



How far do home gardens conserve threatened underutilized species and crop wild relatives in Benin?

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# **— OUTLINE —**

- 1. Background**
- 2. Objectives and hypotheses**
- 3. Methodology**
- 4. Results & Discussion**
- 5. Perspectives**

# 1. Background

Home garden (HG) = small, fenced plots close to a farmer's homestead, where annual, biennial, and/or perennial cultivated species are grown (Vogl and Vogl-Lukasser 2003).



- HG = small ecological niches but repositories of biological diversity (Galluzzi et al. 2010)
- HG = considered as viable sites for *ex situ* and/or *circa situ* conservation for rare and threatened species.

# 1. Background

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HG : preservation of high levels of inter- and intra-specific plant genetic diversity, especially in terms of traditional crop varieties, landraces and Crop Wild Relatives (CWR) (Galluzzi et al. 2010).

HG = utilised as testing plots for new crops,  
= nurseries for plantlets later destined for planting  
in open fields  
= sites for domestication of weedy forms

## The problem?

Biodiversity and patterns of HG contribution to conservation of threatened species and CWR across climates and cultures in Africa is still limited!!!

## Why?

Most researchers have often focused on agroforestry systems such as intercropping trees with crops, thus neglecting HG.

## 2. Objective

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Assess the floristic diversity of home gardens and the extent to which they contribute to conservation of threatened species and CWR across climatic zones.

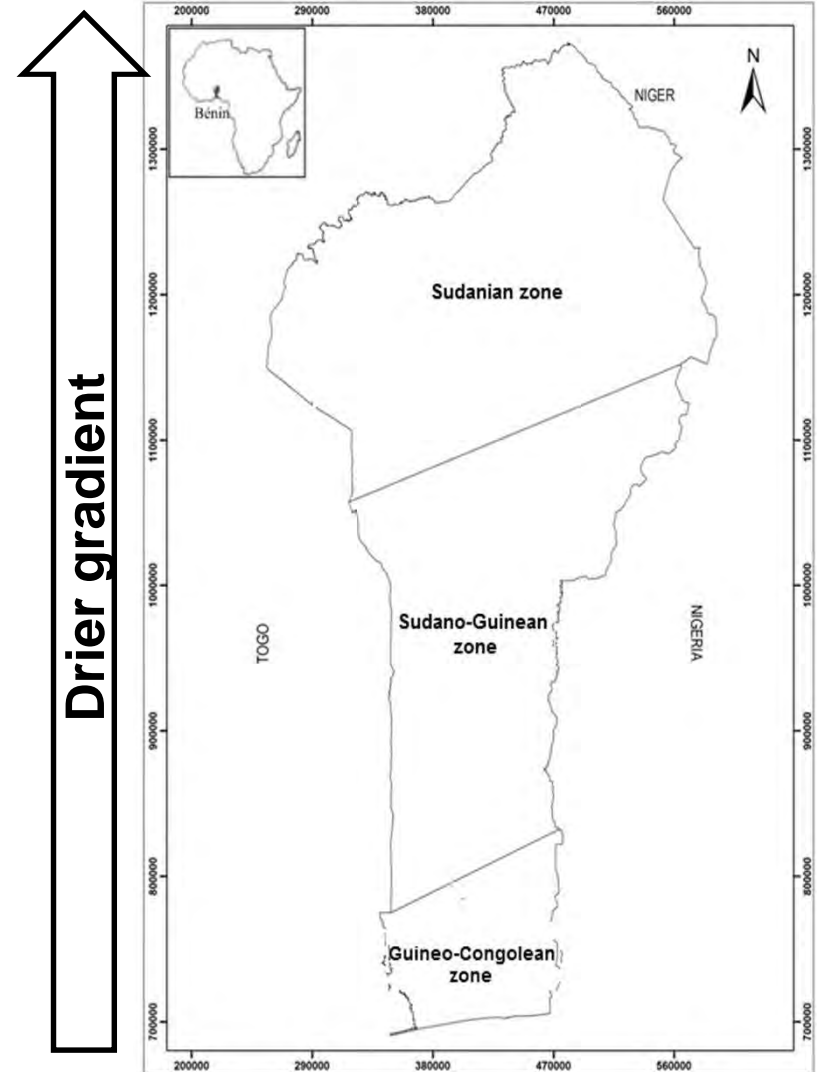
# Hypotheses

Diversity tends to decline with increasing altitude (Schall and Pianka 1978) and also with declining precipitation (Brown and Davidson 1977).

*Hypothesis 1: The floristic diversity of home gardens declines northward*

Farmers will select species in their closed environment

*Hypothesis 2: Species found in home gardens are dominated by native species*



**White (1983)**

# 3. Methodology

## 3.1. Sampling and data collection

Exploratory survey  
(180 interviewees/  
climatic zones) → p(HG owners) →  $n = \frac{U_{1-\alpha/2}^2 \times p(1-p)}{d^2}$  (Dagnelie, 1998)  
Rounded to  
80/climatic zones  
(240 in total)

- ❑ Exhaustive floristic inventory, Abundance and covered area, Size (area of each HG), Socio-economic data (age, socio-cultural group, main activity).
- ❑ Use categorie (Food, Medicinal, Ornamental etc.)

