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Diversity of Useful Plants in the Coffee Forests of Ethiopia

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Research

Abstract

Plant use diversity and their forms of use and management were studied in four coffee forests of Ethiopia. A coffee forest is a segment of moist montane forest with occurrence of wild Arabica coffee populations. The present study was conducted in four forest fragments located in the southwestern and southeastern parts of the country. These forests represent three different indigenous ethnic groups that live in and around the coffee forests. On the bases of ethnobotanical and floristic studies, a total of 143 useful plant species representing 54 families were identified in all study areas. Nearly all species are native except one which is naturalized. The identified use categories include medicine, food, honey, material sources, social services, animal fodder and environmental uses. Overall, Yayu and Harenna shared a high number of useful plant species in common. Of the total, about 25 species (19%) were similarly used across three or more studied ethnic groups. The implication is that there is a difference between and among the four communities studied for general plant knowledge and uses. As observed, deforestation, over-harvesting, cultivation of marginal lands and overgrazing appear to be threatening the plant resources and their habitats in the studied areas. Ecosystem conservation will ensure *in situ* conservation of many useful plant species by applying sustainable harvesting methods for collecting plants for any type of use from wild habitats.

Introduction

Millions of people around the world depend on native plants as sources of food, medicine, wood and other products to sustain their livelihoods. Indigenous people are often very knowledgeable about their environment, including plant and animal species. Farnsworth *et al.* (1991) for example argued that between 35,000 and 70,000 species of plants have been used at one time or another for medicinal purpose around the globe. This has resulted in the accumulation of a vast indigenous knowledge resource base with respect to the utilization of native plants. In recent years, the value of indigenous knowledge in natural resources management and rural development has become increasingly recognized by many ethnobotanists and anthropologists (e.g., Asfaw & Tadesse 2001, DeWalt 1994, Lulekal 2005, Senbeta *et al.* 2005, Walker *et al.* 1995). Such recognition would be good if it leads to the conservation of biological diversity, which justifies a search for ways to stop the erosion of traditional knowledge. Hence, promotion of this valuable indigenous knowledge can make an important contribution to alleviation of rural poverty by improving food security and economic welfare of rural populations if well studied.

In Ethiopia, several studies have been made to document the use of plants in indigenous communities (e.g., Addis 2009, Addis *et al.* 2005, Asfaw 2001, Asfaw & Tadesse 2001, Awas *et al.* 2010, Balemie & Kibebew 2006, Bale-

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mie *et al.* 2004, Deffar 1998, Fichtl & Adi 1994, Guinand & Lemessa 2000, Lulekal *et al.* 2011, Wondimu *et al.* 2006, Yineger 2005). However, the majority of these studies were conducted in highly managed landscapes and low land ecosystems; and only few were made in moist montane forests of Ethiopia (Lulekal *et al.* 2008, Teketay *et al.* 2010).

In Ethiopia, the moist montane forest has long been recognized as the center of origin and diversity of wild *Coffea arabica* L. (Aga *et al.* 2003, Gebre-Egziabher 1990, Meyer 1965, Senbeta *et al.* 2005, Woldemariam *et al.* 2002). Currently, wild populations of *C. arabica* occur in many moist montane forest fragments which are geographically separated and isolated from each other due to natural and anthropogenic factors. These forest fragments with wild Arabica coffee populations are commonly named "coffee forests." Like other forests, these forest fragments are under continuous threat due to the expansion of agriculture and commercial plantations (such as tea and coffee).

The montane forest region of Ethiopia, including the coffee forest belt, is inhabited by many millions of people with diverse ethnic groups and communities. These groups have vast accumulated traditional knowledge and experiences of what and how to use wild plants through long-term interrelations with their environments. However, limited ethnobotanical studies have been carried out up to now to reveal this accumulated traditional resource use knowledge in the moist montane forests in general and in coffee forests in particular (Asfaw & Tadesse 2001, Senbeta *et al.* 2005, Teketay *et al.* 2010). Patterns of indigenous knowledge and trends of wild plant utilization in moist montane forests have been neglected. Apparently, the knowledge remained undocumented because the products are mostly used locally and seldom enter national or international markets. Thus, this study was carried out to document diversity of plant uses in the relatively large blocks of coffee forest patches distributed across southwestern and southeastern parts of the country.

The most common approach to the collection of indigenous knowledge is an ethnobotanical survey, which focuses on the traditional uses of a given plant species. Such information is essential to develop strategies for sustainable use and conservation of useful plant species. The purpose of this paper is, therefore, to analyze and compare knowledge of traditional plant uses among the different ethnic groups in four coffee forests in Southwest and Southeast Ethiopia. In particular, the research focused on assessing the richness of useful plants, their uses and forms of management. The specific objectives of the study were to: 1) investigate general patterns of plant utilization and manipulation processes in the areas; 2) evaluate the importance of these areas within the context of the diversity of useful plant species of Ethiopia; and (3) provide

