sawn wood



fodder

B. Trees for Services



Soil fertility



Carbon



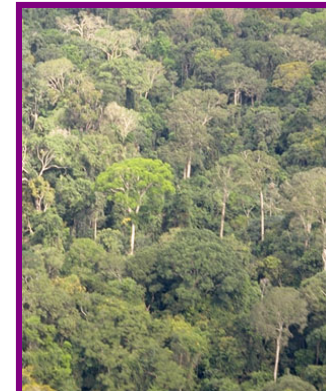
erosion



watershed



shade



biodiversity

C. Trees for right place...

Simple as ABC !?

Locations of 985 useful tree species

www.gbif.org



<i>Occurrences</i>	<i>Species</i>	<i>Percentage</i>	<i>Cum. Percentage</i>
300+	1	0.1%	0.1%
200-299	3	0.3%	0.4%
100-199	31	3.1%	3.6%
50-99	63	6.4%	9.9%
30-49	107	10.9%	20.8%
10-29	184	18.7%	39.5%
1-9	220	22.3%	61.8%
0	376	38.2%	100.0%
All	985	100.0%	100.0%

Biased locations ... and some locations are wrong

vegetationmap4africa

http://www.vegetationmap4africa.org/2_Vegetation_map.html

1 Home

2 Vegetation map

Individual PNVs

Mobile maps

Webmaps

3 Species

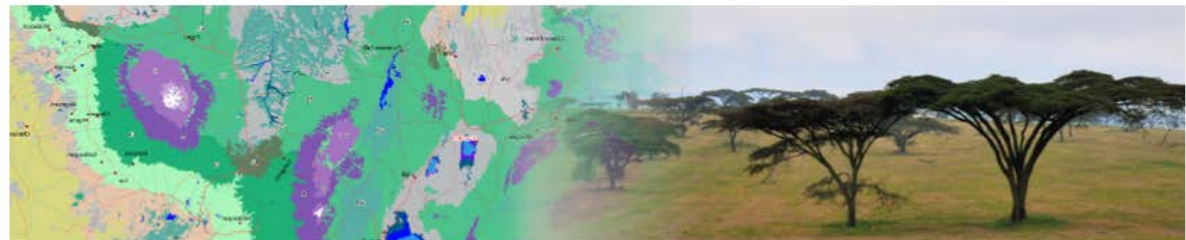
4 Documentation

5 Data

6 About

7 News

8 Contact



A vegetation map for eastern Africa

The map of potential natural vegetation of eastern Africa, gives the distribution of potential natural vegetation in Ethiopia, Kenya, Tanzania, Uganda, Rwanda, Burundi, Malawi and Zambia. The map distinguishes 48 vegetation types, divided in four main vegetation groups: 16 forest types, 15 woodland and wooded grassland types, 5 bushland and thicket types and 12 other types. Furthermore, a number of compound vegetation types are mapped, which include vegetation mosaics, catena's and transitional zones. The current **version is 2.0**. The map is available in various formats, listed below. Before using the maps, please consult the **terms of use**.

Web-based maps



View the interactive online map in your browser and quickly find out more about the natural vegetation and its species for any location. [Click here](#)

Maps in mobile format

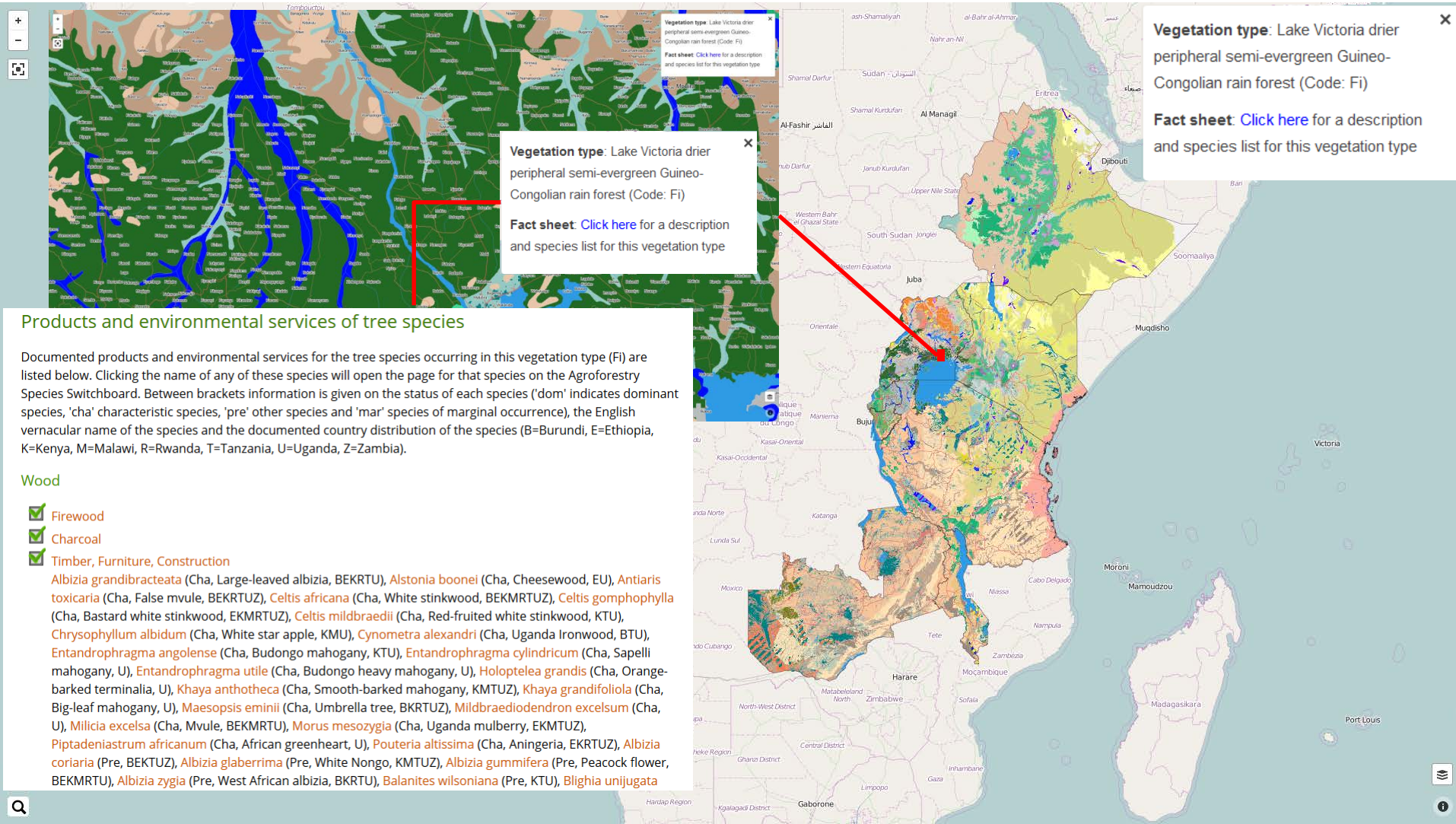


Bring the map with you in the field and know the natural vegetation where ever you are. Download the map for use on your favorite mobile map viewer - [Click here](#).