## 3.2. Data analysis

*Floristic diversity of home gardens across climatic zones*

HG: (S, H, Eq)

Similarities among climatic zones: *Jaccard index*

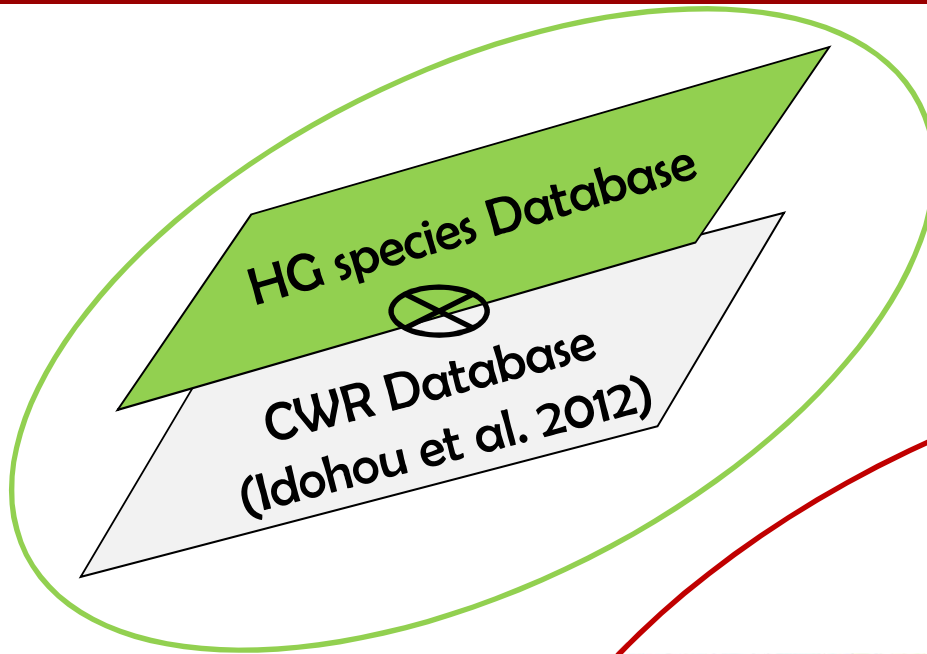
Ecological importance of each HG species according to each climatic zone: IVI (*Curtis & Macintosh, 1951*)

HCA and PCA



# 3. Methodology

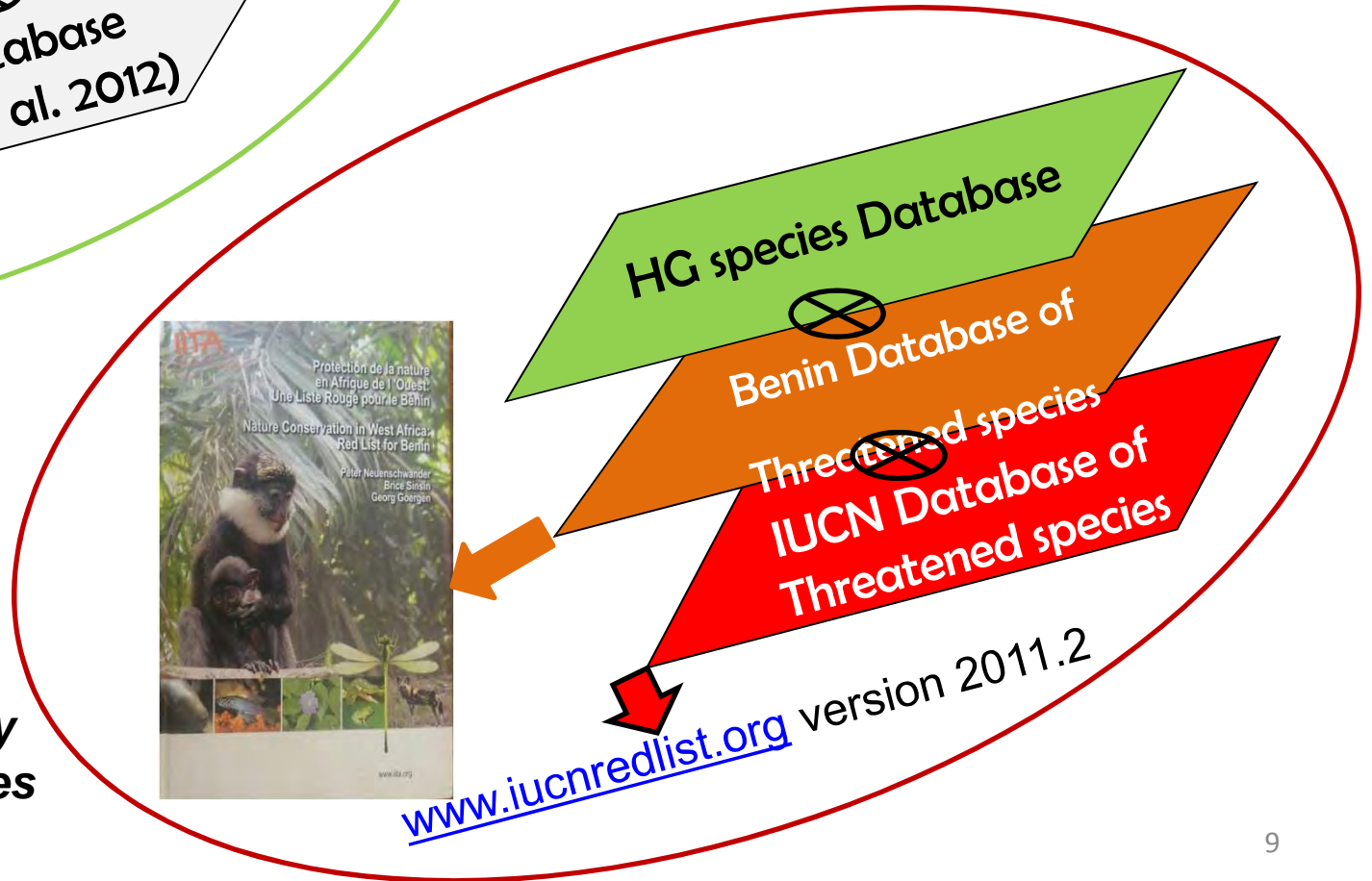
*Assessing diversity  
of CWR in home  
gardens*