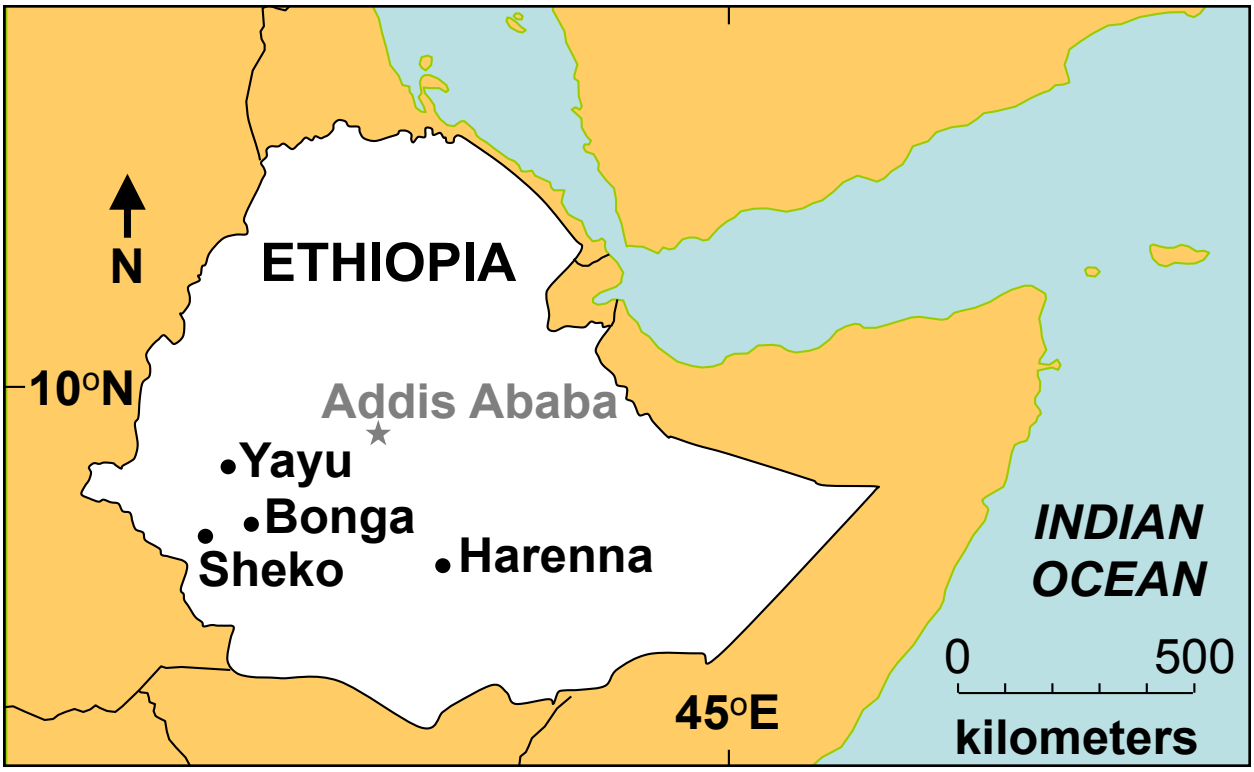

Figure 1. Location of the study areas in Ethiopia.

recommendations for sustainable use and management of these plant resources.

Materials and Methods

Description of study sites

To document the major useful plant species, four coffee forests were selected for the study: Yayu, Sheko, Bonga and Harenna (Figure 1). The first three forests are located in Southwest Ethiopia, and the last one (i.e., Harenna) is located in Southeast Ethiopia. The study sites are separated from each other by agricultural and/or settlement landscapes and other natural features. The closest sites are Bonga and Sheko (distance between them = about 150 km). The vegetation of the study sites is classified as moist montane forest or montane rainforest with occurrence of wild coffee populations. The sites are inhabited by different ethnic groups, which make the study very interesting.

In Bonga, Kaffa is the dominant ethnic group and hence they are the main sources of the present data. Over 90% of the population in the area is engaged in subsistence agriculture. Coffee provides the largest income and employment opportunities for the local communities. Apiculture and spices also play an important role in the households' economy.

In Sheko, diverse ethnic groups live in the area. These include Sheko, Bench, Amhara, Kaffa, Mejenger and Menit. Among these Mejenger is the only group native to the area whereas the others are immigrants from other parts of the country who settled there in the last 3–4 decades. Hence, this study only focused on native Mejenger people. The majority of the population in the area is engaged in subsistence agriculture. Traditionally, the forest supported the major livelihood of the native Mejenger people as a source of non-timber forest products (local information). In the recent past, however, with the arrival of new settlers from other parts of the country, conversion of the forest into agriculture and the expansion of the semi-forest coffee system through removal of trees and undergrowth have greatly reduced the forest cover. At the moment, coffee production and processing provide significant income and employment opportunities to the local people followed by honey production.

In Harenna and Yayu, Oromo is the dominant ethnic group living in the area. In both areas, immigrants from other parts of the country are there although their proportion is very small as compared to the native Oromo population. Hence, in both sites, the study focused on Oromo communities. Livestock and subsistence agriculture form the major livelihoods of the rural communities in both areas. Coffee and honey also play an important role in both sites.

Data collection and analysis

A survey of the useful plant species was conducted between 2004 and 2008 in four montane forest areas of Ethiopia. A total of 120 households (30 households per site) were interviewed for any traditional plant uses. One person per household was interviewed to avoid repetition of ideas from members of the same household. Households were randomly selected from the respective sites; however, systematic sampling was also employed to include one knowledgeable person from each site in the interview. The knowledgeable person was identified with the consultation of the local residents. The interviews were conducted using the preferred language(s), depending on which of the languages the respondents felt more comfortable with. In each site, local guides from among the local residents were used to facilitate a comfortable communication and a fluent conversation with the respondents in the respective study areas. In addition to the individual interview, a group discussion was also held with the local residents to cross-check the validity of the gathered information. In addition to the quantification survey in the field, with regard to the extent of the use, the yields of the collected plants and the market value were also registered when possible. The traditional management system was also documented when available. Plant specimens were collected in the presence of local people participating as key informants. All useful plant species were recorded at species level. The collected voucher specimens were identified and deposited in the National Herbarium (Ethiopia), Addis Ababa University. Data were analyzed using descriptive statistics. Nomenclature of plant taxa follows Hedberg and Edwards (1989, 1995), Edwards *et al.* (1995), Edwards *et al.* (1997), Edwards *et al.* (2000), Hedberg *et al.* (2003) and Hedberg *et al.* (2006).

Results

Taxonomic diversity

A total of 143 species representing 54 families of locally useful plants were recorded in all coffee forests (Table 1). All species were identified taxonomically down to species level. The 10 top plant families that had the greatest number of useful species were Moraceae (11), Fabaceae (10), Euphorbiaceae (8), Lamiaceae (6), Asteraceae (5), Rosaceae (5), Rutaceae (5), Sapotaceae (5), Sapindaceae (4) and Apocynaceae (4).

A high Sorensen's similarity coefficient of useful plant species was observed between Harenna and Yayu sites and the least between Bonga and Sheko. Similarity coefficients of all sites fell between 0.30 and 0.51.

Table 1. Useful plant species in coffee forests of Southwest and Southeast Ethiopia. **Vernacular names:** O-Affan Oromo, K-Kaffico, M-Mejenger; **Habit:** C-Climber, G-Grass, H-Herb, S-Shrub, T-Tree; **Plant Parts used:** Br-Bark, Fl-Flower, Fr-Fruit, Le-Leaf, Rt-Root, Se-Seed/Grain, St-Stem, Wp-Whole Plant; **Use Categories:** Animal feed (forage, fodder), Environmental uses (soil conservation, shade for coffee, ornamentals, live fences, windbreaks, etc.), Food (including fruits, seeds, leaves, tubers), Honey bee plants (pollen or nectar sources), Materials (including lumber, tannin, resin, wax, oils, beehive making, detergent), Poisons (useful and harmful), Remedies (medicine for both humans and animals), Social uses (narcotics, ritual/religious value, used in children games, etc.).

