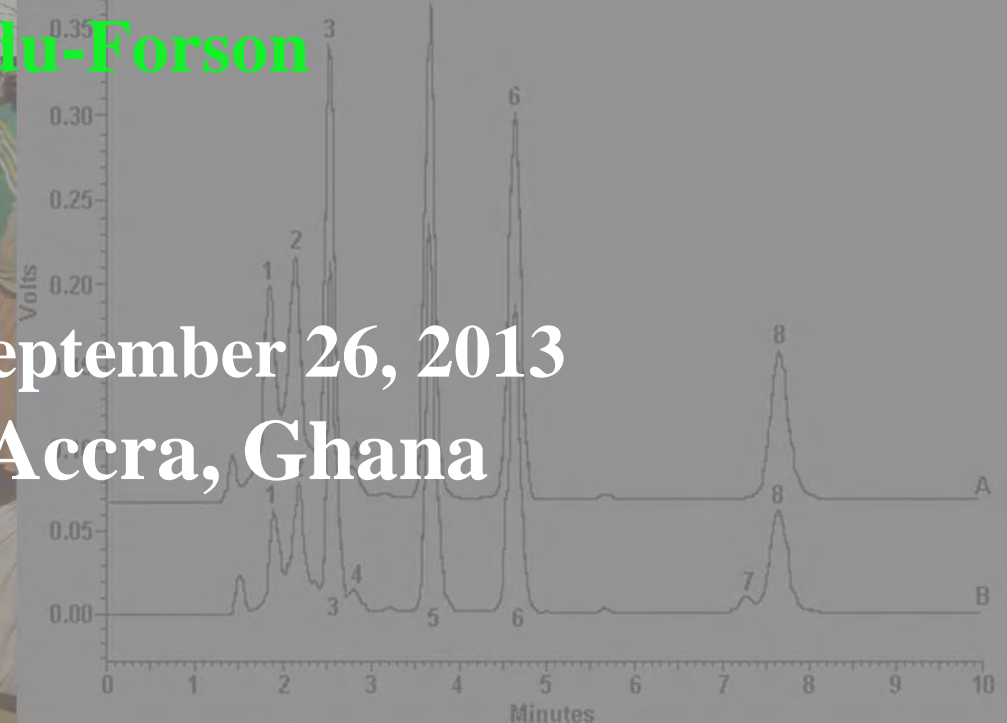


Wild and semi-wild edible plants: diversity, use in household food sovereignty in remote parts of southern Ethiopia and nutritional benefits

Getachew Addis, Zemedu Asfaw, Zerihun Woldu and JJ Baidu-Forson

September 26, 2013
Accra, Ghana



Presentation outline

- **Introduction**
- **Objectives**
- **The study area**
- **Materials and Methods**
- **Results and Discussions**
- **Conclusions & recommendations**
- **Acknowledgements**

Ethnobotany in Ethiopia

- **Ethnobotany as a practice : long years**
 - **Earliest literature focus on traditional medicine**
 - **Francisco Alvares of 16th Century**
 - **Meshafa Fewes of the 17th Century & Meshafa Madhanit of 18th Cent.**
 - **James Bruce (1768)**
 - **G.W. Schimper (1837)**
 - **N.I. Vavilov (1920-30)**

Ethnobotany in Ethiopia cont'd

➤ **Ethnobotany as a science in Ethiopia (recent)**

Qualitative

- **I.E. Siegenthaler (1960)**
- **Amare Getahun (1974)**
- **J. Abbink (1993)**
- **Zemedede Asfaw and Ayele Nigatu (1995)**

Quantitative (Since 2000)

- **MSc and PhD students**
- **Few others**

cont'd

WEPS

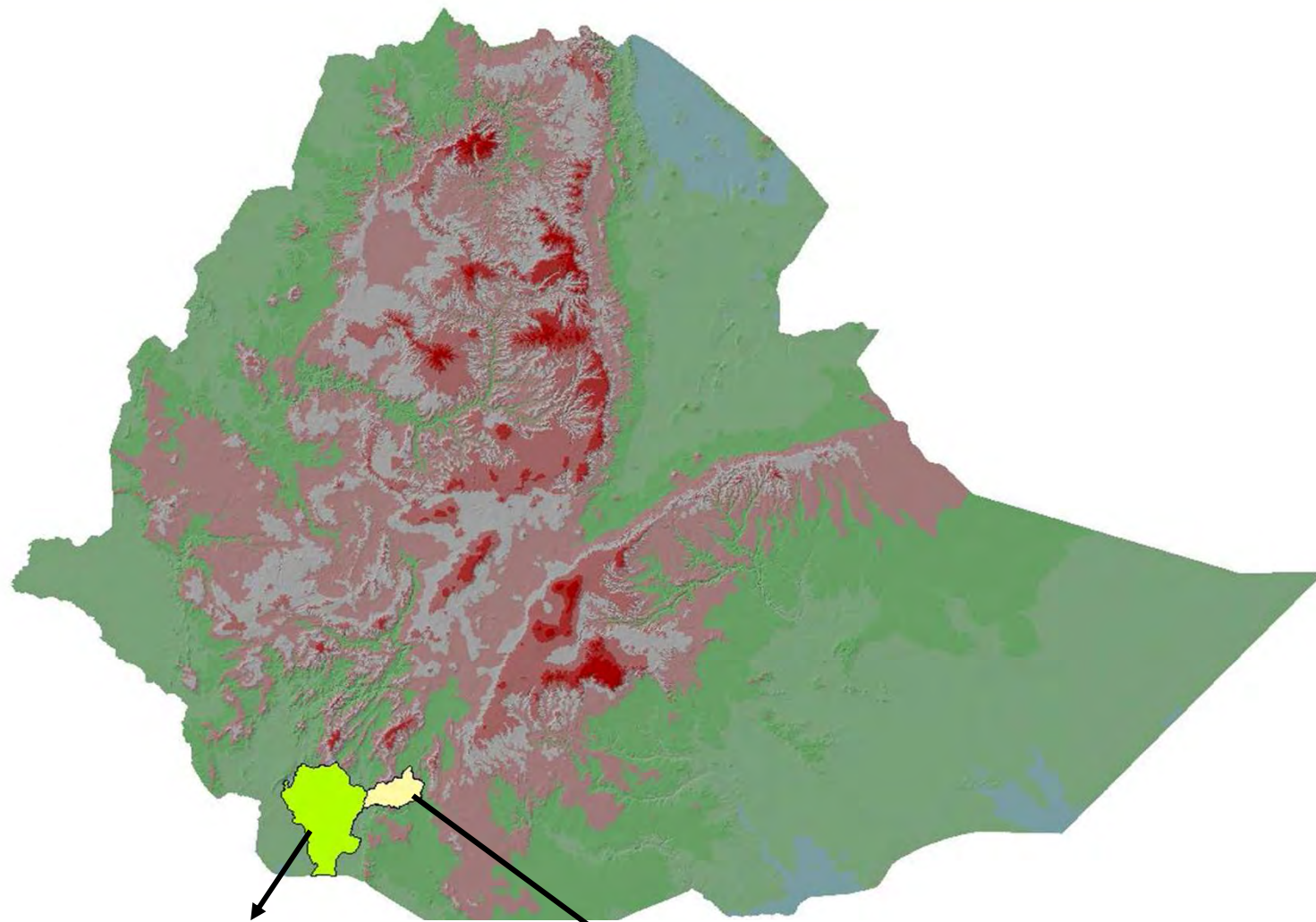
- **Wider use of WEPS**
- **Limited documented information on WEPS**
- **Acculturation, displacement and diminishing biodiversity lead to loss of the IK & WEPS**

