Local Knowledge of Plants and their uses among Women in the Bale Mountains, Ethiopia

Matthew W. Luizza, Heather Young, Christina Kuroiwa, Paul Evangelista, Aserat Worede, Rainer W. Bussmann, and Amber Weimer

Research

Abstract

Women's local ecological knowledge (LEK) is noted by many scholars to be unique and important for local conservation and development planning. Although LEK integration is inherent to ethnobotanical research, in Ethiopia, the knowledge-gender link has not been fully explored, and few studies focus on women's distinct plant knowledge. We catalogued rural women's knowledge of a wide range of plant uses in south-central Ethiopia, conducted through picture identification of 337 local plants. Fifty-seven plant species were identified, constituting 38 families, with the top five families being Lamiaceae, Solanaceae, Asteraceae, Rosaceae, and Pteridaceae. An array of uses were identified ranging from food, livestock and wildlife forage, to honey production and cosmetics. The most prevalent use noted (nearly 70%) was human medicine. This study reveals the important contribution of rural women's plant knowledge in the Bale Mountains, and the potential benefits of including this gender-distinct understanding of local flora in community-based conservation planning.

Introduction

Local ecological knowledge, or "knowledge held by a specific group of people about their local ecosystems" (Olsson & Folke 2001) is argued to be dynamic and heterogeneous, varying across occupations (Crona 2006), age groups (da Silva Sousa *et al.* 2012), gender (Figueiredo *et al.* 1993, Garibay-Orijel *et al.* 2012), or a mixture of these specific variables (Ponderosa *et al.* 2012) and other socio-economic, socio-cultural, and biogeographical factors (Mafimisebi *et al.* 2012, Schunko *et al.* 2012, Toledo *et al.* 2009). Acknowledgment of the knowledge-gender link is critical, as distinctions can be found coming out of culturally defined roles and divisions of labor, including women's unique ethnomycological knowledge, as primary collectors and sellers of wild edible mushrooms world-wide (Garibay-Orijel *et al.* 2012), and gender-based ethnobotanical practices existing with many aboriginal Australian groups (Sky 1995). Despite the inherent complexity of local knowledge, many published studies have not fully explored the importance of women's unique plant knowledge (Pfeiffer & Butz 2005), albeit with notable exceptions (Camou-Guerrero *et al.* 2008, Figueiredo *et al.* 1993, Flintan 2000, Garibay-Orijel *et al.* 2012, Ponderosa *et al.* 2012, Sky 1995, Voeks 2007, Voeks & Leony 2004). This "lack of gender consciousness" (Garibay-Orijel *et al.* 2012:10) is important to address, as women's distinct understanding of local flora can arguably afford researchers with a more complete understanding of biodiversity of a given landscape, and provide a more holistic understand-

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ing of community priorities for conservation and sustainable management approaches.

We explored the local ethnobotanical knowledge of women in the rural town of Dinsho, located in the Bale Mountains in south-central Ethiopia. These mountains are well known for their high concentration of biodiversity and endemic species, but there remains limited understanding of the local plant knowledge. With rapid population growth in the highlands and rural people's dependence on natural resources across Ethiopia, cataloguing and preserving local ethnobotanical knowledge is critical for future community-based conservation efforts. Ethiopia's flora, comprised of approximately 6,000 higher plant species (Hedberg *et al.* 2009), is essential to human well-being and ecological diversity, but is increasingly threatened by a range of anthropogenic pressures. The United Nations Environmental Programme (UNEP) lists a number of important and linked environmental issues facing Ethiopia, including water access and availability, livestock and land degradation, and threats to biodiversity and endemism (UNEP 2008). These long-standing problems have acute impacts on plant communities, and are further heightened by a rapidly growing rural population. Some 85% of Ethiopians live in rural areas, with the vast majority of these people (approximately 90%) living in the highlands and dependent on small-scale, rain-fed subsistence agriculture (Zeleke 2010). Furthermore, between 70 and 80 percent of the population depend on traditional plant-derived medicine for their primary healthcare (Abebe 1986, Assefa *et al.* 2010).

Moreover, we have found no records or studies in the region that explore women's ethnobotanical knowledge and use of plants as part of their livelihoods. A review of four major ethnobotany peer-reviewed journals revealed thirty-nine ethnobotanical studies specific to Ethiopia, spanning forty-six years (1966-2012). Although contributing greatly to the broader literature, a majority of studies only look at a single plant use category, with 26 articles (approximately 67%) looking at medicinal plants, eight articles (approximately 20%) looking at local knowledge of food plants (wild and cultivated), and three articles (approximately 8%) exploring the knowledge and use of plants providing insect-repellent qualities. Additionally, throughout much of these surveys the distinct nature of women and men's knowledge is not explicitly addressed (for the full list of sources see Appendix A). This national trend mirrors broader findings by Pfeiffer and Butz (2005), who explored over 700 ethnobiological and ethnobotanical studies from 1981-2004, discovering that less than 5% addressed gender-based differences in ethnobiological and ethnobotanical knowledge and practice.

With plants playing a critical role in the daily lives of most Ethiopians, our aim was to document and improve our understanding of the roles that plants have in rural livelihoods. Specifically, we were interested in women's knowledge and perspectives because they are greatly underrepresented in the literature, but are the primary family caretakers in Ethiopian culture. This study, thus affords access to knowledge about how plants are used in a range of different activities that may be overlooked by research that does not explore the knowledge-gender link. Such an approach has proven fruitful in other regions, including women's knowledge of a number of edible plants previously catalogued as "weeds" in the American southwest (Bean & Lawton 1993), and distinct medicinal plant knowledge of women in Borneo (Gollin 2001). This study thus, seeks to provide preliminary findings on the extent of local women's knowledge of a broad array of plant uses in the Bale Mountains, and the potential benefits that a gendered understanding of ethnobotanical knowledge can hold for local conservation.

Study Area

Our study was conducted in the town of Dinsho located in the Oromia Region at the northern edge of the Bale Mountains National Park (BMNP) (Figure 1). The elevation of Dinsho is about 3,200 m with mean annual temperatures ranging from 2.4 to 15.5 C°. Precipitation for the area averages 1,219 mm annually (Assefa *et al.* 2010), and has a bimodal distribution pattern with the "small rains" called **belg** occurring from February to May and the "big rains" called **kiremt** occurring from August to October. There are approximately 3,000 residents in the town of Dinsho (Population Census Commission 2008) predominately of Oromo heritage, the main ethnic group of Ethiopia's southern highlands. Traditionally the Oromo people are agro-pastoralists and small-scale subsistence farmers that cultivate wheat and barley as a dietary staple and cash crop. To a lesser extent, cattle, goats and sheep are kept by most households. During the months of cultivation, the livestock are moved into open areas within BMNP where they are grazed until the end of harvest (FZS 2007, Stephens *et al.* 2001). The region is also an area of high biodiversity, with rare endemic species including the endangered mountain **nyala** (*Tragelaphus buxtoni*: Evangelista *et al.* 2007) and the critically endangered Ethiopian wolf (*Canis simensis*: Waltermire 1975). Additionally, Dinsho is the product of a varied elevational and climatic gradient across the region. The landscape is comprised of dense forests populated by immense trees including *Juniperus procera* Hochst. ex Endl. in the predominately dry southern expanses of Gaysay, *Hagenia abyssinica* J.F. Gmel., *Hypericum revolutum* Vahl, *Schefflera abyssinica* (Hochst. ex A.Rich.) Harms and *Schefflera volkensii* (Harms) Harms in the wetter, northern reaches, in addition to an abundance of *Artemisia, Helichrysum*, *Ferula* and *Kniphofia* genera in the flatter sections of the valley (UNESCO 2013). Dinsho's topography and vegetation reflect the extended weathering of lava outflows stemming from the Oligocene Epoch (33.9-23 million years B.P.) (Assefa *et al.* 2010), which have resulted in the loamy, fairly fertile, and low-density Mollic