Scientific name	Vernacular names	Habit	Parts used	Use category							Description of uses	Regions			
				Animal	Environ	Food	Honey	Material	Poisons	Remedy	Social		Bonga	Harenna	Sheko	Yayu
Acanthaceae																
Justicia schimperiana (Hochst. ex Nees) T. Anders	**Dhumugaa** (O)	S	Rt/St					x		x		Root medicinal; stem for construction				x
Amaranthaceae																
Amaranthus hybridus L.	**Chatila** (M)	H	Le/Se			x									x	
Chenopodium procerum Hochst. ex Moq.	**Muradu** (O)	H	Le			x						Edible		x	x	
Anacardiaceae																
Lannea welwitschii (Hiern) Engl.	**Jomee** (M)	T	Br/St					x		x		Bark medicinal; wood for lumber			x	
Rhus ruspolii Engl.	**Tatessa** (O)	S	Wp					x				Charcoal				x
Apocynaceae																
Alstonia boonei De Wild.	**Jogee** (M)	T	Wp							x		Latex for medicine			x	
Carissa spinarum L.	**Hagamssa** (O)	S	Fr			x						Edible		x		x
Landolphia buchananii (Hall. f.) Stapf	**Geboo, Homba** (O)	C	Fr/St			x		x		x		Fruit edible; stem for house construction; latex for glue		x		x
Oncinotis tenuiloba Stapf	**Simbo** (O)	C	Fl				x					Honeybee flora		x		
Araliaceae																
Polyscias fulva (Hiern) Harms	**Karasho** (K), **Koriba** (O), **Karashoyi** (M)	T	Fl/St				x	x				Honeybee flora; wood for beehives	x	x	x	

Scientific name	Vernacular names	Habit	Parts used	Use category								Description of uses	Regions				
				Animal	Environ	Food	Honey	Material	Poisons	Remedy	Social		Bonga	Harenna	Sheko	Yayu
Schefflera abyssinica (Hochst. ex A. Rich.) Harms	**Butoo** (K)	T	Fl				x					Honeybee flora (highly valued for honey production)	x			
Arecaceae																
Phoenix reclinata Jacq.	**Yebo** (K), **Meeti** (O)	T	Fr/Le			x		x				Fruit edible; leaves for baskets	x			x
Asparagaceae																
Dracaena fragrans (L.) Ker Gawl.	**Sarxee**(O), **Emuyi** (M)	S	Wp		x			x				Live fences and construction			x	x
Dracaena steudneri Engl.	**Warko/Caca** (O)	T	Le	x						x		Fodder and medicinal		x		
Asteraceae																
Bidens pilosa L.	**Jongee** (M)	H	Le			x						Edible			x	
Galinsoga parviflora Cav.	**Rafu sibiroo** (O)	H	Le							x		Medicinal				x
Vernonia amygdalina Delile	**Degerto** (K), **Ebichaa** (O)	S	Fl/Le	x			x					Honeybee flora; leaves for fodder	x	x		x
Vernonia auriculifera Hiern	**Reeji** (O)	S	Fl				x					Honeybee flora		x		x
Vernonia leopoldi (Sch. Bip. ex Walp.) Vatke	**Soyomaa** (O)	S	Fl/St				x	x				Honeybee flora; stem for beehives				x
Boraginaceae																
Cordia africana Lam.	**Wadessa** (O), **Dapee** (M),	T	Fl/Fr/St			x	x	x				Honeybee flora; fruit edible; wood for lumber		x	x	x
Cynoglossum amplifolium Hochst. ex A. DC.	**Maxanee** (O), **Chako** (K)	H	Le							x		Medicinal		x		x
Ehretia cymosa Thonn.	**Ulagaa** (O), **Jogomoyi** (M)	T	Fl/Le/St				x	x		x		Honeybee flora; leaves medicinal; wood for farm tools		x	x	x

Scientific name	Vernacular names	Habit	Parts used	Use category							Description of uses	Regions			
				Animal	Environ	Food	Honey	Material	Poisons	Remedy	Social		Bonga	Harenna	Sheko	Yayu
Cannabaceae																
Celtis africana Burm. f.	**Chayi** (O), **Upi** (M), **Ufo** (K)	T	Le/St	x				x				Leaves for fodder; wood for lumber	x	x	x	x
Trema orientalis (L.) Blume	**Hudu fardaa** (O)	T	St					x				Wood for farm tools				x
Canellaceae																
Warburgia ugandensis Sprague	**Befti** (O)	T	Br/Fr/St					x		x		Resin for fumigant; bark and stem for treating stomachache, toothache, wounds		x		
Capparaceae																
Capparis tomentosa Lam.	**Harragaamaa** (O)	C	Rt							x		Medicinal		x		x
Ritchiea albersii Gilg	**Deqoo** (O)	S	Fr/St			x		x				Fruit edible; stems for house utensils		x		x
Celastraceae																
Elaeodendron buchananii (Loes.) Loes.	**Lokko Waso** (O)	T	St					x				Wood for house construction				x
Hippocratea africana (Willd.) Loes. ex Engl.	**Galee** (O)	C	Fl/St				x	x				Honeybee flora; stems for beehives				x
Hippocratea pallens Planch. ex Oliv.	**Xioo** (O)	C	Fl/St				x	x				Honeybee flora; stems for beehives				x
Combretaceae																
Combretum aculeatum Vent.	**Keyam** (M)	S	Fl				x					Honeybee flora			x	
Combretum paniculatum Vent.	**Bagee** (O), **Baji** (M)	C	Fl/Le/St				x			x		Honeybee flora; leaves and stem medicinal				x x
Cucurbitaceae																
Cucumis jeffreyanus Thulin	**Gangoyi** (M)	C	Le					x				Washing clothes			x	