OBJECTIVES

- **Study KAP on WEPS,**
- **Study consumption pattern of edible parts at household level,**
- **Study nutritional composition of selected edible parts,**
- **Effect of processing on nutritional and other compositions.**

STUDY AREAS

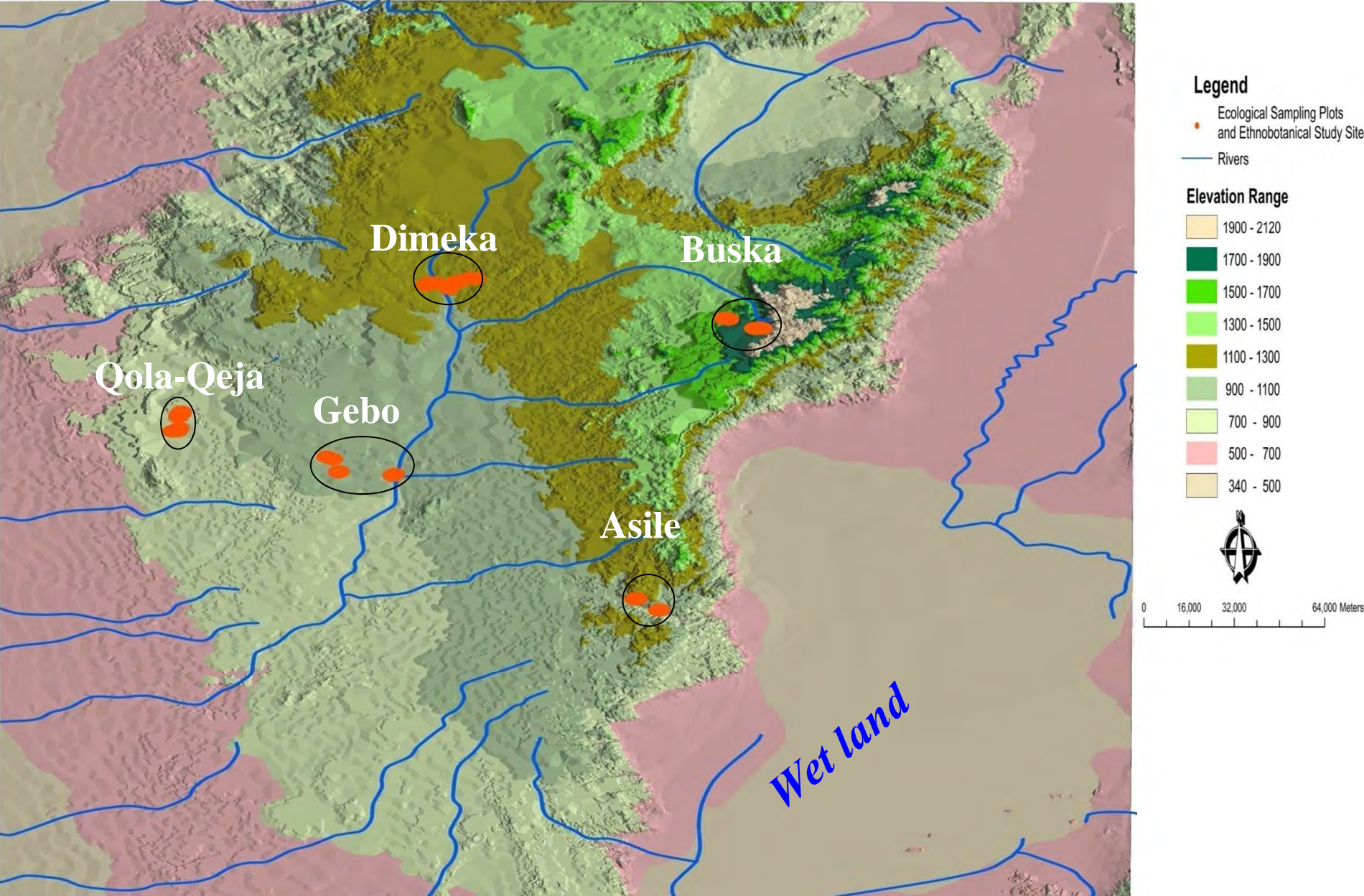
Reconnaissance survey: Two districts



Hamar district

Konso district

STUDY AREA Cont'd : Hamar



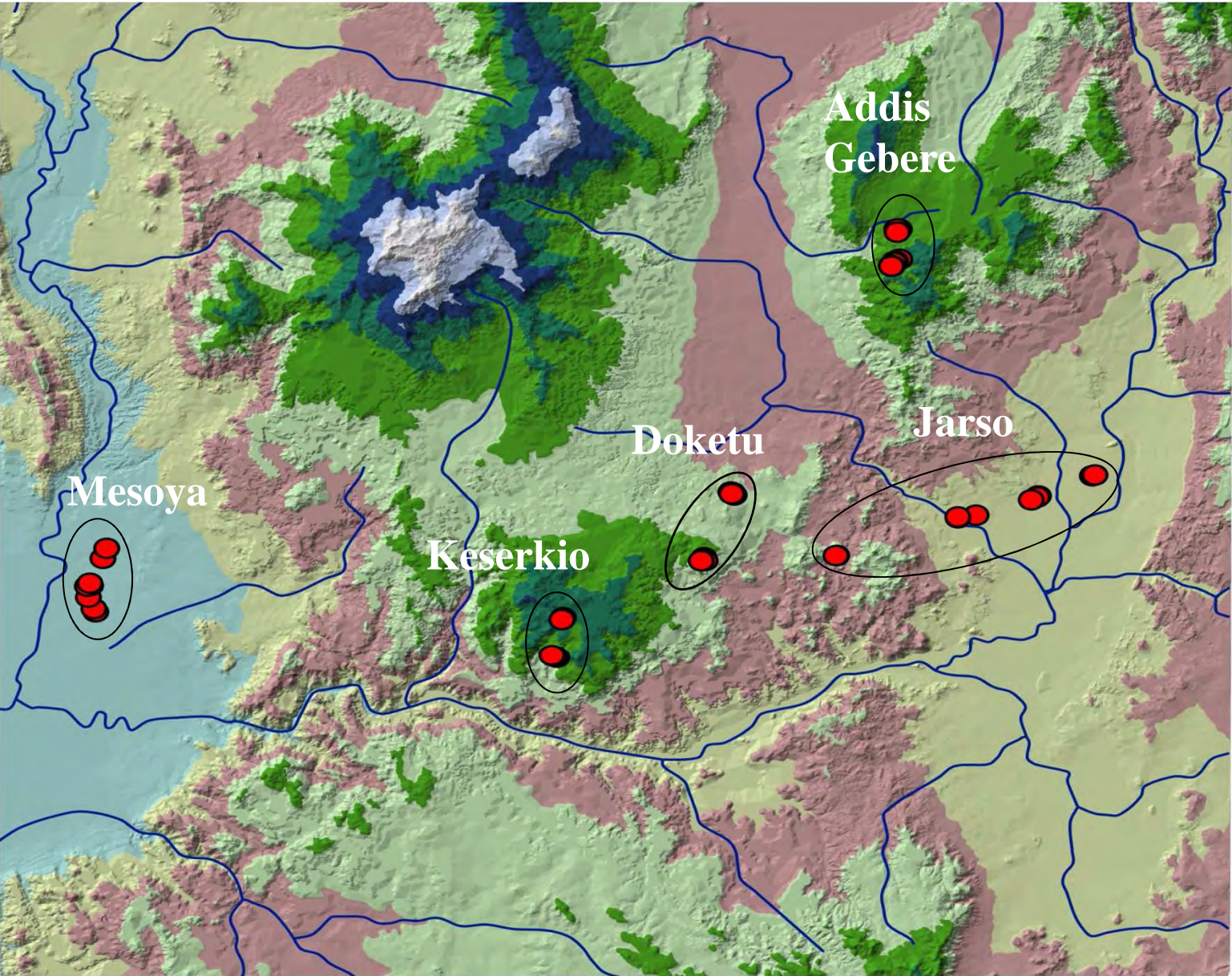
Hamar Community







STUDY AREA Cont'd : Konso



Legend

● Ecological Sampling Plots and Ethnobotanical Study Sites

— Rivers

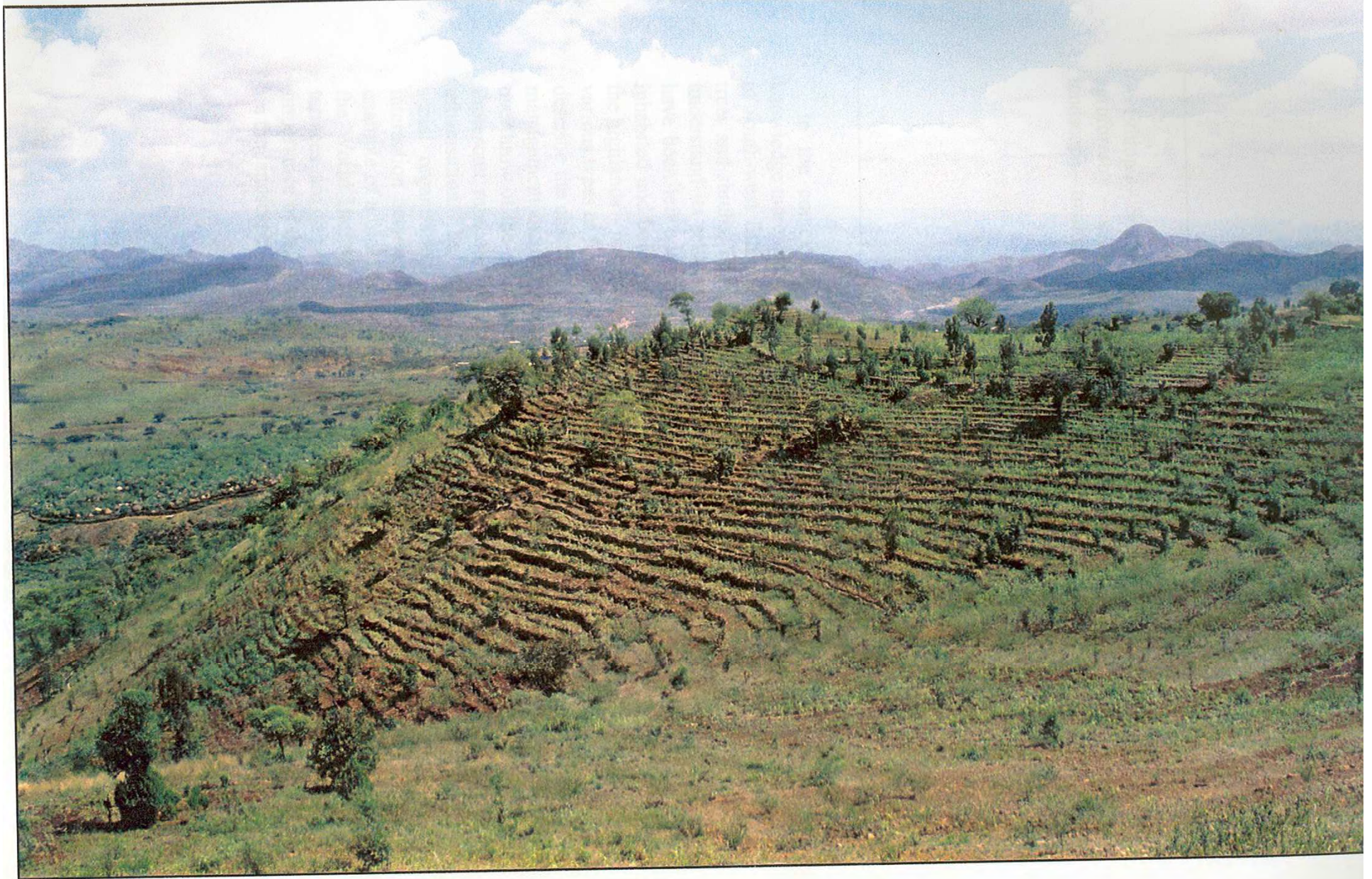
Elevation Range

- 2500 - 2760
- 2250 - 2500
- 2000 - 2250
- 1750 - 2000
- 1500 - 1750
- 1250 - 1500
- 1000 - 1250
- 750 - 1000
- 540 - 750



0 11,500 23,000 46,000 Meters

Konso landscape and terracing



The walled village of Docketu & its vegetation



Lowland



Local practice of Field gene bank



Mura Poqalla: Forest of the king



Food habit



L. hastata collection



MATERIALS & METHODS

Data Collection and Analysis

- **Community based study**
- **Laboratory investigation**
- **Data analysis**

Cont'd

1. COMMUNITY BASED STUDY

➤ Selection of study area

- Reconnaissance survey**
- Preferential selection (Districts and communities)**
- Stratified sampling (Agroecy & Distrbn of Kebeles)**
- Multistage**

Kebeles ---- Primary

Villages---- Secondary

MAT. & MET. Cont'd

- **Households: main study (670) and sub-study (101)**

$$n = \frac{Z^2 * P * (1-P)}{d^2}$$

➤ **Ethnobotanical data collection**

1.1. Guided field interview

1.2. Focus Group Discussion

1.3. Household interview

Cont'd

2. LABORATORY INVESTIGATIONS

➤ Nutritional analysis

- Proximate composition (M+E+P+A+CF + C)
- Minerals (Ca, Mg, Fe, Zn, Mn & Cu + Cd & Pb)
- Amino Acids (profile)

➤ Antinutritional factors

- Phenolics
 - Tannins
 - Phytic acid
 - Oxalates
- } Antioxidants

Cont'd

Proximate Composition

15 Edible parts (Hamar & Konso)

Dried (Moisture etc.)