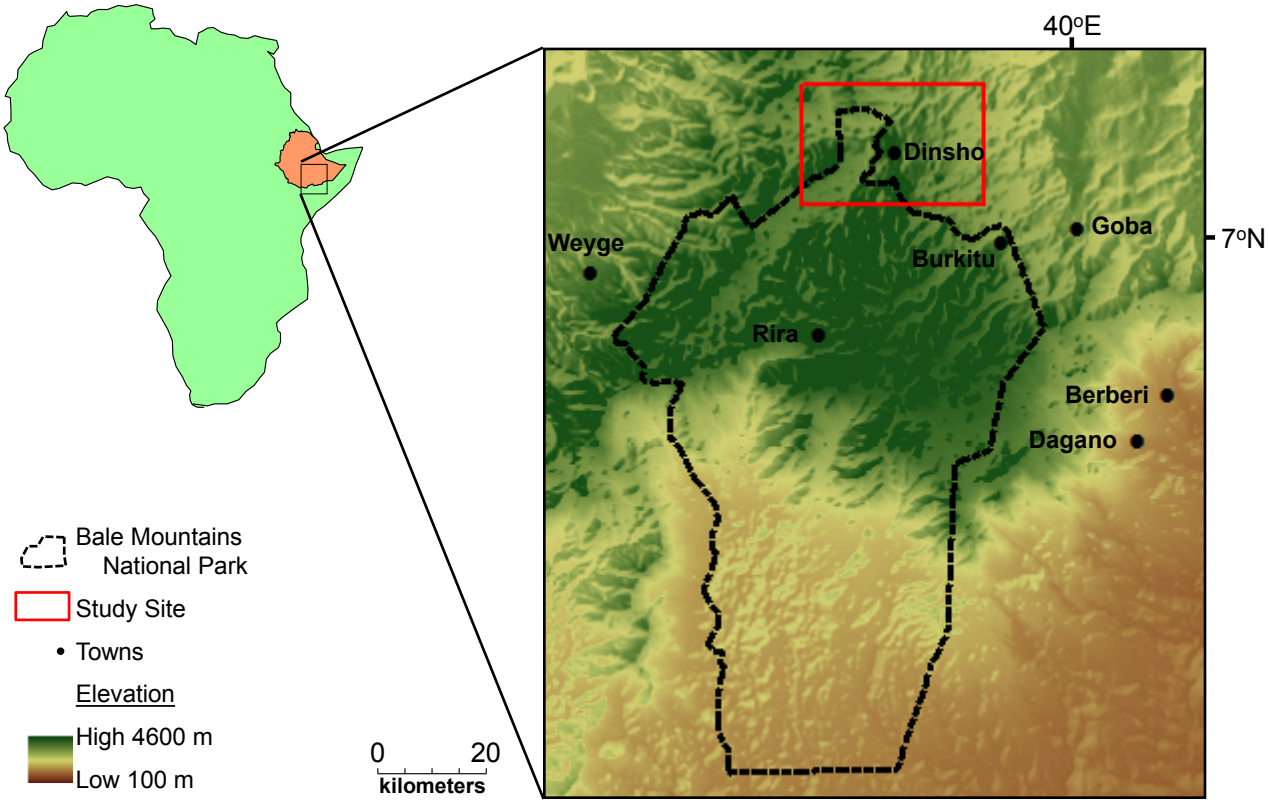

Figure 1. Study site of Dinsho located in the Oromia Region at the northern edge of the Bale Mountains National Park, Ethiopia.

Andosol soils commonly associated with these volcanic sites (Yineger *et al.* 2007). Threatened by deforestation and grazing pressure from a rapidly expanding population of people and livestock, the distinct vegetation of the region is critically important to human well-being and biodiversity as

> "...both the conditions and the isolation of these areas have led to the evolution of unique plant communities that are found nowhere else" (UNEP 2008:11).

Methods

Our study design was pre-approved by the Social, Behavioral, and Education Research Institutional Review Board at Colorado State University (Protocol # 12-3795H). The semi-structured focus group interview was conducted by Young and Kuroiwa in December, 2012 with interpretive support by Worede. A focus group approach was utilized, affording a view of different perspectives about the topic simultaneously (Morgan 1997) and allowing unanticipated information to emerge (Huntington 1998). Furthermore, this approach facilitated a rapid appraisal assessment, as data collection was limited to one day, so as not to unduly impede the respondents from addressing other important obligations including participation at the local market and home and child care responsibilities. Respondents included 10 local women that reside in or around the town of Dinsho. Most of these participants were over the age of 40 and recruited through a women's micro-loan program managed by a local non-profit organization. We compiled 337 pictures of plants collected by Bussmann and colleagues (2011) and found within the TROPICOS botanical database (www.tropicos.org) managed by the Missouri Botanical Garden. These pictures were organized and formatted to contain either one or two full-color images of each individual plant, in the field (often with one close-up shot of the flower, fruit or leaves), with the scientific name and local name (if known) printed on each picture. The nomenclature of all species also follows TROPICOS.

At the beginning of the focus group, a formal introduction was made, explaining the project and its goals before receiving verbal consent by each participant. Pictures were laid out on tables in groups based on habit/growth type (e.g., fern, grass, tree, shrub) and the women were encouraged to walk around, view the pictures and talk with each other as long as they needed. Each respondent collected pictures of plants they recognized, and once everyone had finished, the respondents and interviewers discussed each collected plant's local Oromiffa name and the use(s) derived from it (Figure 2). All participants had the opportunity to contribute their knowledge for each plant species. The focus group lasted for approximately six hours and was conducted in Oromiffa with the help of

Figure 2. Focus group respondents identifying plants and their uses in the town of Dinsho, Oromia Region, Ethiopia.

Worede, who is conversant in Oromiffa and fluent in Amharic and English. In addition to Worede's translation help, the use of hand gestures helped transcend language barriers between the interviewers and focus group respondents. This act of pantomime was especially helpful in describing physical afflictions that medicinal plants are used to alleviate, and the specific application of different plants for medicinal purposes or as cosmetics. Plants that remained on the table were collected and placed in a folder labeled "unidentified" and the activity was repeated until all 337 plants were accounted for. The process of collecting pictures ranged from 20 to 45 minutes depending on the number of pictures in the 9 growth type categories, with some categories being combined. For example, the "herbs" category contained 160 plants, while the categories of "epiphytes", "climbers" and "vines" contained four, twenty-one, and three plants respectively, and were thus combined for the picture collection phase. Plant uses were later grouped into a set of 15 ethnobotanical provisioning service categories (Table 1), in part drawn from Bussmann and colleagues (2011) and supplemented with new categories coming out of the focus group.

Results

Women's Plant Knowledge

The focus group resulted in the identification of 57 plant species (for the full list see Appendix B). All of the women were detailed and forthcoming in their descriptions of the plant uses, particularly because of the relationship that had already been built with the group by the micro-loan program. Having this established trust was critical for our study, which enacted a rapid rural appraisal approach, seeking cost-effective ways to learn about rural conditions (Chambers 1981). Such brief assessments can hold important trade-offs of data collection efficiency, and richness and potential accuracy of the data. A broad array of local and traditional ecological knowledge literature acknowledges the merits of different approaches for documenting knowledge. These approaches involve different data collection methods and levels of engagement and embeddedness in a community of interest, ranging from rapid appraisal workshops with local stakeholders, conducted in a matter of hours (Merritt *et al.* 2009), to more traditional ethnographic approaches, which are often

Table 1. Description of each ethnobotanical provisioning service categories with detailed explanation of each plant use in the town of Dinsho, Oromia Region, Ethiopia. * Denotes a new category coming out of the semi-structured focus group interview.

Plant Use	Description
Construction	Plants utilized in the assemblage of buildings, including homes and other habitable structures, fencing and large farming implements like ploughs
Cooking	Plants utilized as cooking implements for the preparation of food, sieves, containers for food storage, or as non-stick spread for greasing clay injera pans
Cosmetics*	Plants utilized as care substances or implements to enhance the appearance and/or odor of the human body
Detergent	Plants utilized as cleaning agents for clothing or cookware/dishware
Firewood	Plants gathered and utilized as fuel material
Fodder	Plants gathered and utilized as feed for domesticated livestock
Food	Plants gathered and consumed to provide nutritional support for the human body
Forage	Plants consumed in the wild by livestock and/or wildlife
Honey Production	Plants utilized in any aspect of honey production, including plants pollinated or nectar collected by bees, or used in construction of beehives
Medicinal	Plants utilized for their actual or perceived curative properties for a variety of human physical ailments
Other	Plants utilized for in a variety of other less prevalent processes (e.g., leather softeners, aromatics, paint, cleaning implements, baskets and other non-food storage containers, hats, furniture, decoration, food for non-ungulate wildlife or livestock, non-construction related rope/twine, toothbrushes)
Spiritual/Ceremonial*	Plants utilized for alleviating spiritual ailments or afflictions or for special ceremonial events
Unknown/Unidentified	Plants with no known use or not identified in the interview process
Veterinary	Plants utilized for their actual or perceived curative properties for a variety of livestock physical ailments

characterized by individual interviews and involve long-term community engagement spanning a number of years (Peloquin & Berkes 2009).

The plants identified in this study constituted 38 families, with the top five families being Lamiaceae (7 plants), Solanaceae (4 plants), Asteraceae (4 plants), Rosaceae (3 plants) and Pteridaceae (3 plants). The most prevalent use noted (nearly 70%) was medicinal application for humans (**corecha** in Oromiffa), followed by veterinary applications (Figure 3). The dominant growth type of identified plants were 40% herbs (seed-producing annuals, biennials, or perennials that do not develop persistent woody tissue and die down at the end of a growing season), 21% shrubs (relatively low height woody plants, often with several-stems), 16% trees (woody perennial plants with a single, often elongated main stem and generally few branches on their lower extent), 14% ferns (flowerless, seedless vascular plants, with roots, stems, and fronds, that reproduce by spores), 7% climbers (weak-stemmed plants, including vines, that gain support from climbing, twining, or creeping along a surface), and 2% grasses (predominately herbaceous plants with jointed stems, slender sheathed leaves, and flowers produced in spikelet bracts) (Figure 4).