vegetationmap4africa

http://www.vegetationmap4africa.org/Vegetation_map.html

New version with web-based, Google Earth and mobile maps



Vegetation type: Lake Victoria drier peripheral semi-evergreen Guineo-Congolian rain forest (Code: Fi)

Fact sheet: [Click here](#) for a description and species list for this vegetation type

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Products and environmental services of tree species

Documented products and environmental services for the tree species occurring in this vegetation type (Fi) are listed below. Clicking the name of any of these species will open the page for that species on the Agroforestry Species Switchboard. Between brackets information is given on the status of each species ('dom' indicates dominant species, 'cha' characteristic species, 'pre' other species and 'mar' species of marginal occurrence), the English vernacular name of the species and the documented country distribution of the species (B=Burundi, E=Ethiopia, K=Kenya, M=Malawi, R=Rwanda, T=Tanzania, U=Uganda, Z=Zambia).

Wood

- ✓ Firewood
- ✓ Charcoal
- ✓ Timber, Furniture, Construction

Albizia grandibracteata (Cha, Large-leaved albizia, BEKRTU), *Alstonia boonei* (Cha, Cheesewood, EU), *Antiaris toxicaria* (Cha, False mvule, BEKRTUZ), *Celtis africana* (Cha, White stinkwood, BEKMRTUZ), *Celtis gomphophylla* (Cha, Bastard white stinkwood, EKMRTUZ), *Celtis mildbraedii* (Cha, Red-fruited white stinkwood, KTU), *Chrysophyllum albidum* (Cha, White star apple, KMU), *Cynometra alexandri* (Cha, Uganda Ironwood, BTU), *Entandrophragma angolense* (Cha, Budongo mahogany, KTU), *Entandrophragma cylindricum* (Cha, Sapelli mahogany, U), *Entandrophragma utile* (Cha, Budongo heavy mahogany, U), *Holoptelea grandis* (Cha, Orange-barked terminalia, U), *Khaya anthotheca* (Cha, Smooth-barked mahogany, KMTUZ), *Khaya grandifoliola* (Cha, Big-leaf mahogany, U), *Maesopsis eminii* (Cha, Umbrella tree, BKRTUZ), *Mildbraediodendron excelsum* (Cha, U), *Milicia excelsa* (Cha, Mvule, BEKMRTU), *Morus mesozygia* (Cha, Uganda mulberry, EKMTUZ), *Piptadeniastrum africanum* (Cha, African greenheart, U), *Pouteria altissima* (Cha, Anigeria, EKRTUZ), *Albizia coriaria* (Pre, BEKTUZ), *Albizia glaberrima* (Pre, White Nongo, KMTUZ), *Albizia gummifera* (Pre, Peacock flower, BEKMRTU), *Albizia zygia* (Pre, West African albizia, BKRTU), *Balanites wilsoniana* (Pre, KTU), *Blighia unijugata*

Agroforestry Species Switchboard

one-stop shop for information on plant species

www.worldagroforestry.org/products/switchboard

Agroforestry Species Switchboard 1.4

A synthesis of information sources to support tree research and development activities



Enter name and click search icon



Your results for the search term: '**Gliricidia sepium**'

Names found	Current Name (Click to show links on the right)
Gliricidia sepium	Gliricidia sepium

Each species is linked to 43 web-based databases such as the ICRAF Agroforestry Database, the Plant Resources of Tropical Africa (PROTA), the CABI Invasive Species Compendium, Tropical Forages, USDA Food Composition Database or FAO's ECOCROP database

30,542 plant species

38,466 including synonyms

240,157 hyperlinks (excluding 'search')

About the Switchboard/suggested citation

Email: switchboard@cgiar.org

Links to *Gliricidia sepium*

[View](#)

[View](#)

Not Listed

[View](#)

[View](#)

Not Listed

Not Listed

[View](#)

Links to *Gliricidia sepium*

Not Listed

[View](#)

[View](#)

[View](#)

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Homepages ICRAF Databases

[Agroforestry Database](#)

[Tree Seed Suppliers Directory](#)

[African Wood Density Database](#)

[RELMA-ICRAF Useful Trees](#)

[Tree Functional Attributes and Ecological Database](#)

[Useful Tree Species for Africa map](#)

[vegetationmap4africa](#)

[Genetic Resources Unit Database](#)

Homepages Other Databases

[African Orphan Crops Consortium](#)

[Árboles de Centroamérica](#)

[CABI Invasive Species Compendium](#)

[Ecocrop](#)

[E-PROSEA](#)

[Especies para restauración](#)

[EUFORGEN](#)

[Global Invasive Species Database](#)

[MAPFORGEN](#)