Scientific name	Vernacular names	Habit	Parts used	Use category								Description of uses	Regions				
				Animal	Environ	Food	Honey	Material	Poisons	Remedy	Social		Bonga	Harenna	Sheko	Yayu
Peponium vogelii (Hook. f.) Engl.	**Jojo** (K)	C	Fr			×						Edible	×			
Cyperaceae																
Cyperus longibracteatus (Cherm.) Kük.	**Kuni** (O)	G	Rt							×		Medicinal				×
Dioscoreaceae																
Dioscorea praehensilis Benth.	**Kawon** (M)	C	Rt			×						Edible			×	
Ebenaceae																
Diospyros abyssinica (Hiern) F. White	**Loko gurati** (O), **Kuri** (M)	T	Fl/St				×	×				Honeybee flora; wood for construction		×	×	
Diospyros mespiliformis Hochst. ex A. DC.	**Lokko guracha** (O)	T	St					×				Wood for lumber				×
Euphorbiaceae																
Argomuellera macrophylla Pax	**Babus** (M)	S	Fl/St				×	×				Honeybee flora; wood for construction			×	
Croton macrostachyus Hochst. ex Delile	**Bakanissa**(O), **Shomoyi** (M)	T	Fl/Le/ St				×	×		×		Honeybee flora; leaves medicinal; wood for construction	×	×	×	×
Euphorbia ampliphylla Pax	**Domchi** (M)	T	Wp							×		Latex medicinal			×	
Macaranga capensis (Baill.) Sim	**Shakaro** (K)	T	St					×				Wood for house construction	×			
Ricinus communis L.	**Koboo** (O), **Boliri** (M)	S	Rt/Se					×		×		Root and seed for treating different diseases; seeds for body lotion	×		×	×
Shirakiopsis elliptica (Hochst.) Esser	**Shado** (K)	T	Fl/St				×	×				Honeybee flora; wood for beehives	×			
Suregada procera (Prain) Croizat	**Loko adii** (O)	S	St					×				Wood for house construction		×		

Scientific name	Vernacular names	Habit	Parts used	Use category							Description of uses	Regions			
				Animal	Environ	Food	Honey	Material	Poisons	Remedy	Social		Bonga	Harenna	Sheko	Yayu
Tragia brevipes Pax	**Gurgubee** (O), **Dopuyi** (M)	C/H	Le/Rt							×		Leaves for treating viral disease; root medicinal (mixed with *Justicia schimperana*)		×	×	×
Fabaceae																
Acacia abyssinica Hochst. ex Benth.	**Soondii** (O)	T	Fl/St				×	×				Honeybee flora; resin				×
Albizia grandibracteata Taub.	**Alelee** (O), **Kashoyi** (M)	T	Br/Fl/Wp		×		×	×				Bark for latex; honeybee flora; shade plant			×	×
Albizia gummifera (J. F. Gmel.) C.A. Sm.	**Chato** (K)	T	Fl/St				×	×				Honeybee flora; wood for lumber	×			
Albizia schimperiana Oliv.	**Hambabessa** (O)	T	Fl/St/Wp		×		×	×				Honeybee flora; wood for construction; shade plant				×
Baphia abyssinica Brummitt	**Duwee** (M)	T	Fl/St				×	×				Honeybee flora; wood for construction			×	
Caesalpinia volkensii Harms	**Sadeeqa** (O)	C	Fr							×		Medicinal for treating dogs		×		
Calpurnia aurea (Aiton) Benth.	**Chekata** (O)	S	Le							×		Medicinal for treating animal wounds		×		
Entada abyssinica Steud. ex A. Rich.	**Ambalta** (O)	T	Fl				×					Honeybee flora				×
Millettia ferruginea (Hochst.) Baker	**Yagoyi** (M), **Dhahato** (O)	T	Br/Se/Wp		×				×	×		Bark and seed medicinal; seed also poisonous; shade plant	×	×	×	×
Trifolium baccarinii Chiov.	**Alangee** (O)	H	Rt							×		Medicinal for stomachache				×
Lamiaceae																
Clerodendrum myricoides (Hochst.) R. Br. ex Vatke	**Marasisaa** (O), **Ajio** (K)	S	Le/Rt				×			×		Honeybee flora; root medicinal	×			×
Leucas deflexa Hook. f.	**Abshata** (M)	H	Fr/Le							×		Fruit and leaves medicinal			×	

Scientific name	Vernacular names	Habit	Parts used	Use category								Description of uses	Regions			
				Animal	Environ	Food	Honey	Material	Poisons	Remedy	Social		Bonga	Harenna	Sheko	Yayu
Ocimum lamiifolium Hochst. ex Benth.	**Hanchabi** (O)	S	Le							x		Medicinal				x
Ocimum urticifolium Roth	**Damakasee** (O), **Damo** (K)	S	Le							x		Medicinal for both human and livestock diseases	x			x
Plectranthus longipes Baker	**Yeroo** (O)	H	Le							x		Medicinal				x
Premna schimperi Engl.	**Urgessa** (O)	S	Le					x				Resin for house smoking				x
Lauraceae																
Ocotea kenyensis (Chiov.) Robyns & R. Wilczek	**Gigicha** (O)	T	Br/Fl				x	x				Bark for beehives; honey-bee flora		x		
Loganiaceae																
Strychnos mitis S. Moore	**Mulqa** (O)	T	Fr/St			x		x				Fruit edible; wood for farm tools		x		
Malvaceae																
Sida tenuicarpa Vollesen	**Karabba** (O)	H	Le							x		Medicinal				x
Triumfetta rhomboidea Jacq.	**Charaabi** (O)	S	Br	x								Bark sap for calf feed	x			
Meliaceae																
Ekebergia capensis Sparrm.	**Somboo, Ononu** (O)	T	Br/St					x		x		Bark medicinal; wood for lumber	x			x
Trichilia dregeana Sond.	**Luyaa** (O), **Yuya** (M)	T	Br/Se			x		x		x		Bark medicinal and for making beehives; seed oil extract for baking/greasing			x	x
Trichilia prieuriana A. Juss.	**Mangee** (M)	T	St					x				Lumber			x	
Melianthaceae																
Bersama abyssinica Fresen.	**Lolchissa** (O)	T	St	x						x		Fodder and medicinal		x		x

