



# Species diversity and post-harvest practices on the forest edge homegardens in southwestern Uganda

C. W. Whitney<sup>1,\*</sup>, J. Gebauer<sup>1</sup>,

<sup>1</sup> Faculty of Life Sciences, Rhine-Waal University of Applied Sciences, Marie-Curie-Straße 1, 47533 Kleve, Germany

\*contact: cory.whitney@hsrw.eu, +49 2821 80673 +664



## Introduction

### Homegardens as solutions for post-harvest losses and traditional crop preservation

Post-harvest losses (PHL) destroy between 20-60% of the East-African food production, thus heavily contributing to the devastating nutritional situation<sup>1</sup>. The great diversity of homegarden plant varieties are an important genetic pool<sup>2</sup> that may be a place for selecting plants with a high post-harvest performance.

## Research Aims

Hypothesizing that unique varieties and post-harvest practices exist the aims of the fieldwork were two-fold:

- Determine agrobiodiversity of homegardens at the forest edge in southwestern Uganda (Fig. 1)
- Determine ethnobotany and traditional knowledge of plant uses and processing techniques for plant products

## Methods

- **Interviews** with village chairman and 11-12 gardeners in each of three forest-edge villages, Kinoko-A, Kinoko-B, and Remitagu in Rubirizi District, Greater Bushenyi Region southwestern Uganda (Fig.1)
- **Agrobiodiversity Inventory** of 34 homegardens; plant species diversity, photographic and herbarium collections.
- **Recording Ethnobotany and Traditional Knowledge** of plant uses and post-harvest practices.

## Results

### Initial Investigations

Homegarden inventories found a high diversity of introduced and indigenous plant species. Interviews and observations indicated a high number of post-harvest practices (Table 1).

TABLE 1. PLANT SPECIES RICHNESS AND POST HARVEST PRACTICES IN 34 HOMEGARDENS

Village	Richness		Post Harvest Practices
	Total	Indigenous	
Kinoko-A	54	20	32
Kinoko-B	61	28	37
Remitagu	76	29	44

### Agrobiodiversity

Gardens contained high diversity (Fig. 3) with many indigenous plants. Of the 48 indigenous plant species found (Fig. 4) few had post harvest practices. Many were food plants with a flexible harvest while others were occasional medicinal plants.

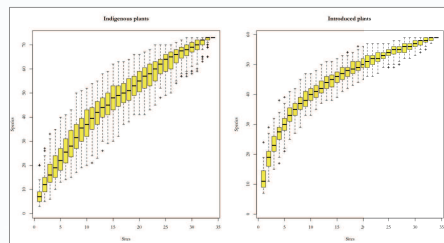


Figure 3. Species accumulation curves for 38 introduced and 46 indigenous plants from homegarden inventories

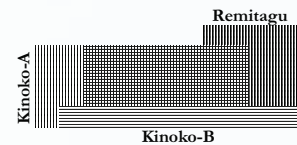


Figure 4. Total of 48 indigenous plant species. 7, 10, and 10 unique to Kinoko-A, Kinoko-B, and Remitagu, respectively.

TABLE 2. MOST ABUNDANT SPECIES IN 34 HOMEGARDENS IN SOUTHWESTERN UGANDA

Species	Kinoko-A	Kinoko-B	Remitagu
<i>Manihot esculenta</i>	177	128	191
<i>Musa acuminata</i>	90	152	137
<i>Amaranthus dubius</i>	494	107	49

Local *Amaranth* varieties (of *Amaranthus* spp. mostly *A. dubius*) have a year-round harvest and are not stored. Banana varieties (of *Musa acuminata*) have no post-harvest practices, instead they are eaten or rot soon after maturity. Cassava varieties (of *Manihot esculenta*) are stored longer term and/or dried and made into a powder to mix in the common local dishes Kalo and Posho.

### Post Harvest Practices

The local Robusta coffee varieties (of *Coffea canephora*) were cited for the most post-harvest practices; commonly dried in the sun before sale. Next most important were cassava and string bean (*Phaseolus vulgaris*) in Kinoko-A, chili (*Capiscum frutescens*) and cassava in Kinoko-B, and chili, and taro (*Colocasia esculenta*) in Remitagu. Sun drying was the main practice employed by gardeners to preserve these plants, while some roots were also stored longer term (Table 1).

