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FOOD SCIENCE & TECHNOLOGY | RESEARCH ARTICLE

Sacred natural sites, herbal medicine, medicinal plants and their conservation in Sidama, Ethiopia

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Abstract: Researches show biodiversity loss has been happening at an alarming scale in the recent decades and this state of affairs has significant implications for the health of local communities and environments across the world. Sacred natural sites (SNS) are increasingly considered showcases for the conservation of biological and cultural diversity, because their strong cultural importance derives from, and requires maintenance of, biodiversity. Tree biodiversity in general and medicinal plants in particular, which otherwise face increasing endangerment, find protection in SNS. The research described in this paper is concerned with the conservation of threatened medicinal plants in SNS and similar informal protection areas of Sidama, southwest Ethiopia. Mixed methods were used to inventory the medicinal plant biodiversity of such places and explore local understandings and explanations of the role such places play in conservation. The results suggest that where SNS exist, medicinal plants and traditional herbal medicine fare well. Further, the findings demonstrated that some medicinal plant species owe their continued existence to maintenance of SNS. This research is hoped to contribute towards improved understanding of the role SNS play in conserving medicinal plants as well as the resilience and dynamics of traditional herbal medicine in the context of SNS.



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ABOUT THE AUTHOR

With a PhD in Ecological Anthropology/ Anthropology and Conservation from the University of Kent, England, I have over twenty years' experience of teaching and conducting inter-disciplinary research as a student in Ethiopia and England, as a faculty member at Hawassa University(HU) in Ethiopia, and as a consultant carrying out commissioned research for GOs and NGOs, including The Christensen Fund, UNDP, UNICEF, national and international NGOs, and some Ethiopian government agencies including the Ministry of Health and Council of Nationalities of the SNNPRS. These projects included ethnographic, survey and ethnohistorical research, and studies of various health and social justice and economic development issues. They culminated in numerous sole- and co-authored reports and publications. I have also a good record as an educator, having published two teaching materials in anthropology and sociology that are widely in use in Ethiopian universities. I have currently has five journal articles under review in highly regarded journals, and a book chapter in the *SAGE Handbook of Nature* (forthcoming, March 2018).

PUBLIC INTEREST STATEMENT

This research reports on the role sacred sites of Sidama in Ethiopia play in the conservation of medicinal plants and preservation of indigenous plant-based medical practices. The research is significant in that it makes contributions to the debate on the emerging issue of biocultural diversity conservation and the role sacred natural sites such as sacred forests under the traditional managements regimes play in conserving both biological and cultural diversity. The findings might be of interest to academics, policy makers and the public in general in the areas of community forestry, culture protected forest management, medicinal plants and their knowledge.

Subjects: Anthropology; Anthropology - Soc Sci; Sustainable Development; Culture & Development; Development Policy; Environment & the Developing World

Keywords: SNS; medicinal plants; herbal medicine; endangerment; conservation; Sidama-Ethiopia

1. Background and introduction

Biocultural diversity is a concept signaling connection between biological and cultural diversity (Loh & Harmon, 2005; Redford & Brosius, 2006). Sacred natural sites (SNS) are socially constructed places (Schaefer, 2003), centering on natural and other man-made objects as epicenters of local ecology, community life, livelihood and belief (Sponsel, 2013). SNS are humanity's important heritages built from time immemorial; they are manifestations of an inextricable link between human cultural systems and nature (Balée, 2006); key evidences of nature as cultural archives and anthropogenic imprints (Pilgrim et al., 2009). Human societies have set aside land areas for special cultural or other needs from time immemorial (Sobrevila, 2008). Sacred mountains, rivers, forests and groves, caves, wells and islands are the world's oldest conservation areas (Dudley, Higgins-Zogib, & Mansourian, 2009), and still form a large and mainly unrecognized network of sanctuaries around the world (Mallarach & Papayannis, 2009; McIvor, Fincke, & Oviedo, 2008). SNS are increasingly considered showcases for biocultural diversity. This is because their strong cultural importance derives from, and requires maintenance of, biodiversity (Dudley et al., 2009; McIvor et al., 2008; Sponsel, 2013; Verschuuren, 2010). Research interest in SNS and their roles in conservation of biological and cultural diversity has been increasing since the 1960s (Sponsel, 2008) and their conservation significance is increasingly recognized globally (Mallarach & Papayannis, 2009; Sobrevila, 2008) following the introduction of the concept of biocultural diversity into conservation debate in the early 1990s.

Medicinal plants are at the center of the growing pluralism of medicine in our contemporary world (Geissler & Prince, 2010; Salick et al., 2007). The role SNS play in the conservation of plant biodiversity of medicinal importance (medicinal plants) also is an important dimension of this growing area of research. The increasing endangerment of medicinal plants on the one hand and the role SNS and other informal protection areas, especially in the developing world, play in their conservation, on the other, are also getting attention of researchers and policy makers (Cunningham, 2001; Salick et al., 2007). Globally, emerging studies generally show that SNS play positive roles in the conservation of plants, including medicinal ones (Anderson, Salick, Moseley, & Xiaokun, 2005).

Research interests in the conservation state of medicinal plants and the role SNS and other informal, traditional tree management areas in Ethiopia play in conserving medicinal plants are generally at their nascent stage. General observations, however, show that the country's native plant species, including medicinal ones, are increasingly in precarious states. Further, emerging studies indicate that SNS, especially places of religious worship often characterized by abundance of trees, are important refuges for the flora of the country, serving as places where households and medicinal specialists harvest from.