The most common ailments treated by medicinal plants included gastrointestinal issues and parasites (i.e., plants acting as anthelmintics), fungal infections, fainting (i.e., plants acting as smelling salts), alleviating cold and flu symptoms, cleaning and healing open wounds, combating respiratory infections and treating **mich**, unknown diseases with uncertain causes, characterized by fever, headache, sweating, swelling and muscle spasms. For example the women noted that **mich** can be brought on by drinking coffee in the sun versus the shade, resulting in a mysterious swelling of the mouth. Various plants were noted to combat **mich** including *Cynoglossum amplifolium* Hochst. ex A.DC., *Leucas martinicensis* (Jacq.) R.Br. and *Cirsium dender* Friis, the root of the latter being chewed to alleviate symptoms, but also being a favorite forage of donkeys. The Oromiffa word for *Cirsium* sp. is **kohare**, which translates as “donkey’s favorite”.

When asked “do you use plants for medicine or go to the doctor?” all of the women noted that they go to the clinic to see a doctor, but first try plant-based remedies, and if the ailment worsens, then they go to the clinic. With much excitement, all agreed that more often than not, conditions improve when using traditional plant-based medicine.

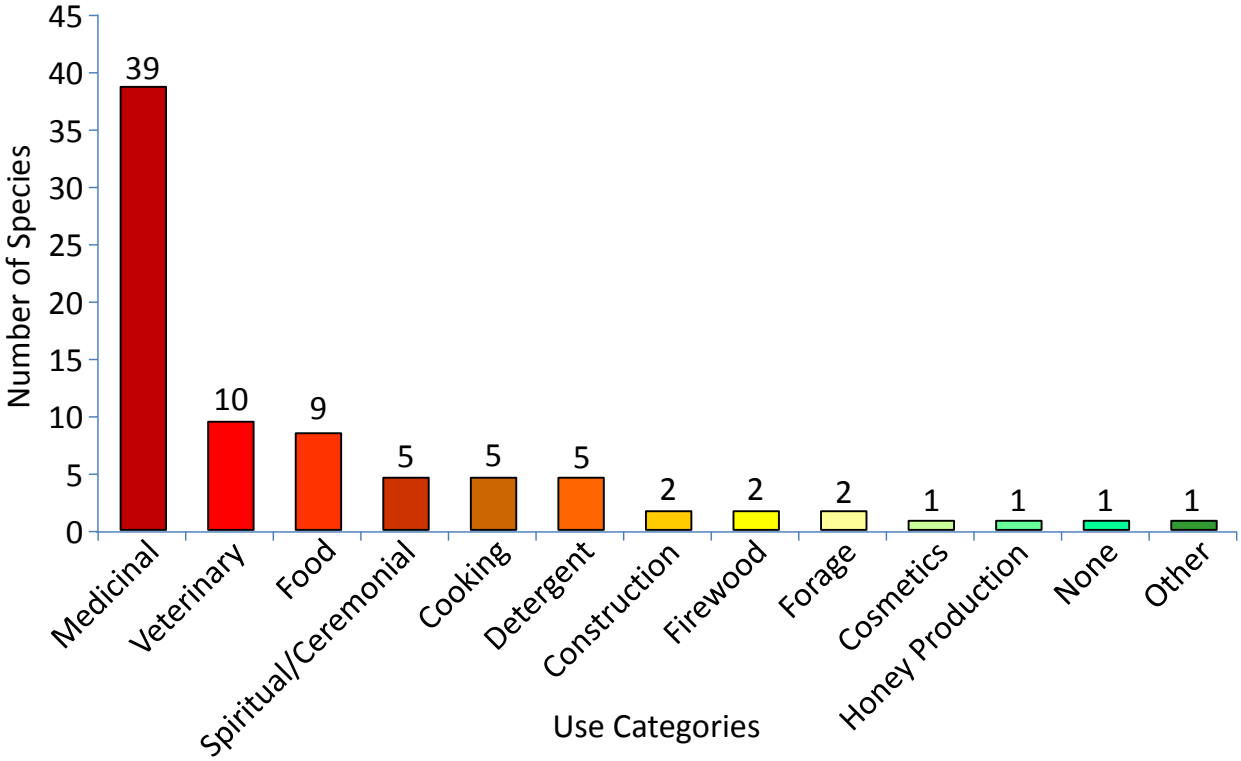

Figure 3. Women's use of plants in Dinsho, Oromia Region, Ethiopia. Number of plant species identified in each use category. Medicinal uses constituted almost 70% of the identified uses.

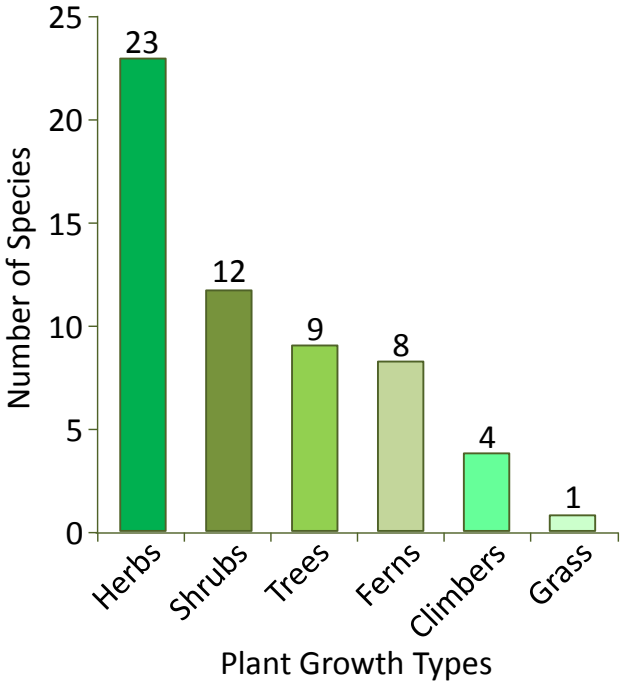

Figure 4. Number of species (by growth type) with women's uses in Dinsho, Oromia Region, Ethiopia.

Sixty-percent of the plants were identified as having only one use. Of the 40% with multiple uses, three plants (*S. volkensii*, *Ricinus communis* L. and *Solanum incanum* L.) had three uses each. The tree, *S. volkensii* (**ansha** in Oromiffa), embodied a common dual plant-use role, of medicinal and spiritual/ceremonial usage, in addition to a third use category, with the tree providing forage for cattle. For this species the respondents noted that the leaves are boiled and used to wash the body of a woman who has just given birth. This bathing process is said to cleanse the new mother, keeping her warm and keeping away evil spirits, with the vapors from the boiling leaves inhaled to induces sweating and expel the aforementioned bad spirits. Other plants with a similar dual medicinal and spiritual/ceremonial usage included the climber *Asparagus falcatus* L. (**senti** in Oromiffa), which is crushed with one of a few variety of ferns (**kokosa** in Oromiffa) and applied as a topical anti-fungal. Additionally the stem of this plant is used with *S. incanum* and put outside of house when a baby is circumcised or if a child has chicken pox, to protect them from evil spirits. Another triple-use plant, the abundant *S. incanum* (**embouy** in Oromiffa) holds an array of medicinal properties, relieving poor digestion when the leaves are chewed with salt, stopping nose-bleeds and drying out open wounds when they become infected. Additionally, the fruit are used as a clothes detergent and as a non-stick spread for **injera** pans. **Injera** is crepe-like bread that is part of most traditional Ethiopian meals. The women further emphasized that the fruit are poisonous

if eaten and can blind if any part of it gets in a person's eyes, yet children like to bite the fruit for fun, as it stains their teeth red. The last triple-use plant, the shrub *R. communis* (**kobo** in Oromiffa) was noted to be an "oil seed" for cooking with various foods, acting as a non-stick coating for **injera** pans, and for veterinary application to relieve dry, cracked wounds on oxen.

Other plants, with fewer, but equally intriguing medicinal applications included the herb *Ocimum* cf. *obovatum* E.Mey. ex Benth. (**tosin** in Oromiffa), which is not only a food spice used in **berbere**, but is brewed as a medicinal anti-hypertensive tea to decrease high blood pressure and reduce the risk of stroke, in addition to being given after a stroke has occurred to help the body recover. The grass *Paspalum* sp. (**chokorsa** in Oromiffa) is a unique medicinal plant only used by special healers to combat venomous snake bites. The healer picks fresh blades of the grass and chews the stems, and then applies the pulp to the wound to extract the venom. It is important to note all of the women were adamant that only special healers can engage in this practice.

The second most identified plant use was veterinary application (approximately 18%). The most common treatments cited were for domestic livestock (particularly cattle) with parasites, open wounds or acting as smelling salts for animals that have fainted. These included plants like *Acanthus* sp. (**sokoro** in Oromiffa), the leaves of which are crushed and mixed with water, then sprayed on the stomach of livestock to reduce swelling, or *Amaranthus* sp. (**ralu usulé** in Oromiffa), the leaves of which are boiled with salt and fed to "skinny livestock" to "wash out the stomach" and help fatten them. Some plants like the herb *Cyclospermum leptophyllum* (Pers.) Eichler (**grisa** in Oromiffa) were noted to have both human medicinal and veterinary applications, acting as a smelling salt for both people and livestock that have fainted, with the respondents noting that the fruit are crushed and put close to the nose of the fainted to reawaken them.