Ash (Furnace)

Ether extractive (Soxhlet)

Nitrogen (Microjeldhal)

Minerals

Ca, Mg, Fe, Zn,
Mn, Cu, Cd, Pb

Crude Fiber

X 6.25

Protein

Carbohydrate = 100 - (M+E+P+A+CF)

Amino acids

REF. : AOAC (1995)
AOAC (2000)
AACC (2000)

Cont'd

“Antinutritional factors”

Phenolics (GAE)

Folin-Ciocalteu reagent (Singleton and Rossi, 1965)

Tannins (Catechin eqt.)

Modified vanillin assay (Burns, 1971, Maxon and Rooney, 1972
Price *et al.*, 1978 and Sadasivam and Manickam, 1992)

Phytic acid

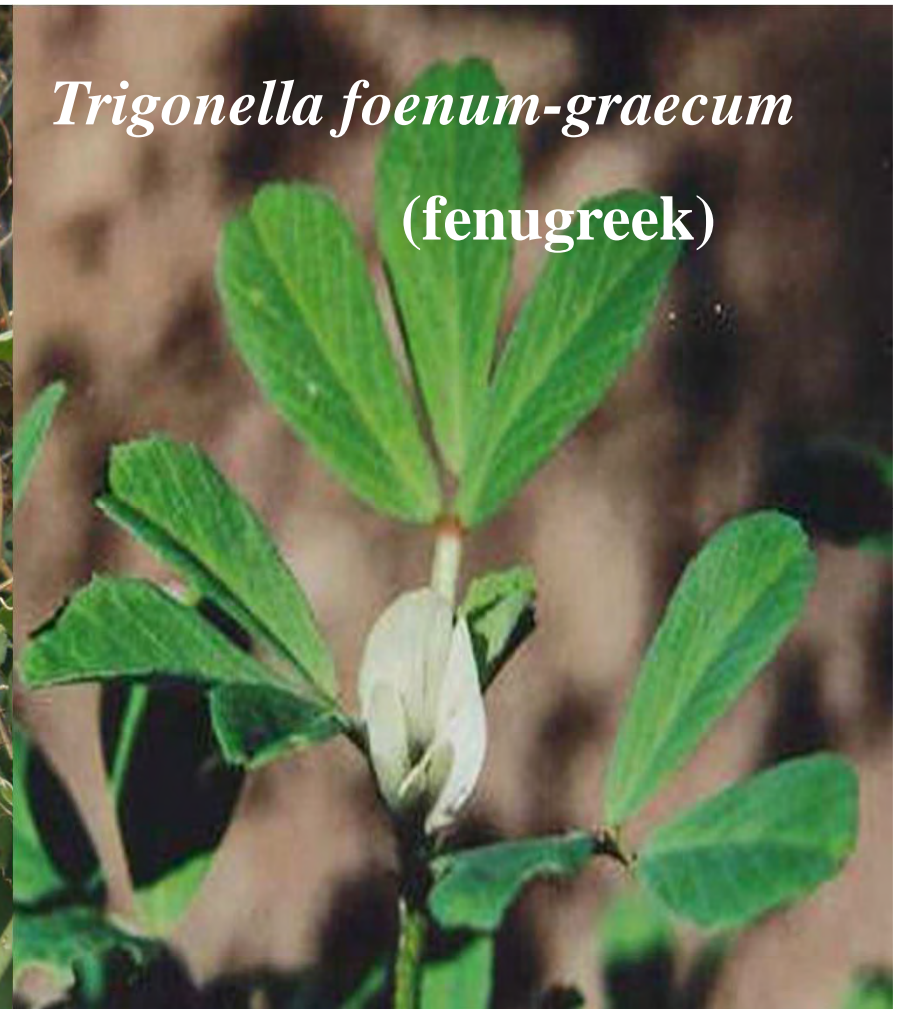
Precipitation analysis (Thompson and Erdman, 1982)

Oxalates (Total & Soluble)

HPLC (Savage *et al.*, 2000)

Effect of processing on some quality parameters of GLVs

The study plants



Processing methods

Drying

- Lyophilizer
- Cross flow drier
- Shade
- Sun

Blanching

- Boiling water
- Saline water (1% NaCl)
- Steam

Blanching & Drying combination treatments

Cont'd

Parameters

- Carotenoids**
- “Antinutritional factors”**
- Antioxidant activity**

Cont'd

3. DATA ENTRY & ANALYSIS

- Data entry
- Descriptive analysis
- Quantitative ethnobotanical tools
 - Preference ranking
 - Fidelity level
 - Classification
 - Ordination
 - Index of ingestion ----- concept used

$$II = \frac{WI}{WO}$$

(Addis *et al.*, 2009)