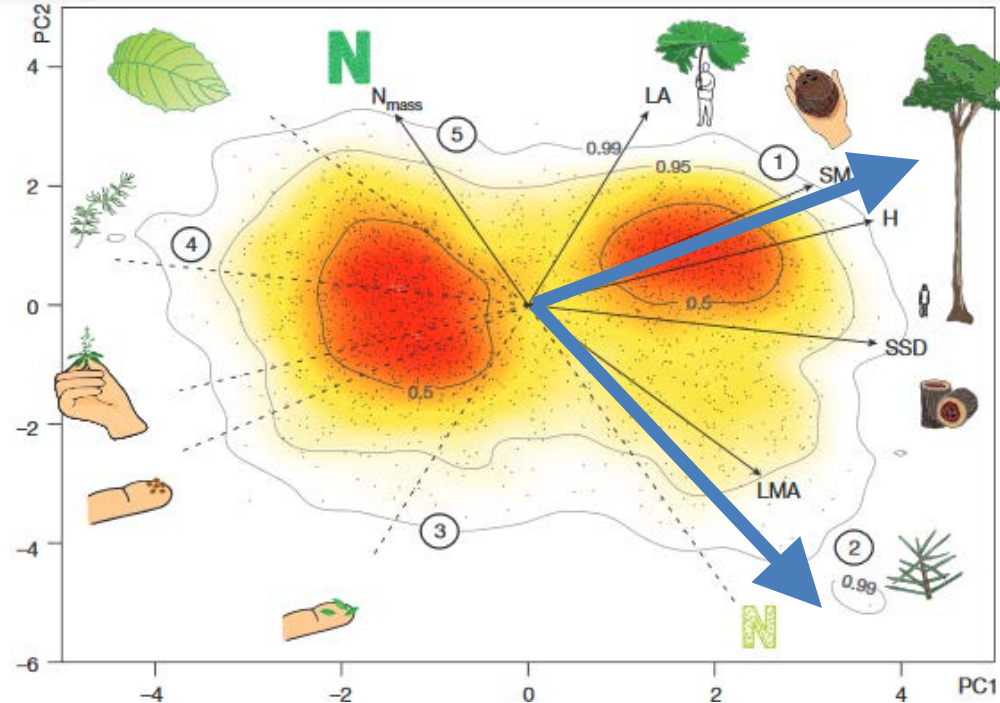
[New World Fruits Database](#)

Plant functional attributes (eg, ecosystem services and services)

Table 10.1. Seed and seedling traits of pioneer and shade-tolerant tree species in tropical forests

Attribute	Pioneer	Shade-tolerant
Seed size	Small	Large
Initial seedling size	Small	Large
Seed dormancy	Capable	Little or no capacity
Seed longevity	Relatively long-lived	Short-lived
Seed germination physiology	Often require red light	No red light requirement
Seedling germination	Mostly epigeal (aboveground)	Mostly hypogeal (belowground)
Cotyledon morphology	Photosynthetic cotyledons	Nonphotosynthetic, reserve cotyledons
