



Tamarind density and distribution: evaluation for climate change adaptation

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International Conference on NUS, Accra-GHANA 2013

Outline

- ✚ **General introduction**
- ✚ **Objectives**
- ✚ **Hypothesis**
- ✚ **Material and Methods**
- ✚ **Results**
- ✚ **Discussions & Conclusions**
- ✚ **Recommendations**

Introduction...1/4

Tamarind

Order: Fabales

Family: Fabaceae

Genus: *Tamarindus*

Species: *indica*

Tamarind: *Tamarindus indica* L.



Reproductive organs



Tamarind fruit

Introduction...2/4



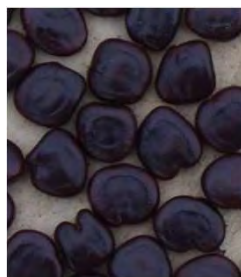
Human nutrition



Animal feed



Multiple uses of *Tamarindus indica* L.



Services

Medicine



Introduction...3/4

Production and distribution areas (El-Siddig *et al.*, 2006; Bowe, 2007)

Figure 1.1: Tamarind distribution

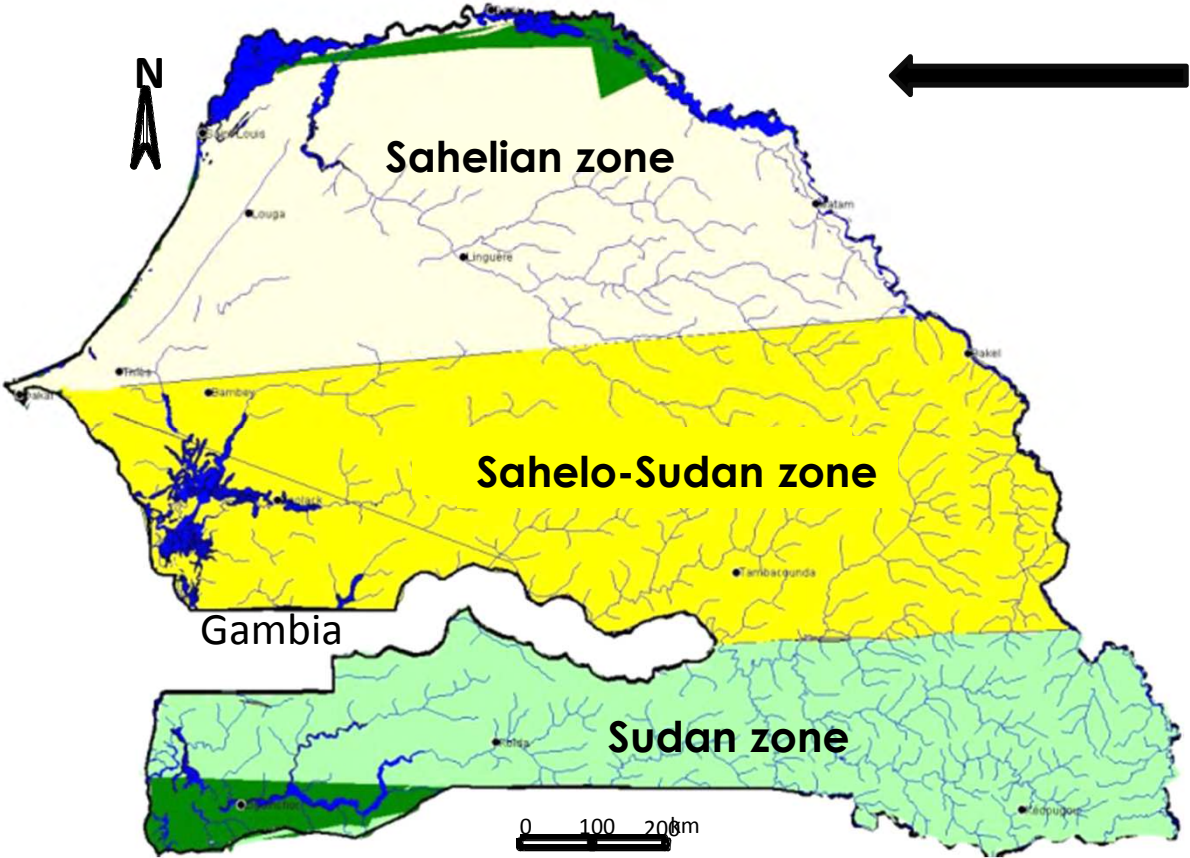


Table 1.1: Tamarind production in 2005 (El-Siddig *et al.*, 2006)

