



# Ethnomedicine of Ogiek of River Njoro Watershed, Nakuru- Kenya

Eunice W. Ngari, L.W. Chiuri, S.T Kariuki and S. Huckett

## Research

### Abstract

Medicinal plants play a major role in meeting the medical and health needs of people, especially in developing countries. However, destruction of habitat through deforestation, over exploitation for commercial purposes, and changes in cultural behaviors threatens to drive many of these species into extinction. This broad study focused on documenting most of the medicinal plants used by the Ogiek community in Mau Forest Complex to facilitate conservation efforts. Stratified random and snowball sampling methods were used to identify 60 men and 60 women living in the community to participate in this research. A semi-structured questionnaire was administered and data were analyzed using the Statistical Packages for Social Sciences (SPSS). 94 traditionally recognized plants were identified and correlated with their medicinal uses as indicated by informants. These were found mainly in open fields, riparian zones and in the forest. Men identified relatively more medicinal plants and their medicinal values than women did. In contrast, women had more knowledge of techniques for preparation and administration of herbal drugs for domestic uses. There was a positive correlation between the number of plants known to respondents and the age of respondents.

### Introduction

Medicinal plants constitute 28 percent of all plants on earth (Farnsworth & Soejarto 1991). In more developed countries, they are used as templates for manufacturing modern pharmaceutical drugs whereas, in developing countries they are an important resource for the treatment of various maladies and illnesses, and are a major component of treatment within the primary health care systems. In spite of their importance, medicinal plant populations are threatened worldwide by both the rapid disappearance of tropical forests and other natural habitats, rapid

socioeconomic change in indigenous cultures which affect perception and use, and shifts in local medical traditions from traditional medicines to more modern medicines (Farnsworth & Soejarto 1991). The World Health Organization (WHO) estimates that over 80 percent of people in developing countries depend upon traditional medicine for treatment of disease and other maladies in their primary health care (Bisht *et al.* 2006, Farnsworth 1994). In Kenya, it is estimated that 75-90% of rural communities rely on ethnomedicine knowledge and medicinal plants for treatment of illnesses as prescribed by local health care systems or as a supplement to modern medicines (Kiringe 2006). Ethnomedical practices are preferred largely because medicinal plants are less expensive, readily available and reliable, and they are considered to have fewer side effects than modern medicines. Loss of medicinal plants may lower the quality of health care for rural people; especially, indigenous people who rely on these plants to meet their various health-care needs. Therefore, the conservation of medicinal plants

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and the indigenous knowledge associated with their use is important.

Indigenous people are considered to be native inhabitants of a given region. In Kenya, they are considered the minority groups of people who maintain traditional lifestyles, living mainly in rural and less developed landscapes, i.e., rangelands, savanna, forested environments (Stavenga 2004). Indigenous people are perceived to live in relative harmony with nature and typically have a higher degree of direct dependency on natural resources than their more urbanized cousins for sustaining their livelihoods (Sajem & Gosai 2006). Moreover, they often have a richer knowledge of medicinal plant uses acquired through observation and experiential learning as part of their cultural heritage (Altieri 2004, Bisht *et al.* 2006, Farnsworth 1994, Kiringe 2006, Seters 1997). Because of this, indigenous people are a valuable asset in ethnobotany studies due to their knowledge of native plants and their uses (Canigo & Sierbert 1998, Lewis & Elvin-Lewis 1994, Schutles 1994). They also play a crucial role in maintaining habitat biodiversity, particularly when their traditional knowledge is integrated into modern health care and development of natural resource management program (Cabrera *et al.* 2001, Quansah 2004).

The Ogiek people are one such indigenous people in Kenya who have a wealth of indigenous knowledge regarding medicinal plants. Historically, they inhabit the Mau Forest Complex and forests around Mount Kenya living as hunters and gatherers. However, with the rapid disappearance of natural habitats in their homelands, the Ogiek are losing important medicinal plant resources and are experiencing rapid changes to their traditional lifestyle. Records indicate that the Ogiek settled in the forests near Nessuit, Njoro District of the Mau Forest Complex between 100 to 150 years ago (Makenzi 1998). As deforestation, settlement, and conversion of forests to agricultural lands, and forest resource extraction by other ethnic groups escalated, they moved deeper and deeper into the forest (Mwichabe 2002). Additionally, they have been subjected to various evictions from the Mau Forest Complex in an attempt by the government to settle landless peoples of other tribes such as the Kipsigis, Kikuyu and Tugen onto degazetted forest lands. As a result, the Ogiek have been forced from their forest homelands into villages, and made to adopt a more sedentary subsistence agriculture lifestyle. This has negatively impacted their knowledge of medicinal plants, traditional medicine, and cultural heritage.

The Ogiek community has depended on medicinal plants as their primary source of medicines for treatment of illness and maladies for many decades (Kiragu 2006). However, documentation of their knowledge of medicinal plants has been missing, overlooked, marginalized or neglected, especially as differentiated by gender and the intergenerational nature how this indigenous knowledge is passed on. This is especially important to the study of eth-

nobotany because women's perceptions and knowledge, patterns of access, use, and control of resources are often different than those possessed by men (Pidatala & Khan 2003). Therefore, ethnomedicinal and ethnobotanical studies should focus also on the gender specific information available to these fields in order to more fully extract valuable indigenous knowledge and to more fully appreciate how gender influences use, access to, and control of medicinal plants.

With this perspective in mind, this study was focused on the documentation of medicinal plants and their application within the Ogiek community for treatment of human diseases. Ethnomedicinal studies may be disease- or plant-focused: identifying various diseases treatable by some grouping of plants, or identifying various plants used to treat a particular disease. This was a broad study aimed at identifying most of the useful medicinal plants found in the area that can be targeted for domestication and management. This information is intended to safeguard this vital resource and knowledge before it is lost through the various changes in land use and traditional practices. Documentation of medicinal plant resources is also important for promotion of habitat for resource conservation and for preserving the local indigenous knowledge base to support future claims of common property rights. This was accomplished by:

1. Assessing traditional knowledge acquisition and practices related to medicinal plants in regard to age and gender.
2. Recording people's perception and knowledge of the effectiveness and status of medicinal plants in the Ogiek community.
3. Documentation of traditional resource management systems used by the Ogiek and how these conserved medicinal plants.