*Assessing diversity  
of threatened species  
in Home gardens*



[www.iucnredlist.org](http://www.iucnredlist.org) version 2011.2

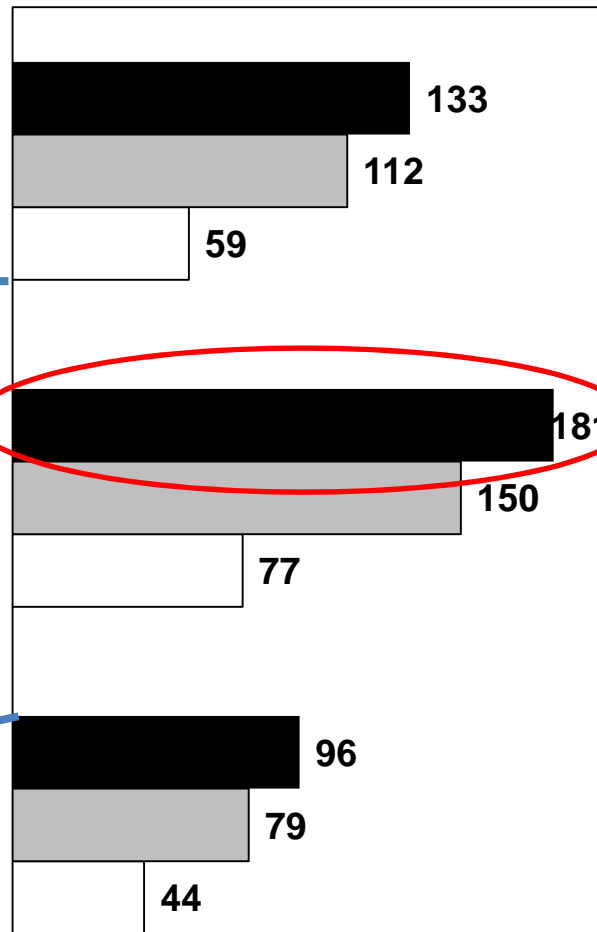
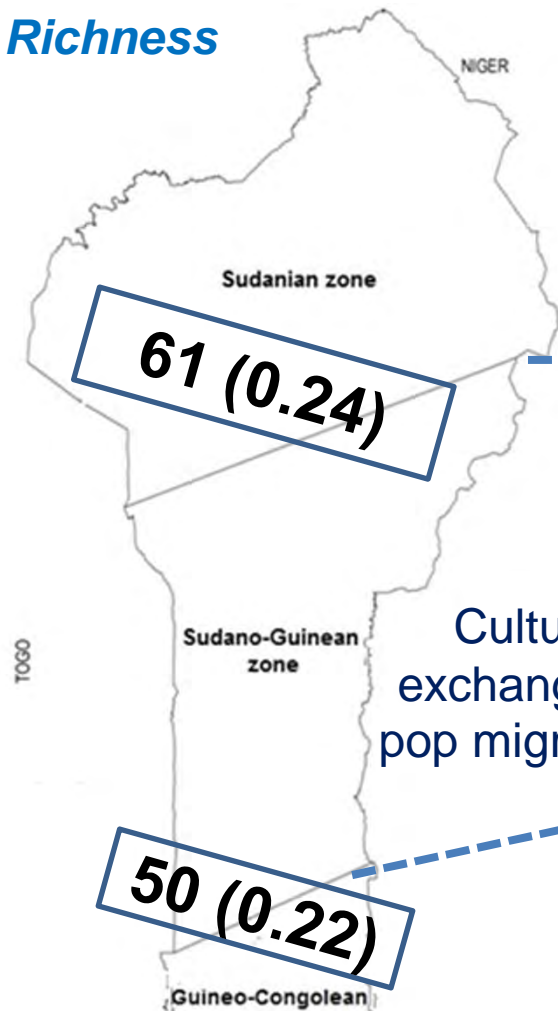


# 4. Results & Discussion

## 4.1. Floristic diversity of home gardens across climatic zones

Richness

285 species ~ about 10 % of the floristic diversity of the whole country (2800)