Scientific name	Vernacular names	Habit	Parts used	Use category							Description of uses	Regions			
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Menispermaceae																
Stephania abyssinica (Quart.-Dill. & A. Rich.) Walp.	**Kalala** (O)	C	St					x				Utensils		x		
Moraceae																
Antiaris toxicaria Lesch.	**Dangi** (O), **Dekee** (M)	T	Br/St					x				Bark for clothing; wood for lumber			x	x
Ficus exasperata Vahl	**Balantaie** (O), **Kachi** (M)	S/T	Le							x		Medicinal			x	x
Ficus mucuso Welw. ex Ficalho	**Abe** (M)	T	Fr/St			x		x				Fruit edible; latex for glue			x	
Ficus ovata Vahl	**Opo** (K)	T	St					x				Wood for fumiture	x			
Ficus sur Forssk.	**Harbu** (O), **Charo** (K)	T	Fr/St			x		x				Fruit edible; wood for furniture	x	x		x
Ficus sycomorus L.	**Odaa** (O)	T	Fr/Wp	x							x	Fruit for fodder; plant a symbolic tree for Oromo people				x
Ficus thonningii Blume	**Tigago** (K), **Dambi** (O)	T	St					x				Wood for furniture	x			x
Ficus umbellata Vahl	**Dokko** (O), **Dokee** (M)	T	St					x				Latex for candles; wood for house utensils			x	x
Ficus vasta Forssk.	**Wobdaa** (O)	T	Fr/St	x				x				Fruit for fodder; wood for house utensils				x
Morus mesozygia Stapf	**Iseki** (M), **Sachoo** (O)	T	Fl/Fr/St			x	x	x				Honeybee flora; fruit edible; wood used for lumber			x	x
Trilepisium madagascariense DC.	**Gogee** (O), **Gemuy** (M)	T	Fr/St			x		x				Fruit edible; wood for lumber			x	x

Scientific name	Vernacular names	Habit	Parts used	Use category								Description of uses	Regions			
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Myrtaceae																
Eugenia bukobensis Engl.	**Satol** (M)	T	Fr			x						Edible			x	
Syzygium guineense subsp. *afromontanum* F. White	**Yino** (K), **Badessa** (O)	T	Fl/Fr/St			x	x					Honeybee flora; fruit edible; wood for lumber	x	x		x
Oleaceae																
Chionanthus mildbraedii (Gilg & Schellenb.) Stearn	**Gagama** (O)	S	Le/St	x				x				Leaves for fodder; wood for farm tools		x		
Olea welwitschii (Knobl.) Gilg & Schellenb.	**Baha'a, Onoma** (O), **Yaho** (K)	T	Br/Fl/St	x			x	x				Bark for fodder; honeybee flora; resin for house fumigating	x	x		x
Passifloraceae																
Passiflora edulis Sims	**Koko** (K)	C	Fr			x						Edible (plant is naturalized not native)	x			
Phyllanthaceae																
Margaritaria discoidea (Baill.) G. L. Webster	**Bulala** (O)	T	Br/Fl/St				x	x		x		Bark medicinal for livestock; honeybee flora; wood for construction		x		
Phytolaccaceae																
Phytolacca dodecandra L´Her.	**Handodee** (O), **Dankee** (M)	C	Fr/Le/Rt					x		x		Fruit and leaves for clothes-washing detergent; root medicinal for both human and livestock		x	x	x
Piperaceae																
Piper capense L. f.	**Torato** (K)	H	Fr			x						Edible	x			x
Piper umbellatum L.	**Timizi** (K), **Gunjo** (O)	H	Fr			x						Edible	x			x

Scientific name	Vernacular names	Habit	Parts used	Use category							Description of uses	Regions			
				Animal	Environ	Food	Honey	Material	Poisons	Remedy	Social		Bonga	Harenna	Sheko	Yayu
Pittosporaceae																
Pittosporum viridiflorum Sims	**Solee, Balambessa** (O)	S	Br/Le							x		Bark and leaves medicinal for human and livestock		x		x
Podocarpaceae																
Podocarpus falcatus (Thunb) Endl.	**Birbissa** (O)	T	Fr/Se/St			x		x		x		Fruit medicinal; resin boiled as a tea; wood for lumber		x		x
Polygonaceae																
Rumex nepalensis Spreng.	**Boldokee** (O)	H	Rt							x		Medicinal				x
Polypodiaceae																
Platycerium angolense Welw. ex Hook.	**Ajash** (M)	H	Le							x		Medicinal for asthmatic problems			x	
Primulaceae																
Embelia schimperi Vatke	**Dupo** (K), **Hanku** (O)	C	Fr							x		Medicinal	x	x		x
Maesa lanceolata Forssk.	**Chago** (K), **Abayi** (O), **Tuluti** (M)	S	Se					x				Oil making	x		x	x
Ranunculaceae																
Clematis longicauda Steud. ex A. Rich.	**Bagee** (O)	C	Le/St					x		x		Leaves medicinal for cattle wounds; stem for construction				x
Clematis simensis Fresen.	**Hida fiti** (O)	C	Le/St					x		x		Leaves medicinal for human wounds; stem for construction		x		
Thalictrum rhynchocarpum Quart.-Dill. & A. Rich.	**Sira buzu** (O)	H	Rt							x		Medicinal for spider injury				x
Rhamnaceae																
Gouania longispicata Engl.	**Hoomaachoo** (O), **Sismee** (M)	C	Fl/St				x	x				Honeybee flora; wood for beehives		x	x	x

Scientific name	Vernacular names	Habit	Parts used	Use category								Description of uses	Regions			
				Animal	Environ	Food	Honey	Material	Poisons	Remedy	Social		Bonga	Harenna	Sheko	Yayu
Rhamnus prinoides L´Her.	**Geshoo** (O)	S	Fr/Le			x						Fruit and leaves for making local beer		x		x
Rhizophoraceae																
Cassipourea malosana (Baker) Alston	**Tiloo** (O)	T	St					x				Farm tools		x		x
Rosaceae																
Prunus africana (Hook. f.) Kalkman	**Hoomi, Sukee** (O)	T	Br/St					x		x		Bark medicinal; wood for lumber		x		x
Rosa abyssinica R. Br.	**Qaqawi** (O)	C	Fr			x						Edible				x
Rubus apetalus Poir.	**Gora** (O), **Katigaro** (K)	C	Fr			x						Edible	x	x	x	
Rubus rosifolius Sm. ex Baker	**Katigaro** (K)	S	Fr			x						Edible	x			
Rubus steudneri Schweinf.	**Gora** (O), **Peyin** (M)	C	Fr			x						Edible	x		x	x
Rubiaceae																
Coffea arabica L.	**Buna** (O), **Kari** (M)	T	Le/Se			x						Edible	x	x	x	x
Pavetta abyssinica Fresen.	**Bururi** (O)	S	Fr							x		Medicinal		x		
Rutaceae																
Clausena anisata (Willd.) Hook. f. ex Benth.	**Limicho** (K), **Ulmayi** (O), **Hirmachayi** (M)	S	Fr/St			x		x				Fruit edible; stem for toothbrush	x	x	x	x
Fagaropsis angolensis (Engl.) H. M. Gardner	**Sisa** (O), **Yayo** (K)	T	Le/Se/St			x		x		x		Leaves medicinal; seed edible; wood for lumber	x	x		
Teclea nobilis Delile	**Hadhessa** (O)	S	Le							x		Medicinal for stomachache		x		
Toddalia asiatica (L.) Lam.	**Gora uka** (O)	C	Rt							x		Medicinal for skin diseases		x		