## Study area

This study focused on the Ogiek community residing in the upper portion of the River Njoro watershed. This watershed is located in Nakuru District of the Rift Valley Province of Kenya and is within the Eastern Mau forest Complex, which is considered as one of the five primary 'water towers' of Kenya (Figure 1). The River Njoro is a vital source of fresh water for nearly 250,000 people; either through direct extraction from the river or indirectly via extraction of near surface groundwater resources and contributes approximately 39 percent of the water supplied to Lake Nakuru, an important Ramsar site (Lelo *et al.* 2005). Vegetation cover in the watershed ranges from bare soil in areas affected by anthropogenic activities such as agriculture and livestock husbandry, to upland indigenous forests where vegetation cover equals about 90 percent of the land surface. Three main vegetation zones characterize the watershed uplands 1) Moorlands, 2) Montane Forest, and 3) Forest Plantations (Mathooko & Kariuki

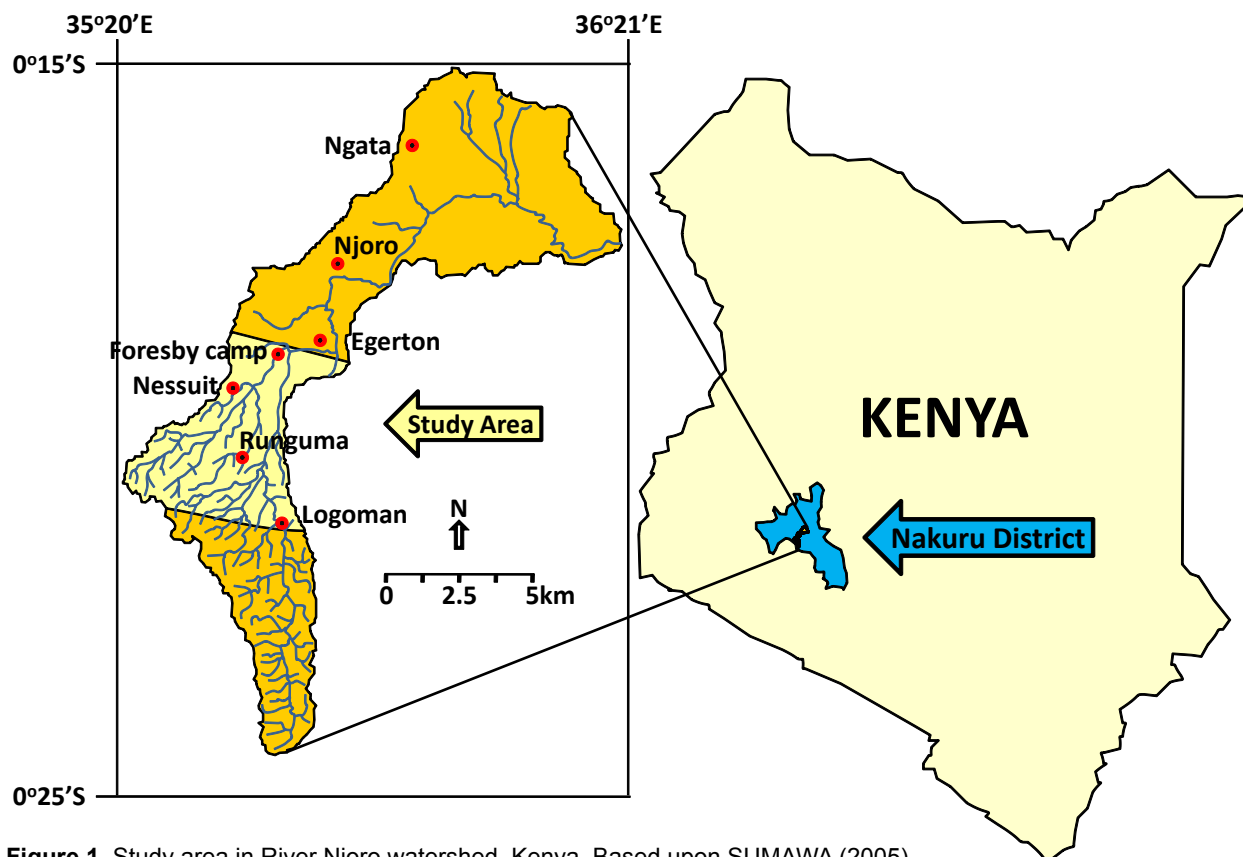


Figure 1. Study area in River Njoro watershed, Kenya. Based upon SUMAWA (2005).

2000). Indigenous montane forest is mixed with bamboo and in plantations various *Cupressus* and *Pinus* species are dominant.

The climate of the Njoro region is characterized by a tri-modal precipitation pattern; whereas, long rains occur in April and May, short rains occur from November to December, and an additional short rain season occurs in August (Krupnik 2005). Between 1949 and 2001, the mean annual rainfall measured at Njoro town was 939 mm and the average annual minimum and maximum temperatures for the area were 9° and 24° Celsius, respectively. Soils in the upper watershed are classified as mollic andisols and are generally fertile. There are three major land use systems in the upper third of the watershed that include indigenous and plantation forests, free-range livestock grazing, and smallholder agriculture.

## Materials and Methods

This work was limited to the study of medicinal plants and their uses; preparation methods were not examined. Data were obtained in 2007 using a semi-structured survey questionnaire administered to 120 respondents (60 males, 60 females) in the community of Ogiek. Respondents ranged from 17 to 78 years of age for male respondents and 18 to 72 years for females. Prior to conducting

the survey, several meetings and workshops were held with influential local leaders from the community to inform them of the purpose of this research and to obtain informed consent from respondents. This was to inform them that the findings of this study would be used to document the existence and use of medicinal plants and to promote their conservation. During these meetings, community leaders were asked to inform community members about the research to facilitate a greater level of co-operation from community members.

Snowball and stratified sampling methodologies were used to identify survey participants and collect data. Snowball sampling involves sampling in stages where the first few respondents are identified and interviewed. These respondents are concurrently used to identify other additional potential contributors who were then asked to participate in the study. The sample population continues to grow in stages until the required sample size is attained. For this study, the requisite characteristic of respondents included age, gender and ethnic group (only Ogiek community members were involved in the study). In stratified sampling, the population is divided into strata or pre-defined levels, to ensure all sub-populations are represented in the sample. Four major strata were defined: i.e., men (1) and women (2), below 30 years of age (3) and above 30 years of age (4). Each stratum was repre-

sented by 30 respondents, so that each minor subgroup should have between 20-50 cases following recommendations by Kathuri & Pals (1993).