Leaf and stem tissue density	Low	High
Cotyledon/leaf toughness	Low	High
Photosynthetic capacity	High	Low
Specific leaf area	High	Low
Seedling survival rate	Low	High
Seedling growth rate	High	Low
Herbivore resistance	Low	High

Sources: Based on Bazzaz (1991), Kitajima (1996), and Alvarez-Clare and Kitajima (2007).



H: adult plant height N: N content per unit leaf mass
 LA: leaf area SM: diaspore mass
 LMA: leaf mass per area SSD: stem specific density

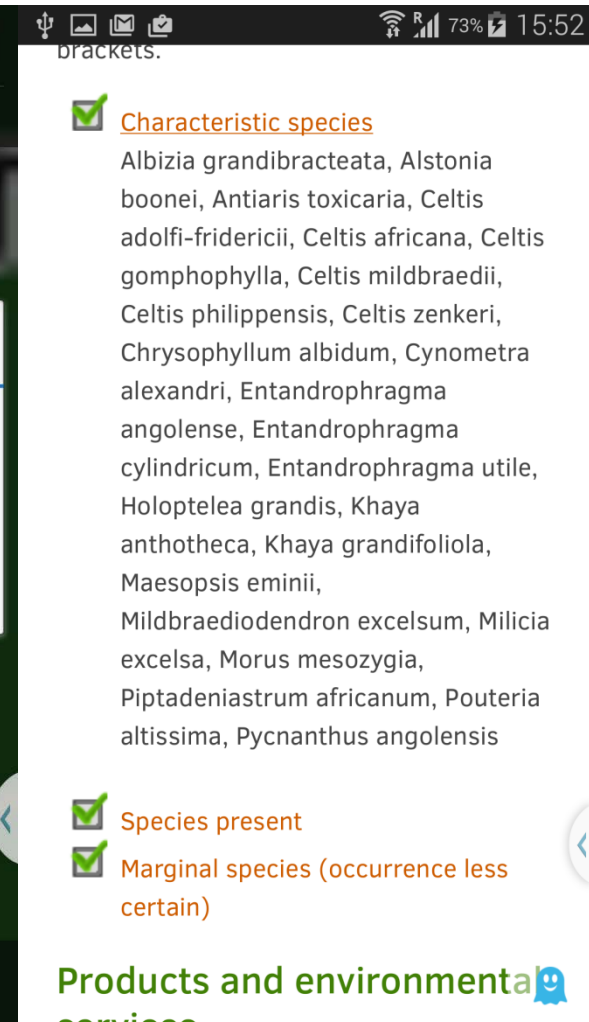
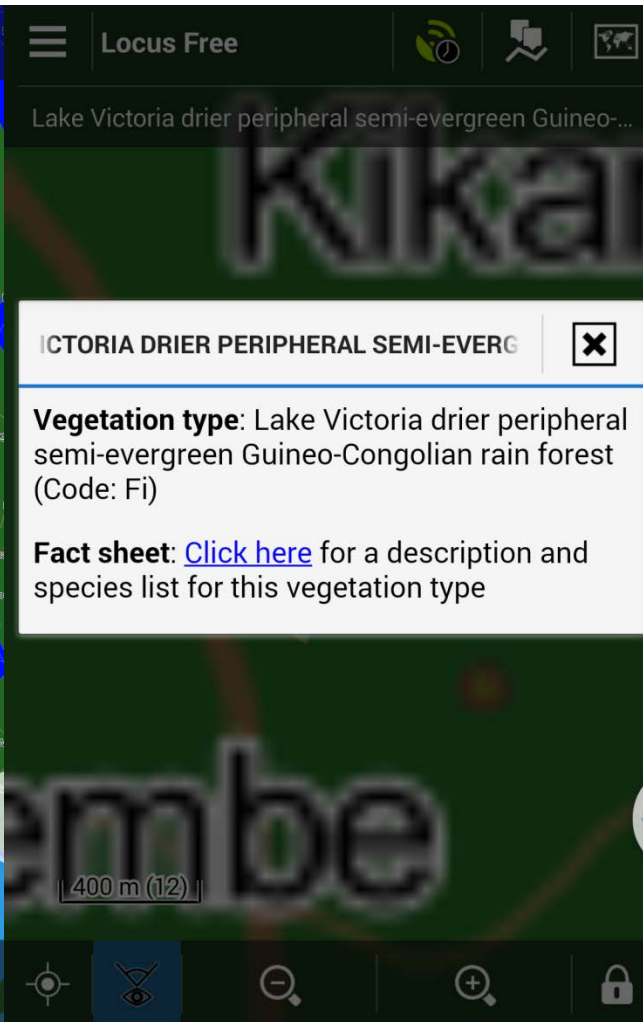
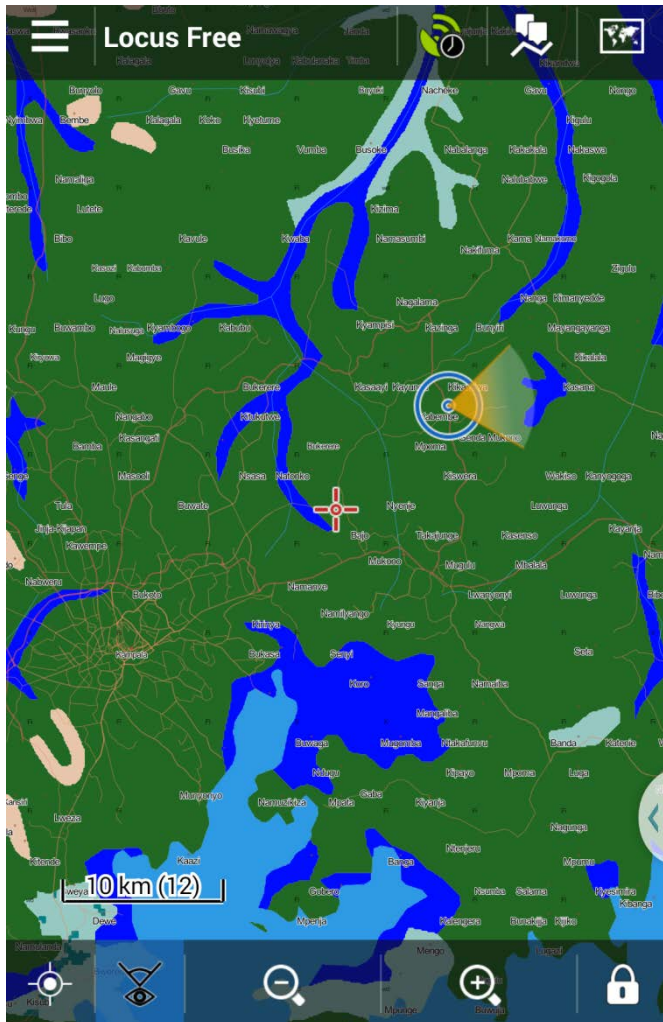
(data from 46,085 plant species)