Continent	Producing countries	Quantity produced (t/y)	Importing countries of tamarind
Asia	India	300,000	Pakistan
	Thailand	140,000	Arabic countries
America	Costa Rica	220	Europe (UE)
	Mexico	37	North America
	Puerto Rico	23	(USA, Canada)

Introduction...4/4

Senegal



Agro-ecological map of Senegal

Objectives

Evaluate current density and predict future distribution of tamarind in Senegal:

- *density evaluation in relation to the habitats*
- *actual distribution of tamarind*
- *future distribution and climate change effects*

Hypothesis

Observed climate change in Senegal (rainfall and temperature curves changes, etc..) can influence current and future presence/distribution of tamarind

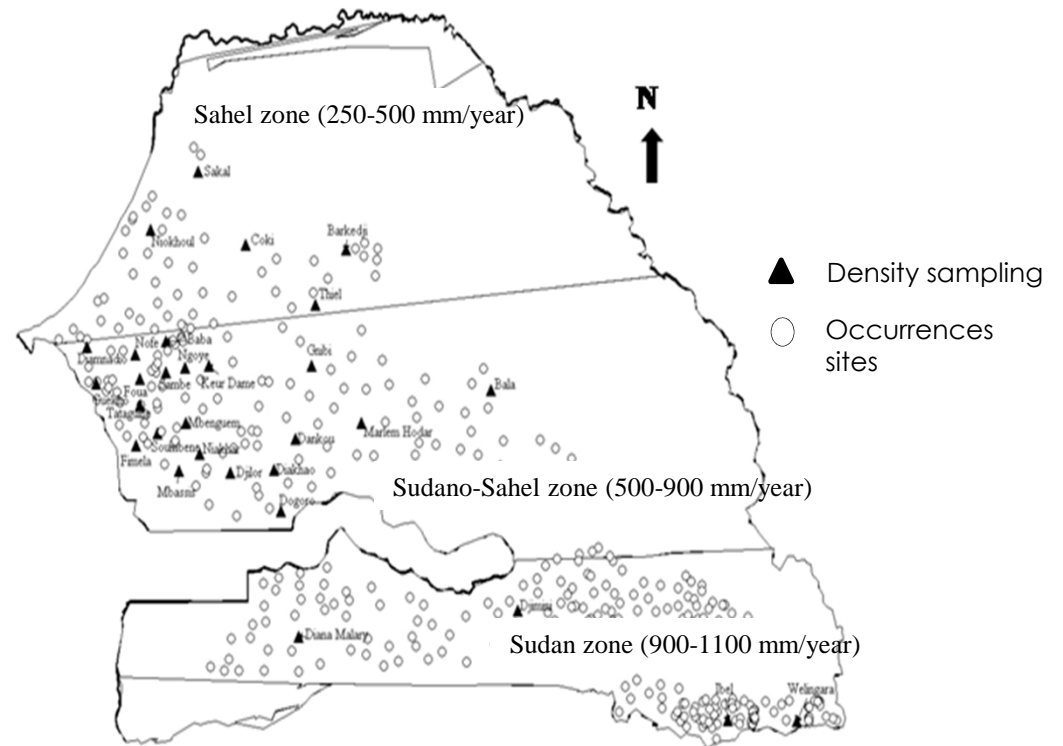
Material and methods...1/4

□ Prevalence sites of tamarind were observed and recorded across Senegal

□ Tamarind density (number of trees per km²) around 30 villages was measured across Senegal

Choice of 30 sites was done randomly on all sites visited (489) in the three agro-ecological zones.