Throughout the focus group process, the respondents shared additional insights of their local ecological knowledge, including broader environmental changes witnessed during their lives. When asked if they have seen

> "...changes to nature...observed in your community during your lifetime, for example changes in plants, water, soils or wildlife?",

some of the women noted that certain places are "gone" including the plants and wildlife, replaced by agriculture and houses from the rapidly expanding population inside and adjacent to BMNP. One respondent further explained that many rivers have entirely dried up because the trees have all been cut in some areas, and that the water table was once accessible at one-meter depth, but now is only accessible starting at five meters depth. This statement was qualified by the same respondent noting that this issue does not affect the residents of Dinsho too much, as the town has recently gained access to tap water. Other women nodded in agreement and added that the further you get away from the town and into the more rural areas, the more water access becomes a noticeable problem. Moreover, all of the women concurred that in the past decade the rains of both rainy seasons do not come at the expected times as they once did, resulting in more devastating droughts and floods. When asked "what do you think caused this change?", the women did not speculate too much, but a few noted that access to "tap water" and other advancements have likely caused much of the observed changes. After some silence another respondent added that "humans" in general are causing the changes, with "more people" and "more houses" in the region.

The Importance of Gender for Understanding Local Plant Use Knowledge

Findings from the focus group revealed local women's knowledge of plants to cover a wide range of use categories, with respondents being especially knowledgeable about plants providing medicinal and veterinary services. We argue that a more concerted, systematic exploration of the knowledge-gender link should be undertaken in ethnobotanical studies in Ethiopia and more broadly. These gender distinctions in plant knowledge and prevailing plant use patterns are known to often be linked with daily activities, predominately coming out of socially defined gender roles (Pfeiffer & Butz 2005, Ponderosa *et al.* 2012), and play an important role in how plants are valued both economically and intrinsically (Camou-Guerrero *et al.* 2008, Ponderosa *et al.* 2012). Only two studies could be found in Ethiopia that explore a wide range of plant uses (Bussmann *et al.* 2011, Gemedo-Dalle *et al.* 2005), with each having barriers to conducting a truly systematic comparison. The work of Gemedo-Dalle and colleagues (2005) for instance, occurs in a different region of the country, with distinct flora. Bussmann and colleagues (2011) although occurring in the same region as our study and only documenting men's ethnobotanical knowledge also does not provide a truly clean comparison. First, demographic distinctions exist that could interfere with an accurate understanding of gender-distinct knowledge, with the women interviewed in this study coming from an urbanized town on the edge of a national park, and the men from the Bussmann and colleagues study coming from an extremely remote village. Additionally, despite building on an existing plant identification database of Bussmann *et al.* the data for each study were collected in different manners. Our focus group participants were recruited through non-random convenience sampling facilitated by a local non-profit, and focused entirely on picture identification. Bussmann and colleagues administered semi-structured questionnaires and conducted individual interviews in the field with respondents randomly selected from the local community. Additionally, plants were identified from a mixture of live cut specimens and field identification. Despite these issues, and finding no other studies in the region

that explore a wide range of plant uses that we could conduct a comparison of in *lieu* of Bussmann *et al.* their study was deemed useful to highlight potentially significant differences in gendered knowledge in the region, and speak to the importance of future systematic exploration of the knowledge-gender link.

Their research documents an equally wide range of plant use knowledge in the Bale Mountains, as we have attempted in this study, but looks solely at men. Twelve adult male respondents from a rural village adjacent to a protected hunting concession provided detailed information about 294 local plants. Noticeable distinctions are present when looking at the most widely identified categories of the men compared to the women from our focus group. Our aforementioned results denote the two largest use categories being plants providing human medicinal services and veterinary services respectively (almost 70% of the plants identified constituting the former category and approximately 18% in the latter). For men in the region, the largest use category of 172 species (nearly 60%) were plants identified as providing forage and fodder for livestock (especially cattle), with the second largest use category at 51 species (approximately 17%), being plants that act as firewood.

Moreover, 162 species were identified by the men as having "no use". Closer examination of these plants reveals ten of these "no use" species to have identified uses by the women from this study (See Appendix B for full list). Such species included *Helichrysum formosissimum* Sch. Bip., which the women noted to provide honey production services, with bees pollinating and collecting nectar from the flowers, and thus acting as a useful plant for local bee-keepers. *Satureja* sp. (**nana** in Oromiffa) was noted to be consumed by people in the form of tea and also dried and made into potpourri for its pleasant aroma. Additionally, *Stachys* sp. was identified by the women as having medicinal properties, with the leaves crushed and the extracted juice added to coffee, or topically applied, to reduce cold and flu symptoms including fever, chills and stomach aches. A final example is *Dorstenia soerensenii* Friis, which the women noted to provide veterinary services, with the plant crushed and applied topically to heal oxen harness wounds.

With medicinal and veterinary applications being the most prevalent use categories identified by our female respondents (approximately 86% of uses), we were interested in further gauging the agreement on plant uses between men and women in the region and the broader ethnobotany literature, in addition to exploring the efficacy of our picture identification methodology. We compared the uses of medicinal and veterinary plants described by the women with that of a local male elder working at BMNP, who is known to be extremely knowledgeable about medicinal plants. The inclusion of this local "expert" was done simply to build on the surface distinctions found between our study and the findings of Bussmann and colleagues, and further gauge general agreement around the plants the women identified as providing medicinal and veterinary services. Additionally, we hoped to reveal potential overlap or distinctions in specific application methods, but not treat the exercise as a systematic method for validating the women's knowledge. Our male respondent was shown all 57 plants identified in the focus group, but was unaware of the women's responses, and asked to show us which have medicinal and veterinary applications and explain their uses. Fourteen plants were identified, with around 85% agreement on general medicinal and veterinary properties. When inconsistencies arose, they stemmed from differences in specific ailments alleviated, with additional nuances present when comparing the women's description of some of these plant uses with the local male respondent, and the broader ethnobotany literature.

For example, the herb *Bidens macroptera* (Sch.Bip. ex Chiov.) Mesfin was identified by the women's focus group as a medicinal plant, the flowers and leaves of which are used to remove pus from infected wounds. Our male respondent noted this same plant to be a medicinal herb, but that the leaves are used to make a tea to alleviate stomach ailments. Similarly, the shrub *Rhamnus prinoides* L'Hér. (**geesho** in Oromiffa) was identified by the male respondent as having medicinal properties, with the leaves heated by the fire until dried, then ground into a powder and applied to cuts, whereas the women's focus group noted this plant as being fermented and used to make the alcoholic beverage **teg**. It is important to note that all the women were adamant that as Muslims, they do not drink or even make this beverage for others. When exploring the broader ethnobotany literature, validation is found for both distinct uses as an alcoholic beverage (Bussmann *et al.* 2011) and as a medicinal plant for the same region (Bussmann *et al.* 2011, Yineger *et al.* 2007) and other regions in Ethiopia (Teklehaymanot & Giday 2007, Teklehaymanot *et al.* 2007, Zenebe *et al.* 2012). A final illustrative example of this partial identification correspondence is present with the herb *Artemisia absinthium* L. (**ch'igun** in Oromiffa). The women noted that people attacked by the "evil eye" smell the plant to induce screaming and thus release the evil inflicted on them. Although this plant was not identified as having any medicinal or veterinary application by our local male respondent, the broader literature confirms this plant as having medicinal, spiritual and "homeopathic" uses (Bekalo *et al.* 2009, Bussmann *et al.* 2011, PFAF 2012, Yineger *et al.* 2007).

Seventeen species identified by our female respondents were not found in any of the other Ethiopia ethnobotany studies reviewed. This included the herb *Delphinium wellbyi* Hemsl. (**helo ababa** in the national language Amharic) which was noted to have strictly spiritual/ceremonial uses. The flowers are said to be picked by children at the start of the "new year" and carried in celebration, with the children

singing and dancing around the river. Others included the herb *Plantago palmata* Hook.f. (**anamuru** in Oromiffa), identified by the focus group as having medicinal applications, including the treatment of parasites, swollen tonsils and general throat swelling, and the fern *Thelypteris* sp. (**kokosa** in Oromiffa), identified by the women as another medicinal plant, the leaves of which are crushed, mixed with butter and applied as a topical anti-fungal medication. All three of these species were additionally noted by men in the Bussmann *et al.* (2011) study as having "no use".

This assessment revealed the women participants were generally able to identify plants just as well as our male participant, and additionally possessed unique knowledge about local flora. This warrants further research, as such distinct knowledge can better inform ethnobotanical studies and local conservation planning conducted in the Bale Mountains.