Sources: Chazdon RL. 2014. **Second Growth: The Promise of Tropical Forest Regeneration in an Age of Deforestation**
 Diaz S et al. 2016. **The global spectrum of plant form and function.** Nature 529

Smart phone version via the Locus App

http://www.vegetationmap4africa.org/2_Vegetation_map.html

Mobile maps



Species site-matching and distribution modelling

<https://CRAN.R-project.org/package=BiodiversityR> (priority and AOCC species)

http://www.vegetationmap4africa.org/Vegetation_map.html (expand beyond Africa)

<https://play.google.com/store/apps/details?id=com.icraf.gsl.africatreefinder>

The image is a composite of three parts. The top-left shows a group of people in a forest setting, some holding branches. The bottom-left shows a hand holding a smartphone displaying a map. The right side shows a software interface for species details.

Vegetation type: Lake Victoria drier peripheral semi-evergreen Guineo-Congolian rain forest (Code: Fi)

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Species Details

You Selected: **Warburgia ugandensis (pre)**

Origin
Indigenous

Local Names

Name	Language
East African green wood, Kenya	English
greenheart	
Mukuzanume	Luganda
Muwiya	Buddu
Balwegira	Lusoga
Mwiha	Runyankore
Musizambuzi	Runyoro
Muharami	Rutoro

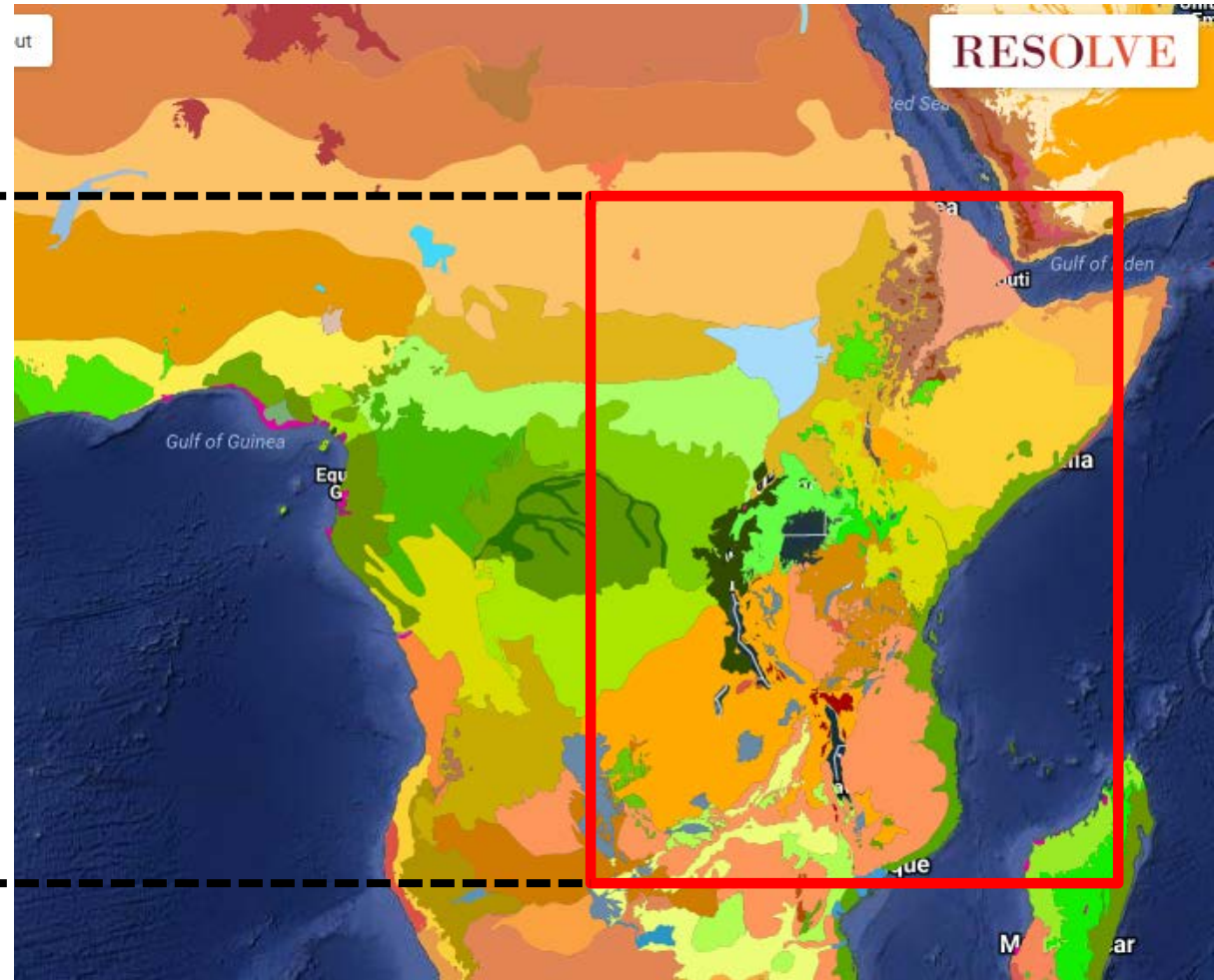
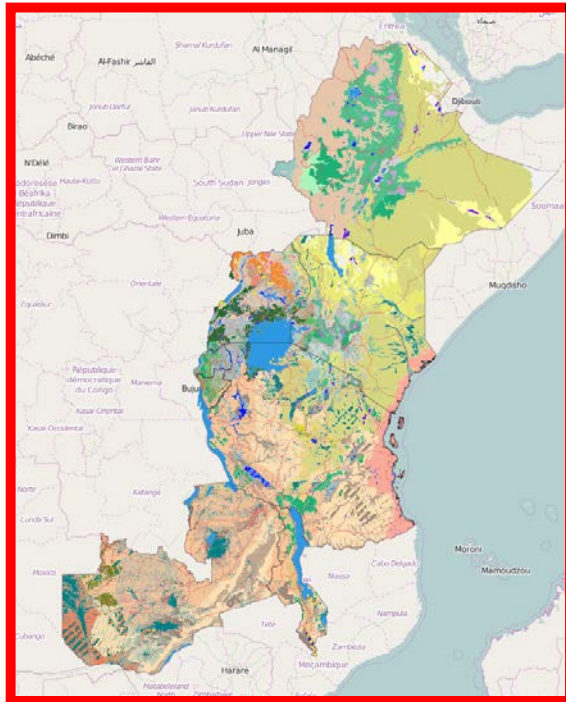
Description