■ Species

■ Genera

□ Family

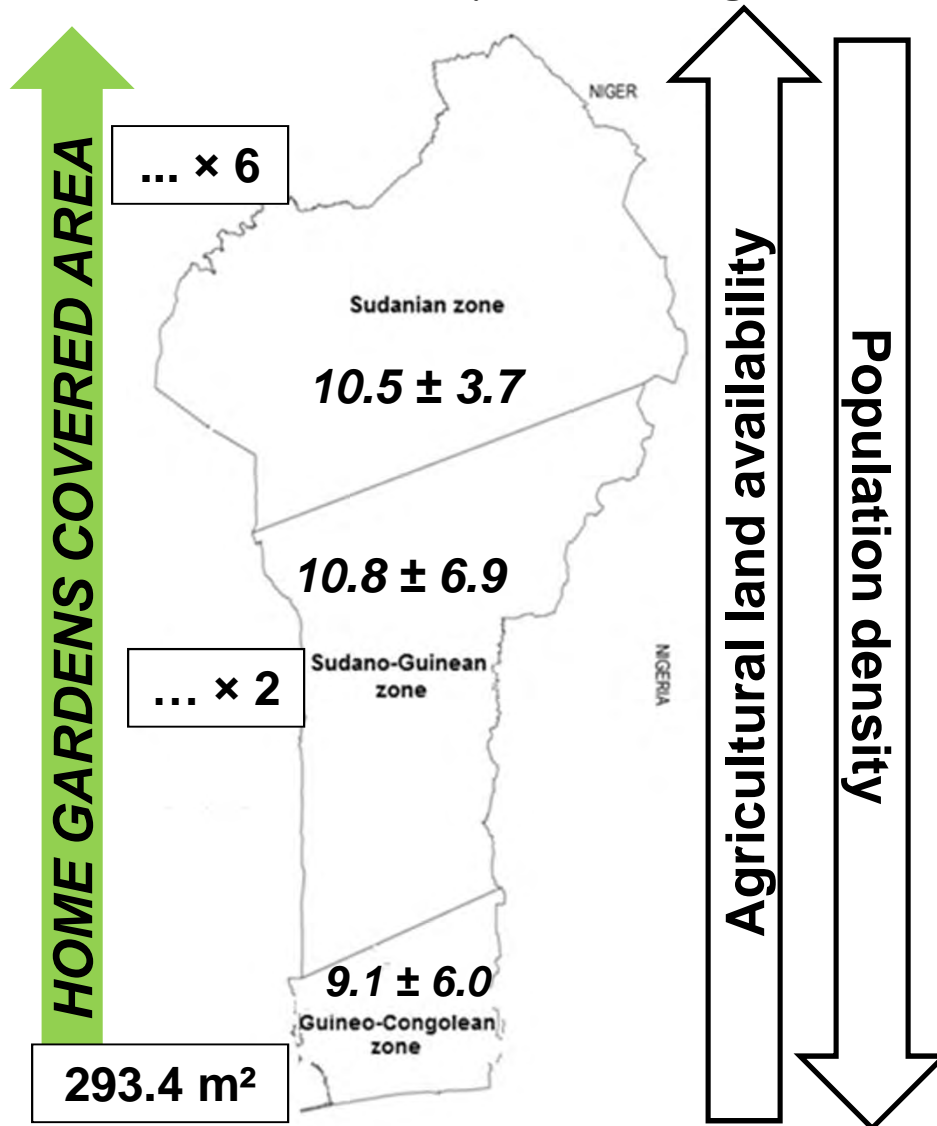
Rejection of H1: floristic diversity in HG does not decline with increasing altitude or declining precipitations

Richness



# 4. Results & Discussion

## 4.1. Floristic diversity of home gardens across climatic zones



### HG covered area

*The more available the land, the larger the home gardens area*

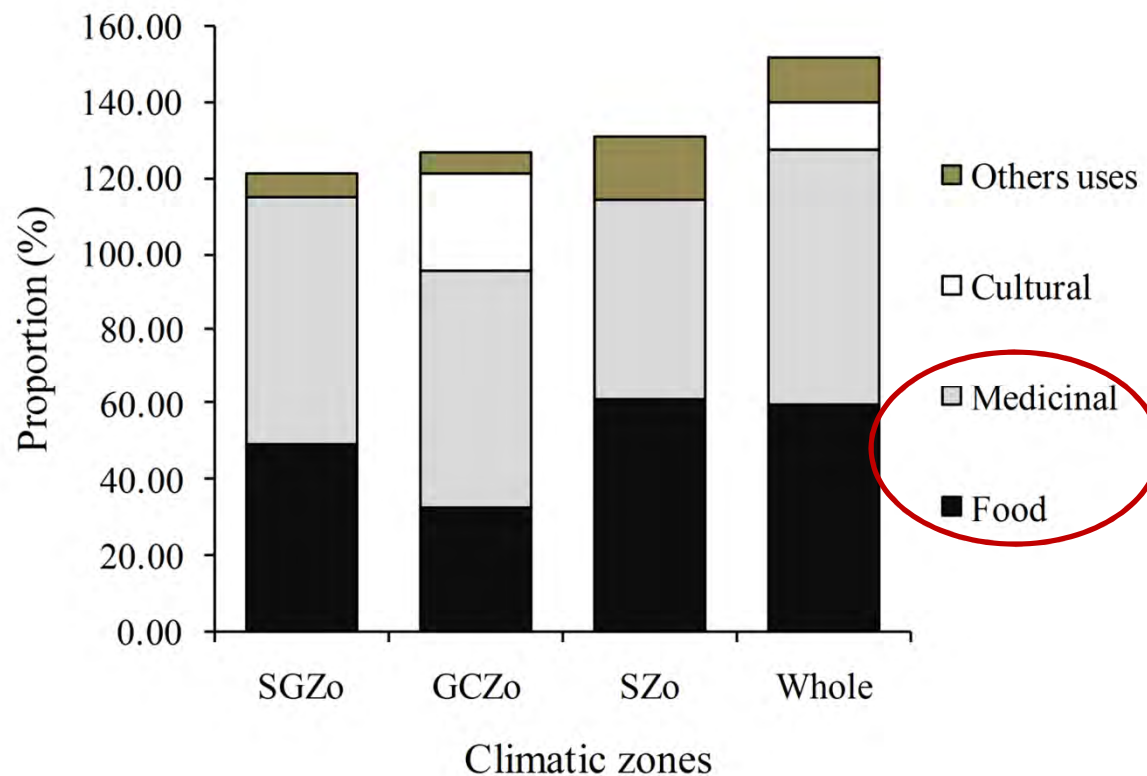
Average size for HG is context-dependent (Galluzi *et al.* 2010).