The questionnaire consisted of open ended questions which were answered by informant narrative and discussion, and with more structured questions that constrained respondents answers to bi-modal (Y/N), multiple choice, and ranking responses (Appendix 1). To document the traditional knowledge of medicinal plants, the respondents were asked to recall local plant names and their medicinal value as well as their habitat. A list of all medicinal plants mentioned by the 120 respondents was compiled. Questions regarding perception of status and effectiveness of medicinal plants were structured to record response categories such as increasing, decreasing, or no change status ratings. Respondents were also asked to state their perception of medicinal plant effectiveness in managing common ailments in the community. These results were ranked using the following scale:

1. Effective against greater than 80 percent of all diseases,
2. Effective against 50 to 80 percent of all diseases,
3. Effective against less than 50 percent of all diseases.

Questions regarding existing traditional management systems of medicinal plants were also included. These were open ended questions where the respondents were asked to state how they conserve medicinal plants through application of their cultural traditions.

Fresh samples of each medicinal plant mentioned during fieldwork were collected from the field with the help of a local medicine man and a qualified botanist for evaluation and identification. Plant identification was made by field guides who collected specimens. These were compared with specimens kept in the herbarium of the Department of Biological Sciences, Egerton University, and the botanical literature (Agnew & Shirley 1994). The dried specimens were deposited in the herbarium of the Department of Biological Sciences, Egerton University.

Data for the total number of medicinal plants indicated by men and women, in the two age categories (less than or equal to 30 and greater than 30 years), were analyzed using SPSS statistical analysis program. Student's t-test was performed to determine the statistical difference be-

tween medicinal plants mentioned by men versus those mentioned by women. Correlation analysis was performed to access the relationship of age to the medicinal plants indicated by respondents. Descriptive analysis was performed on other variables such as the rating of effectiveness of medicinal plants, perception of status of medicinal plants and the existing management systems. The results are presented as percentages for each response.

## Results

### *Ogiek Medicinal Plants knowledge*

This study revealed that the Ogiek community depended on herbal remedies for their primary treatment of illnesses and for their general medical upkeep. Both, young and old persons knew about medicinal plants and the specific diseases each plant could treat. However, both older men and women held slightly greater knowledge of the number of medicinal plants identified and their use than did the younger (less than 30 years of age) generation (Table 1). Older persons also played the major role of passing knowledge on to younger persons mainly by field excursions to collect the plants. The young people accompany their elders to the field to collect plants and participate in preparation activities and administration of the herbal drugs. This practice of passing traditional knowledge to young people via field identification and collection, preparation, and application (use) serves to entrench traditional knowledge of medicinal plants and their uses into the community.

**Table 1.** Mean number of medicinal plants known by gender and age category.

Gender	Age category	Mean number of plants
Male	<= 30 years	6.6
	>30 years	9.6
Female	<= 30 years	5.1
	> 30 years	7.6

A total of 94 traditionally named medicinal plants and corresponding disease and treatments were documented representing 95 scientific plant taxa (Table 2). This inventory of plants was delineated as follows: herbs (45%), trees (27%), shrubs (25%), grasses (2%), and epiphytes (1%). The most commonly used plant parts were roots

**Table 2.** Plants of medicinal value and their parts used in treating diseases/disorders in the Ogiek community residing in the upper portion of the River Njoro watershed, Nakuru District of the Rift Valley Province, Kenya.

Botanical Name	Family	Local Name	Disease/Disorder treated	Part used
<i>Acacia abyssinica</i> Hochst.ex Benth.	Fabaceae	Lelnet	Spinal cord problem, body weakness	Roots, bark
<i>Acanthus eminens</i> C.B Clarke.	Acanthaceae	Sasaandet	Fever	Roots

Botanical Name	Family	Local Name	Disease/Disorder treated	Part used
<i>Agelanthus pennatulus</i> (Sprague) Polhill & Wiens	Loranthaceae	<b>Gomboto</b>	Chest problems, malaria, Fever, pneumonia, common colds, joint pain, stomach complications	Leaves, roots
<i>Alchemilla rothii</i> Oliv.	Rosaceae	<b>Senetoit</b>	Backache, spinal cord problem, eye infection, bruises, malaria	Leaves
<i>Aloe volkensii</i> Engl.	Xanthorrhoeaceae	<b>Tangaratwet</b>	Wounds	Roots
<i>Angraecum sacciferum</i> Lindl.	Orchidaceae	<b>Saleyweg</b>	Pneumonia	Leaves
<i>Asparagus racemosus</i> Willd.	Asparagaceae	<b>Mindeywet</b>	Boils	Leaves
<i>Basella alba</i> L.	Basellaceae	<b>Nderemiat / Ta-patapig</b>	Joint pain, burns	Leaves
<i>Bersama abyssinica</i> Fresen.	Melianthaceae	<b>Ilkirenyin</b>	Common cold, stomach complications, fever	Bark, leaves
<i>Bidens pilosa</i> L.	Asteraceae	<b>Kang'ei</b>	Skin infections	Leaves
<i>Calodendrum capense</i> (L.f.) Thunb.	Rutaceae	<b>Sagawaita</b>	Fever	Bark
<i>Carduus keniensis</i> R.E.Fr.	Asteraceae	<b>Katetnegoy</b>	Spinal cord problem	Roots
<i>Clausena anisata</i> (Willd) Hook.F.ex Benth.	Rutaceae	<b>Pusaregap</b>	Mouth infection in babies	Bark, leaves
<i>Clutia abyssinica</i> Jaub. & Spach	Euphorbiaceae	<b>Girpanyat</b>	Stomach complications, menstrual cramps, spinal cord problem, joint pain	Roots, leaves
<i>Clutia lanceolata</i> Forssk.	Euphorbiaceae	<b>Kirpanyal-netuy</b>	Stomach complications	Roots
<i>Clematis hirsuta</i> Guill. & Perr.	Ranunculaceae	<b>Pisiinda</b>	Head ache, common cold, malaria, fever, ear problem, chest problem	Stem, flower, leaves, roots
<i>Conyza newii</i> Oliv. & Hiern	Asteraceae	<b>Lito</b>	Backache	Roots
<i>Cotyledon barbeyi</i> Schweinf. ex Baker	Crassulaceae	<b>Tegeldit</b>	Teeth problem, skin infections, stomach complications, spinal cord problem	Leaves
<i>Crassocephalum mannii</i> (Hook. f.) Milne-Redh.	Asteraceae	<b>Chepkirpo</b>	Stomach complications, spinal cord problem	Roots, leaves
<i>Crassocephalum vitellinum</i> (Benth.) S. Moore	Asteraceae	<b>Kwamanayet</b>	Stomach complications, malaria mouth infection in babies	Leaves
<i>Crotalaria agatiflora</i> Schweinf.	Fabaceae	<b>Ilongoyonit</b>	Skin infections, wounds	Roots, leaves
<i>Crotalaria keniensis</i> Baker.f.	Fabaceae	<b>Oleparmunyo</b>	Fever	Roots
<i>Crotalaria mauensis</i> Baker.f.	Fabaceae	<b>Putputiet</b>	Mouth infection in babies	Leaves
<i>Cucumis ficifolius</i> A.Rich.	Cucurbitaceae	<b>Sumeito</b>	Malaria, stomach complications	Roots (tuber), fruit
<i>Cussonia spicata</i> Thunb.	Araliaceae	<b>Katetrelel</b>	Fever, spinal cord problem, teething	Leaves
<i>Cyathula cylindrica</i> Moq.	Amaranthaceae	<b>Mutumiat</b>	Malaria, stomach problems, wounds, joint pains	Roots