In this paper, the author describes how Ethiopia's valued plants and trees of medicinal importance have been conserved in the context of SNS and other informal protection areas in a south-western community of Sidama. It concludes that conservation of a number of plants and trees of medicinal importance in Sidama has been possible due mainly to the existence and maintenance of sacred forest sites in this community.

2. Materials and methods

This study combines broadly qualitative methods. Data were collected using mixed methods comprising an assortment of tools and materials, including transect walks and inventories with local traditional medicinal practitioners at selected sacred groves and other tree protection areas, in-depth interviews with local herbal experts, household surveys and focus group discussions. Data were managed and analyzed using NVivo 10 and SPSS 20. NVivo analysis of qualitative data involved

thematic analysis through coding. Findings from the household survey were integrated as corroborative information for qualitative analysis.

3. Results

In the following sections, the author will first situate the research in its geographic and socio-economic context; this will be followed by presentation of results that relate to the core substance of the research, namely, the role of SNS in conserving medicinal plants. Before this, however, the author will try to describe the broader context by way of looking at the local views and experiences pertaining to medicinal relevance of plants, their identification, categorization and the like.

3.1. A description of the study area and communities

The Sidama are a Cushitic speaking people of southwest Ethiopia in the Horn of Africa (Braukämper, 1978; Hamer, 2002) and the most populous the Southern Nations Nationalities and Peoples' Regional State (SNNPRS) of Ethiopia, with estimated population size between 3 and 4.5 million (CSA, 2013). Their land, referred to as the Sidama Zone, is located some 275 km southwest of Addis Ababa, the national capital (Figure 1).

The Sidama Zone has a total land area of ca. 7,200 km², characterized by varieties of topographic, climatic and agro-ecological features. The Great East African Rift Valley divides the land into two parts, the western lowlands and eastern highlands. The altitude ranges from 500 masl in the west to 3,500 masl in the eastern highlands, with mean annual temperature and rainfall of 10–27°C and 800–1,600 ml, respectively (Yilma, 2013).

The land is home to many SNS, where various tree species and other biodiversity are conserved. Further, a traditional agroforestry supports an extractive form of conservation of otherwise endangered native tree species and diverse flora (Zebene, 2003). Sacred groves are important components of the Sidama topographic, biocultural and livelihood landscape, enabling protection of trees and ancestral institutions. The social-cultural institutions and practices supporting maintenance of sacred sites have existed for centuries, defying the onslaughts of various militating factors (Figure 2).

The Wonsho District where the fieldwork was conducted is one of 23 such sub-divisions located in the south-eastern part of the Sidama Zone. It is located at 06°45'11''N and 38°30'16''E and is approximately 45 km from Hawassa, the zonal and regional capital. Wonsho topography and agroecology are characterized as cooler and to some extent milder compared to other districts in Sidama, as

Figure 1. Location map of Sidama, Ethiopia.

Source: Bureau of Finance and Economic Development, Southern Nations, Nationalities and Peoples' Regional State-SNNPRS of Ethiopia.

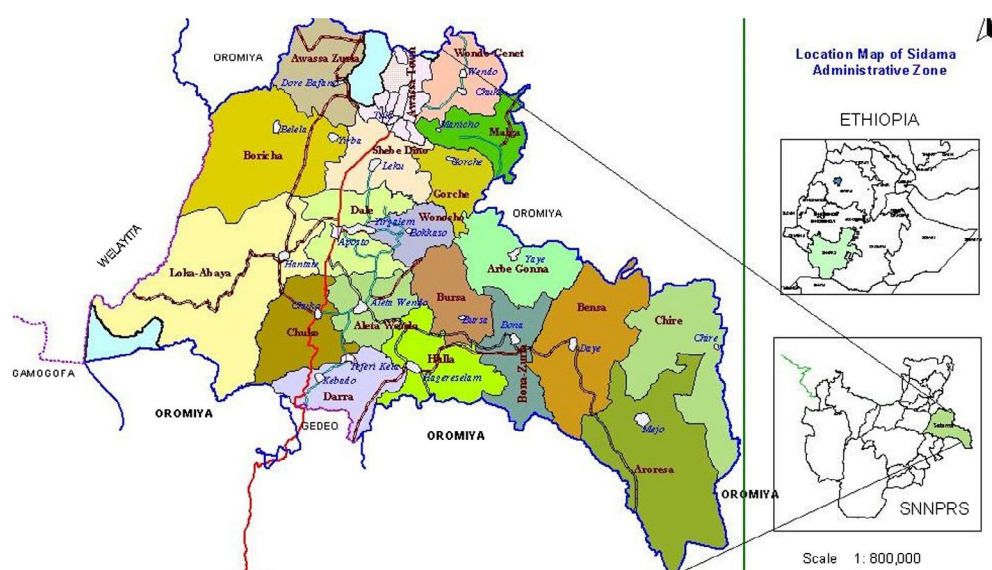
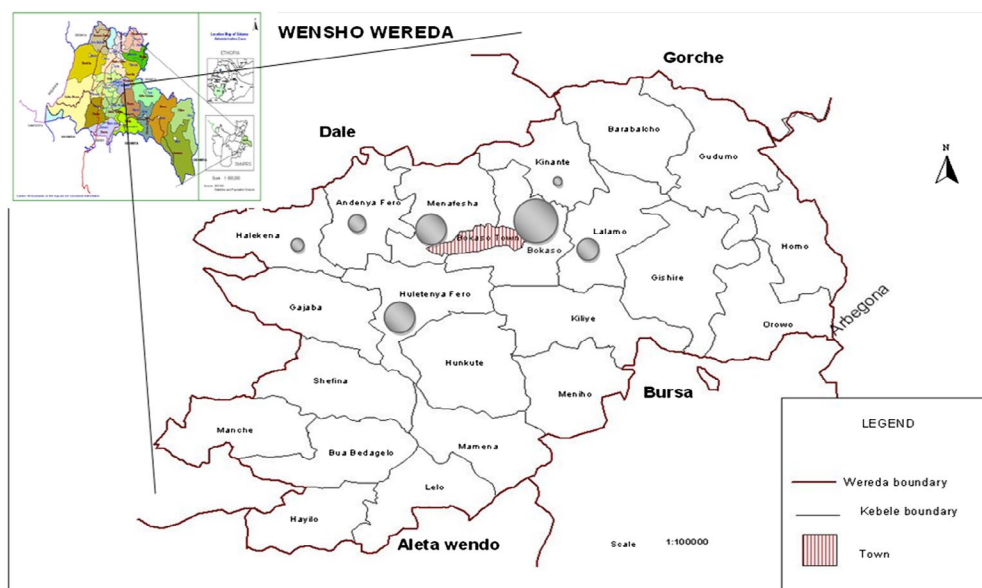