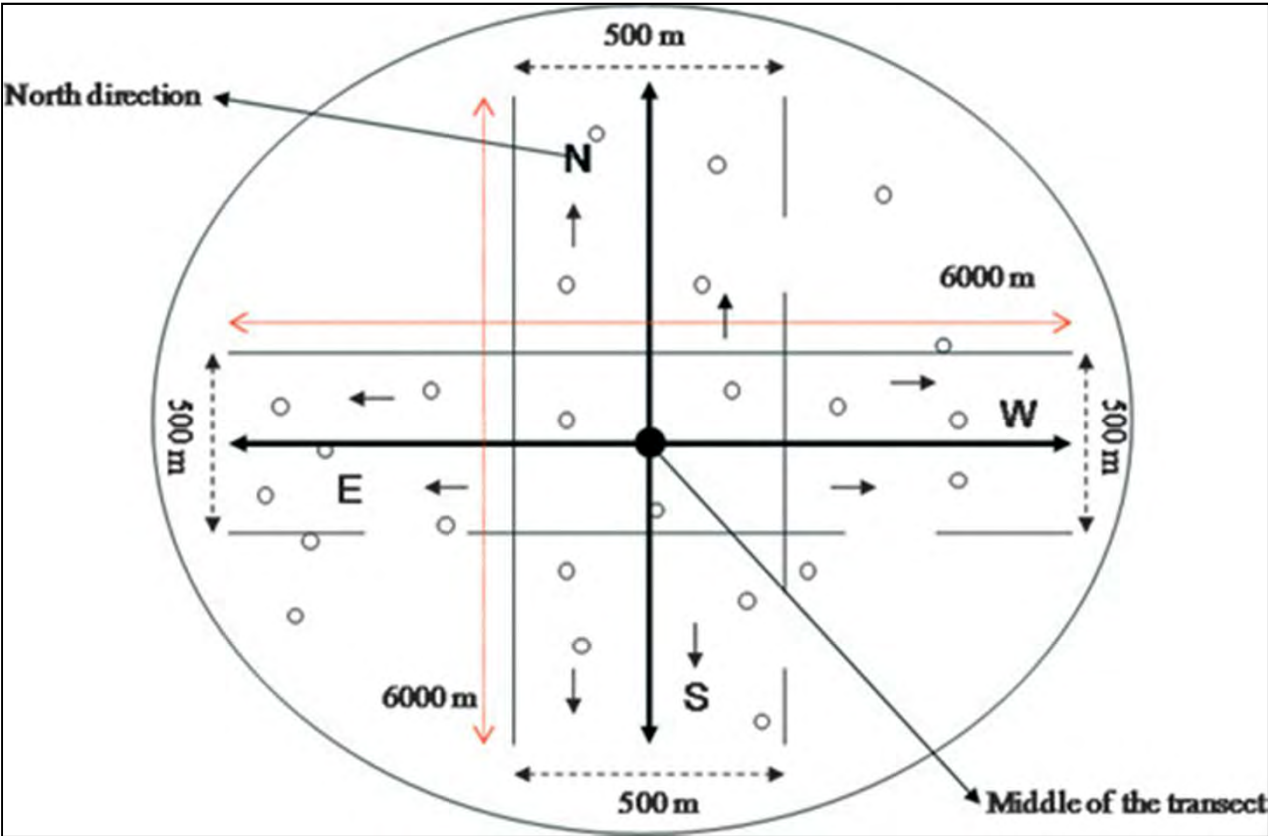
Figure 1.2: Exploration areas



Material and methods...2/4