Botanical Name	Family	Local Name	Disease/Disorder treated	Part used
<i>Dombeya goetzenii</i> K.Schum.	Malvaceae	<b>Silibwet</b>	Stomach complications, malaria, intestinal worms, diarrhea	Bark, leaves, roots
<i>Dovyalis macrocalyx</i> (Oliv.) Warb.	Salicaceae	<b>Nukiat</b>	Headache, common cold, joint pain, fever, malaria, breast problem, stomach complications, body weakness	Roots, fruit
<i>Ekerbegia capensis</i> Sparrm.	Meliaceae	<b>Isongoroit</b>	Stomach complications, joint pain, common cold, kidney problem, spinal cord problem, fever, typhoid	Bark, roots
<i>Eleusine jaegeri</i> Pilg.	Poaceae	<b>Segutiet</b>	Wounds, skin infections	Leaves
<i>Embelia schimperi</i> Vatke.	Myrsinaceae	<b>Sochonot</b>	Joint pain, chest pain, malaria, common cold, intestinal worms, wounds, stomach complications, fever	Bark, leaves, roots, fruit
<i>Engleromyces goetzei</i> Henn.	Xylariaceae	<b>Puinda</b>	Malaria, stomach complications, headache	Berry, roots
<i>Eucalyptus rostrata</i> Cav.	Myrtaceae	<b>White blue gum</b>	Skin infections, chicken pox, measles, asthma	Leaves
<i>Euclea divinorum</i> Hiern	Ebenaceae	<b>Getuywet</b>	Infertility, spinal cord problem	Bark
<i>Euphorbia hirta</i> L.	Euphorbiaceae	<b>Pirirwet</b>	Skin infections, stomach problems, chest problems	Leaves, roots
<i>Ficus natalensis</i> Hochst.	Moraceae	<b>Sopoitit</b>	Skin infections, teeth problem	Bark, roots, stem, leaves, sap
<i>Fraxinus pennsylvanica</i> Marshall	Oleaceae	<b>Muarubaine</b>	Stomach fever complications, joint, common colds	Bark, leaves
<i>Galium spurium</i> L.	Rubiaceae	<b>Gaititiet</b>	Stomach complications, false teeth	Leaves, roots
<i>Gomphocarpus physocarpus</i> E.Mey.	Apocynaceae	<b>Tylitioi</b>	Tooth ache	Stem, fruit (balls)
<i>Hagenia abyssinica</i> (Bruce).J.F. Gmel	Rosaceae	<b>Lipoindoit</b>	Stomach complications	Bark, leaves
<i>Helichrysum schimperi</i> (Sch. Bip. ex A. Rich.) Moeser	Asteraceae	<b>Manarariat</b>	Stomach complications, fever, nausea	Leaves, roots
<i>Heteromorpha trifoliata</i> (H.L. Wendl.) Eckl. & Zeyh.	Apiaceae	<b>Murgan</b>	Skin infections, measles	Leaves
<i>Hibiscus diversifolius</i> Jacq.	Malvaceae	<b>Meswot</b>	Malaria	Bark
<i>Hypericum keniense</i> Schweinf.	Hypericaceae	<b>Pirirkorog</b>	Joint pain	Leaves, roots
<i>Hypoestes verticillaris</i> R.Br.	Acanthaceae	<b>Nerubat</b>	Stomach problems, joint pain/common colds, chest pain	Roots
<i>Impatiens hochstetteri</i> Warb.	Balsaminaceae	<b>Tekweyot</b>	Mouth infection in babies	Roots
<i>Jasminum floribundum</i> R. Br. ex Fresen.	Oleaceae	<b>Imoliliot</b>	Malaria	Roots