Results and Discussion

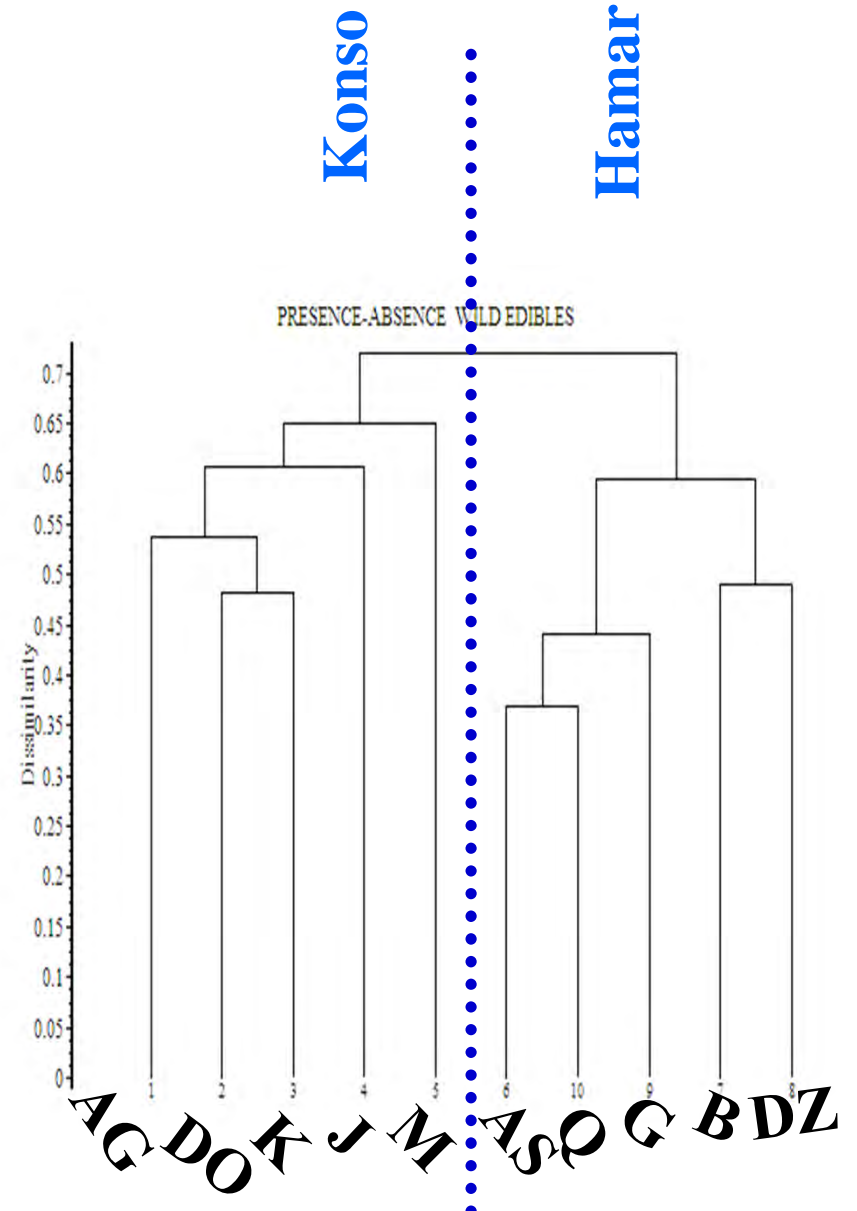
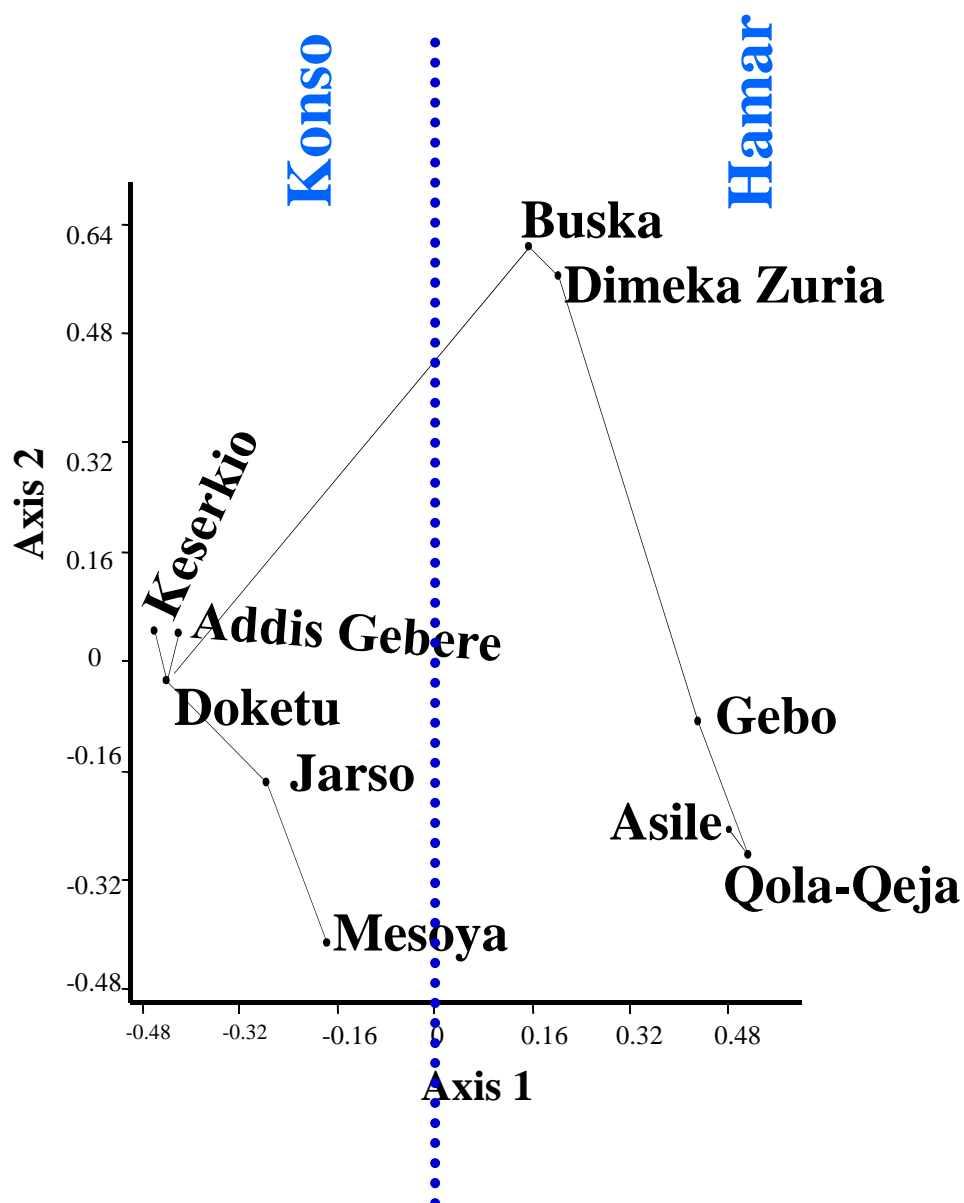
➤ Ethnobotanical knowledge on WEPS

- Knowledge conveyed through practice and folklore
- 206 EWSWPS (185 at species, 6 Genera & 15 LN)
 - 143 Hamar
 - 138 Konso