Figure 2. Administrative maps of Wonsho District, Sidama, Ethiopia.

Source: Bureau of Finance and Economic Development, Southern Nations, Nationalities and Peoples' Regional State-SNNPRS of Ethiopia.



the district lies in the highland area, east of the Ethiopian Rift Valley. Its altitude ranges from 1,978 m (west, lower end) to 2,149 m (east or upper end) above sea level (Moges, Dagnachew, & Yimer, 2013).

The local botanical environment, ecology and agricultural landscape is rich in a diverse and dense floristic community, from massive, high-growing native trees such as *dagucho* (*Podocarpus falcatus*) to the ubiquitous *bardaffe* (*Eucalyptus camaldulensis*), as well as other recently introduced exotic trees. These serve multiple and complex needs including agro-forestry, firewood, aesthetics and ornamentation, herbal medicine, shade for crops, animals and humans, soil fertility management, income sources and food security supplement.

4. Medicinal plants of Sidama, Ethiopia

4.1. Importance of medicinal plants in local community health

In Sidama and Ethiopia in general, medicinal plants occupy a crucial place in traditional health care system (Zewdu & Demissie, 2001) and “all plants”, as wisely observed by one of local informants, possessed a form of medicinal utility and hundreds of species have been more specifically selected out and utilized for meeting a range of health and paramedical needs of the community. While local people generally noted all plants of their community, from herbs to big trees, were medicinal in one way or another, surveys yielded more specific, concrete demonstrations of the role of plants in community health. Although very limited in scale, more than 50 per cent of the 154 plants or trees inventoried during the fieldwork were directly tagged as medicinal and most of these were currently in use. From these, based on reports from a team of local herbalist informants, about 68 distinct decoctions were in use for tackling 28 human and veterinary ailments. A comparable study from Wondo Genet district of Sidama reports 85 plant species used as cures for 61 ailments (Sintayehu, 2001). Another comparable study by Ruelle of “the healing agriculture” in the northern Ethiopian community identified 142 plants of which 29 had medicinal uses (Ruelle, 2014).

4.2. “All plants are medicinal”; but some plants are more medicinal than others

What locals called *shimada murro* (small plants) served the most important medicinal role. *Shimada murro* include herbs, climbers, shrubs, grass and other small plants. These were invariably touted as highly medicinal. In a small, informal survey, about 86 tree species were identified at a major sacred forest. Of these, more than half were such plants and most were understood as medicinal.¹ The most widely noted use of this category of plants was medicinal, followed by their importance as firewood,

animal fodder, and occasionally wild food sources. As our practicing herbalist informants noted, the most commonly used source of decoctions in their pharmacopeia come from the leaves, seeds and roots of the small plants. “Big trees” were also a useful category to which medicinal plants belonged. In general, informants were of the opinion that all plants and trees in their locale were useful medicinally in one way or another for treating a range of human and cattle ailments.

4.3. Identifying and classifying medicinal plants of Sidama

Locals use different parameters to classify plants in general. Specifically, medicinal plants may be classified depending on how popular and widely known, the type of human or cattle ailments they treat, where they grow, and how they facilitate or generate healing. Some medicinal plants were universally recognized by children, women and herbalists alike.

The most popular of all, measured in terms of their current actual use as home-based self-medication remedies, abundance, and identification by the younger generation, were *çikicho* (*Justicia schimperiana*) and *binjile* (*Clusia abyssinica*), both small plants. *J. schimperiana* is used as a readily available emergency source for a decoction for treating tummy pain and varieties of other human ailments. The widely known and used medicinal plants were generally regarded as important for health problems that did not require specialist skills and complex processing procedures (Table 1).

From the expert herbalist’s point of view, the supernatural, curative, or medicinal properties of many local trees and other plants—particularly climber, grassy and shrub groups—are recognised only by them and not by the common people. The identification and procuring of these, especially those from wild, obscure sources, requires specialist knowledge and hard work. The medicinal identity and efficacy of such trees were often claimed as revealed to the practitioners through dreams, which also coincide with what they claim as the origin of their skill. From the experts’ point of view, some tree species whose medicinal properties were unknown by the general community were the most widely used sources of herbal decoctions.