Botanical Name	Family	Local Name	Disease/Disorder treated	Part used
<i>Kalanchoe crenata</i> (Andrews) Haw.	Crassulaceae	<b>Mosingiliet</b>	Stomach problems, bruises, wounds, umbilical cord problem	Leaves, stem
<i>Lantana trifolia</i> L.	Verbenaceae	<b>Muyet</b>	Teeth problem	Roots
<i>Leonotis mollissima</i> Gürke	Lamiaceae	<b>Mosipchet</b>	Stomach complications, wounds, teething	Bark, roots, leaves
<i>Leucas martinicensis</i> (Jacq.) R. Br.	Lamiaceae	<b>Mochiwet</b>	Wounds, liver problem	Leaves
<i>Maytenus undata</i> (Thunb.) Blakelock	Celastraceae	<b>Chemumuriet</b>	Teething, diarrhea, false teeth	Roots, stem
<i>Momordica foetida</i> Schumach.	Cucurbitaceae	<b>Cheririet</b>	Wounds, teething	Plant sap
<i>Nicotiana tabacum</i> L.	Solanaceae	<b>Tumotet</b>	Eye problem	Leaves
<i>Nuxia congesta</i> R. Br. ex Fresen.	Stilbaceae	<b>Chorwet</b>	Body weakness	Roots
<i>Oenanthe palustris</i> (Chiov.) C. Norman	Apiaceae	<b>Susuriet</b>	Stomach complications	Leaves
<i>Oenanthe procumbens</i> (H.Wolff) C. Norman	Apiaceae	<b>Chesolei</b>	Mouth infection in babies	Leaves
<i>Olea europaea</i> L.	Oleaceae	<b>Masaita</b>	Common cold, diarrhea, mouth infection in babies, pneumonia, chest problem, fever, eye infections	Bark, stem
<i>Olea europaea</i> L. subsp. <i>africana</i> (Mill.) P.S. Green	Oleaceae	<b>Yemndit</b>	Eye problem, chest pain, stomach problems	Stem, leaves, bark
<i>Pennisetum clandestinum</i> Hochst. ex Chiov.	Poaceae	<b>Seretiot</b>	Skin infections, ring worms	Leaves
<i>Pentarrhinum abyssinicum</i> Decne.	Apocynaceae	<b>Lepleponiat</b>	Pneumonia	Roots
<i>Periploca linearifolia</i> Quart.-Dill. & A. Rich.	Apocynaceae	<b>Sinendet</b>	Fever, joint pains, common colds, gonorrhoea, teeth problem, spinal cord problem, stomach complications	Roots, leaves, stem
<i>Pittosporum abyssinicum</i> Delile	Pittosporaceae	<b>Tabonit</b>	Malaria	Roots, bark
<i>Plectranthus barbatus</i> Andrews	Lamiaceae	<b>Maironget</b>	Wounds, swellings, joint pain, stomach problems, malaria	Roots, leaves
<i>Podocarpus falcatus</i> (Thunb.) R. Br. ex Mirb.	Podocarpaceae	<b>Ormagutgut</b>	Fever, malaria	Roots, bark, leaves
<i>Polyscias kikuyuensis</i> Summerh.	Araliaceae	<b>Mogoyet</b>	Joint pain	Bark
<i>Prunus africana</i> (Hook.f.) Kalkman	Rosaceae	<b>Tenetwet</b>	Stomach complications, backache, malaria, diarrhea	Bark, roots
<i>Pterolobium stellatum</i> (Forssk.) Brenan	Fabaceae	<b>Simbeywet</b>	Stomach problems	Roots, bark
<i>Rapanea melanophloeos</i> (L.) Mez	Myrsinaceae	<b>Gorapariet</b>	Common colds, chest pain	Fruit

Botanical Name	Family	Local Name	Disease/Disorder treated	Part used
<i>Rhamnus prinoides</i> L'Hér.	Rhamnaceae	<b>Kosisito/ Ilo-nyilit</b>	Stomach complications, joint pain, fever, diarrhea, common cold, malaria, body weakness, appetizer	Leaves, roots
<i>Rhamnus staddo</i> A.Rich.	Rhamnaceae	<b>Ingogoloit</b>	Stomach complications, chest pain, backache, fever, pneumonia, joint pain	Bark, leaves, roots, stem
<i>Rhus natalensis</i> Bernh.	Anacardiaceae	<b>Sirondit</b>	Stomach complications, constipation, spinal cord problem	Leaves, roots, bark
<i>Rubia cordifolia</i> L.	Rubiaceae	<b>Tonogitiet</b>	Mouth infection in babies, pneumonia	Leaves, stem
<i>Satureja biflora</i> (Buch.-Ham. ex D. Don) Briq.	Lamiaceae	<b>Kipsogitiet</b>	Stomach complications, teeth problem, pneumonia	Leaves
<i>Schefflera volkensii</i> (Harms) Harms	Araliaceae	<b>Chelumbut</b>	Chest pain, fever, kidney problems, common colds, sore throat	Leaves, bark, stem, sap
<i>Senecio petitianus</i> A.Rich.	Asteraceae	<b>Ng'awng'awet</b>	Diarrhea	Roots
<i>Senna didymobotrya</i> (Fresen.) H.S. Irwin & Barneby	Fabaceae	<b>Sinetwet</b>	Skin infections, joint pain, typhoid, stomach problem, eye infection, intestinal worms, constipation, malaria	Leaves, roots, stem,
<i>Sida cuneifolia</i> Roxb.	Malvaceae	<b>Kipkurgo</b>	Throat, chest blockage	Leaves
<i>Solanum aculeastrum</i> Dunal / <i>Solanum aculeatissimum</i> Jacq.	Solanaceae	<b>Sigowet</b>	Eye problem, fever, spinal cord problem, common colds	Roots, leaves, fruit
<i>Solanum sessilistellatum</i> Bitter	Solanaceae	<b>Lapotwet</b>	Common colds, skin infections, joint pain, wounds, chest pain, fever, ear problem	Root, fruit
<i>Spilanthes mauritiana</i> (A. Rich. ex Pers.) DC.	Asteraceae	<b>Ndutuit</b>	Diarrhea, spinal cord problem	Roots
<i>Syzygium guineense</i> (Willd.) DC.	Myrtaceae	<b>Masomboriet</b>	Stomach complication, wound	Bark
<i>Tagetes minuta</i> L.	Asteraceae	<b>Mupangi</b>	Nose bleeding	Leaves
<i>Tarchonanthus camphoratus</i> L.	Asteraceae	<b>Lelechwet</b>	Skin infections	Leaves, roots
<i>Teclea nobilis</i> Delile	Rutaceae	<b>Guriot</b>	Malaria, headache, joint pains, common cold, pneumonia, intestinal worms, chest pain	Bark, roots
<i>Toddalia asiatica</i> (L.) Lam.	Rutaceae	<b>Chepindorwet</b>	Common cold, fever, malaria, mouth infection in babies, pneumonia, chest pain	Roots, stem, leaves
<i>Trichocladus ellipticus</i> Eckl. & Zeyh.	Hamamelidaceae	<b>Toroniati/ Peregeyat</b>	Teeth problem	Bark, roots, leaves



Botanical Name	Family	Local Name	Disease/Disorder treated	Part used
<i>Urtica massaica</i> Mildbr.	Urticaceae	Siwot	Kidney problem, malaria, typhoid, bruises	Roots, leaves
<i>Vangueria acutiloba</i> Robyns	Rubiaceae	Chepsoliet	Mouth infection in babies, stomach complications	Roots
<i>Verbena bonariensis</i> L.	Verbenaceae	Pirirwapsot	Mouth infection in babies	Leaves
<i>Vernonia lasiopus</i> O.Hoffm.	Asteraceae	Imusekwait	Intestinal worms, stomach ache, malaria, spinal cord problem	Leaves, roots
<i>Warburgia ugandensis</i> Sprague	Canellaceae	Soget	Chest problems, common colds, stomach complications, intestinal worms, headache	Fruit, bark
<i>Zanthoxylum chalybeum</i> Engl.	Rutaceae	Oloisugit	Pneumonia	Bark
<i>Zehneria scabra</i> (L.f.) Sond	Curcubitaceae	Gatkalonet	Malaria	Roots

(42%), bark (39%), and leaves (15%) while stems (1.5%), flowers (1.5%), and plant sap (1%) were the least used plant components. The plants were distributed in 44 plant families with asteraceae having the highest number of species (11.6%). Over half (23) of the plant families mentioned had only one species as a known medicinal plant.