75 (36.4%) of the species common to both Hamar & Konso

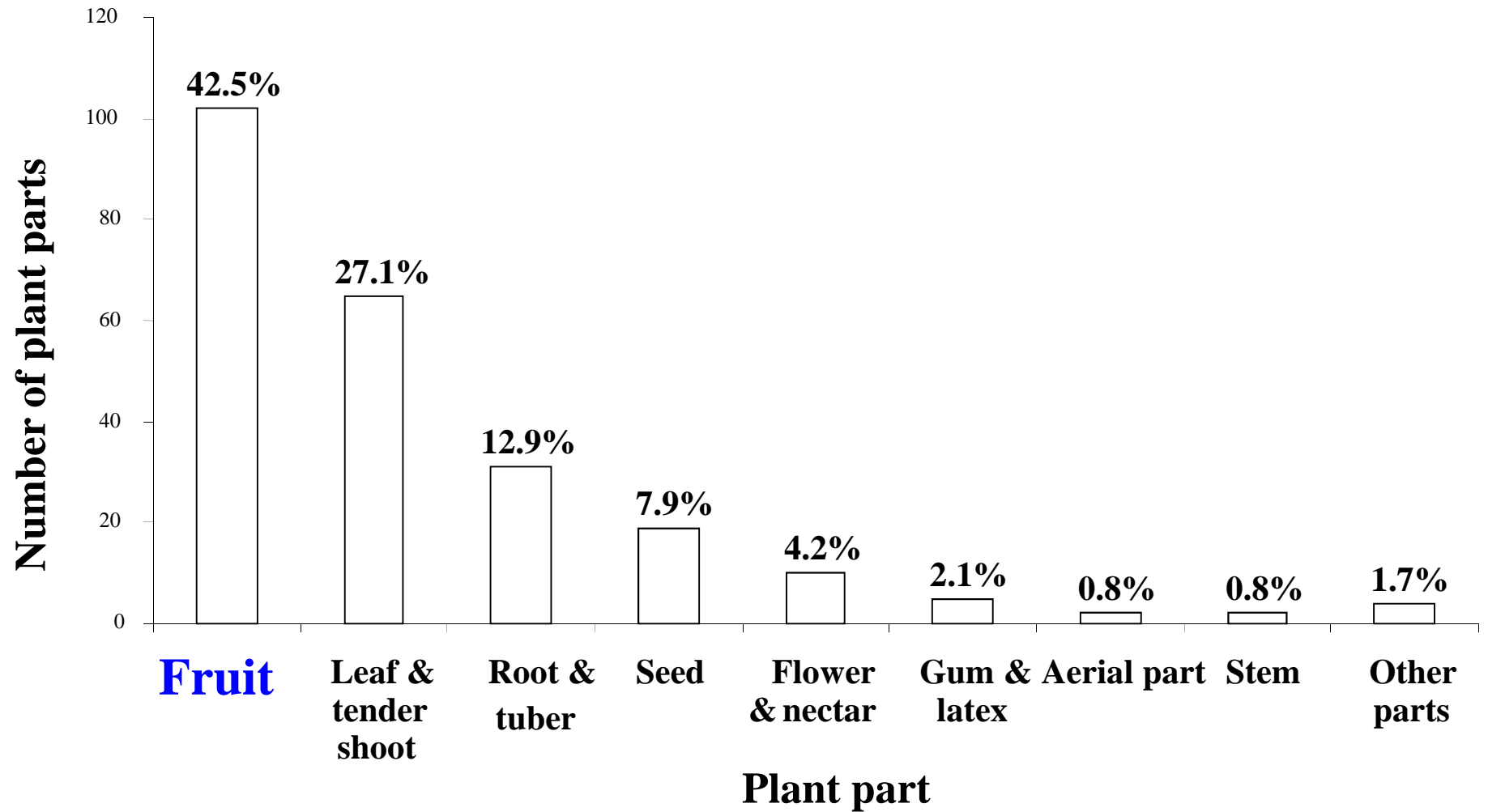
Cont'd

Presence/absence of WEPS (Ordination & classification)



Cont'd

Plant parts (240)



Hamar



Maerua angolensis

Moringa stenopetala



Leptopetalonia



Ximenia caffra

Konso

WEPS in home garden

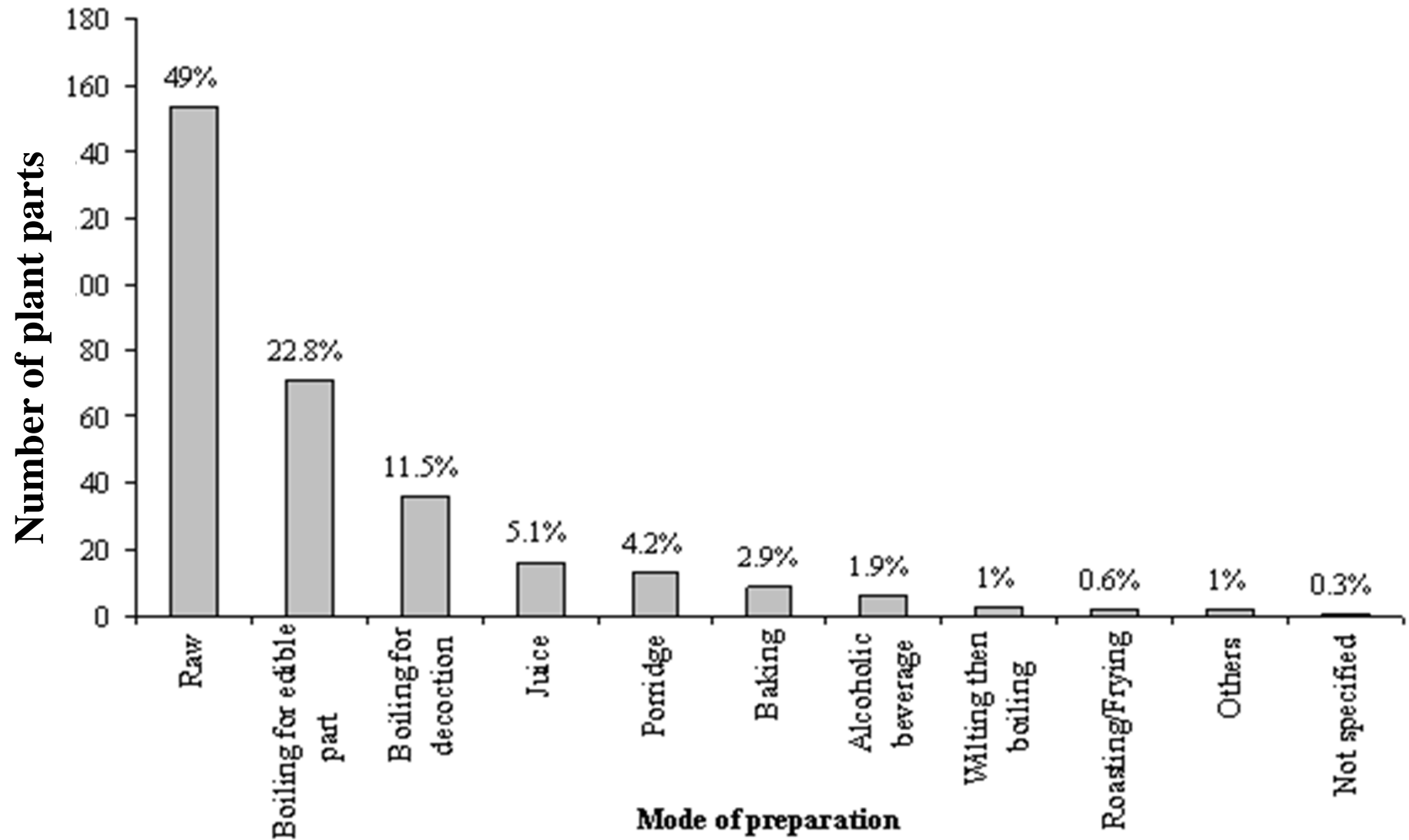


Konso



Cont'd

Preparations



Cont'd

➤ **Preference**

■ **Taste:**

Fruits: *Opuntia ficus-indica* (Konso)