Classifying medicinal plants based on the types of health and paramedical problems they are employed to cure is also important. Some plants are suited for generic and common health

Table 1. Widely known and used medicinal plants in Sidama, interviews and focus group discussions (FGDs), Sidama, Ethiopia, 2012

Local name	Scientific name	Description	Commonly treated health problem
<i>Çikicho</i>	<i>Justicia schimperiana</i>	Herb, native	Decoction from leaves drunk for treating <i>dingeteñu</i> (sudden and emergency health problem causing diarrhea and vomiting; stomach ache)
<i>Binjile</i>	<i>Clusia abyssinica</i>	Herb, native	Decoction from leaves drunk for treating <i>woranto</i> , a cow disease and <i>rarate</i> , liver disease
<i>Dongicho</i>	<i>Prunus africana</i>	Tree, native	Decoction from bark for treating <i>hamessa</i> , a commonly perceived infant tummy problem; considered as a necessary “vaccination” for infants
<i>Dadako</i>	<i>Hagenia abyssinica</i>	Tree, native	Decoction from berry and leaves for treating worm infestation <i>hamashe</i> (“tapeworm”)
<i>Godicho</i>	<i>Fagaropsis angolensis</i>	Tree, native	Berry eaten for treating <i>dingeteñu</i>
<i>Haranjicho</i>	<i>Phytolacca dodecandra</i>	Shrub, native	Leaves used as a detergent; decoction from leaves for treating <i>dingeteñu</i>
<i>He’echo</i>	<i>Vernonia amygdalina</i>	Tree, native	Decoction from leaves drunk for stomach aches
<i>Gobacho</i>	<i>Maesa lanceolata</i>	Tree, native	Decoction drunk for stomach ache; decoction rubbed for treating foot sores, wounds, etc
<i>Garbicho</i>	<i>Ekebergia capensis</i>	Tree, native	Decoction from the leaves and berries used to treat cattle disease; <i>dingeteñu</i>
<i>Wajo bardaffe</i>	<i>Eucalyptus globules</i>	Tree, exotic	Decoction from leaves drunk for stomach aches; leaves smoked for fumigating home

problems. Informants often talked about such plant categories being employed for *dingeteñu*. *Dingentenu*, a generic a generic term for a group of illnesses that may occur both in humans and animals and characterized by a set of symptoms including diarrhea, vomiting, tummy pain, head ache, fever, etc. These plants are generally those readily available and accessible in the backyards without the need for specialist trekking to the wild forests and are used with minimal specialist herbal knowledge. For example, *çikicho* (*B. antidyseutrica*), *binjile* (*C. abyssinica* Jaub.), *dongicho* (*Prunus africana*) and *wajo bardaffe* (*Eucalyptus globulus*) and many other herbs belong to this category.

Some, on the other hand, are defined as best employed for dealing with psycho-social and more mystical health problems. These include socially relevant recreational, psychoactive plants and those that are employed to deal with psychological problems and ward off evil influences and misfortunes. *Çaate* (*Katha edulis*), *buncho* (*Coffea arabica* L.) and *ɣaddo* (*Rhamnus prinoides*) may be cited as examples. While *araddo* (*Nicotiana tabacum*), a traditional stimulant, is becoming more archaic, *çaate* is becoming a widespread psychoactive, recreational, drug plant, especially among youth and healers.

Further, there are plants for preventing or repelling snake and other insect bites (e.g. *araddo* [*N. tabacum*]) and treating specific health problems such as *hammessa*, a common infant health problem (e.g. *dongicho*, *P. africana*); *hamashe*, tape-worm (e.g. *dadako*, *Hagenia abyssinica*) and the like. Some medicinal plants were known and identified by their use for aromatic, dental and oral hygiene needs. Some of these include *ejersa* (*Olea europea*), *nolle* (*Achyranthes aspera* L.), *had'essa* (*Lactuca inermis* Forssk) and *saticho* (*Borassus aethiopum*). Traditional oral and dental hygiene management using twigs carved out of branches, bark and roots of some trees is still important.

Nativity or the indigenous status of plants is another local parameter employed to identify medicinal plants. Informants regarded the lion's share of species as "their own", and hence native; this shows the understandably key role of these species in their culture, livelihoods and traditional medicinal needs. Exotic species were also increasingly used as medicinal. According to herbalists, it was part of their duty to continuously experiment to identify and extract medicinal qualities of plants in their localities. This is a demonstration of the resilience and dynamism of traditional herbal medicine in that while herbalists maintained maintained core beliefs, they were open to experimenting with new things and to incorporating them into their system.