Scientific name	Vernacular names	Habit	Parts used	Use category								Description of uses	Regions			
				Animal	Environ	Food	Honey	Material	Poisons	Remedy	Social		Bonga	Harenna	Sheko	Yayu
Vepris dainellii (Pic. Serm.) Mziray	**Arabee** (O)	T	Fl/Fr			x	x					Honeybee flora; fruit edible		x		
Salicaceae																
Flacourtia indica (Burm. f.) Merr.	**Hakoku** (O)	S	Fr			x						Edible		x		
Sapindaceae																
Allophylus abyssinicus (Hochst.) Radlk.	**Tatessa** (O)	S	Rt							x		Medicinal				x
Blighia unijugata Baker	**Cucuu** (O), **Keyam** (M)	T	Fl/St				x	x				Honeybee flora; wood for lumber			x	x
Filicium decipiens (Wight & Arn.) Thwaites	**Chena** (O)	T	St					x				Lumber		x		
Paullinia pinnata L.	**Hidaa gafarsaa** (O)	C	St					x				Wood for house construction				x
Sapotaceae																
Manilkara butugi Chiov.	**Butugi**	T	Fr/St			x		x				Fruit edible; wood for lumber			x	
Mimusops kummel Bruce ex A. DC.	**Qoolati** (O), **Woni** (M)	T	Fr/St			x		x				Fruit edible; wood for lumber		x	x	x
Pouteria adolfi-friederici (Engl.) A. Meeuse	**Guduba** (O)	T	Fl/St				x	x				Honeybee flora; wood for lumber		x		
Pouteria alnifolia (Baker) Roberty	**Shokoshi** (M)	T	St							x		Latex for treating toothache			x	
Pouteria altissima (A. Chev.) Baehni	**Gomuyi** (M)	T	St					x				Lumber			x	
Simaroubaceae																
Brucea antidysenterica J.F. Mill.	**Koomagnoo** (O)	S	Se							x		Medicinal		x		x

Scientific name	Vernacular names	Habit	Parts used	Use category								Description of uses	Regions			
				Animal	Environ	Food	Honey	Material	Poisons	Remedy	Social		Bonga	Harenna	Sheko	Yayu
Solanaceae																
Capsicum annuum L.	**Berbere sibira** (O), **Mermit** (M)	H	Fr			x						Edible		x	x	x
Physalis peruviana L.	**Xoosi, Sambaruf** (O), **Gongor** (M)	H	Fr			x						Edible		x	x	x
Solanum giganteum Jacq.	**Tukiti** (M), **Hidi** (O)	S	Fr/Rt							x		Fruit juice for cattle cough treatment; roots for treating veneral diseases		x	x	
Urticaceae																
Girardinia diversifolia (Link) Friis	**Dobi** (O), **Dopuyi** (M)	H	Br					x				Making threads/ropes		x	x	
Verbenaceae																
Lippia abyssinica (Otto & A. Dietr.) Cufod.	**Kusayee** (O)	S	Le					x				Washing milk pots and other kitchen utensils to add good fragrance		x		x
Vitaceae																
Rhoicissus revoilii Planch.	**Hida refa, Taru** (O), **Boyiti** (M)	C	Fr/Le/ Rt			x				x		Fruit edible; leaves for snake bites; roots (mixed with *Phytolacca dodecandra* root) for abortion		x	x	x
Zingiberaceae																
Aframomum corrorima (C. Pereira) P.C.M. Jansen	**Ogiyo** (K), **Ogiyoo** (O, M)	H	Fr/Se			x				x		Fruit edible; seed for remedy	x		x	x

Use diversity

The following use categories were recognized: plants for medicine, food (edible), honey, material sources (including lumber, resin, oils, beehives, detergent), social services (ritual/religious value, used in children's games, etc.), animal fodder and environmental uses (soil conservation, shade for coffee, ornamentals, live fences, etc.) (Table 2). The number of species for each use category is indicated in the following paragraphs.

Honeybee flora

Across the study areas, 32 plant species representing 19 families were recorded as being sources of honeybee forage. Fabaceae contributed the highest amount of honeybee flora plants with six species. As the majority of honey production in the study areas is more of traditional type, these species are highly important.

Edible plants

Over 35 wild plant species belonging to 24 plant families were considered by the local people as edible in all study areas. Of these the highest number of edible species was recorded within Rosaceae and Moraceae, each represented by four species. The majority of the recorded edible species have their fruits and/or seeds as the edible parts and the rest have the vegetative parts of the plants, i.e., leaves, stems and tubers/roots. Generally, fruits/seeds tend to be more common in the families dominated by trees, and leafy vegetables tend to be more common in the families with many herbs and shrubs. The highest numbers of edible plant species were recorded in Yayu site (23) followed by Sheko (20), Harenna (20) and Bonga (14).

Medicinal plants

A total of 50 plant species belonging to 34 families were recorded as having medicinal uses (Table 1). The highest number of medicinal species were recorded within Lamiaceae (5 species), Fabaceae (4), Euphorbiaceae (4) and Rutaceae (3). These species are used to treat various kinds of ailments of humans and livestock such as rabies, viral disease, headache, stomachache, wounds, etc. (Table 1). A comparison of the study areas revealed that the community in Yayu area uses the highest number of plant species (33) for the treatment of different illnesses followed by Harenna (25), Sheko (18) and Bonga (9). However, some species are well known across all study sites for their medicinal values, e.g., *Millettia ferruginea* (Hochst.) Baker, *Ocimum lamiifolium* Hochst. ex Benth., *Ocimum urticifolium* Roth, *Croton macrostachyus* Hochst. ex Delile and *Ricinus communis* L.