***Grewia erythraea* (Hamar)**

GLVs (K & H)

Leptadenia hastata

■ **Low Food Stock (K & H)**

Leptadenia hastata

Cont'd

- **Cash earning**

Leptadenia hastata

Balanites rotundifolia (seed)

Cont'd

➤ **Consumption pattern at household level**

- **All study participants consumed WEPS**
- **Intensity and frequency of consumption**

depends on:

- **Food stock**
- **Season**

Cons.-pattern in Hamar (Table con_pat_Ham)

Cons.-pattern in Konso (Table con_pat_Xon)

Cont'd

➤ Nutritional and antinutritional factors

■ Edible plant parts

- 13 GLVs
- One tuber
- One fruit

■ Tests

- Proximate (Protein, fiber, minerals)
- Selected minerals (Table 25)
- Selected antinutritional factors (Table 26)
- Amino acids (Lysine rich)
 - *Coccinia grandis*
 - *Trigonella foenum graecum*

Cont'd

Effect of processing

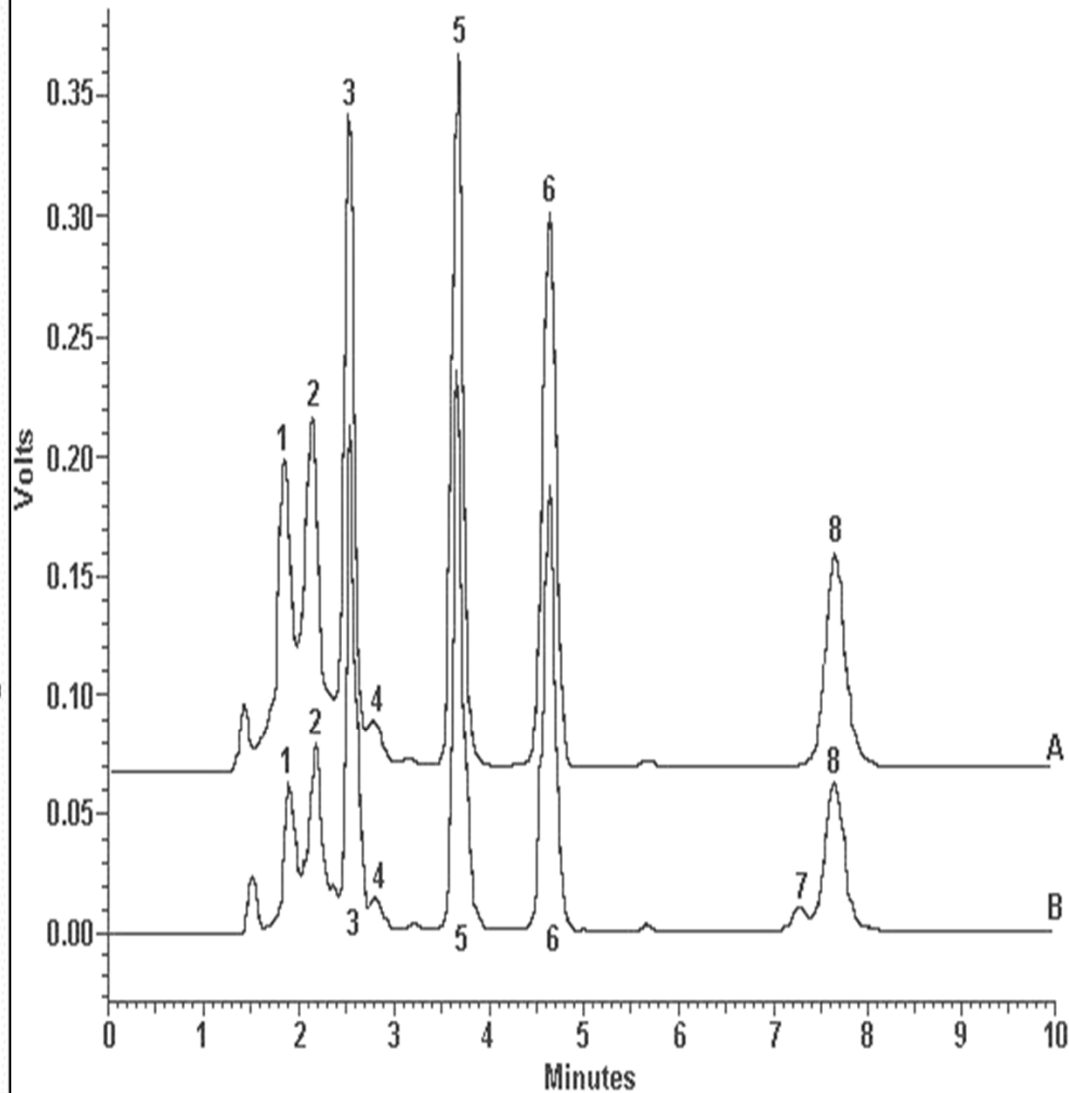
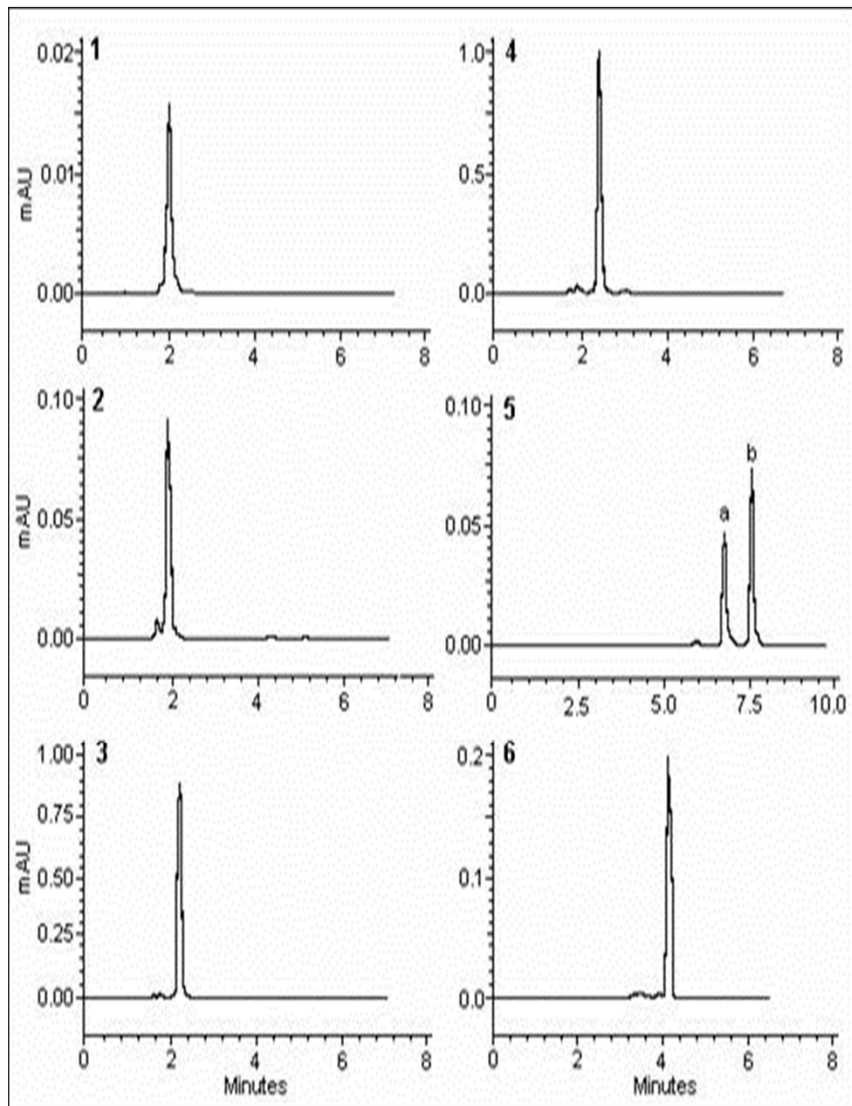
- **Test ingredients**