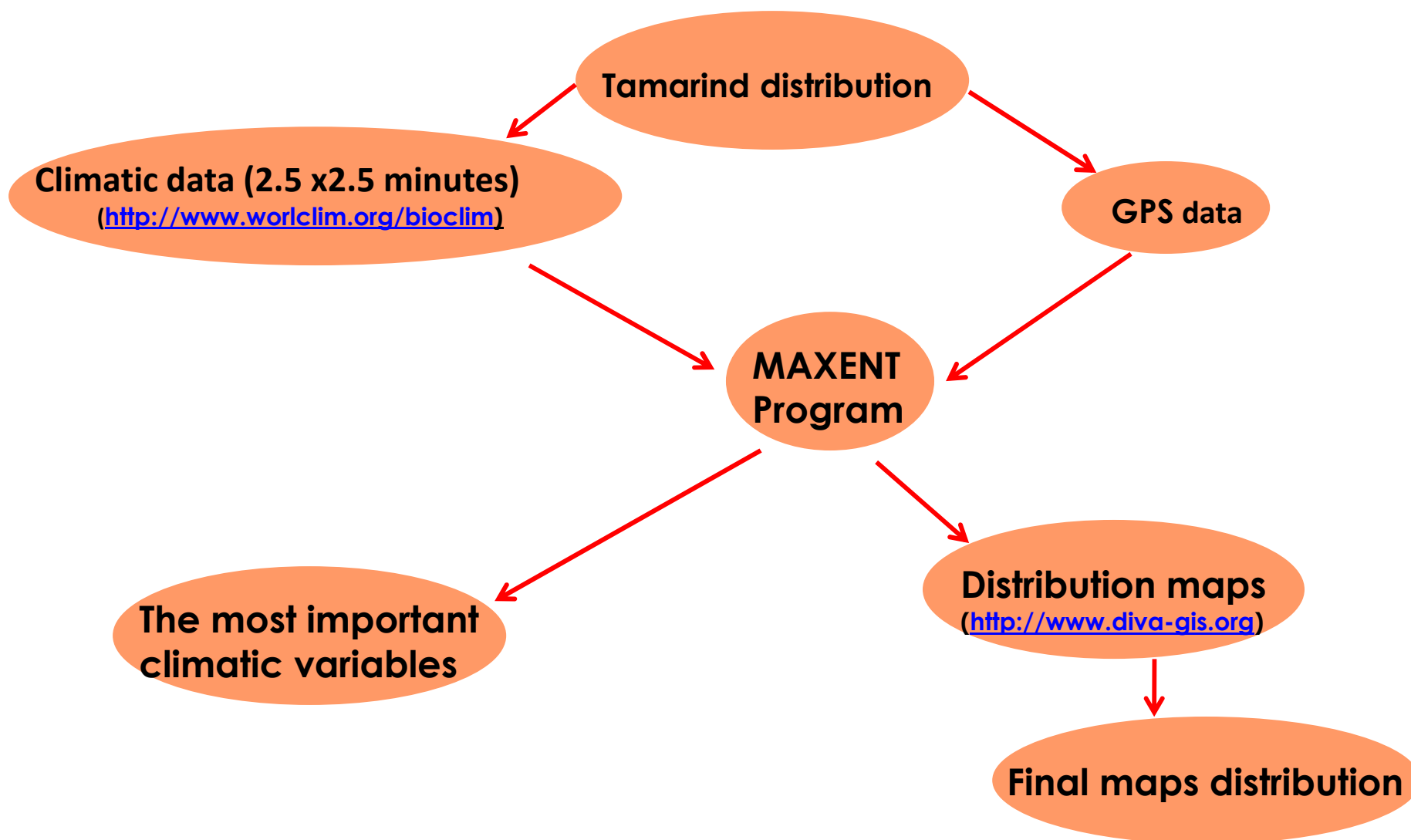
Tamarind density

Figure 1.3: Transect method (Assogbadjo *et al.*, 2005)