- *In rural area, their size is to some degree proportional to the size of the overall farm (Guarino and Hoogendijk 2004).*
- *In cities they largely depend on the competition for land from buildings and infrastructural development (Linares 1996).*



# 4. Results & Discussion

Uses categories of home gardens species according to the climatic zones



Other uses = Fodder + Ornamental + Timber + Fence

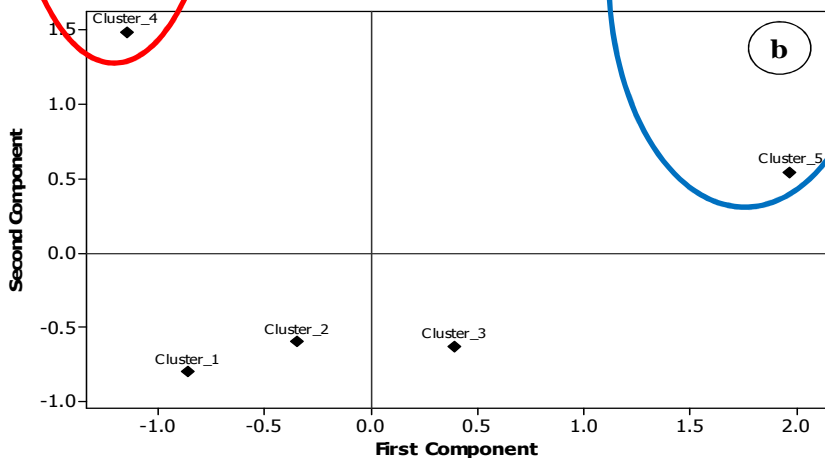
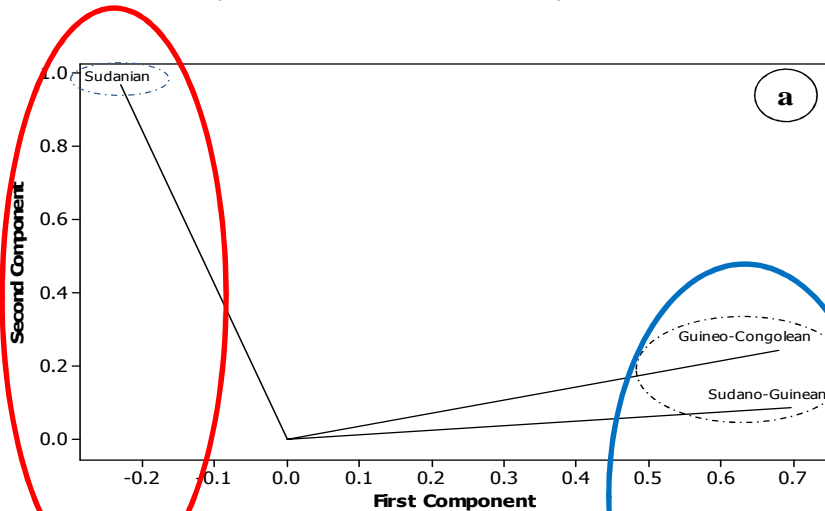


# 4. Results & Discussion

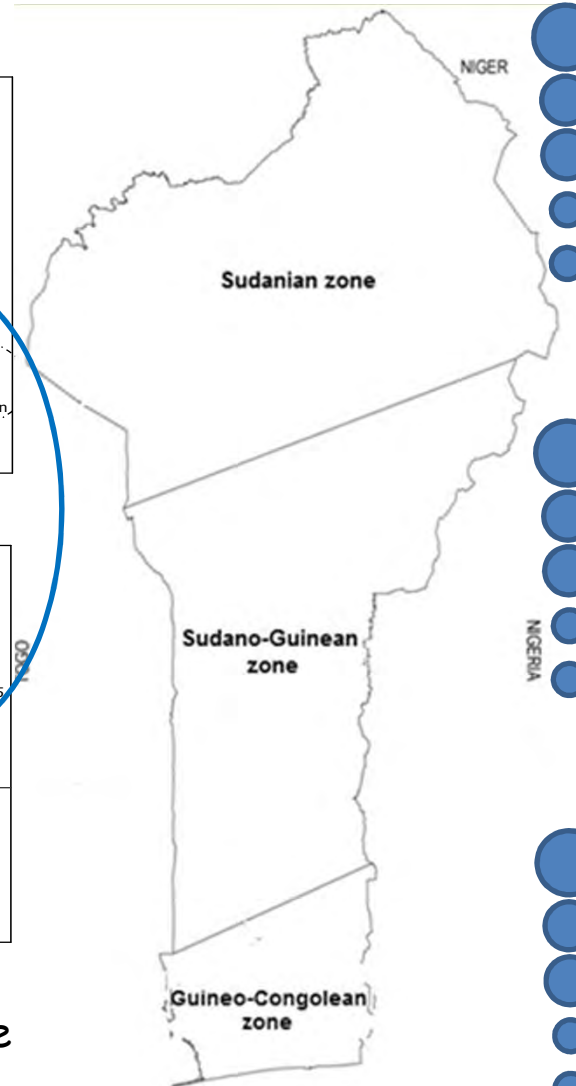
## 4.1. Floristic diversity of HG across climatic zones