Despite the introduction of modern health services in the area, many people continued to use traditional medicine regularly to treat their health problems or to supplement modern medicine use. Thirty-eight diseases/disorders were specified as being commonly treated (Table 3). Respondents indicated that most of the common diseases (89%) reported in the study area could be treated using medicinal plants found in the area. Further, the majority of the respondents (70.8%) indicated that the community used traditional medicine to treat the common diseases while 29.2 percent used modern medicine regularly. Modern medicine use was reported more commonly by the younger generation to treat diseases where no medicinal plants were known to produce good treatment. This suggests that despite the various cultural and behavioral changes taking place in the community, mainly due to adoption of more sedentary lifestyles and ethnic mixing, knowledge of traditional herbal remedies and of the use of various plant species for medication remained high. However, for diseases like asthma, tuberculosis, HIV/AIDS, and cerebral malaria, respondents indicated that few medicinal plants were effective for treatment and these diseases were therefore, primarily treated using modern medicines.

Regarding delineation by gender, our results indicated that male respondents mentioned more medicinal plants than did female respondents in both age groups. The difference between the mean number of medicinal plants known to men (8.08) and women (6.35) was significantly different ( $t = 2.522$ ,  $df = 118$ ,  $P = 0.013$ ).

A positive correlation between age of a person and the number of medicinal plants one mentioned is indicated by a Pearson correlation of 0.327, and is significant at the 0.01 level of significance. Analysis of respondent narrative data indicated that collection of medicinal plants was reported as being done by both men and women, however, this activity was dependent on the habitat where plants are found. Women mainly collected plants found around homesteads, in open fields and along the river. Men on the other hand collected plants located further away from their homes, especially in the forest when they are hunting or leading cattle to grazing lands. Conversely, preparation of medicinal plants and administration of these medicines were the women's affair. This helped to explain observations in other studies (Krupnik 2005, Rambaldi *et al.* 2007) noting that women in the Ogiek community were generally able to give more detailed accounts of the use and preparation of medicinal plants than men.

A majority of respondents (72%) believed that medicinal plants were very effective against more than 80 percent of all of the diseases affecting the community. Twenty-three percent of respondents indicated that medicinal plants were effective against 50 to 80 percent of all diseases while only five percent believed that these plants were less effective. Knowledge of medicinal plants among the Ogiek is believed to have declined over the last twenty years when other communities have settled in the area. The current generation knows less of plants and their medicinal value. Forty-one percent of respondents attributed the decline of indigenous knowledge to the presence of modern health services; whereas, 25 percent indicated decline of indigenous knowledge is because of lack of medicinal plants attributed to habitat destruction, and 10 percent suggested that this was due to cultural changes affecting the community.

**Table 3.** Number of species used to treat diseases/disorders in the Ogiek community residing in the upper portion of the River Njoro watershed, Nakuru District of the Rift Valley Province, Kenya.

Disease/disorder	Number of species	Percentage
Stomach complications	36	15
Malaria	22	9.4
Fever	21	9
Common cold	18	7.7
Joint pain	16	7
Spinal cord problem	13	6
Wounds	11	5
Skin infections	10	4.3
Chest pain	10	4.3
Mouth infections	8	3.4
Pneumonia	7	3
Eye problem	6	2.6
Diarrhoea	6	2.6
Teeth problems	5	2
Headache	5	2
Teething	4	1.7
Intestinal worms	4	1.7
Kidney problem	3	1.3
Body weakness	3	1.3

Disease/disorder	Number of species	Percentage
Backache	3	1.3
Typhoid	2	0.9
Measles	2	0.9
False teeth	2	0.9
Ear problem	2	0.9
Umbilical cord problem	1	0.4
Sore throat	1	0.4
Nose bleeding	1	0.4
Nausea	1	0.4
Menstrual cramps	1	0.4
Liver problem	1	0.4
Infertility	1	0.4
Gonorrhoea	1	0.4
Constipation	1	0.4
Chicken pox	1	0.4
Burns	1	0.4
Breast problem	1	0.4
Boil	1	0.4
Asthma	1	0.4

Ninety-one percent of respondents indicated that medicinal plants in their locality were diminishing. They attributed this decline to indiscriminate vegetation clearing in the area for charcoal burning or for smallholder farming purposes. They also suggest that men and women from various communities living in the area are culpable for the wholesale clearing of vegetation (medicinal plants and other plants) to clear lands for agriculture. However, charcoal burning was distinguished as the most detrimental practice threatening the survival and persistence of medicinal plants. Currently, there are few traditional conservation mechanisms in place to protect medicinal plant communities. This is opposite of practices within the Samburu community where both *in-situ* and *ex-situ* protection measures are in place (Nanyingi *et al.* 2008). *In-situ* protection entails conserving the plants in their natural habitat whereas *ex-situ* involves domestication of useful plants in other habitats not their natural habitats. Community members did however indicate that they have tried to protect natural habitat of medicinal plants as well as to domesticate some medicinal plants on their farms.

## Discussion

Several studies done in Kenya show that application of herbal remedies is common in several communities within the country. A study in Kaijiado (Kiringe 2006), document-

ed various plant species used by the community for medicinal purpose. In Loita and Samburu, (Bussmann 2006, Maundu *et al.* 2001, Nanyingi *et al.* 2008) documented various uses for plants including medicinal purposes. This study indicated that herbal remedies in the Ogiek community were used alone or in combination with modern medicines. However, an association of traditional and modern medicines was reported in a minority of cases (20%). It was noted that community members used medicinal plants to treat diseases at home, however, would visit modern health centers for treatment when the disease persisted. This initial home treatment of a sick person was noted to be common among African communities (Kiringe 2006). Respondents indicated that they combine traditional medicine and modern medicine in treating a few diseases (< 20 percent of all diseases), when advised to do so by traditional or modern health experts. In the community people are usually referred to modern health experts when the traditional herbal remedies do not effectively treat the ailments. In some cases patients are also referred to traditional hearers when modern health experts see it necessary. This indicates that both traditional and modern health services are used by the community though herbal remedies are the frequently used in disease management. Every respondent knew some medicinal plants and their medical remedies. The list of 94 traditional plants generated from responses in this study

showed that the respondents may know more plants and their medicinal uses than those mentioned but could not recall all the plants during the questionnaire administration.