5. SNS and conservation of medicinal plants

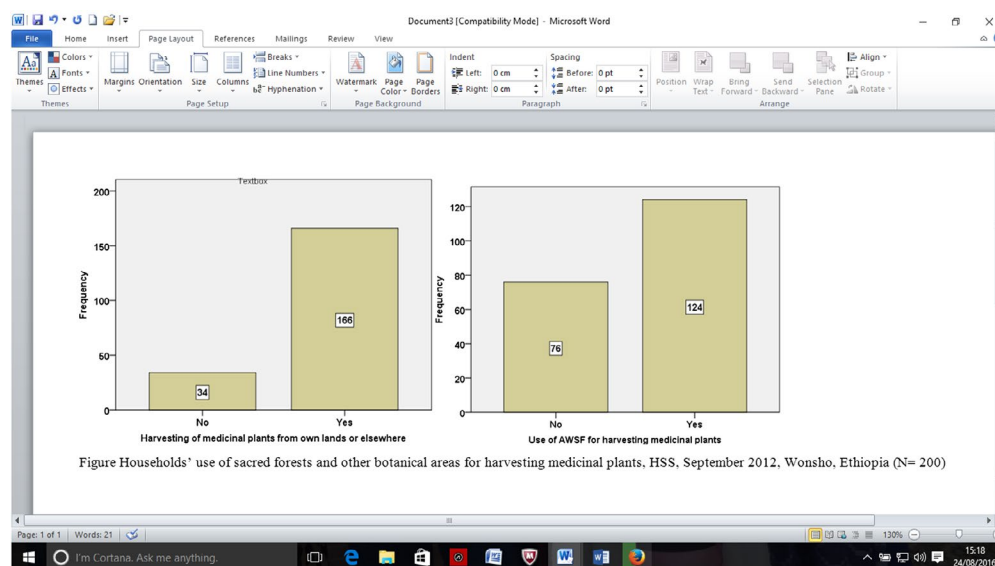
Medicinal plants in Sidama and across Ethiopia find refuge in a range of botanical environments. Below I analyze, firstly, how SNS, notably sacred groves provide crucial protection for medicinal plants and some critically threatened native trees. The conservation, conscious or otherwise, of medicinal plants in other informal protection areas such as farmers' backyards is presented subsequently.

5.1. SNS as major sources of harvesting medicinal plants in Ethiopia

SNS such as sacred groves are important sources for harvesting medicinal plants for sustaining traditional medical practices, which in turn sustains local ways of selective conservation of medicinal plants. In Ethiopia, with 80 per cent of the population dependent on traditional medicine, local communities turn to existing sacred forest areas to harvest medicinal plants. For many of the so-called mysterious and difficult-to-manage health problems, medicinal plants are more likely to be harvested from wild areas, including sacred forests, while for simple, common health problems plants in backyards often serve this need.

Across communities in Ethiopia, as is the case in Sidama, sacred forests serve as good sources for households to select and harvest herbs, climbers and other small plants that are not easily found elsewhere. Harvesting and use of medicinal plants from sacred forests was indicated as important for Wonsho households in Sidama. Eighty-three percent of the household survey respondents indicated they currently resorted to their own gardens and other local botanical environments to

Figure 3. Households' use of sacred forests and other botanical areas for harvesting medicinal plants, HSS, September 2012, Wonsho, Ethiopia (N = 200).



harvest medicinal plants. Sixty-two percent reported using sacred forests for medicinal needs, which was slightly lower compared to those depending on their own gardens or other places (Figure 3).

5.2. Medicinal plants in sacred forests

Broadly speaking, the community sees their sacred forests as important havens for hundreds of plants, from the humblest *hayso* (common grass or herb) to the graceful *dagucho* (*P. falcatus*). In view of this, it is perhaps understandable that Wonsho-Sidama sacred forests are repositories for the preservation of medicinal plants.

Of a total of 154 plants identified at Sidama SNS and other botanical environments during the fieldwork, 77 (51.3%) were reported as directly medicinal. This was the most important use of plants identified, followed by other livelihood uses. Of these plants and trees, except for some exotic species which by virtue of taboos were excluded and few native trees that do not adapt easily to sacred forest' micro-climate, all of the native species were harbored in sacred forests.

The case of some trees that were locally reported as “fast disappearing” or “already lost” at other places being conserved at sacred forests is significant. It is generally the view of the community, represented through interviews and household surveys, that sacred forests serve as havens for such trees. Through overutilization for medicinal and other livelihood needs, some woody native trees such as *dongicho* (*P. africana*) were reported as now found only in sacred sites. Some other native species of medicinal importance were also believed to be found only at such places. In the household survey, 182 household heads (91%) reported that sacred forests were sole havens for many [or some] medicinal plants (Figure 4).

Sacred groves, therefore, along with the flora of the agroforests and other places, were perceived as important refuges for medicinal plants, from small, “humble” climbers such as *surruppa* (*Lagenaria siceraria*) to the dignified *duwancho* (*Syzygium guineense*) or *dongicho* (*P. africana*). Sacred groves of Sidama serve as important sources of subsistence wild foods, cattle fodder, wildlife food, and firewood, but even more importantly, of preferred medicinal plants (Table 2).

5.3. Medicinal plants in farmers' backyards

While sacred groves harbor many medicinal trees or plants that are otherwise lost in farm plots and other household lands, households, nevertheless, usually rely on their backyards for harvesting medicinal plants throughout Ethiopia. A matter worth noting is the conservation of some medicinal

Figure 4. Household heads' opinions of sacred forests' role as sole havens for some medicinal trees not found elsewhere, Wonsho HHS, September 2012, Sidama, Ethiopia.

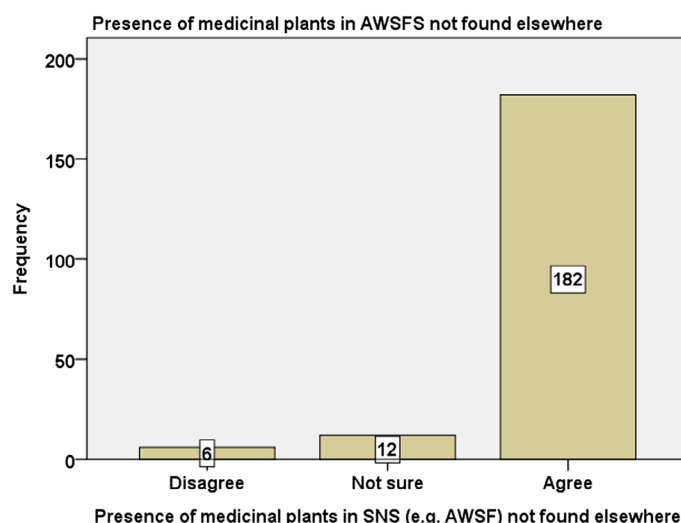


Table 2. “Disappearing” or “lost” medicinal trees found at sacred forests, interviews and focus group discussions, Sidama, Ethiopia, 2012