An evergreen tree to 25 m with a dense leafy canopy. BARK: rough brown-black, cracked into rectangular scales. LEAVES: shiny dark green above, midrib very clear below, edge wavy, to 10 cm long. FLOWERS: inconspicuous green-cream. FRUIT: round to egg-shaped, to 5 cm long on short stalks, green to purple with a waxy, white surface. Several flat heart-shaped seeds inside a pulp.

Ecology

Dinerstein et al. 2017. An Ecoregion-Based Approach to Protecting Half the Terrestrial Realm

<https://doi.org/10.1093/biosci/bix014>; <http://ecoregions2017.appspot.com/>



REPUBLIC OF UGANDA



Ministry of Water and Environment

Forest Landscape Restoration Opportunity Assessment for Uganda

2016



Uganda has committed 2.5 million ha to the Bonn Challenge

The Restoration Opportunities Assessment Methodology (ROAM) identified agroforestry and woodlots as main restoration options

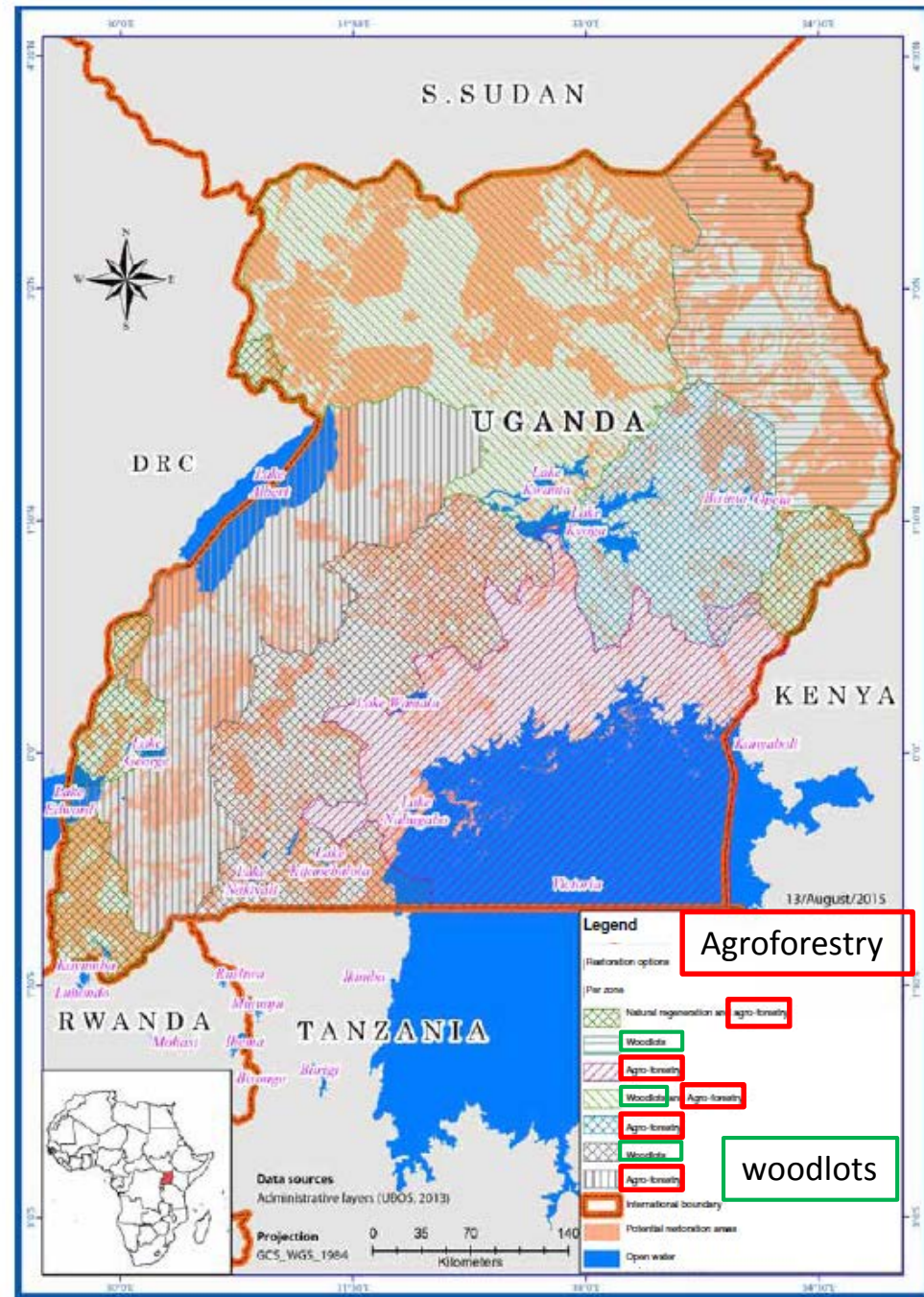


Figure 13: Recommended restoration options for each site in all landscapes

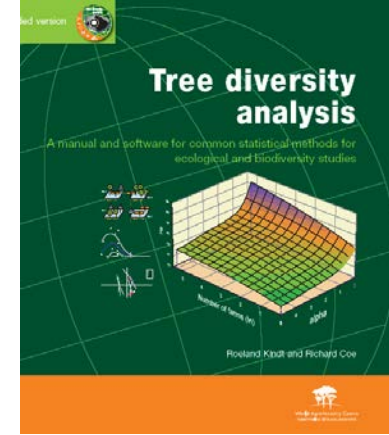
Species Distribution Modelling (relevant for ecological genomics, collection gap analysis and sampling)



Contents lists available at [ScienceDirect](#)

Environmental Modelling & Software

journal homepage: www.elsevier.com/locate/envsoft



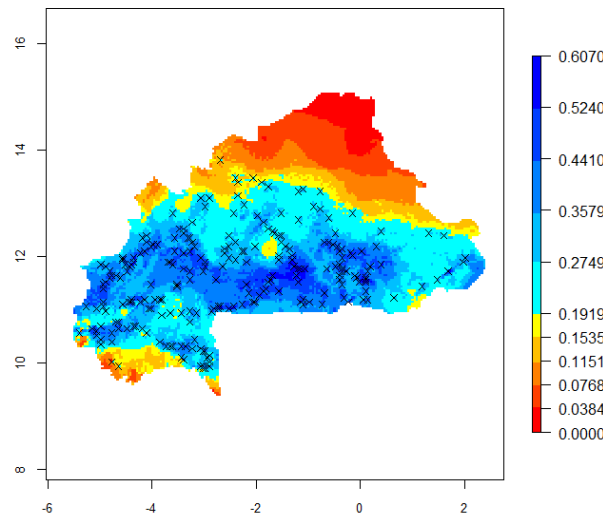
(> 77,000 Installations in R-
Studio since 2012)

Ensemble species distribution modelling with transformed suitability values

R. Kindt ¹

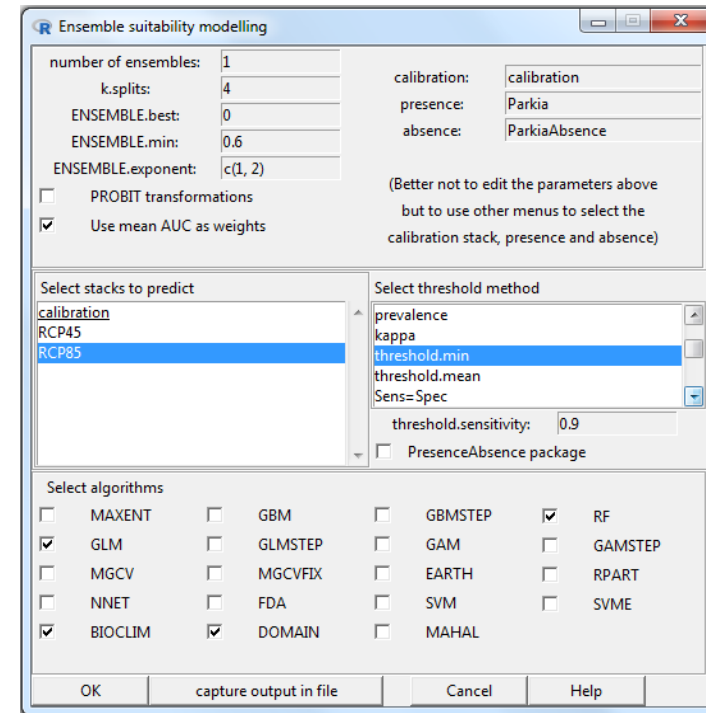
World Agroforestry Centre (ICRAF), 30677-00100 Nairobi, Kenya