Most medicinal plants are found growing in the wild, with only a few species being intentionally grown in gardens or agricultural fields. The plants were found growing in both disturbed and undisturbed habitats. Plants in the Asteraceae family, which was the mostly commonly reported used, were found growing in disturbed habitats. The other medicinal plants were collected mainly from forests and fairly undisturbed riparian zones. This finding is in agreement with findings reported in other studies from China, Brazil, and Mexico, where it was indicated that most plant species used for traditional medicine were collected from the wild (Albuquerque 2006, He & Sheng 1997, Lozoya 1994).

Many medicinal plants have bioactive secondary metabolites such as certain alkaloids and phytoalexins that exist in above average concentrations when compared to plants considered to be non-medicinal (Lewis 2003). These compounds act against pathogens in human and animal bodies. Roots contain higher concentrations of these active ingredients since they are storage organs (Kitula 2007). This helps to explain why roots and tubers are reported to be the most commonly collected plant part. This observation also highlights the importance of conserving natural habitat of plants to reduce loss of the important resource, since the plants growing in the wild may have accumulated active ingredients over a longer period of time.

In the Ogiek community, knowledge about medicinal plants is a cultural heritage that is treasured and maintained in different age groups. This knowledge is transmitted orally from one generation to another thus insuring that traditional knowledge about medicinal plants is not lost. This cultural activity is similar to what is observed in Kikuyu, Luo, Gusii, and Masai communities (Kiringe 2006). In Ogiek communities, knowledge transmission was found to be gender specific in that older women train younger women, while young men are taught by the older men. This was found to be true also in Tanzania where same gender sharing of medicinal plant knowledge was reported (Kitula 2007). This is thought to be due to cultural norms whereby men spend a lot of time with boys as they graze cows or while hunting in the forest, and where older women typically spend their time with younger girls during the course of daily activities and household chores. Also, older men and women have had more time to assimilate knowledge about medicinal plants and their medicinal values than younger people in the community and thus act as repositories of knowledge (Bisht *et al.* 2006, Voeks & Leony 2004).

There are possible reasons for women acknowledging fewer medicinal plants than men do. Ogiek women are

more reserved due to internal cultural pressures, thus were more hesitant to converse with researchers and were more concerned about 'inappropriately' exposing their knowledge to an outsider. From the study it was evident that mentioning more medicinal plants does not necessarily mean more knowledge about the uses of plants in the Ogiek community. The issue of knowledge disclosure strongly comes out in the community, since it provides them recognition in the region. From this study's results, women were involved in preparation and administration of medicinal plants concoctions, then it was expected that women would know more plants and their medicinal uses. However it was noted that women were hesitant in disclosing their knowledge about plant use for fear of external exploitation. This observation was also noted in the Western Himalaya by Uniyal *et al.* (2006). This may mean that women can be better conservators of indigenous knowledge about specific plants uses than men, though this observation needs further examination. Uniyal *et al.* (2006) also noted that in the Western Himalaya, females had more household work, responsibility and peer pressure in the community to maintain the household, therefore, they had limited time and access to the plants found apart from their homesteads. Other studies reported similar results with men respondents mentioning more medicinal plants than the women respondents (Bisht *et al.* 2006, Teklenaymanot & Giday 2007). Bisht *et al.* (2006) attributed this knowledge differential to the economic importance of medicinal plants within the community, noting that men were more concerned with the commercial potential of marketing medicinal plants, whereas women were more concerned with how medicinal plants could be used within the household. This was also suggested to be true in the Ogiek community, where women collect medicinal plants mainly for domestic consumption, whereas men were reportedly more involved in collecting medicinal plants for sale. Finally, it is simply possible that men know more about medicinal plant habitats than women in part because women seldom travel to forests.

Males in this study were less familiar with women's health problems and their treatment, than women were with men's health problems and treatment. A similar situation was reported in Malawi (Fassil 2004). This is possibly because of the gendered response to illness, which may be due to psychological differences, cultural norms, and social experiences where women suppress expressions of sickness only when seriously affected, as opposed to men who respond more quickly to disease symptoms (Keleher 2004, Krieger 2003). Women also tend to know much more about children's illness and treatment because they have the responsibility for nurturing and caring for children's well-being. The naming of diseases by local people was noted to be generalized; they do not distinguish between the disease and the symptoms. Example, the respondents indicated plants used to treat stomach complications implying stomachache, constipation and other stomach discomforts. Teeth problems were also high-

lighted which included toothache, sensitivity and bleeding gums. This can be explained by the fact that the local people base the names of diseases and conditions on general symptoms and not on aetiological information as noted by Nanyingi *et al.* (2008).

Modern medicine was introduced to the area in 2000 (Kiragu 2005). Before then people used to treat themselves with medicinal plants. However with the presence of modern clinics in the area some people, especially younger people (less than 30 years), have adopted the use of modern medicine rather than medicinal plants. Indigenous knowledge and use of medicinal plants is being influenced by modern medicine. This agrees with reports by Sherry and Myers (2002) who highlighted that indigenous knowledge is being influenced by Christianity, contemporary practices, and use of modern health services. This study shows that acculturation in the community could not be ignored; since some people (5%) indicated that they do not use medicinal plants at all. They mentioned that they do not trust medicinal plant efficacy for disease treatment and are concerned about the dosage of the drugs. The main cause of diminishing populations of medicinal plants is due to charcoal burning by men in the community. Women stated that although they use the same trees for firewood, they only cut the trees when they are dry and cannot be used for medicinal purposes any longer. Unsustainable harvesting methods, such as bark removal, which leads to plant death, were also noted as contributing to the decline of medicinal plants. Due to the lack of effective conservation mechanisms in the area, there are some species which have been reported to be threatened to extinction, mainly *Engleromyces goetzei*, and *Cucumis ficifolius*. Some attempts to preserve natural habitat of the medicinal plants were reported. This indicates that the community has realized the need to conserve medicinal plants since their diminishing status has been widely recognized in the community. There were indications in the community that plant domestication was being attempted, whereby some people had planted useful medicinal plants on their farms for ease of access and protection against loss. *In-situ* conservation is especially important to protect natural plants habitat of trees and shrubs that have taken several years to grow and are habitat specific. Examples include *Hagenia abyssinica*, *Polyscias kikuyuensis*, *Syzygium guineense*, *Toddalia asiatica* and *Trichocladus ellipticus* among others.