Animal fodder

In all studied areas, many grass and herbaceous species are usually used for animal fodder. However, this study considered only shrubby and tree species that are known to be fodder plants. Overall, nine species were cited as important sources of animal fodder in the study area. Some of these species were used in all study areas and include *Vernonia amygdalina, Triumfetta rhomboidea* Jacq., *Ficus vasta* Forssk., *Ficus sycomorus* L. and *Chionanthus mildbraedii* (Gilg & Schellenb.) Stearn.

Plants for agricultural and domestic uses

Over 60 plant species were recorded as being used to make different house utensils, farm tools, lumber and baskets. Among these are *Antiaris toxicaria* Lesch., *Cordia africana* Lam., *Ekebergia capensis* Sparrm., *F. vasta, Girardinia diversifolia* (Link) Friis, *Phoenix reclinata* Jacq., *Podocarpus falcatus* (Thunb.) R. Br. ex Mirb. and *Pouteria adolfi-friederici* (Engl.) A. Meeuse. In this regard, the highest numbers of plant species were recorded for Yayu (43), Harenna (30), Sheko (29) and Bonga (16). For example, *A. toxicaria* bark is used to make mattresses, and *P. reclinata* leaves are used to make baskets. *Phoenix reclinata* leaves can be used as mats for floor covering, containers to carry goods or basket-like, general-purpose containers. The products are highly marketable and can be found in many local markets. *Girardinia diversifolia* is widely used to make special rope that can be used locally and also marketed in some places. Many of the other available tree species are used as building materials in

Table 2. Use categories and the corresponding number of useful plant species recorded in all study sites.

Use	Number of species
Material sources (including lumber, resin, oils, beehives, detergent)	69
Remedies (medicine for both humans and animals)	50
Edible (including fruits, seeds, leaves, tubers)	38
Honeybee flora (pollen or nectar sources)	32
Animal feed (forage, fodder)	9
Environmental uses (soil conservation, shade for coffee, ornamentals, live fences, etc.)	4
Social services (ritual/religious value, used in children's games, etc.)	2
Poisons (useful and harmful)	1

carpentry, woodwork, furniture and utensils. The majority of tools and household items are made up of woods from the different tree species.

Some species are used to produce oil for lamps, for food and for medicinal purposes. Some of these local oil plants are *Trichilia dregeana* Sond., *Maesa lanceolata* Forssk. and *Ficus ovata* Vahl. A variety of other plant species have also been quoted for various uses, such as for incense (e.g., *Ocotea kenyensis* (Chiov.) Robyns & R. Wilczek and *Mimusops kummel* Bruce ex A. DC.), glue (e.g., *Ficus umbellata* Vahl), gum (e.g., *Premna schimperi* Engl., *Warburgia ugandensis* Sprague and *P. falcatus*), and some plants were essential parts of children's games (e.g., *Landolphia buchananii* (Hallier f.) Stapf).

Other uses

Some plants are used for spiritual/ritual purposes. For example, *F. sycomorus* is a symbol of Oromo people. It is a tree that the Oromo people use as a "live church," general assembly place and for other social gatherings. Importantly, it is a traditional courthouse, where people sit under it and make a dialogue and solve their disputes. This use is only known from Yayu and Harenna where the Oromo people are the dominant ethnic group.

There are also some poisonous (useful and harmful) species that are used by the local communities for different purposes. In addition to its medicinal and environmental use, the seed of *M. ferruginea* is used as fish poison.

Management and marketing

Respondents were asked to tell whether they are managing the plant species or not. Accordingly, about 95% of the respondents stated that they are not managing the useful plant species and their habitat in their locality due to different reasons like ownership and lack of awareness. This perception was reflected in the same way in all study areas.

Regarding the marketing of the plant products, coffee and honey were noted as the most traded products among the others. All respondents (100%) claimed that these two products are highly marketable at various levels. Thousands of tons of coffee and honey had been produced in each study area every year which makes trading more conducive. But the other products are less marketed and mostly consumed at a household level, occasionally with limited local market value in all sites.

Discussion

Plant diversity and uses

Owing to the extreme variations in climate, topography and ecological systems, Ethiopia possesses diverse plant and animal species. The higher plants of Ethiopia are estimated at around 6000 species, of which about 10% are endemic (Hedberg *et al.* 2009). However, the species which are or are not useful and the different purposes for which the local communities use them are not well known. Some studies have demonstrated the presence of over 1000 vascular plant species that are used by the local communities for different purposes (Asfaw & Tadesse 2001, Getahun 1974). Nevertheless, the National Herbarium of Ethiopia has already had a database of more than 1000 vascular plant species that are used in traditional medicine alone (Ethiopian Medicinal Project Database). On top of that, the diversity of cultural and indigenous knowledge of plant uses is unevenly distributed among the different communities in Ethiopia (Asfaw 2001). Peoples with different religious, linguistic and cultural backgrounds and locations have their own specific knowledge about the use of plants, which, in part, has gradually entered wide circulation in the country. The present study has revealed that 143 useful plant species are used for different purposes by the local communities dwelling in the Yayu, Sheko, Bonga and Harenna areas of Southwest and Southeast Ethiopia. In all the study areas, the local communities consider plants as very important items for their livelihoods.

Similar studies have also reported a considerable number of plant species that are used for medicine, food and others in other parts of the country. For example, 74 veterinary medicinal plant species were reported from Bale Mountains National Park, Southeast Ethiopia (Yineger *et al.* 2007), 29 ethnoveterinary medicinal plant species from Gilgel Ghibe area (Yineger *et al.* 2008), 120 traditional medicinal plant species from the lowlands of Konta, Southern Ethiopia (Bekalo *et al.* 2009), 30 wild edible trees and shrubs from the semi-arid lowlands of southern Ethiopia (Assefa & Abebe 2011), 51 traditional medicinal plant species from Erer Valley, Eastern Ethiopia (Belayneh *et al.* 2012), and 230 medicinal plant species from Mana Angetu, Southeastern Ethiopia (Lulekal *et al.* 2008). All of these findings, including the present study, show the existence of vast accumulated ethnobotnical knowledge and the diversity of useful plant species in Ethiopia.