Local name	Scientific name	Reason for decline
<i>Dongicho</i>	<i>Prunus africana</i>	The most over-utilized medicinally through de-barking for dealing with “hamessa”, a commonly perceived infantile ailment
<i>Gidincho</i>	<i>Ehretia cymosa</i>	A native woody tree overutilized as a popular medicinal source and other livelihood pressures
<i>Bulancho</i>	<i>Withania somnifera</i>	A major medicinal plant, reported as over utilized
<i>Godicho</i>	<i>Fagaropsis angolensis</i>	Livelihood overutilization
<i>Gatame</i>	<i>Commiphora schimperi</i>	Livelihood overutilization
<i>Duwancho</i>	<i>Syzygium guineense</i>	Livelihood overutilization (esp. charcoal, construction material needs, etc.)
<i>Ejersa</i>	<i>Olea europae</i>	Medicinal, firewood, and construction use
<i>Dagucho</i>	<i>Podocarpus falcatus</i>	Declining outside of sacred sites due to overutilization
<i>Nolle</i>	<i>Achyranthes aspera</i>	Medicinal and livelihood overutilization

plants at such places by some households through what may be considered as conscious or intentional conservation. Some scattered cases of conserving medicinal plants at household level were documented during fieldwork and a number of local informants, whose back- and front-yards were surveyed for plant/tree species, reported they had explicitly planted some species for medicinal purposes.

As for formal attempts of government and other actors with respect to medicinal plants conservation work, it may be stated this as a whole is nascent, at best. Conscious, direct conservation measures for medicinal plants from local to national scales were emerging. At the scale of Sidama where the study was conducted, there was a general absence of targeted work on medicinal plant conservation. There were no projects to identify and document the status of traditional medicinal practice and the stock of medical plant species locally used from the sacred sites and other places.

6. Discussion

The foregoing paragraphs described major results on the state of herbal medicine and medicinal plants and the role of SNS and other botanical environments in conserving the latter. In the following paragraphs, I place the findings in broader national, global and ethnographic contexts.

Conservation of medicinal plants in SNS is garnering increased attention from scholars. The results presented above indicate the ongoing importance of traditional medicine and medicinal plants in the health care of Sidama and Ethiopia at large, a fact that demonstrates the current relevance of traditional medicine throughout the world and the values of plants and herbal medicine. This is a system that meets the needs of over three billion people for their primary health-care, recognized by the World Health Organization (WHO) not only as an alternative medical system, but also as the mainstay of healthcare delivery or a complement to it across the world (WHO, 2014). In view of this, the WHO Beijing Declaration call for member states to recognize the role traditional medicine plays in keeping populations healthy and to integrate it into national health systems is understandable (WHO, 2008).

In Sidama and across communities in Ethiopia, medicinal plants occupy a crucial place in the alternative health care system (Zewdu & Demissie, 2001). Many people believe that “all plants” possessed a form of medicinal utility and hundreds of species have been more specifically selected out and utilized for meeting a range of health and paramedical needs of the communities. This is understandable in the context of a country where, some reports estimate, about 80 per cent of the population utilizes traditional medicine that mainly depends on medicinal plants (BIE, 2006; Kassaye, Amberbir, Getachew, & Mussema, 2006). Over 95 per cent of decoctions for folk drugs are sourced from medicinal plants (Abebe, 1986). About 887 plant species were used for medicinal purposes, constituting over ten per cent of vascular species of the country (Bekele, 2007; Zewdu & Demissie, 2001), of which 2.7 per cent were reported to be endemic to the country. In recent years, studies from mainly biological science perspective on ethnomedical-botanical beliefs and practices among the various ethnic groups of Ethiopia show continuing relevance of plants in dealing with human and animal health problems (See, for example, Assefa, Glatzel, & Buchmann, 2010; Sintayehu, 2001; Wassihun, Asfaw, & Demissew, 2014).

The continuing relevance of herbal medicine in Sidama and Ethiopia in general may help demonstrate the values of medicinal plants across time and space. Medicinal plants are at the center of the growing pluralism of medicine in the contemporary world (Geissler & Prince, 2010; Salick et al., 2007). Historically, for example, the *materia medica* of ancient Greek scholar Dioscorides documented over 500 medicinal plants (Balick & Cox, 1996). In China, documented sources indicate that there were about 12,807 species used in medicinal treatment, of which 1,582 were animals, 11,146 were plants and 81 were minerals (Pei, 2002). Among the Baganda in Uganda, more than 200 plant species were used by herbal healers (Hamill, 2002). The Dogon utilize some 200 plant species (Van Beek & Banga, 1992), while over 130 plants were used by Samoans (Whistler, 2000). Moerman (1998) documents for 291 societies of Native Americans use of 4,029 plants for over 44,691 uses in five main categories of drug, food, fibre, dye and other. He writes, “Of the 44,691 usages, 24,945 are medicinal ...” (Assefa et al., 2010; Moerman, 1998; Negash, 2010, p. 8).