## Conclusions

### Plant Diversity and Post-Harvest Practices

- Forest-edge homegardens of southwestern Uganda harbor traditional knowledge and varieties valuable for post-harvest performance.
- Post-harvest practices include sun drying and long term storage of root vegetables.
- Indigenous plants are the minority of the plants found but are nonetheless abundant.

### Future Research

- Consider the time-tested selection of plants with a long term flexible harvest (cf. *Dioscorea* spp., and *Colocasia* spp.) (on the decline in the villages surveyed).
- Consider problems for farmers: living below poverty level with small landholdings and extreme economic pressure to sell what little land they have for tree plantations and from crop raiding forest Baboon species (*Papio anubis*).

## Acknowledgements

### Funding

This study was undertaken as part of 'Verringerung von Nachernteverlust – Wertschöpfung in ostafrikanischen Nahrungsketten, Partner B' (031A247B) financially supported by the German Federal Ministry of Education and Research (BMBF) within the collaborative research project GlobE: RELOAD.



### Support

This work would not have been possible without the support of the Ugandan National Science foundation, the office of the President, and the approval of the local Regional District Coordinator and Chief Administrative Officer of Rubirizi. Special thanks are also due to Prof. Dr. Oliver Hensel of the University of Kassel in Witzenhausen Germany, Prof. Dr. John Tabuti, Dr. Joseph Bahati, and MSc. Antonia Nyamukuru, of Makerere University, Kampala, Uganda, and Dr. Katja Kehlenbeck of the World Agroforestry Centre (ICRAF), in Nairobi, Kenya.

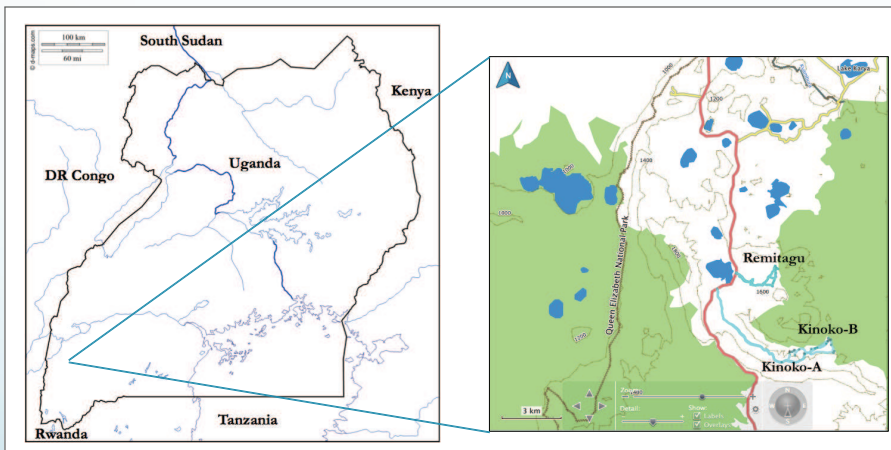


Figure 1. Map of Kinoko-A, Kinoko-B, and Remitagu in Rubirizi District, Greater Bushenyi Region southwestern Uganda (Map from D-Maps, France (INPI 09 3 673 169), inset from Garmin Basecamp © 2013 Garmin Ltd. (version 4.2.4), developed in QGIS 2.0.1-Dufour, Quantum GIS Development Team (2013), Open Source Geospatial Foundation Project



Figure 2. (a) Farmer processing common Local *Musa acuminata* cv. Ebitoke. (b) Farmer with local *Amaranthus* sp. cv. Doodo Mazungu (c) *Amaranthus* sp. cv. Doodo Ryankole on market stall. (d) Sun-drying *Manihot* sp. cv. Muhogo

1. Hensel, O. Welchen Beitrag kann die Forschung im Bereich Nacherntetechnologie zur Lösung des Welt Ernährungsproblems leisten? *Büro für Technikfolgen-Abschätzung*, Berlin (2011).
2. Wiehle, M. et al. Effects of transformation processes on plant species richness and diversity in homegardens of the Nuba Mountains, Sudan. *Agroforest Syst* 88, 539-562 (2014).