PARbig suitability for calibration



<https://CRAN.R-project.org/package=BiodiversityR>

<https://doi.org/10.1016/j.envsoft.2017.11.009>



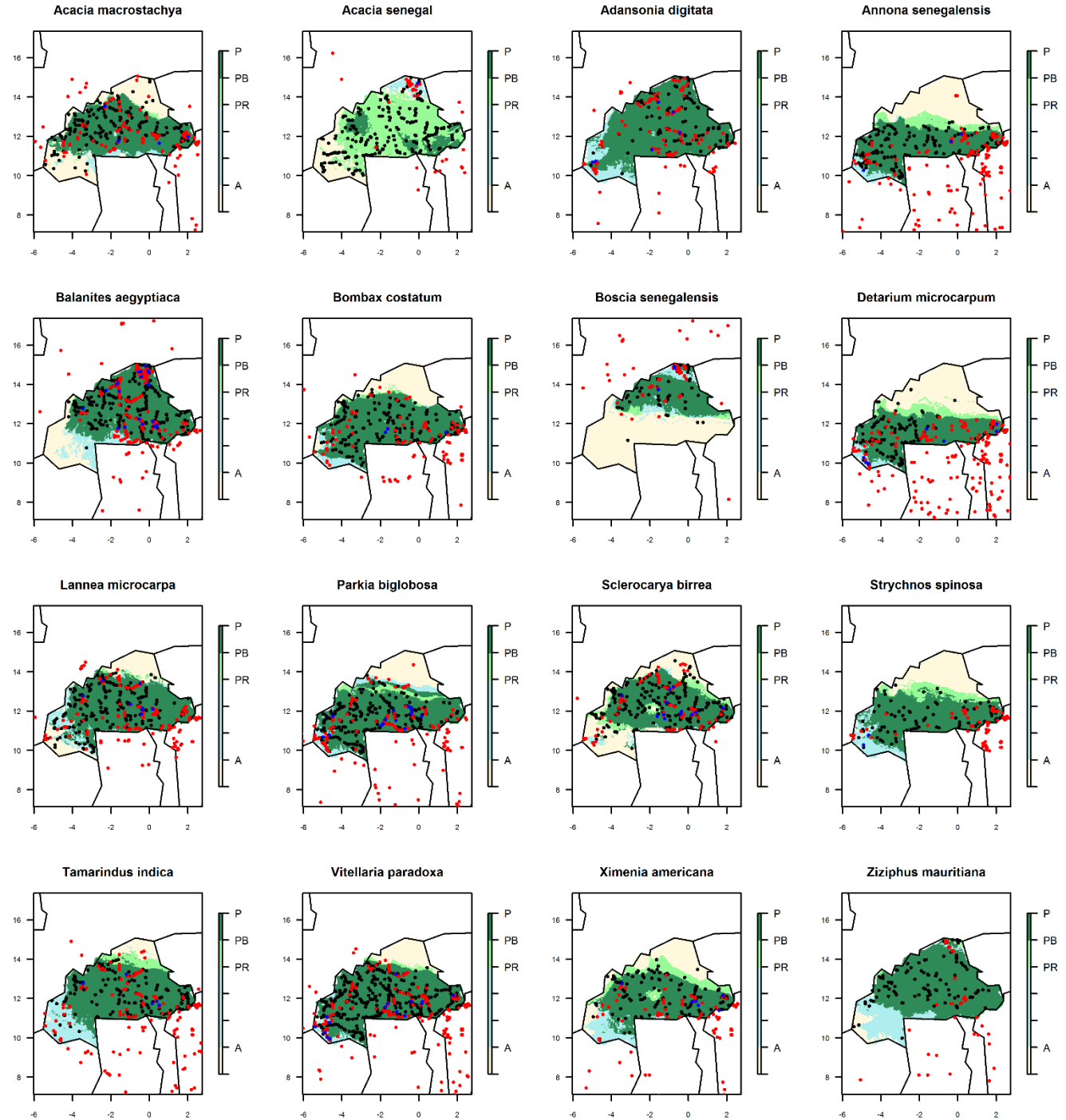
Example: Burkina Faso (baseline climate)

<https://doi.org/10.1371/journal.pone.0184457>

regional model (red point locations, blue suitable habitat)

local model (black point locations, light green suitable habitat)

consensus regional and local model (dark green)



Climate Change Atlas for Central America for 54 agroforestry species (Bioversity, CATIE, ICRAF)

<http://www.worldagroforestry.org/atlas-central-america>

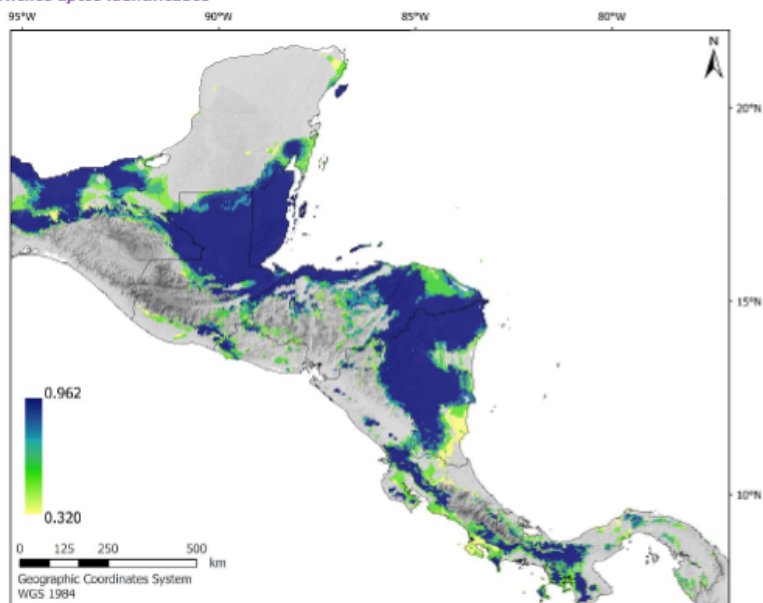
Swietenia macrophylla King

Familia: Meliaceae

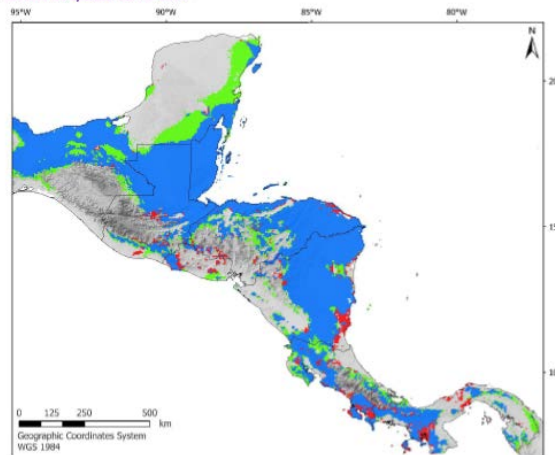
Nombres comunes: Caoba, mahogany (BZ)

Atributos de toda la planta		Usos reportados		Reproducción		Tolerancias ambientales	
Forma de vida	Árbol	Madera aserrio	Sí	Sistema de reproducción	Monota alogama	Sequía	Por identificar
Altura (m)	33 (25 - 40)	Construcción rural	Sí	Vector de polinización	Insectos	Inundaciones	Sí
Espinas	Sí	Leña	No	Peso de mil semillas (g)	477.5 (357.4 - 617.3)	Heladas	No
Fija nitrógeno	No	Frutal	No	Almacenamiento semilla	Intermedia	Sombra	No
Densidad madera	0.51 (0.35 - 0.70)	Forraje	No	Dormancia semilla	No	Salinidad	No
Fenología	Caducifolio	Otros usos	Apicultura	Propagación vegetativa	Sí	Fuego	Por identificar