As evidenced from our fieldwork, generally herbs, shrubs and climbers are more highly valued medicinally, as compared to big trees. Of 78 or so specifically tagged medicinal species, about 48 were such plants. Some big trees, such as *P. africana*, *H. abyssinica* and *Ehretia cymosa*, however, played important medicinal roles. It is similarly recognized at the national scale that the majority of medicinal plant species are herbs and shrubs. Over 271 herbs, 168 shrubs and 110 woody trees were identified as medicinal. *H. abyssinica* and *P. africana* have been bigger woody species of classic and widespread medicinal importance in Ethiopia for millennia, for treating intestinal worm infestation, headaches, stomach-ache, and fever.

As Voeks (2004) argues, this may not be surprising given the fact that (contrary to the widespread assumption that pristine, undisturbed primary forests are the most important repositories for medicinal plants) the preferred foraging places for many tropical rural groups are anthropogenic places of their own creation: “trails, kitchen gardens, swiddens, and forest fallows” (Voeks, 2004, p. 868), which are the places where smaller plants are more likely to abound. These “disturbance pharmacopoeias” are easily accessible, relatively abundant and persistent even in anthropogenically “disturbed” areas.

Related to this is, as shown in the findings above, how local people perceive, identify and classify medicinal plants. Key local parameters in doing this were generally related to specific types of human or cattle diseases that were dealt with by using decoctions from a specific plant part or a mix of parts from different plants, a practice which is widely common across traditional societies (Balick & Cox, 1996). For instance, the case of plants/trees used as “chewing sticks” for oral and tooth hygiene is an interesting one. About seven species, as noted above, were utilized for such needs in communities studied in Sidama. The practice is time-honored and still common in Ethiopia and many other parts of the world where many plant species are employed for such needs (Araya, 2007).

In the Sidama context, medicinal plants may be identified as native or exotic, the majority being the former; some may be identified as commonly used and recognized others secretive; in terms of their provenance of harvesting they may be home-grown or wild sourced, etc. The way local communities use and manage plants in their daily lives, including for their medicinal purposes, is highly influenced by their sociocultural belief systems (Brush, 1992; Ingold, 1992) and best understood within the framework of the “knowledge-belief-practice” (Berkes, 1999) or “cosmos-corpus-praxis” interface of the ethnoecology of local communities (Toledo, 2013). Furthermore, contributions that medicinal plants make to people’s lives in terms of health support, financial income, cultural identity and livelihood security are also important factors (Hamilton, 2004). Understanding this system is essential for the proper interpretation of the ways people use and make decisions in the management of plant resources such as medicinal plants (Balick & Cox, 1996).

The results outline above indicate, primarily, presence of plant species, endangered or not, in the SNS, notably sacred groves, some of which not found elsewhere. They also show some abundance and distribution patterns. For example, the 78 medicinal plants were both reported and some of them inventoried, at surveyed sacred groves of Sidama. Some medicinal species such as *bulancho* (*Withania somnifera*) were reported to be found only in sacred groves. Such were, however, unconfirmed piece-meal cases and more conventional plant species surveys at the sacred site might further reveal the number and abundance of plants with medicinal values that were solely protected in sacred groves. Species such as *binjile* (*C. abyssinica*), *he’echo* (*Vernonia amygdalina*), *masincho* (*Croton macrostachyus*), *rejicho* (*Vernonia auriculifera*), *çikicho* (*J. schimperiana*), *çekata* (*Calpurnia aurea*), *akirsa* (*Aloe vera*) and *hançululicho* (*Kalanchoe petitiata*) were both reported and observed to be abundant and distributed well over the landscape, both at sacred sites and in other botanical areas.

In general, such results clearly demonstrate that in Sidama and Ethiopia at large, the maintenance of sacred groves and other informal tree conservation areas has some veritable, tangible conservation outcomes for medicinal plants. Local people also recognize this, indicating the fact that while relentless deforestation processes and other tree-biodiversity-harming factors have caused decline of tree species, existing sacred forests and some other informal protection contexts have proved to be key repositories for medicinal plants, endangered or not. Except for a handful of trees which were found elsewhere such as in private household lands or in other areas, all of the tree species from the sample inventoried were harbored in sacred groves. Those absent from such places were exotic species, native species imported from other areas or those lacking ability to adapt to sacred site micro-climates.

In Ethiopia, studies documenting the role of SNS in conserving medicinal plants are emerging. These studies indicate that SNS, especially forest areas where ancestral religious traditions are maintained, are important refuges for the flora of the country. It is also reported that the hundreds of forests in Ethiopia owned by the Ethiopian Orthodox Christian Church (Berahne-Selassie, 2008; Massey, Bhagwat, & Minnis, 2014), are also havens for hundreds of medicinal plants. These places were most cherished ones for local medicinal plant harvesting. It is understood that SNS, especially sacred groves, provide multiple functions to the local communities, and that medicinal plants are harvested from these places while at the same time getting shelter there. Bekele (2007) documented the actual situation of medicinal plants in the country, on the basis of which in 2008 the Ethiopian Biodiversity Institute commissioned a national project aimed at their conservation (Zewdu &

Demissie, 2001). The BIE reports the outcomes of this project, which included preliminary inventorying of medicinal plants in various agro-ecological zones and that a number of experimental *in situ* and *ex situ* conservation of medicinal plants were on going (EIB, 2014).