Discussion

This study should be viewed as an initial attempt to catalogue and engage rural women's local ecological knowledge of plants in the Bale Mountains of Ethiopia, revealing important preliminary findings of the distinct nature of women's local plant knowledge and the efficacy of our rapid appraisal approach. Inherent trade-offs and different benefits of the varied local ecological knowledge collection methods exist (Berkes & Berkes 2009, Fazey *et al.* 2005, 2006, Marie *et al.* 2009, Merritt *et al.* 2009, Peloquin & Berkes 2009), but with any given methodology, gaining the trust of participants is critical. In our case, the focus group respondents were members of a microloan program, and had a pre-existing level of trust and comfort with each other. Additionally, they were trusting of our research team as the non-profit who has worked with these women over many years gave their full support of our research endeavors. The importance of trust-building is present in other local ecological knowledge research as well (Fernandez-Gimenez *et al.* 2006, Wagner & Fernandez-Gimenez 2008). In a study of wetlands conservation management in Australia, researchers spent two months volunteering with land managers to gain a better understanding of existing conservation issues and to build trust between the research team and managers participating in the study (Fazey *et al.* 2005).

Future research on women's ethnobotanical knowledge is warranted, in addition to a more comprehensive comparison of their plant knowledge with that of local men, to build on these preliminary findings and address limitations inherent to our survey methodology. Contextualizing this study within broader discussions of gendered knowledge in the ethnobiology literature and elsewhere is important in relaying the intrinsically dynamic nature of local and traditional ecological knowledge. Since the 1960s and 1970s the idea of heterogeneous intra-cultural variation in knowledge has become popular in the fields of anthropology and biology, but existing quantitative studies of ethnobotany have not fully accounted for important variables like age and gender in their sampling approaches (Reyes-Garcia *et al.* 2007). Although this lack of conceptual and methodological consistency has led to some conflicting conclusions in measures of individual knowledge, a growing understanding of the importance of gender distinctions can be found in the ethnobiology literature and other related fields.

Pfeiffer and Butz's (2005) important assessment of the limited exploration of gender-based differences within recent ethnobiology work additionally provides a multidisciplinary review of 220 gender-inclusive studies from an array of disciplines with cases spanning the globe. They reveal the great extent of gender distinctions in ethnobiological knowledge and practice, arguing that

> "just as the recognition of spatial and temporal variation in ecological systems enables researchers to understand how system components behave both independently and in relation to one another, recognizing the patterns of spatial and temporal variation in cultural systems facilitates a more holistic understanding of the independent and interrelated factors underlying gender differentiation in ethnobiological knowledge and practice" (Pfeiffer & Butz 2005:264).

A number of more recent ethnobiological and ethnobotanical studies further corroborate the importance of gender-distinct knowledge. Exploring the distribution of local plant knowledge in rural communities in Brazil, Ponderosa *et al.* (2012) argue plant knowledge to be intimately related to use patterns, with women generally having greater knowledge of medicinal plants and men having greater knowledge of timber resources and other plants used for construction. Similar important findings of gender-distinct knowledge linked with use patterns and gender-based division of labor are present with Figueiredo *et al.*'s (1993) study of an island fishing community off of the coast of southeastern Brazil, assessments of plant knowledge of indigenous communities in northern Mexico (Camou-Guerrero *et al.* 2008), and knowledge and utilization of mushrooms spanning Africa, Australia, Eastern Europe, Latin America, and Southeast Asia (Garibay-Orijel *et al.* 2012). Moreover, as noted by Pfeiffer and Butz (2005), research outside of the ethnobiology literature including local and traditional ecological knowledge scholarship based in the fields of anthropology, community based natural resource management and ecology argue for the importance of understanding gender-distinct knowledge, including Fernandez-Gimenez (2000), whose assessment of ecological knowledge of Mongolian pastoralists reveals gender to be a factor of noticeable variability in knowledge of specific plant species; a finding further echoed by Turner *et al.* (2000) when exploring traditional ecological knowledge of aboriginal groups in British Columbia, Canada. Shackleton *et al.* (2011) goes even further to uncover

potential negative unintended consequences of policies that overlook the dynamic and heterogeneous nature of local knowledge. They explore the potential benefits derived by local South African communities from invasive prickly pear (*Opuntia ficus-indica* L.), which the national government has taken a concerted effort to eradicate. They document an array of prickly pear products that are used and sold domestically by rural communities including jams, syrups, beer, medicine and even the fruit itself. Women are noted to comprise a much higher proportion of those involved in the prickly pear economy, and thus highly dependent on it, as

> "the prickly pear trade (like several other petty trading activities) offers a chance to earn income in a way that requires relatively little skill and capital, and so is an attractive opportunity for this demographic group" (Shackleton *et al.* 2011:183),

which due to lower socio-economic standing and limited access to education are at much greater risk to chronic poverty.

Although our study further supports the notion of the importance of gender-distinct knowledge, limitations are present with the methodology employed. The following example of the tree *H. abyssinica* (**kosso** in Amharic and **heto** in Oromiffa) is illustrative. Following the initial rounds of plant identification, we asked the focus group participants, "are there other plants we have not mentioned that you use?" All of the women nodded and the first plant discussed was *H. abyssinica,* which was noted by all to be an extremely important plant in the region. The women explained that it provides medicinal properties, with the flowers used as an anthelmintic to combat tapeworm, in addition to being a critical timber source for house construction and furniture. *Hagenia abyssinica* was present in the pool of 337 plant identification pictures (ID # 16057) but not identified by the women. This oversight likely stems from both color pictures of *H. abyssinica* being close up shots of the flower, with no reference to the tree in its entirety including the bole and branches. This may also explain the limited number of plants validated by our local male respondent from BMNP, who identified 14 medicinal and veterinary plants from the pool of 57 plant pictures identified by the focus group.

Additionally, some of the plant pictures had the local Oromiffa name, previously determined by Bussmann and colleagues (2011) survey of Oromo men in the Bale region, printed on the picture. This may have led to a level of undue influence. While most women were unable to read the plant names since they were written in the Latin alphabet instead of the Arabic script in which Oromiffa is written, a few women were able to identify the Oromo names written on the pictures and then shared those names with the group, aiding in identification. This played a large role within the fern growth type. The Oromiffa name for this growth type is **kokosa**, and this name was labeled on most of the fern pictures. Subsequently all focus group respondents immediately noted whenever encountering one of these pictures, that **kokosa** had anti-fungal medicinal properties. Perhaps all 8 ferns identified by the women did contain the same medicinal properties, but removing any local plant names from future picture identification interviews would likely mitigate confusion or unintentional influence on participant responses.

The overall low identification rate within the pool of 337 plants may also be influenced by other factors including the rapid rate of urbanization in the town and the sampling that occurred to inform the photos that were used in this study was conducted in the more rural areas around a protected hunting concession south-east of Dinsho (Bussmann *et al.* 2011). This area may have a much higher level of floral diversity than Dinsho, thus further reinforcing the need to include field identification in follow-up studies in the region.

Having a female translator in the future may also be beneficial. While the interviewers in this study were both women, the translator was a man. Having a group consisting entirely of women may lead to more trust and uninhibited communication among the women, especially when discussing plants used for personal health and hygiene.

Conclusions

Rural women's local ecological knowledge in the Bale Mountains reflects a rich and unique understanding of plants and broader environmental processes occurring in the region, and supports the argument of strong links between resource knowledge and use (Reyes-Garcia *et al.* 2007). With a majority of ethnobotanical studies focusing on medicinal plants, traditional healers are often the main interview respondents, and those roles tend to be filled by men. Yineger *et al.* (2007), looking at veterinary application of plants in the Bale region, notes that women made up less than 20% of the traditional healers interviewed in their study, but that these women were just as knowledgeable as the men. For Assefa *et al.* (2010), the Bale region was one of three study sites making up a extensive survey of the medicinal properties of *H. abyssinica*. Although they had a mix of male and female respondents, the authors do not relay how many of each gender made up the total pool of 90 respondents. Bussmann *et al.*'s (2011) exploration of a wide range of plant uses in the Bale region only interviewed men due to the lack of access to women participants. Our findings suggest this may hold important implications for our understanding of ethnobotany in the region and effectively addressing local conservation issues.

A number of scholars argue that ethnobotanical studies are critical for ecological conservation (Cohen *et al.* 1991, Figueiredo *et al.* 1993). For example this deep understanding of a landscape's flora is known to often capture

unnoticed variants in plant species, which is crucial for understanding biodiversity in a given region, with

> "...recognition of "kinds" or "strains" of wild species which offer no morphological or otherwise tangible differences but which are well established and named in the native classifications" (Schultes 1994:204).

Furthermore, identifying not only the extent of knowledge and present variation of species, but also understanding what species are the most important to local resource users and why, is of equal importance for effective conservation planning and may reveal knowledge on existing local conservation methods (Ponderosa *et al.* 2012). Documentation and assessment of gender-distinct ethnobotanical knowledge arguably can provide a more nuanced and holistic understanding of local ecological knowledge and local valuation of services provided by different plant species. This can hold important weight for determining local conservation targets and overlaps and disconnects between different user groups in regards to their priorities.