Nichos aptos identificados

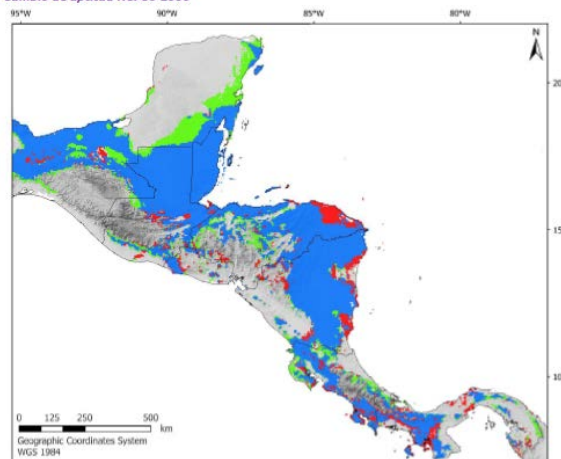


Cambio de aptitud RCP45 2050



RCP 4.5
2050s

Cambio de aptitud RCP85 2050

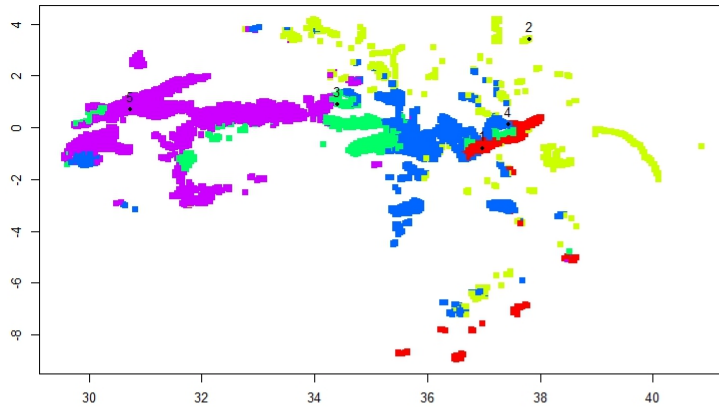


RCP 8.5
2050s

Seed source definition based on centroid in environmental space and the Mahalanobis distance...

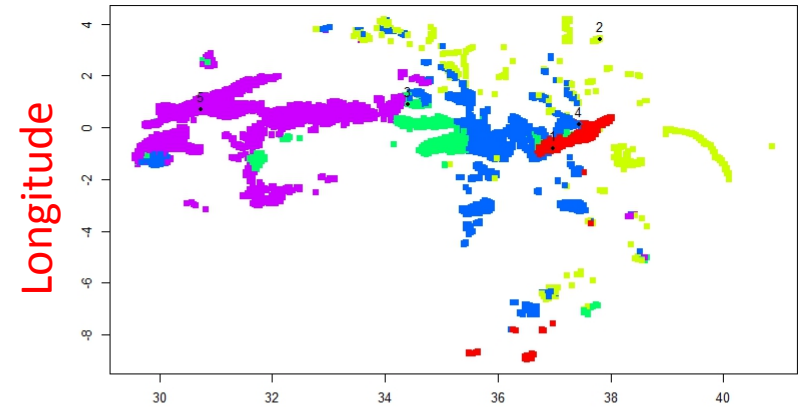
Link with genetic variation, adaptation, provenances

zones (based on K-means clustering in PCA) and locations of centroid analogs

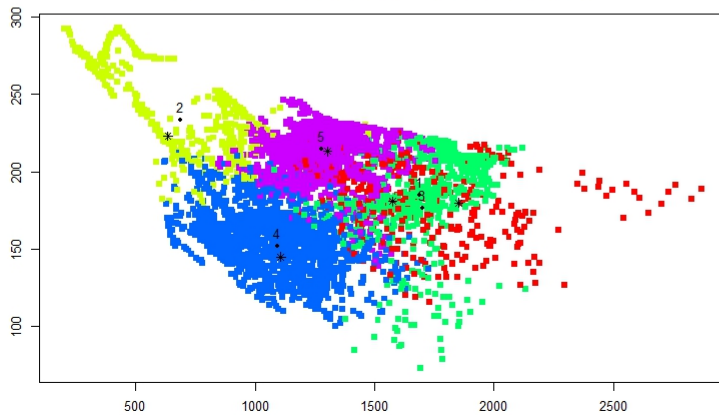


Latitude

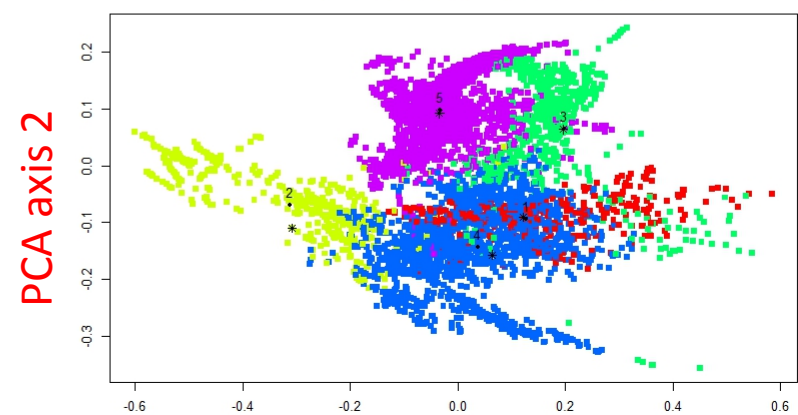
zones (based on Mahalanobis distance from centroid) and locations of centroid analogs



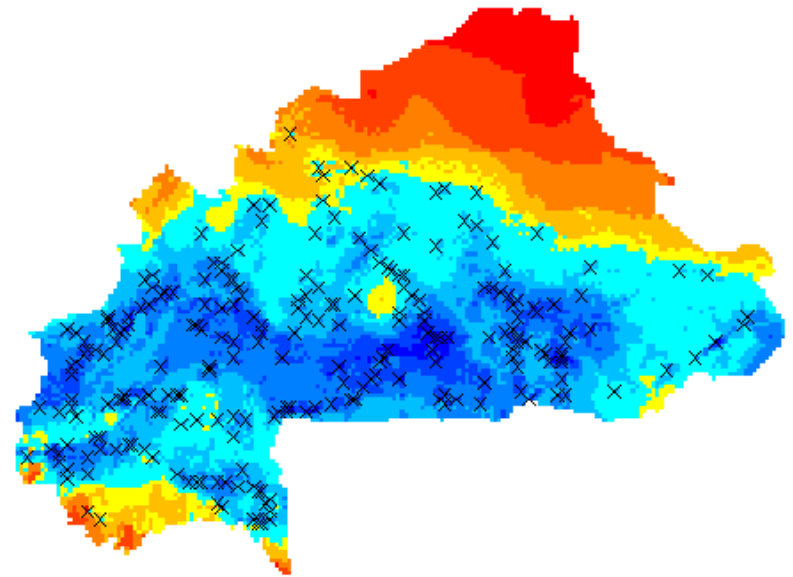
Latitude



Precipitation



PCA axis 1



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