### Most important HG species

TOP 5 important HG species



PCA: SG and GC zones shared the same important species (highest IVI-values)



Abelmoschus esculentus,  
Hibiscus asper,  
Capsicum frutescens,  
Hibiscus cannabinus,  
Solanum annuum

**(Cluster 4)**

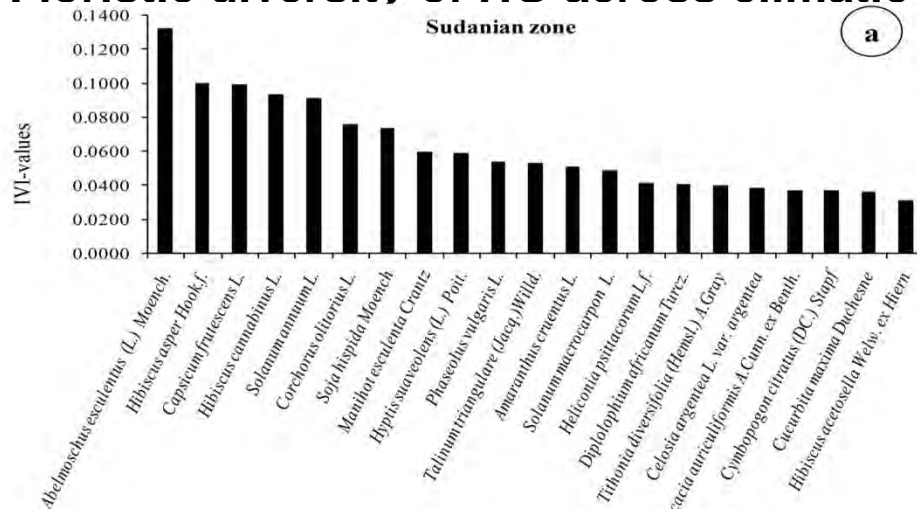
Solanum lycopersicum,  
Zea mays,  
Ocimum gratissimum,  
Colocasia esculentum,  
Citrus aurantium

**(Cluster 5)**

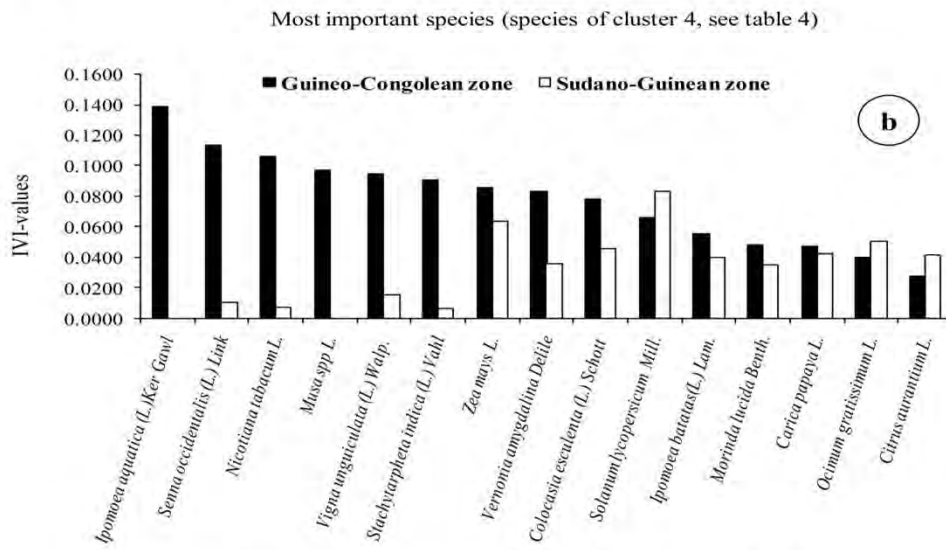
Ipomoea aquatica,  
Senna occidentalis,  
Nicotiana tabacum,  
Musa spp  
Vigna unguiculata