This study reveals the broad extent of local women's plant knowledge and their especially detailed knowledge of medicinal and veterinary plants (approximately 86% of uses), with respondents identifying 57 plants constituting 38 families across six growth types. Furthermore, it reveals the urgent need to include this gender-distinct understanding of local flora in a region with few ethnobotanical studies and limited exploration of the knowledge-gender link. In addition to the added insights afforded, this "gender consciousness" is vital for effective and holistic management of plant resources and attempts at community-based conservation. Engaging local women about their local ecological knowledge in many ways provides a level of empowerment for participants. The focus group respondents at first thanked our research team for coming to teach them about plants, but we quickly clarified that they were the teachers, and their excitement at this unexpected role change was quickly noticed. Moreover, the women noted that the focus group process made them aware of an existing disconnect they have overlooked yet perpetuated in their daily lives. One where "nature and plants" are separate from "people and livelihoods", and more importantly revealed the strong connections between these critically interconnected parts.

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Authors' Contributions

MWL and PE co-designed the study. HY, CK and A. Worede conducted the focus group and MWL collected additional observational data. MWL coordinated the analysis and interpretation of the data and wrote the manuscript, with feedback and additional contributions made by all co-authors. RWB compiled the plant picture identification database used in the study, which was modified by A. Weimer for use in the field.

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Appendix A. Thirty-nine ethnobotanical studies in Ethiopia, spanning forty-six years (1966-2012) were reviewed, revealing 26 articles (approximately 67%) focusing solely on medicinal plants. Eighty percent of the papers do not distinguish gendered knowledge. Of the 8 studies that do, over 60% (5 surveys), do note and provide the number of men and women taking part in the study, or have a significantly larger sample size of men compared to that of women.

Author(s)	Pub. Year	Geographic Region	Survey Focus (Plant-Use)	Gender-Knowledge Distinction Made
Bezuneh & Feleke	1966	Entire country	Use of single genus Ensete (*Ensete ventricosum* (Welw.) Cheesmiia)	No
Wilson & Mariam	1979	Northern Ethiopia (Tigre/Tigray)	Medicinal plants	No
Abebe	1984	North-western Ethiopia (Gondar Region)	Medicinal plants	No
Abebe	1986	North-western Ethiopia (Gondar Region)	Medicinal plants	No
Teshome *et al.*	1999	North-eastern Ethiopia (Afar Region)	Use of single genus (*Sorghum bicolor*)	No
Asfaw & Tadesse	2001	Entire country	Wild food plants	No
Esser *et al.*	2003	Entire country	Use of single species (*Phytolacca dodecandra*)	No
Gedif & Hahn	2003	Central Ethiopia (Butajira)	Medicinal plants (All women study)	No
Giday *et al.*	2003	Central Ethiopia (Rift Valley)	Medicinal plants	No
Fassil	2005	North-western Ethiopia (Gojam)	Medicinal plants	Yes
Gemedo-Dalle *et al.*	2005	Southern Ethiopia (Borana)	All plant uses	No
Balemie & Kebebew	2006	Southern Ethiopia (Derashe and Kucha)	Wild edible plants	Yes
Giday *et al.*	2007	North-western Ethiopia (Metekel and Agew-Awi)	Medicinal plants	No
Teklehaymanot & Giday	2007	North-western Ethiopia (Zegie Peninsula)	Medicinal plants	Yes
Teklehaymanot *et al.*	2007	Central Ethiopia (Debre Libanos)	Medicinal and veterinary plants	No
Wondimu *et al.*	2007	Central Ethiopia (Arsi Zone)	Medicinal and veterinary plants	No
Yineger *et al.*	2007	South-central Ethiopia (Bale Mountains)	Veterinary plants	No
Yineger & Yewhalaw	2007	South-western Ethiopia (Jimma Zone)	Medicinal plants	No
Mengitsu & Hager	2008	North-western Ethiopia (Amhara Region)	Wild edible fruits	No
Yineger *et al.*	2008	South-western Ethiopia (Jimma Zone)	Medicinal plants	No
Bekalo *et al.*	2009	South-western Ethiopia (Konta Special Woreda)	Medicinal plants	No
Flatie *et al.*	2009	Western Ethiopia (Asosa)	Medicinal plants	No

Author(s)	Pub. Year	Geographic Region	Survey Focus (Plant-Use)	Gender-Knowledge Distinction Made
Giday *et al.*	2009a	South-western Ethiopia (Bench-Maji)	Medicinal and veterinary plants	No
Giday *et al.*	2009b	South-western Ethiopia (Bench-Wereda)	Medicinal plants	No
Karunamoorthi *et al.*	2009a	Western Ethiopia (Jimma zone)	Insect repellant plants	Yes
Karunamoorthi *et al.*	2009b	Northwestern Ethiopia (Gondar)	Insect repellant plants	Yes
Mesfin *et al.*	2009	South-western Ethiopia (Wonago Woreda)	Medicinal and veterinary plants	No
Teklehaymanot	2009	Northern Ethiopia (Dek Island- Lake Tana)	Medicinal plants	No
Assefa *et al.*	2010	North and South-central Ethiopia (Amhara and Bale Region)	Medicinal use of single species (*Hagenia abyssinica*)	Yes
Giday *et al.*	2010	South-western Ethiopia (Wereda)	Medicinal plants	No
Teklehaymanot & Giday	2010	South-eastern Ethiopia (Omo Zone)	Wild edible plants	No
Bussmann *et al.*	2011	South-central Ethiopia (Bale Mountains)	All plant uses (All men study)	No
Shewayrga & Sopade	2011	North-eastern Ethiopia (Amhara Region)	Use of single genus (*Hordeum vulgare*)	No
Belaynah *et al.*	2012	Southern Ethiopia (Babile Wereda)	Medicinal plants	No
Feyessa *et al.*	2012	Central Ethiopia (Shewa)	Wild edible plants	No
Karunamoorthi & Husen	2012	South-eastern Ethiopia (Western Haraghe)	Insect repellant plants	Yes
Karunamoorthi & Tsehaye	2012	Western Ethiopia (Jimma Zone)	Medicinal plants	Yes
Mesfin *et al.*	2012	Eastern Ethiopia (Somali Region)	Medicinal plants	No
Zenebe *et al.*	2012	Northern Ethiopia (Tigray)	Medicinal plants	No

Appendix B. Full list of 57 plant species identified in the women's focus group, including species name, plant family, local name, growth type and plant use with a more detailed use explanation. Additionally, we have included uses for these 57 species identified in other ethnobotanical studies conducted across Ethiopia, revealing overlaps and distinctions in uses among the studies. The scientific names for *Bidens macroptera* (Sch.Bip. ex Chiov.) Mesfin and *Salvia tiliifolia* Vahl. were identified by pictures after the focus group interviews by a local contact at the Addis Ababa University National Herbarium. **These species were identified by local men in the region (Bussmann *et al.* 2011) as having "no use", but noted by women in this study to provide different services.

Scientific Name	Oromiffa	Habit	Use(s)	Notes	Uses From Literature
Acanthaceae					
Acanthus sp. (ID # 16191)	**Sokoro**	Herb	Veterinary	Leaves crushed & mixed with water. Sprayed on swollen area of livestock's stomach to reduce swelling.	N/A
Acanthus sennii Chiov. (ID # 16236)	**Sukoro**	Shrub	Medicinal	Leaves crushed and put on wounds (wrapped with bandage).	N/A
Adiantaceae					
Cheilanthes farinosa (Forssk.) Kaulf.** (ID # 16101)	**Kokosa**	Fern	Medicinal	Leaves crushed, mixed with butter & applied as a topical anti-fungal. *Note: All ferns identified were said to have this use.	Medicinal (Yinegar *et al.* 2007, Yonathan *et al.* 2006)
Alismataceae					
Alisma plantago-aquatica L.	**Grisa**	Herb	Medicinal & Veterinary	Fruit crushed & sniffed for humans & animals that faint (smelling salts).	N/A
Amaranthaceae					
Cyathula uncinulata (Schrad.) Schinz (ID # 16127)	Unknown	Herb	No Use	N/A	N/A
Anacardiaceae					
Rhus sp. (ID # 16289)	**Tadesa**	Tree	Medicinal	Skin of the fruit acts as anti-fungal medicine.	Forage and Food (Bussmann *et al.* 2011)
Apiaceae					
Cyclospermum leptophyllum (Pers.) Eichler	**Grisa**	Herb	Medicinal & Veterinary	Fruit crushed & sniffed for humans and animals that faint (acts as smelling salts).	N/A
Apocynaceae					
Carissa spinarum L. (ID # 16326)	**Agempsa**	Shrub	Food & Cosmetics	Edible fruit. Thorns used to pierce ears.	Food (Asfaw & Tadesse 2001, GenedoDalle *et al.* 2005) Forage (Bussmann *et al.* 2011) Medicinal (Giday *et al.* 2003, Zenebe *et al.* 2012)

