

Plant Agrobiodiversity in Ethiopia

Zemedet Asfaw, Department of Biology, Addis Ababa University, Ethiopia

Abstract

The situation with the agrobiodiversity of plants in Ethiopia is briefly highlighted to give a picture of its distribution across landscapes and farming systems; concurrently relating it with farmers' traditional management. The spatial layout in home gardens, crop fields and adjacent areas presents a complex pattern of distribution. Major crop categories, species and the genes in these and other useful plants depict another level of agrobiodiversity. A major portion of Ethiopia's most valuable biological diversity is maintained in and around agricultural ecosystems through farmers' on-farm conservation. To the diversity that exists at the ecosystem, species and genetic levels, traditional cultivators have added another dimension that reflects their social needs and cultural practices. When natural phenomena and the human impact are considered, agrobiodiversity conservation poses a real challenge on theoretical and practical considerations. Our conservation actions have to be equivalently geared to the different hierarchical levels in order to be able to maintain adequate amounts of the diversity that nature and human efforts have produced..

Introduction

Ethiopia has a relatively big landmass with contrasted geography, extensive highlands and rugged topography. Variations geology, climate, soil and other physical features are also considerable. The major plant-based farming systems that evolved during the long period of agricultural practices are the grain-based, enset-based and shifting cultivation types in which many indigenous and introduced crops are actively managed. A rich agrobiodiversity is documented in this Vavilovian gene centre, which is a primary gene centre for crops like *Eragrostis tef*, *Ensete ventricosum*, *Coffea arabica*, *Guizotia abyssinica*, *Coccinia abyssinica*, *Plectranthus edulis*, *Brassica carinata* and *Eleusine coracana* and gene diversity centre for many others. Indigenous and introduced crops are managed under traditional farming in home gardens and fields distributed in the varied agroecosystems. The poster tries to mark up the "hotspots" of Ethiopia's agrobiodiversity across landscapes and farming systems. The major useful plant categories and individual species that display yet another level of agrobiodiversity are also outlined. The social needs and cultural practices are strong factor that shape the agrobiodiversity in farming systems and at home by the farming community. Knowledge of the whereabouts of the agrobiodiversity is necessary to propose conservation measures pertinent and applicable to its components at the different layers.

Materials and Methods

- ◆ Information has been drawn out of research results on study of indigenous food plants, home gardens, ethnobotany of selected lesser-studied societies, inventory of biodiversity of useful plants
- ◆ Data collection involved:
 - ★ Fieldwork
 - ★ Herbarium work (identification, verification, authentication, voucher preparation)
 - ★ Discussion with farmers, household members, key informants
 - ★ Administration of semi-structured interviews, photographic documentation, sketching, tracing rare crops and varieties
 - ★ Market surveys

Layout of **Plant Agrobiodiversity**

■ **Agrobiodiversity Across Landscapes**

- ◆ Spread over landscapes
- ◆ Distribution in microhabitats
- ◆ Useful plant biodiversity in a pattern of increasing intensity towards the home

■ **Agrobiodiversity across farming systems**

- ◆ Crop fields
- ◆ Home gardens
- ◆ Areas adjacent to homes and fields

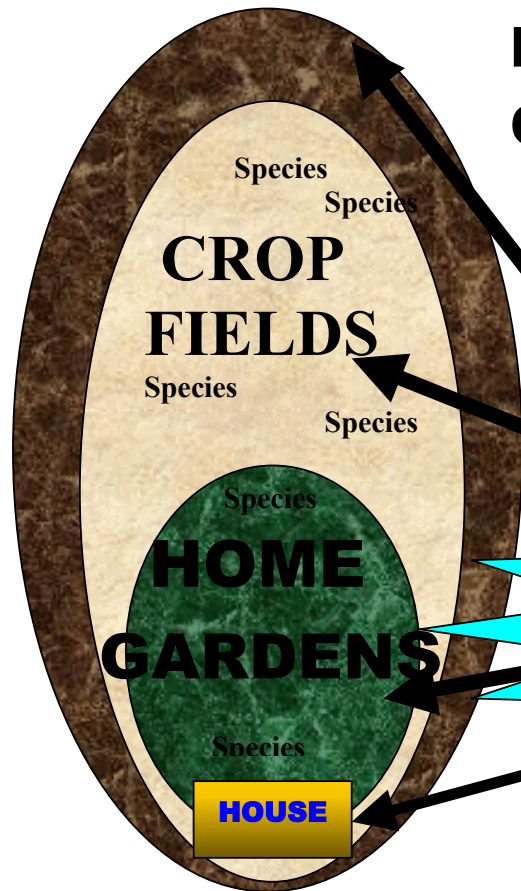
■ **Proportion of crops in home gardens & crop fields**

- ◆ Repository of valuable plant biodiversity
- ◆ About 85% of cultivated species in home gardens, larger populations in fields

Landscape level

- **Farmlands (cultivated fields, margins, fallow lands, natural points)**
- **Settlement areas (home gardens, fences, surrounding fields, open spaces)**
- **Grazing areas (seedling sources for some crops, wild gene sources)**

LAND ADJACENT TO CULTIVATED AREA



Farming Systems level

- **Permanent field cropping**
- **Home gardening**
- **Shifting cultivation**
- **Traditional agroforestry**
- **Cultivation under tree canopy**