## Conclusion

Our ethnobotanical study of the Ogiek community indicated that the community still values traditional medicine as a way of meeting their medical needs. The community continues to use medicinal plants regularly, thus enhancing the passage of knowledge between generations. Introduction of modern health services in the area has resulted in use of more modern medicines, and community members

were visiting modern health centers for treatment of diseases not treatable by medicinal plants. However, these more modern practices are supplemented by the use of herbal medicine because of people's historical use and perceptions of traditional medicines as being less expensive, readily available and reliable, and they are considered to have fewer side effects than modern medicines.

Some medicinal plants in the area are threatened with local extinction as earlier illustrated and both *in-situ* and *ex-situ* conservation practices are required urgently to conserve the resource. Further research on plants efficacy, dosage, quality and toxicology need to be carried out to support the ethno-medicinal results of this study. This will make the findings of this research useful to other researchers to provide baseline information and to the community to support their ethnomedicine claims.

## Statement

The Ogiek community of River Njoro watershed, Kenya is the rightful owner of the indigenous knowledge presented in this paper. Any benefits that may arise from the use of this information must be shared with them.

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**Appendix 1.** Questionnaire consisting of open ended questions which were answered by informant narrative and discussion, and with more structured questions that constrain respondents answers to bi-modal (Y/N), multiple choice, and ranking responses. Questionnaire used in the Ogiek community residing in the upper portion of the River Njoro watershed, Nakuru District of the Rift Valley Province, Kenya.

Serial no.

Date

**Research Questionnaire**

This questionnaire schedule is aimed at acquiring information on Ogiek's indigenous knowledge of medicinal plants within the upper river Njoro catchment. All the information given will be treated confidentially and used for the purpose of this study only. Your participation will be highly appreciated.

**Part 1. Respondent Details and General Information**

1. Age

2. Sex a) Male b) Female

3. Home of Respondent: GPS Point: Easting ..... m Northing..... m  
Elevation.....m Accuracy ... m

4. What are the most common ailments in this community?  
.....  
.....  
.....

5. What ailments are common in your family? (Children, men, women)?

Disease			Treatment( Traditional / Modern)		
Children	Men	Women	Children	Men	Women

6. How did you learn about the uses of plants?

- a) From mother or grandmother
- b) From father or grandfather
- c) From neighbors
- d) From women or men groups.
- e) Herbalists
- f) Others

7. What was the instructional method used to teach you this knowledge?

- a) Field excursions to identify and gather
- b) Preparation session
- c) Administration session

8. Are you passing on this knowledge to a younger person in your family or community?

- a) Yes
- b) No

9. If the problem persists do you have other people you refer to for additional help such as medicine men or medicine women?  
a) Yes b) No

10. Who are they (their no.)?

- a) Medicine men.....
- b) Medicine women .....

11. Do you have modern health services in this area? a) Yes b) No

12. When do you seek modern health services?  
.....  
.....

13. Have you ever been referred to traditional health institutions from a modern health institution or vice versa?  
 a) Yes                      b) no

14. If yes which disease(s) were you/or family member suffering from then that was referred to modern health services or traditional medicine?

- i)
- ii)
- iii)

**Part 2 Knowledge and Practice (identification, use, transmission of the knowledge)**

1. Based on your knowledge, use and perceptions on medicinal plants found within you area, answer the questions below?

Plant Name	Can you identify it in the field	Location where identified				What disease/s is it used to treat	What part of plant is used for the treatment of the disease	Who prepares and administers the medicinal component of the plant		
		Easting	Northing	Elevation	Accuracy			Gathering (M/W)	Preparation M/W	Administration M/W

2. Who in your community performs the following task?

I. Collect the medicinal plants for household use

- a) Men    b) Women    c) Both (M/W)    d) Youth

II. Prepare the drugs after they have been collected

- a) Men    b) Women    c) Both (M/W)    d) Youth

III. Administer the drugs

- a) Men    b) Women    c) Both(M/W)    d) Youth

3. In your community, which diseases are women known to deal with, if any?

.....

.....

4. Which ones do men deal with?

.....

.....

5. Are there young persons in this community who are also able to administer herbal medicine?

- a) Yes                                      b) No

6. Are there changes in the knowledge and use of medicinal plants in your household?

- a) Yes                                      b) No

7. If yes, what are the main reasons?

- a) Lack of access of medicinal plants
- b) More health facilities/drugs
- c) Change in culture

8. Are there certain intangible cultures through which traditional knowledge on medicinal plants is transmitted?

- a) Riddles                      b) Stories                      c) Songs                      d) Drama





4. If yes please list them

- i)
- ii)
- iii)
- iv)

5. Have you planted any medicinal plants in your farm or you depend on wild sources of plants? a) Yes b) No

6. Do you as a community practice selective forest/vegetation clearing, gathering and plants parts extraction regimes which may contribute to conservation? a) Yes b) No

Please explain .....

7. Do you have traditional mechanism for protection and conservation of medicinal plants from local and external exploitation? a) Yes b) No

If yes please explain .....

8. Who participates in establishing protection and conservation guidelines and their implementation?

- a) Men
- b) Women
- c) Both
- d) Youth

9. Who are the traditional custodians of medicinal plants? a) Men b) Women c) Both d) Youth

10. Are there some medicinal plants that are known to you and have disappeared completely? a) Yes b) No

If yes please list them

- i)
- ii)
- iii)
- iv)

11. Are there intervention projects you would support which deals with medicinal plants conservation?

- a) Yes
- b) No

If yes which ones?

- i)
- ii)
- iii)

12. How would you contribute to make them a success?

- a) Monetary
- b) Attending meetings
- c) Other resources
- d) Labor

13. Where do you think the interventions would be best situated?

- a) Communal land
- b) Individual farm
- c) Other

14. Who will be responsible in management of the projects?

- a) Men
- b) Women
- c) Both
- d) Youth

15. Who do you think will benefit much from medicinal plants conservation projects?

- a) Men
- b) Women
- c) Both
- d) Youth