Scientific Name	Oromiffa	Habit	Use(s)	Notes	Uses From Literature
Araliaceae					
Schefflera volkensii (Harms) Harms (ID # 16025)	**Ansha**	Tree	Medicinal, Spiritual/ Ceremonial & Forage	Leaves are boiled & used to wash the body of a woman who just gave birth to cleanse, keep warm and keep away evil spirits. Vapors from boiling leaves inhaled to induces sweating. Forage for cattle.	Forage, Firewood and Other (Bussmann *et al.* 2011)
Arecaceae					
Phoenix reclinata Jacq. (ID # 16043)	**Meti**	Tree	Cooking	Leaves used to make baskets for storing milk and butter (tight-woven baskets).	Food (Mengitsu & Hager 2008, PFAF 2012) Other (Bussmann *et al.* 2011, Mesfin *et al.* 2009). Medicinal (Zenebe *et al.* 2012)
Asparagaceae					
Asparagus falcatus L. (ID# 161135)	**Senti**	Climber	Medicinal & Spiritual/ Ceremonial	Crushed with Kokosa (*Pteris* sp., *Pteris dentata* Forssk., *Pteris catoptera* Kunze, *Thelypteris* sp., *Dryopteris* sp., *A. monanthes*, *A. friesiorum*, or *Cheilanthes farinosa* (Forssk.) Kaulf.) leaves and applied as a topical anti-fungal. Stem of plant used with *S. incanum* and put outside of house when a baby is circumcised to protect from evil, or if they have chicken pox.	Forage and Medicinal (Bussmann *et al.* 2011)
Aspleniaceae					
Asplenium friesiorum C. Chr.** (ID # 15990)	**Kokosa**	Fern	Medicinal	Leaves crushed & mixed with butter and applied as a topical anti-fungal medicine *Note: All ferns identified were said to have this use.	N/A
Asplenium monanthes L. (ID # 16017)	**Kokosa**	Fern	Medicinal	Leaves crushed & mixed with butter and applied as a topical anti-fungal medicine *Note: All ferns identified were said to have this use.	Forage (Bussmann *et al.* 2011)
Asteraceae					
Artemisia absinthium L. (ID # 16147)	**Ch'igun**	Herb	Spiritual/ Ceremonial	People attacked by the "evil eye" smell the plant to release the evil by inducing screaming. Some respondents noted that it smells particularly bad.	Medicinal (Bekalo *et al.* 2009, Bussmann *et al.* 2011, PFAF 2012, Yinegar *et al.* 2007) Food (PFAF 2012) Other (PFAF 2012) Veterinary (Bussmann *et al.* 2011)

Scientific Name	Oromiffa	Habit	Use(s)	Notes	Uses From Literature
Bidens macroptera (Sch.Bip. ex Chiov.) Mesfin* (ID# 16133)	Unknown	Herb	Medicinal	Flowers & leaves used to remove pus from infected wounds.	N/A
Cirsium dender Friis (ID # 16122)	**Yehaheya**	Herb	Forage & Medicinal	Favorite food of donkeys (**Yehaheya** means "donkey"). Root chewed for alleviating **mich**.	Forage (Bussmann *et al.* 2011)
Helichrysum formosissimum Sch. Bip.** (ID # 16176)	Unknown	Shrub	Honey Production	Bees pollinate & collect nectar from flowers (honey production application).	N/A
Solanecio angulatus (Vahl) C. Jeffrey (ID # 16131)	**Rafu**	Climber	Medicinal & Spiritual/ Ceremonial	5-7 days after giving birth the new mother's body is washed with the plant to protect from evil. Boil & inhale vapors during delivery-induces sweating which helps rid the body of evil spirits & keeps the mother warm.	Medicinal (Bussmann *et al*. 2011, Yinegar *et al*. 2007)
Boraginaceae					
Cynoglossum amplifolium Hochst. ex A. DC. (ID # 16162)	**Chogogit**	Herb	Medicinal	Used to alleviate **mich**. Crushed & apply topically, or juice extracted & ingested for internal ailments.	Medicinal (Bussmann *et al.* 2011, Giday *et al.* 2009, 2010)
Chenopodiaceae					
Amaranthus sp. (ID # 16355)	**Ralu usulé**	Herb	Veterinary	Leaves boiled with salt & fed to skinny livestock to wash out stomach & help fatten them.	Food (Asfaw & Tadesse, 2001, Balemie & Kebebew 2006, Bussmann *et al.* 2011) Forage, Medicinal and Veterinary (Bussmann *et al.* 2011)
Crassulaceae					
Kalanchoe petitiana A. Rich. (ID # 16086)	**An'churura**	Herb	Medicinal	Leaves are warmed by a fire & applied to a fracture, then wrapped. Used to soften the fracture & skin to allow easier bone resetting (leave wrapped for two days). Root used to alleviate sore throat & used as smelling salts.	Medicinal (Bussmann *et al.* 2011, Giday *et al.* 2010, Teklehaymanot, 2009, Teklehaymant & Giday 2007, Teklehaymanot *et al.* 2007, Yinegar *et al.* 2007) Veterinary (Bussmann *et al.* 2011)
Cucurbitaceae					

Scientific Name	Oromiffa	Habit	Use(s)	Notes	Uses From Literature
Zehneria scabra (L. f.) Sond. (ID # 16117)	**Alola fiti**	Climber	Medicinal & Detergent	Leaves used for washing dishes. When giving birth, the delivering mother's body is washed with this plant.	Medicinal (Abebe 1986, Gedif & Hahn 2003, Geyid *et al.* 2005, Giday *et al.* 2007, Karunamoorthi & Tsehaye 2012, Teklehaymanot 2009, Teklehaymanot & Giday 2007, Teklehaymanot *et al.* 2007, Yinegar *et al.* 2007) Fodder (Bussmann *et al.* 2011) Other (Bussmann *et al.* 2011)
Cupressaceae					
Juniperus procera Hochst. ex Endl. (ID # 16424)	Unknown	Tree	Construction & Medicinal	Used to build the main house frame (strong timber). Leaves boiled with *H. revolutum* leaves to make a tea that alleviates cold/flu symptoms.	Construction and Firewood (Bussmann *et al.* 2011) Medicinal (Giday *et al.* 2007, Teklehaymanot *et al.* 2007, Yinegar *et al.* 2007)
Dryopteridaceae					
Dryopteris sp. (ID # 16016)	**Kokosa**	Fern	Medicinal	Leaves crushed & mixed with butter and applied as a topical anti-fungal medicine *Note: All ferns identified were said to have this use.	Forage (Bussmann *et al.* 2011)
Ericaceae					
Erica arborea L. (ID # 16096)	**Sato**	Shrub	Firewood & Medicinal	Smoke from burning wood inhaled to treat respiratory infections.	Forage, Firewood and Honey Production (Bussmann *et al.* 2011)
Euphorbiaceae					
Ricinus communis L. (ID # 16416)	**Kobo**	Shrub	Veterinary, Food, & Cooking	"Oil seed" used for making oil and non-stick spread for **injera** pans. Seeds also crushed and oil is applied to dry cracked wounds on oxen.	Food (Bussmann *et al.* 2011, Mesfin *et al.* 2009, PFAF 2012) Cosmetics and Detergent (PFAF 2012)Other (Bussmann *et al.* 2011, PFAF 2012) Medicinal (Bekalo *et al.* 2009, Flatie *et al.* 2009, Giday *et al.* 2009, Mesfin *et al.* 2009, PFAF 2012, Teklehaymanot, 2009, Teklehaymant & Giday 2007, 2010, Wondimu *et al.* 2007, Yinegar *et al.* 2007, 2008, Zenebe *et al.* 2012) Forage and Cooking (Bussmann *et al.* 2011)
Hypericaceae					
Hypericum revolutum Vahl. (ID # 16033)	**Garramba**	Tree	Construction & Medicinal	Used to make house frame beams. Leaves boiled with *J. procera* leaves to make a tea that alleviates cold/flu symptoms.	Construction and Medicinal (Bussmann *et al.* 2011) Veterinary (Mesfin *et al.* 2009)