# 4. Results & Discussion

## 4.1. Floristic diversity of HG across climatic zones



*Most important HG species*

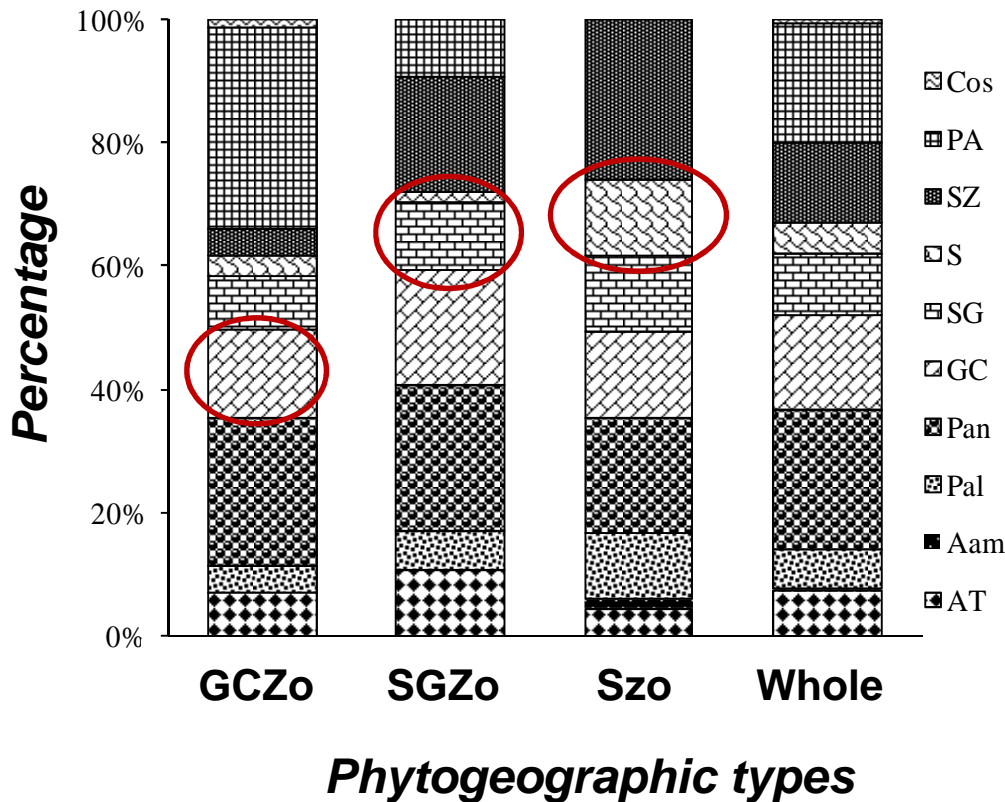


**Most important HG species vary according to climatic zones**

Most important species (species of cluster 5, see table 4)

# 4. Results & Discussion

Climatic zones were not dominated by their basic elements (native species).

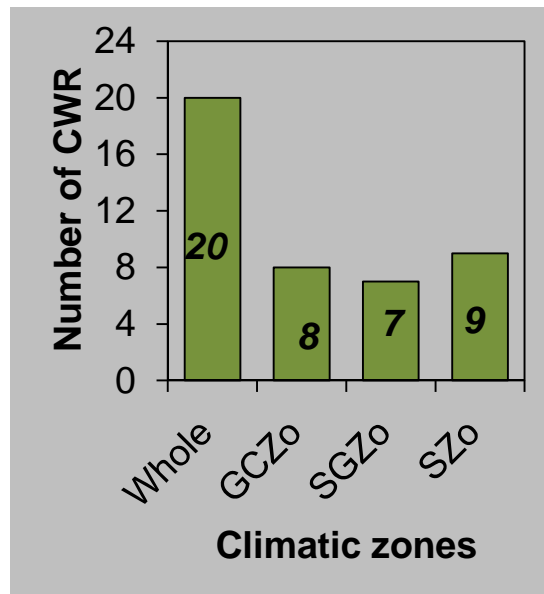


*Rejection of H2 and we conclude that HG are not dominated by chorological zones native species.*

**This reinforces the hypothesis of migration but would also suggest in some extent that HG are made to conserve non native plants brought by the owner from his trips or his connection with other ethnical groups.**