Material and methods...3/4

Distribution and climate change effects

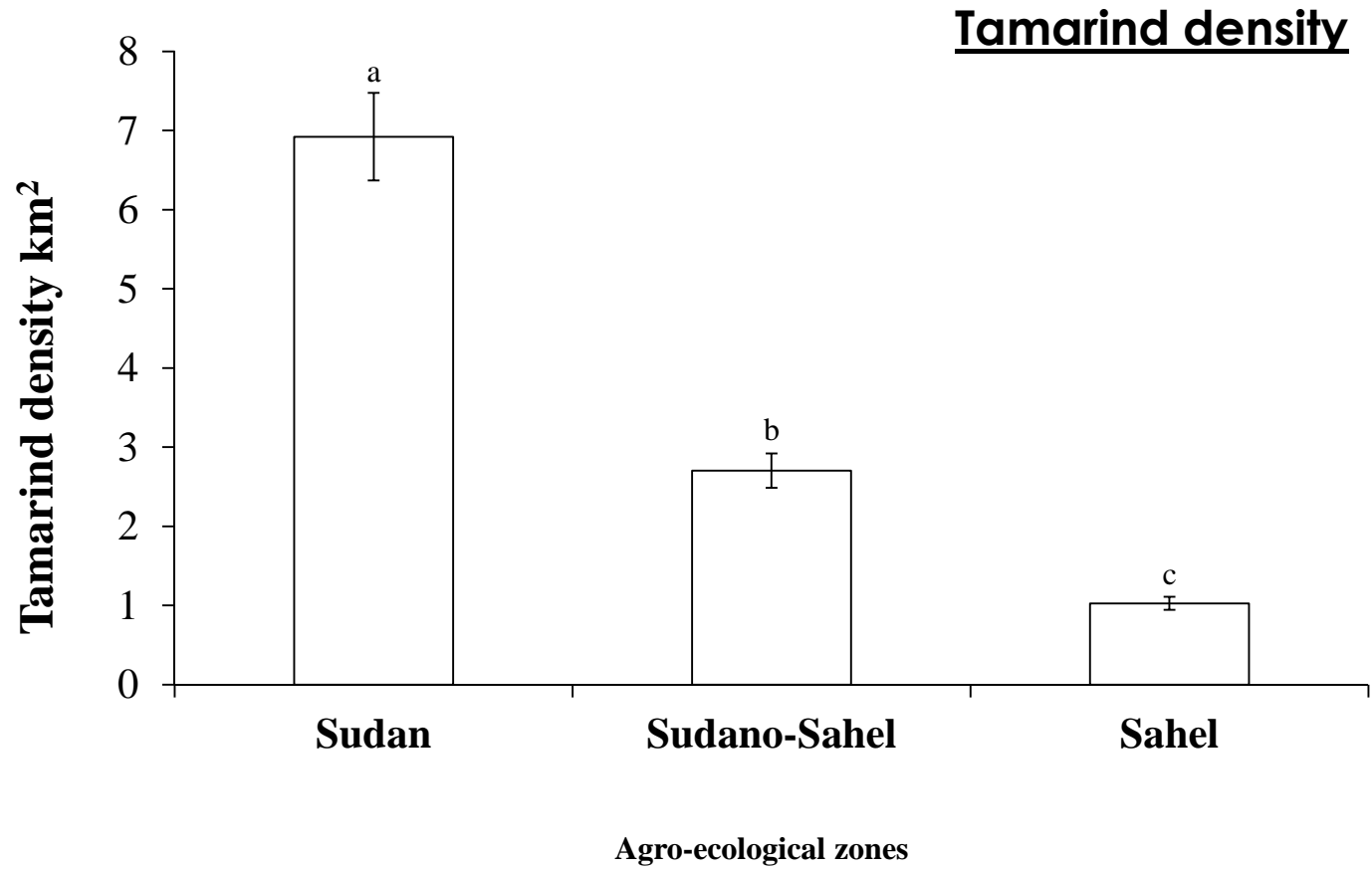


Material and methods...4/4

MAXENT

The screenshot shows the MAXENT software interface. A central dialog box titled "Maximum Entropy Parameters" is open, with the "Basic" tab selected. A red circle highlights the "Basic" tab. The dialog box contains several checked options: "Random seed", "Give visual warnings", "Show tooltips", "Ask before overwriting", "Skip if output exists", "Remove duplicate presence records", "Write stamp grid when projecting", and "Do MESS analysis when projecting". Below these are input fields for "Random test percentage" (0), "Regularization multiplier" (1), "Max number of background points" (10000), and "Replicates" (1). A "Replicated run type" dropdown is set to "Crossvalidate", and there is a "Test sample file" field with a "Browse" button. In the main window, a red arrow points to the "File" field under "Samples", labeled "Species prevalence data". Another red arrow points to the "Directory/File" field under "Environmental layers", labeled "Environmental data". At the bottom right, a red circle highlights the "Output format" dropdown menu, which is set to "Logistic". Other options in this area include "Create response curves" (checked), "Make pictures of predictions" (checked), and "Do jackknife to measure variable importance" (checked). The "Output file type" is set to "asc". At the bottom of the window are buttons for "Run", "Settings", and "Help".

Results...1/3



Results...2/3

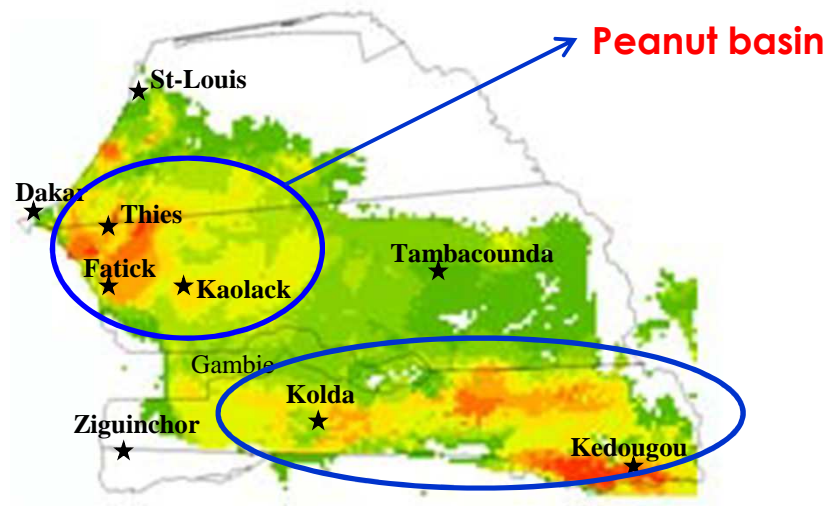
The most important climatic variables

- Isothermality (BIO3),
- Maximum temperature of warmest month (BIO5),
- Precipitation of wettest month (BIO13)
- Precipitation seasonality (BIO15)