Individual crop species level

- **Farmers' varieties (landraces) of more than 100 crops species**
e.g. Sorghum bicolor, Hordeum vulgare, Eragrostis tef, Ensete ventricosum, Coffea arabica, Guizotia abyssinica, Pennisetum

Fig. 1 A Generalized Panoramic View of the Spatial Distribution of Agrobiodiversity Across Landscapes and Farming Systems

Table 1 Number of species of useful plants found in and around home gardens in Ethiopia
 (Many introduced ornamentals are not recorded, and multipurpose species have been recounted in multiple categories)

Category of useful plants	Number of species				
	Herbs	Shrubs	Trees	Climbers	Total
Crops purposely cultivated in home gardens	88	47	37	17	172
Medicinal plants in and around home gardens	37	38	19	3	54
• Crops cultivated primarily for medicinal use	3	8	1	-	12
• Crops with supplementary medicinal value	30	16	8	2	54
• Wild plants used in traditional medicine	4	14	10	1	28
Traditional vegetables in & around home gardens	4	6	36	2	46
• Cultivated in home gardens	1	3	7	2	11
• Occur wild in the vicinity of home gardens	3	3	29	-	35
Live fence and shade plants of home gardens	0	38	25	1	64
Wild/semi-wild useful plants around home gardens	45	47	46	6	148
Total recorded useful plant species	135	146	123	25	412

Diversity Within Main Categories of Useful Plants

- The following main categories have high species diversity with many indigenous crops. The numbers recorded from home gardens are given in Table 3

Cereals, Pulses and Oil Crops

- Usually large-scales in the fields, have high population sizes and show high landrace and genetic diversity

Root-Tuber Crops

- Many indigenous and introduced are found
- Mostly grown in home gardens, some in fields or in fields that are either adjacent or close to home gardens.

Vegetable and Spice Crops

- Long tradition of using spices, condiments, additives and herbs in foods
- Successful integration of introduced crops into farming systems and original dishes

Fruit Crops

Medicinal Plants Cultivated as Home Garden Crops

Trees and Shrubs Maintained as Live Fence and Shade Plants

Other Useful Wild/Semi-Wild Plants found in the Vicinity of Home Gardens

Table 2 Number of crop species and place of their cultivation

(Data collected from eleven study sites widely distributed in southern, western and southwestern Ethiopia)

Study Site	Number of Distinct Crop Species Cultivated				Percent of crops cultivated in home gardens
	In home gardens only	In home gardens and fields	In fields only	Total	
1	25	25	5	55	91
2	13	30	9	52	83
3	41	17	9	67	87
4	30	22	6	58	90
5	23	8	4	35	89
6	18	14	7	39	82
7	31	5	13	49	73
8	10	6	3	19	84
9	6	6	3	15	80
10	5	3	4	12	67
11	5	7	0	12	100
Total	50	35	15	100	85

Table 3 Number of species of crops in Ethiopian home gardens under horticultural categories

Crop Category	Number of Species	Percentage of Total	Remarks
Food crops	127	74	Close to $\frac{3}{4}$ are food plants
Cereals	6	3	
Pulses	14	8	
Roots and tubers	13	8	
Fruits	36	21	
Vegetables	30	17	
Oils, nuts and sugars	12	7	
Spices and herbs	16	10	Many used in traditional medicine
Non-food crops	45	26	About $\frac{1}{4}$ non-food necessities
Non-food oil crops	3	2	
Fragrance plants	6	3	
Stimulants and narcotics	2	1	
Implements, crafts plants	9	5	
Medicinal	10	6	Only conventional crops included
Utility plants	3	2	
Miscellaneous	12	7	
Total	172	100	

Agrobiodiversity Entrenched Within Individual Crops

- Many crops in Ethiopia show diversity in
 - Landrace form
 - Agromorphologic characters
 - Biochemical characters
 - Molecular characters
- Diversity within individual crops could be illustrated by taking a few diversity rich crops
 - Barley (*Hordeum vulgare*)
 - Sorghum (*Sorghum bicolor*)
 - Enset (*Ensete ventricosum*)
- About 90 social groups apply their cultural effects in the different areas

Plant Agrobiodiversity Management

- Field cropping and home gardening are established traditions
- Tradition of managing useful wild plants within cultivated landscapes
- Managing agrobiodiversity at home
 - Seed selection and germplasm acquisition method
 - Rich indigenous knowledge
- Tradition of nurturing and using different plants
 - ◆ Managing polycultures
 - ◆ Association of types with uses and values

Threats to Agrobiodiversity

- ◆ The traditional system was sustainable in the past but changing now
- ◆ Fast changes are taking place in:
 - ◆ Landscapes
 - ◆ Farming systems
 - ◆ Individual crops
 - ◆ Peoples' lifestyles
 - ◆ Breaking of traditional systems
- ◆ Actual and potential threats are progressing from different direction

Conclusion

- Pressures on agrobiodiversity have to be checked
- More studies are required to produce
 - Checklist of crops
 - Checklist of other useful plants
 - Checklist of varieties, threatened taxa of useful plants
 - Inventory, monitoring, enhancement
- Protect traditional systems, knowledge, skills and practices
- Modern agrobiodiversity conservation must be linked to farmers
- Ecosystems surrounding crop fields and home gardens are reservoirs of plants and gene sources for agrobiodiversity
 - The continuity of this Vavilovian diversity centre poses a major challenge
 - Are conservation efforts targeted to agrobiodiversity at the different layers?