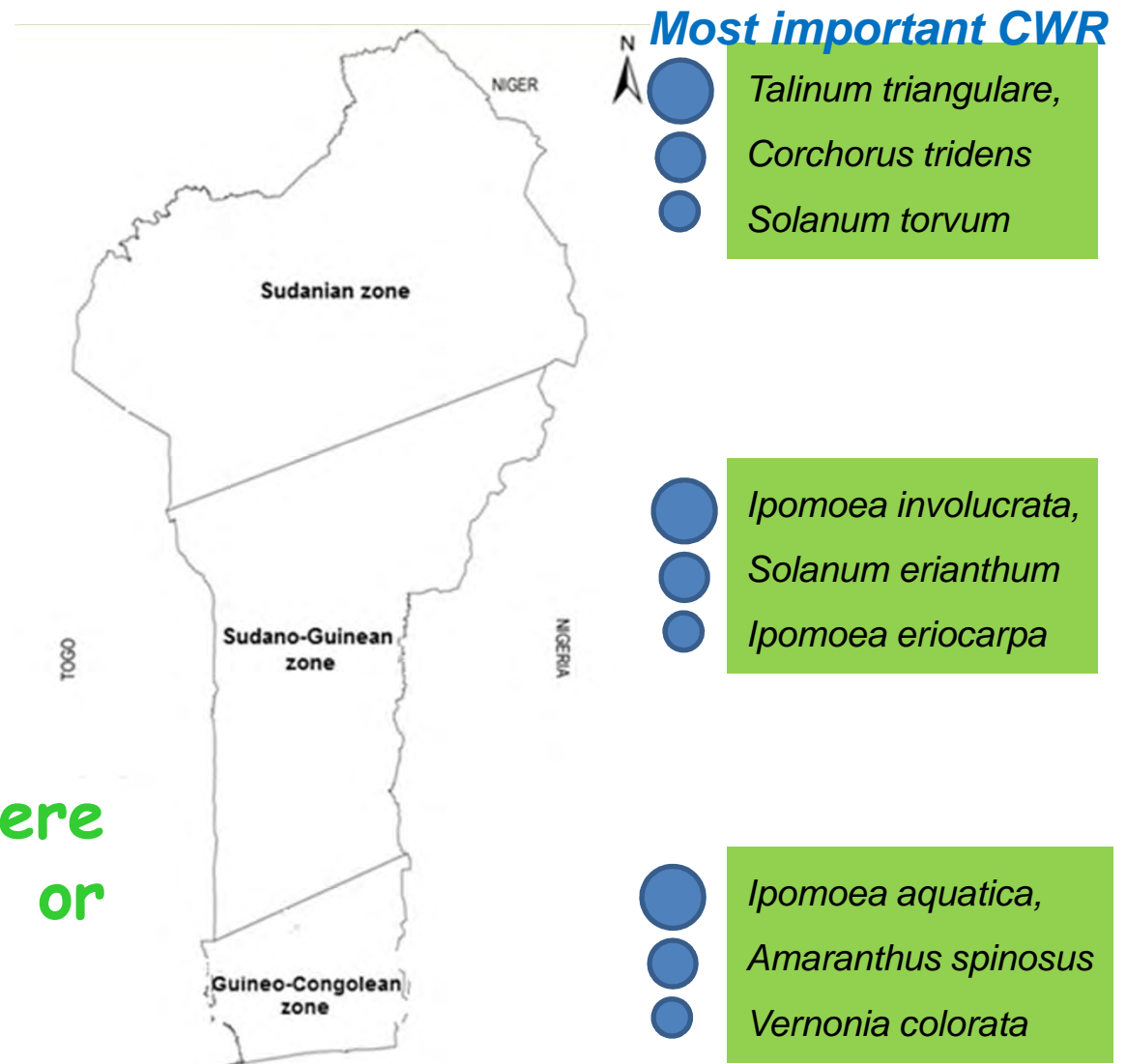
# 4. Results & Discussion

## 4.2. Diversity of CWR in home gardens through climatic zones



**Fig.** Number of CWR in climatic zones.

Most of the CWR were vegetables and pan or paleotropical (50%)



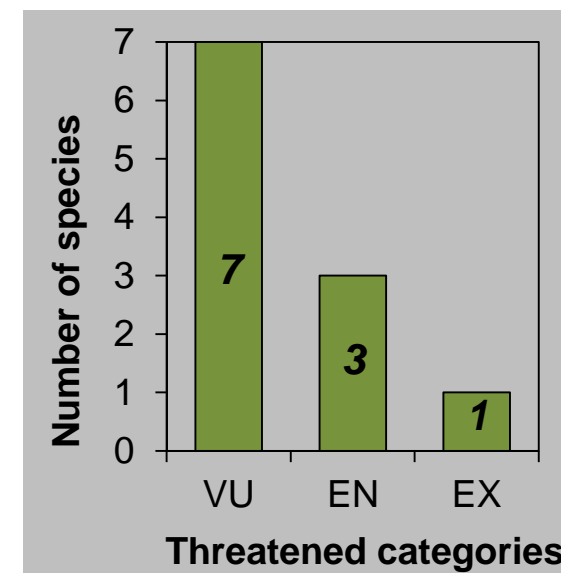


# 4. Results & Discussion

## 4.3. Conservation status of home gardens species

**Table.** List of home garden species threatened either on UICN or Benin Red List according to climatic zones

Species	Conservation status				
	Whole		GCZ	SGZ	SZ
	IUCN	Benin			
<i>Borassus aethiopum</i>	NE	VU		×	×
<i>Caesalpinia bonduc</i>	NE	EW	×	×	
<i>Christiana africana</i>	NF	EN		×	
<i>Colocasia esculenta</i>	LC	NE	×	×	×
<i>Commelina erecta</i>	LC	NE			×
<i>Culcasia scandens</i>	LC	NE		×	
<i>Irvingia gabonensis</i>	NT	NE		×	
<i>Khaya senegalensis</i>	VU	EN		×	×
<i>Kigelia africana</i>	NE	VU	×		
<i>Milicia excelsa</i>	NT	EN		×	
<i>Pentadesma butyracea</i>	NE	VU		×	
<i>Pterocarpus santalinoides</i>	LC	NE	×		
<i>Rhodognaphalon brevicuspe</i>	VU	NE	×	×	
<i>Terminalia superba</i>	NE	VU		×	
<i>Vitellaria paradoxa</i>	VU	VU		×	×
<i>Voacanga africana</i>	NF	VU	×		
<i>Zanthoxylum zanthoxyloides</i>	NF	VU	×	×	
<b>Total</b>	<b>3</b>	<b>11</b>	<b>5</b>	<b>9</b>	<b>3</b>



**Fig.** Number of HG threatened species in each category of threat.

106 plant species are threatened in Benin (Neuenschwander *et al.* 2011): 10% of which were found in HG. Their propagation in HG offer a protection environment and long-term conservation.

# 5. Perspectives

Conservation should also focus on HG instead of only protected areas !!!

Tropical home gardens deserve increased research attention as their potential for conservation is being considered (Edward and Kabir 2009).

- ❑ Analysis of the use value of the identified most important home garden species
- ❑ Socio-economic factors supporting the choice of HG species by farmers and how this vary from a rural context to a urbanized context
- ❑ Socio-economic factors supporting the possession of HG
- ❑ Traditional knowledge transmission through generations (old persons, youth, women)

❑ Sensitization

Provide more insights on the effectiveness of HG in conserving sustainably biodiversity, especially rare and threatened species and CWR.

**Thank you for  
your attention**



# RESEARCH TEAM