Scientific Name	Oromiffa	Habit	Use(s)	Notes	Uses From Literature
Lamiaceae					
Ocimum cf. *obovatum* E.Mey. ex Benth. (ID # 16160)	**Tosin**	Herb	Medicinal & Food	Used in **berbere** spice mix and as a tea to decrease high blood pressure and risk of stroke. Also given after a stroke (anti-hypertensive).	Food (Bussmann *et al.* 2011)
Leonotis nepetifolia (L.) R. Br. (ID # 16137)	**Bokolu**	Shrub	Veterinary	Leaves crushed, mixed with water & fed to livestock to alleviate stomach parasites.	Food and Medicinal (Bussmann *et al.* 2011)
Leucas martinicensis (Jacq.) R. Br. (ID # 16225)	**Bokolu**	Herb	Medicinal & Veterinary	Leaves crushed & mixed with water. Ingested to treat **mich** and fed to livestock to alleviate stomach parasites.	Forage (Bussmann *et al.* 2011) Medicinal (Geyid *et al.* 2005)
Salvia nilotica Juss. ex Jacq. (ID # 16001)	**Urgu**	Herb	Medicinal & Veterinary	Leaves crushed and ingested to alleviate fever in humans and livestock.	Forage (Bussmann *et al.* 2011), Medicinal (Giday *et al.* 2009, 2010, Yinegar *et al.* 2007)
Salvia tiliifolia Vahl.* (ID # 15995)	**Damakase**	Herb	Medicinal	Green leaves crushed & extracted juice is added to coffee. Alleviates cold/flu symptoms & clears congestion. Applied topically to stop "shivers" & is considered to be a potent & effective medicine for stomach ailments.	N/A
Satureja sp.** (ID # 16098)	**Nana**	Herb	Food & Other	Used to make tea & for potpourri in homes for its pleasant aroma.	Food (Asfaw & Tadesse 2001)
Stachys sp.** (ID # 16178)	Unknown	Herb	Medicinal	Leaves crushed & juice added to coffee to alleviate cold/flu symptoms. Topically applied to reduce fever & "shivers" and alleviate stomach disorders.	N/A
Malvaceae					
Malva sp. (ID # 16130)	**Lut**	Herb	Medicinal & Detergent	Root crushed & applied to skin to heal dry wounds. Root also used for washing dishes.	Forage and Medicinal (Bussmann *et al.* 2011)
Moraceae					
Dorstenia soerensenii Friis** (ID # 16203)	**Rhet** (Amharic)	Herb	Veterinary	Crushed & applied topically to oxen harness wounds.	N/A
Ficus sur Forrsk. (ID # 16340)	**Oda**	Tree	Food	Edible fruit.	Medicinal (Bekalo *et al.* 2009) Honey Production and Food (Bussmann *et al.* 2011) Other (DeSmet 1998)

Scientific Name	Oromiffa	Habit	Use(s)	Notes	Uses From Literature
Myrsinaceae					
Myrsine africana L. (ID # 16022)	**Abeye**	Tree	Cooking	Leaves used to wrap bread dough for cooking.	Food (Asfaw & Tadesse 2001, PFAF 2012) Medicinal (PFAF 2012, Yineger & Yewhalaw 2007) Other (Bussmann *et al.* 2011) Firewood (PFAF 2012)
Rapanea melanophloeos (L.) Mez (ID # 16194)	**Tula**	Tree	Firewood & Cooking	Burned to make charcoal. Bread dough wrapped with leaves for baking.	N/A
Phytolaccaceae					
Phytolacca dodecandra L'Hér. (ID # 16121)	**Andode**	Climber	Medicinal & Detergent	Fruit used for washing clothes. Crush fruit & boil as anti-rabies medicine for humans if bitten by a rabid dog.	Medicinal (Abebe 1986, Bekalo *et al.* 2009, Bussmann *et al.* 2011, Gedif & Hahn 2003, Giday *et al.* 2007, 2009, 2010, Karunamoorthi & Tsehaye 2012, Mesfin *et al.* 2009, Teklehaymanot 2009, Teklehaymanot & Giday 2007, Teklehaymanot *et al.* 2007; Wilson & Mariam 1979, Yinegar *et al.* 2007, Zenebe *et al.* 2012) Detergent (Bussmann *et al.* 2011) Other (Bussmann *et al.* 2011, DeSmet 1998)
Plantaginaceae					
Plantago palmata Hook. f.** (ID # 16428)	**Anamuru**	Herb	Medicinal	Used to treat parasites, swollen tonsils & general throat swelling.	N/A
Poaceae					
Paspalum sp. (ID # 16248)	**Chokorsa**	Grass	Medicinal	Stem is chewed & put on venomous snake bite (only special healers can do this).	Forage (Bussmann *et al.* 2011)
Polypodiaceae					
Thelypteris sp.** (ID # 16394)	**Kokosa**	Fern	Medicinal	Leaves crushed, mixed with butter & applied as a topical anti-fungal medicine. *Note: All ferns identified were said to have this use.	N/A
Pteridaceae					
Pteris catoptera Kunze (ID # 16015)	**Kokosa**	Fern	Medicinal	Leaves crushed, mixed with butter & applied as a topical anti-fungal medicine. *Note: All ferns identified were said to have this use.	Forage (Bussmann *et al.* 2011)

Scientific Name	Oromiffa	Habit	Use(s)	Notes	Uses From Literature
Pteris sp. (ID # 16420)	**Kokosa**	Fern	Medicinal	Leaves crushed, mixed with butter & applied as a topical anti-fungal medicine. *Note: All ferns identified were said to have this use.	N/A
Ranunculaceae					
Delphinium wellbyi Hemsl.** (ID # 16059)	**Helo ababa** (Amharic)	Herb	Spiritual/ Ceremonial	Flowers are picked by children at the new year & celebrate by singing & dancing with the flowers around the river.	N/A
Rhamnaceae					
Rhamnus prinoides L'Hér. (ID # 16431)	**Geesho**	Shrub	Food	Entire plant is cut up, dried then boiled & fermented to make alcohol called **teg**. Respondents noted that they do not use it as they are Muslims.	Food (Bussmann *et al.* 2011, Mesfin *et al.* 2009) Medicinal (Teklehaymant & Giday 2007, Teklehaymanot *et al.* 2007, Yinegar *et al.* 2007, Zenebe *et al.* 2012)
Rosaceae					
Alchemilla fischeri Engl. (ID # 16169)	**Tuta**	Herb	Medicinal	Leaves smashed & put on wounds from metal objects.	Forage and Other (Bussmann *et al.* 2011)
Rubus pinnatus Willd. (ID # 1)	**Hagena**	Shrub	Medicinal	Leaves boiled, mixed with butter & ingested in morning to soothe coughing.	Food (Asfaw & Tadesse 2001)
Rubus steudneri Schweinf. (ID # 16192)	**Gora**	Shrub	Food	Edible fruit.	Food (Asfaw & Tadesse 2001, Bussmann *et al.* 2011, Mengitsu & Hager 2008) Forage (Bussmann *et al.* 2011) Medicinal (Demma *et al.* 2009, Giday *et al.* 2009)
Rubiaceae					
Coffea arabica L. (ID # 16305)	**Bũn**	Tree	Medicinal & Food	Leaves dried for tea. Beans ground & brewed for coffee. Bean shells "in the old times" were made into a coffee tea (not common anymore). Coffee with lemon & honey used to treat diarrhea.	Food (Bussmann *et al.* 2011, Mesfin *et al.* 2009) Medicinal (Gedif & Hahn 2003, Giday *et al.* 2010, Mesfin *et al.* 2009)
Solanaceae					
Datura stramonium L. (ID # 16363)	**Atsafaris**	Herb	Medicinal & Veterinary	Leaves crushed & used to wash the body of cattle with infected open wounds. Fruit acts as a pain killer for toothaches.	Medicinal (Abebe 1984, 1986, Gedif & Hahn 2003, Giday *et al.* 2007, 2009, Teklehaymanot & Giday 2007, Teklehaymanot *et al.* 2007, Wilson & Mariam 1979, Wondimu *et al.* 2007, Zenebe *et al.* 2012) Veterinary (Giday *et al.* 2009; Zenebe *et al.* 2012) Food (Mesfin *et al.* 2009)

Scientific Name	Oromiffa	Habit	Use(s)	Notes	Uses From Literature
Solanum incanum L. (ID # 16319)	**Embouy**	Herb	Medicinal, Detergent & Cooking	Poisonous if eaten. Can blind if it gets in a person's eyes (children like to bite fruit as it stains teeth red). Fruit used as clothes detergent. Used as a "non-stick" spread for clay **injera** pans. Leaves chewed with salt to assist with poor digestion, nose-bleeds & to dry out open wounds. Noted as very abundant in region.	Veterinary (Bekalo *et al.* 2009, Mesfin *et al.* 2009) Forage (Bussmann *et al.* 2011) Medicinal (Bussmann *et al.* 2011, Giday *et al.* 2003, Teklehaymanot 2009, Teklehaymanot & Giday 2010, Wilson & Mariam 1979, Wondimu *et al.* 2007, Yinegar *et al.* 2007, Zenebe *et al.* 2012) Other (Bussmann *et al.* 2011)
Solanum sp. (ID # 16320)	Unknown	Shrub	Detergent	Fruit is poisonous. Used as clothes detergent.	Medicinal (Abebe 1984) Detergent (Bussmann *et al.* 2011) Food (Mesfin *et al.* 2012)
Solanum sp. (ID # 16371)	Unknown	Shrub	Medicinal	Root or leaves chewed (but not both at same time) with salt to alleviate indigestion.	Medicinal (Abebe 1984) Detergent (Bussmann *et al.* 2011) Food (Mesfin *et al.* 2012)
Verbenaceae					
Lantana sp. (ID # 16281)	**Sukai**	Shrub	Medicinal & Food	Leaves used as a spice & also chewed to help aid digestion.	Food (Asfaw & Tadesse 2001, Bussmann *et al.* 2011) Forage (Bussmann *et al.* 2011)