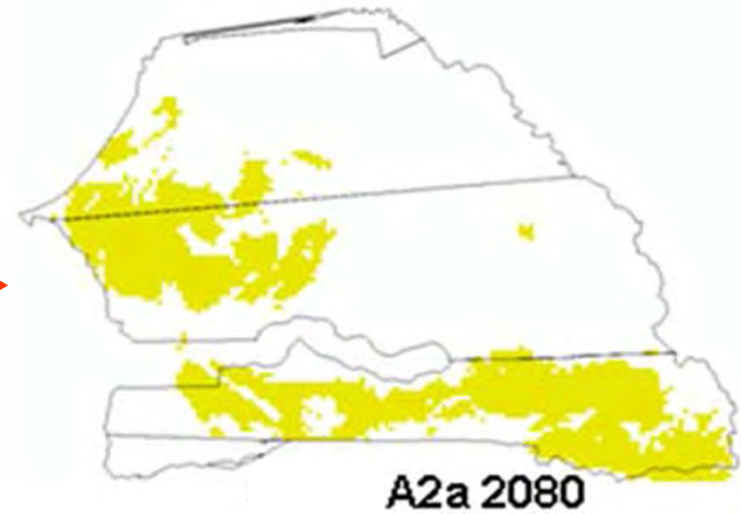
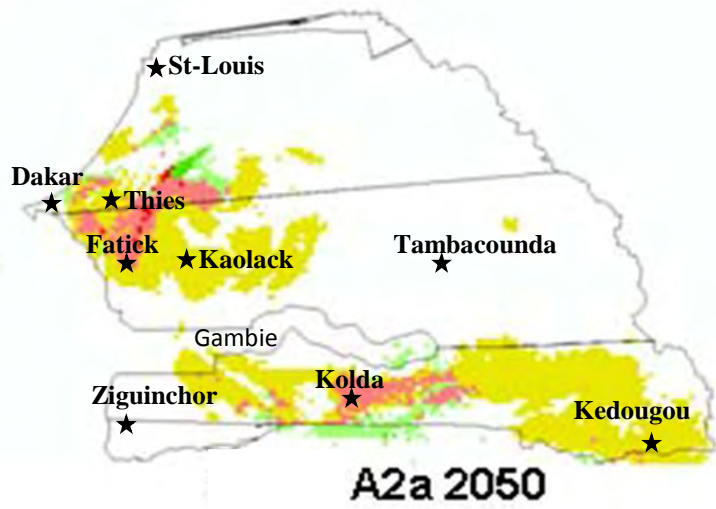
Results...3/3

Tamarind distribution

Figure 1.5a: Tamarind distribution



Actual distribution



Lessons learned/Conclusion

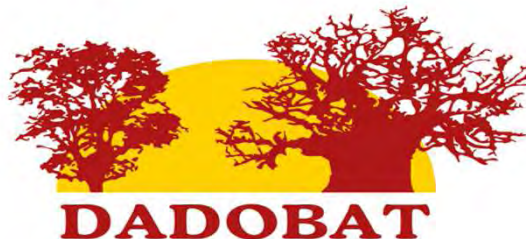
- ✚ Tamarind population density per agro-ecological zone is known and evaluated.
- ✚ The most important climatic variables for tamarind development are estimated and modeled.
- ✚ Occurrence probability of tamarind is known to reduce with time (2050 and 2080). Tamarind prevalence will reduce greatly by 2080 in Senegal.
- ✚ Peanut basin was observed to be a future refuge area of tamarind in Senegal.
- ✚ Finally, Senegalese policymakers should undertake concrete actions for the conservation and sustainable management of *T. indica* (**Law nr 98/03 of 08 January 1998**)



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Thanks for your kind attention !!



Institut Sénégalais de Recherches Agricoles



DON BOSCO

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Office allemand d'échanges universitaires