- Carotenoids (direct sun light)**

Cont'd

Carotenoid standards

Trigonella foenum-graecum (A) and *Coccinia grandis* (B)



Cont'd

- ☐ Antinutritional factors (each has its own property and must be dealt individually)**
- ☐ Antioxidant activity (sun)**

Cont'd

➤ *Other major uses*

➤ **Medicine**

Nutraceutical

Other parts

Ximения caffra



Cont'd

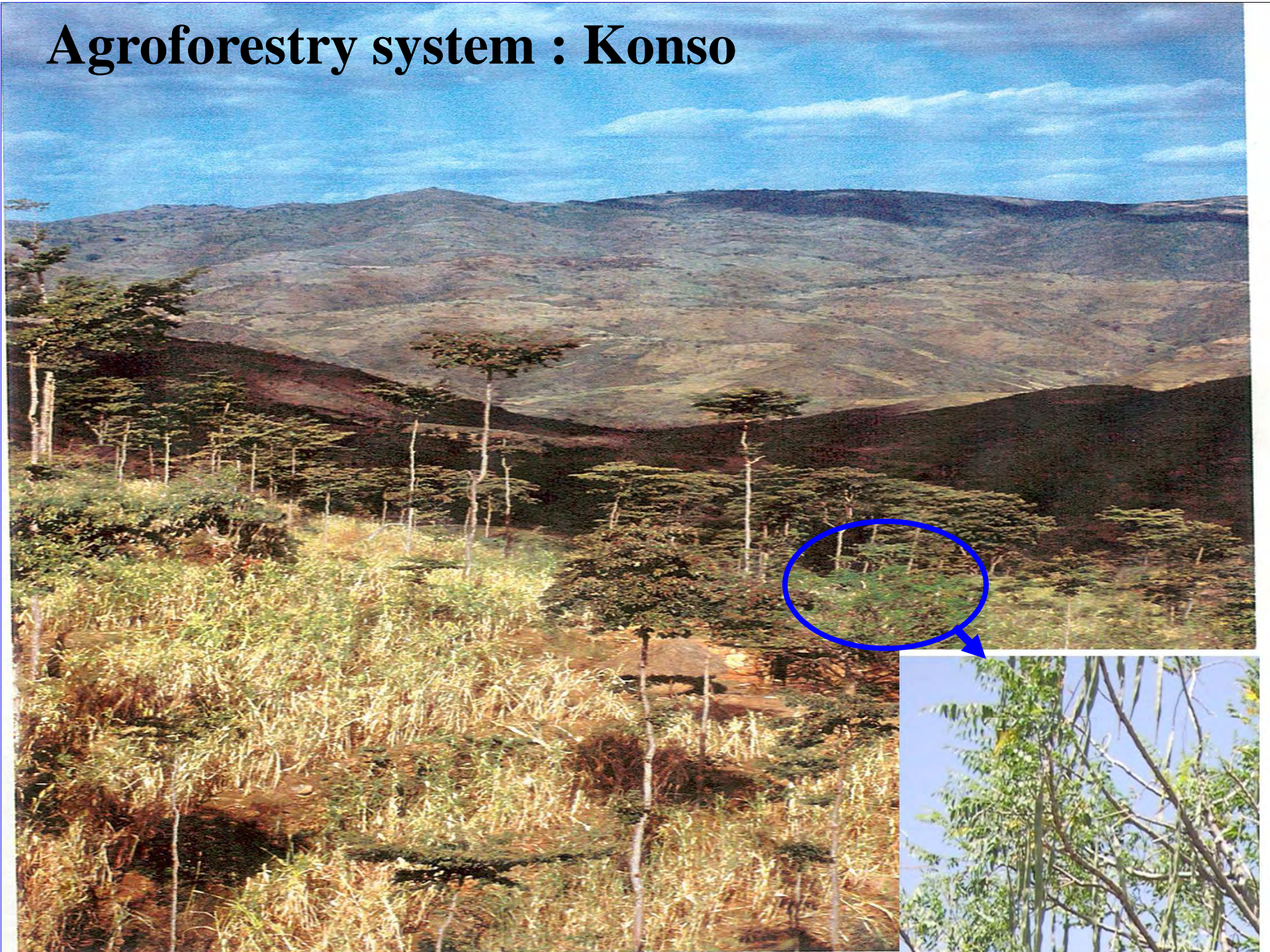
➤ **Beehive making**

- **Low impact on sustainability (good resilience)**
- **Destructive harvesting (low/no resilience to harvesting)**

Impact of harvesting plants for beehive making, Hamar



Agroforestry system : Konso



Conclusions & recommendations

- 1. There is higher diversity and dietary significance of WEPS**
- 2. Selective harvesting (destructive) for different uses other than edibility is a threat to many tree and shrub WEPS**
- 3. There is wild-cultivated continuum of WEPS in both communities**
- 4. GLVs (dried) are rich in protein & lysine but requires bioavailability study**
- 5. Consume assorted vegetables & others**

Cont'd

5. Promotion: Stepwise

✓ **first line**

❑ *Moringa stenopetala* (Leaf)

❑ *Solanum americanum* (Leaf)



Hamar & Konso

❑ *Amaranthus hybridus* (grain)

❑ *Opuntia ficus-indica* (Fruit)



Konso

Policy recommendations

- ✓ **Identify, conserve & conduct research (multidisciplinary) on WEPS**
- ✓ **Develop and Promote WEPS in stepwise manner**
- ✓ **Create/raise community awareness on the benefit of conserving & using (for food) WEPs**

Acknowledgements

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- **Dr V. Prakash**
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- **Dr Girma Akalu**
- **Dr Alemayehu Worku**
- **Konso & Hamar**
- **Staff of EHNRI**
- **Staff of CFTRI**
- **AAU**
- **My family**

Organizations

- **EHNRI**
- **AAU**
- **UNU**
- **CFTRI**
- **NH of AAU**
- **NMA**
- **Hamar & Konso**



Ameseginalahu!!