In the present study, the greater proportions of the recorded species were used for timber, firewood, construction, farm tools and production of charcoal. Almost all available trees are quoted for building materials use, such as carpentry, woodwork, furniture and utensils. A comparison of ethnic groups showed that the community from Yayu disclosed the highest number of plant species for the differ-

ent use categories followed by Harenna, Sheko and Bonga.

Among the quoted use categories, medicinal value is more important both locally and nationally. It could be because of this importance that the majority of the ethnobotanical studies so far made in Ethiopia focused on medicinal plant surveys (Bekalo *et al.* 2009, Belayneh *et al.* 2012, Lulekal *et al.* 2008, Yineger *et al.* 2007, Yineger *et al.* 2008). For instance, Lulekal (2005) and Yineger (2005) have revealed a significant number of medicinal plants in southeastern Ethiopia (about 337 species). In Ethiopia, medicinal plants still play a crucial role in the provision of primary health care (e.g., Farnsworth *et al.* 1985). Despite this importance, however, over 70% of the medicinal plant collections involve destructive harvesting because of the use of parts like roots, bark, leaves and the whole plant, in the case of herbs. Because of the destructive harvesting method followed for exploitation, some of these species are already under threat and some are on the verge of extermination locally, according to the respondents. This is compounded with the loss of habitats and indigenous knowledge, which are also aggravated by the level of medicinal plant harvest. Such threats can create significant problems to the future well-being of the human and animal populations that have relied for generations on these resources to combat various ailments.

Honey production is another major source of income for many rural communities dwelling in the study areas. Like other use categories, the wild honeybee flora also plays an important role in honey production. Apparently, the majority of the remnant forest vegetation is serving as refugia of honeybee flora in the absence of modern honey production systems. However, with the growing frequency of habitat changes and deforestation, the abundance and diversity of honeybee flora is declining or disappearing. These concerns were raised repeatedly by many key informants. Some respondents indicated the declining amount of honey production in the recent years because of the continuing destruction and loss of forest resources.

Generally, the floristic similarity coefficient of useful species recognized among the study areas/communities was found to be between 0.3 and 0.5. Overall, Yayu and Harenna shared a high number of useful plant species in common as compared to the others which is probably attributed to ethnic similarity. Of the total listed species (Table 1), about 25 species (19%) were similarly used across three or more studied ethnic groups.

The implication is that there is a difference between and among the four communities studied for general plant knowledge and uses. This result is expected because of the dissimilarities in cultural, social and economic aspects among the communities studied.

Management and marketing

In all studied areas, the forests are offering various goods and services for the local communities living in and around them. Despite their importance, however, the forests and their products are less managed in many of the studied areas. Many people perceived the resources as communal—anybody could go and collect whenever there is an opportunity. If the potential of wild plant resources is to be managed and sustainably used by local communities, then ownership of the resources must be clearly established. There is little incentive for the local communities to engage in management activities as land tenure is uncertain (Agrawal 2003, Fisher *et al.* 2010). Many rural households, especially those with little land of their own, rely on common property areas for gathering wild plants or plant products that contribute to their household economies. Both focus group discussants and respondents have voiced in the same way. The forest offers something for everyone, but to maintain its abundance over time it must be managed, keeping in mind this great diversity of needs.

As to a marketing of useful plant products, very few are traded in the studied areas. Among others, two of the most traded plant products noticed in the study areas were coffee and honey. In the study areas, the coffee berries are still being harvested from wild (i.e., non-domesticated) coffee trees growing naturally in the forests (Senbeta & Denich 2006, Senbeta *et al.* 2005). Other than coffee, honey is also one of the well-traded products in the studied areas. According to all respondents (100%), both coffee and honey are important sources of livelihoods in the area. Others like fruits and seeds of wild edible plants, medicinal plants and resins are less traded and mostly used for home consumption as highlighted by respondents.

Threats and conservation

Deforestation due to agricultural expansion, over-harvesting, fire, cultivation of marginal lands, overgrazing and urbanization appear to be threatening the plant resources and their habitats in Ethiopia (Senbeta & Denich 2006, Senbeta *et al.* 2007, Woldemariam *et al.* 2002). Such threats can be a challenge for the future well-being of humanity and the environment. For example, some medicinal plant species in Ethiopia are reported to have been already threatened through the overuse for marketing or domestic consumption purposes, e.g., *Hagenia abyssinica* G.F. Geml. (Asfaw 2001, Deffar 1998, Teketay *et al.* 2010). This holds true for many of the other useful plant species in many parts of the country. Although Ethiopia has already developed policies and strategies that enhance sustainable use and conservation of biodiversity, including plants, the threats are still continuing. So far, the impacts of these policies and strategies are very slow or inadequate. Apparently, sustainable use of plant resourc-

es is a timely issue in Ethiopia because of the continued resource degradation in many parts of the country. Ecosystem conservation will ensure *in situ* conservation of many of the useful plant species by applying sustainable harvesting methods for collecting plants for any type of use from their wild habitats. The issue of plant conservation in Ethiopia today calls for categorical studies and documentation of useful plant species before environmental change (e.g., climate change) and cultural transformation destroy the last remaining biophysical entities and the associated knowledge base. Innovative options like eco-agricultural, maintenance of traditional farming systems and linking conservation with utilization by community need to be carefully developed and implemented.

Conclusions

Traditional knowledge of plant use is becoming less common in many parts of Ethiopia (Addis 2009, Guinand & Lemessa 2000). Trends in frequency of use are in favor of introduced and economically important species. Local knowledge of useful native plants, especially medicinal plants, may, therefore, disappear in the medium to long term as many parts of the study areas are rapidly changing. Despite the ongoing habitat conversion, the present study highlighted the presence of diverse plant species and their uses in some of the coffee forests of Ethiopia. The study showed that there is still traditional knowledge available in the public domain, and this reflects the cultural heritage of the studied communities with respect to their ethnobotanic knowledge of wild plants. The diverse plant resources and associated knowledge are important for the survival and livelihoods of the people. A future ethnobotanical study of local knowledge experiences and transfer within the rural communities would be useful. A complete inventory of floristic account and genetic diversity of important species is badly needed. A thorough study of the life cycles of economically important, vulnerable and endangered plant species should be a priority in future efforts. Awareness should be generated among the local communities to adopt the strategy for the sustainable use of important species, such as these endemic plant resources.

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