Globally, studies generally show that SNS play positive roles in the conservation of medicinal plants and botanical knowledge. For example, studies of sacred mountains as repositories for plants, including medicinal, in Tibet demonstrate this (Anderson et al., 2005; EIB, 2014). Junsongduang, Balslev, Inta, Jampeetong, and Wangpakapattanawong (2013) discusses the importance of swidden fallow fields and sacred forests as havens of medicinal plants among the Karen and Lawa people of Thailand where they document a total of 365 species of which 72 were medicinal and most of these in sacred forests. Lebbie and Guries (1995), in their study of the conservation value of sacred places among the Kappa Mende of Sierra Leone, report the discovery of rare plants conserved in sacred groves. Other studies also show the role of sacred groves in conserving medicinal plants in various Indian indigenous communities (see for example, Bhagwat & Rutte, 2006; Rao, 2002).

Furthermore, other places apart from sacred forests, such as home gardens and/or agro-forests and premises in various government and other institutions also provide shelter for medicinal plants. These were observed and reported to be relatively abundant with plants that are managed as food-medicinals as well as for specific medical needs. In many other communities in Ethiopia, such places are known to be very rich with medicinal plants (Ruelle, 2014; Sintayehu, 2001; Wassihun et al., 2014) and the country's biodiversity conservation institute pays attention to such places as loci for *in situ* conservation. Conservation and management of medicinal plants by concerned individuals and groups in Ethiopia were rare although there were some cases.

Herbalists in Ethiopia generally tend to harvest medicinal plants from the wild. For instance, over 887 plant species were reported to have been used as medicinal sources in the country of which about 24 were endemic in the wild. About 89 plant species were cultivated by users, although not primarily for medicinal purposes, while over 357 species were wild. Across the world, while the "wild" is a vital source for medical herbalists to harvest plants (Cotton, 1996; Cunningham, 2001), the practice of purposefully planting and managing medicinal plant farms is common among some traditional societies. For example, Schultes and Raffauf (1992) noted, citing the example of Amazonian Indians, that while much of the repertoire of medicinal plants are the wild forests, some of the more sacred species of hallucinogenic plants are often well managed and taken care of. In general, the value of subsistence-based places for maintenance and harvesting of medicinal plants should not be undermined (Voeks, 2004).

Medicinal plants and associated herbal knowledge of local communities need an organized and sustainable form of conservation (Cunningham, 2001; Plotkin, 1993), as supporting the local herbal medicinal tradition has conservation effects for medicinal plants (Brown, 1992). There is an increasing erosion of local communities' ability and right to use health care systems that suit their own local conditions, ecologies and knowledge systems in Ethiopia and across the world (Kassam, 2014; Ruelle, 2014). Furthermore, there is insufficient policy support and weak implementation provided for traditional herbal medicine. With the loss of medicinal plants, traditional management and conservation mechanisms, these plants face endangerment. Biocultural diversity loss affects medicinal plant species and its associated knowledge system. Factors such as deforestation endanger the centuries old traditional medicinal-plant knowledge base, which in turn adversely affects the health and welfare needs of the local communities who to a large degree depend on folk medicine rather than on professional healthcare (Cotton, 1996; Toledo, 2013). It is now known that, as noted above, throughout the world, ancestral knowledge, such as those relating to medicinal plant use, is being lost as local communities are being integrated into the mainstream culture in their respective nation-states. Such erosion of traditional medical botanical knowledge and practice degrades local communities' rights and power to manage and address their health needs in culturally meaningful ways. Medicinal plant knowledge and use maintains such rights, power and needs, in which local peoples have meaningful options in their social, epistemological and ecological systems, and maintain their "health sovereignty" (Hirsch, 2011; Ruelle, 2014).

Medicinal plants and associated herbal knowledge held by local communities need organized and sustainable conservation. At the time the research for this paper was conducted, such efforts in Sidama and Ethiopia were at their infancy. Some preliminary inventorying of medicinal plants in various agro-ecological zones, and *ex situ* and *in situ* conservation programs were being carried out by the relevant government sectors as noted above. Field gene banks for endangered medicinal plant species were established through identification of 57 national forest priority areas in mid 2000s. In selected parts of the Sothorn Region, a number of experimental *in situ* and *ex situ* conservation of medicinal plants were on going. However, such programs were often faced with uncertain future support needed to sustain them.

As stated above, medicinal plant species need conservation attention (Cunningham, 2001). The need is necessitated by their multifaceted uses as well as on various aesthetic, ethical and scientific grounds (Plotkin, 1993). On the other hand, local herbal medical knowledge and use are major incentives for the preservation of both the knowledge and the plant species. Conserving traditional medical knowledge has conservation effects for medicinal plants (Brown, 1992).

7. Conclusion

In the foregoing paragraphs, a range of issues were raised and discussed including the state and characteristics of the Sidama herbal medical system, the place of medicinal plants therein, and the role of SNS and other related informal *plant* protection areas in meeting community health needs and conservation of endangered medicinal plants. Based on the findings and discussion, it may be concluded that SNS are repositories for *endangered* medicinal plant species, ensuring their conservation while at the same time serving as places *local* communities can turn to for their health needs. SNS, notably sacred groves are resilient and are relevant for the conservation of medicinal plants. *They and their* traditional mechanisms of their maintenance are salutary for both medicinal plants and botanical traditions. Therefore, maintenance of SNS promotes health and wellbeing, conservation of otherwise endangered medicinal plants and contributes to use and resilience of local herbal medicine as a traditional yet dynamically adaptive system. Community health, herbal medicine and medicinal plants fare better in conditions where sacred groves are maintained. *In view of this, therefore, there is a need for providing stronger formal support for existing culture-based protection and management of sacred forests in Sidama.*

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Note

1. As may be understood from the subheading, while local people view all tree/plant species as potentially medicinal, some categories of trees, the *shimada muro* (small trees/plants) were perceived/ experienced as more medicinal.

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