Exploring the preference for indigenous medicinal plant medicine in Buliisa District, Western Uganda

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Abstract

This paper explores the preference for indigenous medicinal plant medicine in Buliisa district, situated in the Albertine Graben. Despite attempts to improve access to conventional health services, there seems to be a preference for alternative medicine from medicinal plants. The specific objectives included examining the forms of indigenous herbal medicine, how they are administered and passed on from generation to generation, preservation challenges and mitigation measures. The study utilises a multidisciplinary approach by using archaeological transect walks, oral interviews with 50 herbalists, observation of the administration of herbal medicine, focus group discussions, and documentary review to collect data. Four hundred and seventy-seven medicinal plant sites were marked using a hand-held Global Positioning System at 80 locations. The results revealed that all plant parts are used for treatment as either independent parts or combined and often with other plant types. The most commonly used medicinal plant parts are the leaves. Buliisa medicinal plants cure various diseases, but the most common ones are sterility, sexually transmitted infections, high blood pressure, back pain, eye diseases, external body injuries, poisoning, and nose bleeding. In addition, treatment for aspects such as luck and spiritually related ailments are also handled. Though the harvesting poses a key conservation challenge, the secrecy embedded in the transmission of indigenous knowledge, education, Christianity and oil exploration is each equally a threat. The study recommends that since most herbal medicines have no overdose, there is a need to undertake more research to document the dosage and side-effects of using medicinal plants and compile a red list of the endangered species. The study has implications for the knowledge and development of herbal indigenous medicinal plants.

Keywords: indigenous knowledge, medicinal plants, herbal medicine, heritage preservation

Introduction

In this era of science and improved technology, why would one bother with medicinal plants while almost all ailments have alternative therapeutic treatments, as is the case in Buliisa? Medicinal plants are part of indigenous knowledge that is part and parcel of the intangible African heritage. The UNESCO 2003 convention for safeguarding intangible cultural heritage (Scovazzi, 2015) recognises indigenous knowledge as part of an intangible heritage expressed through world views that include the traditional healing systems at the heart of community culture and identity. Byarugaba and Anyali (2019) regard the hidden economy in indigenous medicinal plants held by medicine women and men to be like "oil" itself that can harvest more money than the constantly falling oil prices. "Medicinal plants" include any plant that can prevent, protect, cure and solve health complications, socio-cultural issues or reduce pain using its parts or the entire plant.

Medicinal plants provide herbal medicine, which involves "using a plant's seeds, berries, roots, leaves, bark, or flowers for medicinal purposes" (Bill 2003:1). Medicinal plants locally treat ailments such as intestinal worms, impotence, headache, measles, indigestion, dermatitis and malaria (Ssegawa and Kasenene 2007).

In 2009, "commercially exploitable oil reserves were identified in the Albertine Lake Basin" (Gelb 2011), and this is where Buliisa is located. Based on experiences elsewhere, scholars like Doro and Kufakurinani (2018), Kiiza *et al.* (2011), Ogwang *et al.* (2019), Gelb *et al*. (2011) Olanya (2015) predicted an oil curse, while Mbabazi (2013) felt it could be turned into a blessing, Oloka-Onyango (2020) suggested ways of taking advantage of the oil to be like Botswana, Norway, Chile and Indonesia. The resource course, also termed the 'paradox of plenty', suggests that countries with abundant natural resources usually fail to utilise them well and end with problems or 'curses'. Therefore, Buliisa at the centre of the oil activities, will make one wonder if the oil will be a 'curse or a blessing'. Similarly, in the same area, with plenty of oil are the medicinal plants. Therefore, this study intends to explore why the people in Buliisa prefer their medicinal plants even when they have conventional forms of treatment, many of which have been put in place following the oil activities that turned out to be more of a blessing than a curse in this regard, through promoting better services.

Purpose and research questions

The study intended to examine the preference for indigenous medicinal plant medicine in Buliisa District, Western Uganda. Four research questions guided the study: (1) What are the types of medicinal plants utilised by the people of Buliisa? (2) How is the indigenous knowledge concerning medicinal plants passed on from generation to generation? (3) How are the medicinal plants prepared and administered by patients as herbal medicine? (4) What are the challenges and mitigations for conserving indigenous medicinal plant knowledge?

Theory and literature review

The Social Choice theory guides this study. The Social Choice theory rooted in economics is "concerned with the relationships between individuals' preferences and social choice" (Fishburn (1973, p. 3). The theory means "the study of systems and institutions for making collective choices or choices that affect the people" (Kelly 2013:1). The approach was "pioneered in the 18th century by Nicolas de Condorcet and Jean-Charles de Borda, and in the 19th century, by Charles Dodgson (also known as Lewis Carroll). The social choice theory took off in the 20th century with work by Kenneth Arrow, Amartya Sen, and Duncan Black. Its influence extends across economics, political science, philosophy, mathematics, and recently also computer science and biology. Apart from contributing to our understanding of collective decision procedures, the social choice theory has applications in the areas of institutional design, welfare economics, and social epistemology". Specifically, the research hinges on preference aggregation by a society like Buliisa district to use medicinal plants at the expense of conventional medicine. This is further supported by the 'resource curse' hypothesis concerning natural resource utilisation, as is the case for the medicinal plants in Buliisa. This relates to the people in Buliisa making effective use of the medicinal plants to benefit from them or misuse them to promote chaos. The challenge with the social choice theory arises from "the desire to fit essentially different classes of group aggregation problems into one uniform framework and from seeking excessive generality" (Sen 1977:53). That is why the best option is to make the choices as suggested by Sen . The one that fits this study is social welfare judgement, where individuals have to choose the best option from among alternatives. In this case, the people of Buliisa choose the medicinal plants.

The knowledge of medicinal plants is part of indigenous knowledge and an intangible cultural heritage. Though aware of the debates concerning 'terminologies like indigenous knowledge, local or traditional knowledge' (Lanzano 2013: 3) and defining indigenous based on the people has been contested for a long time, because it is difficult to determine who is indigenous. While this may be problematic in the case of people, for the plants it is relatively different. Indigenous knowledge in this paper focuses on the "nativeness, historical continuity of plants produced naturally in the land and belonging naturally to the soil" (Dove 2006:192). In this context, medicinal plants are considered in Buliisa as part of the people's heritage passed on from generation to generation. The question then is: how have they been passed on? And what can be done to preserve this intangible knowledge from the various threats? The paper attempts to inform the public that indigenous medicinal plant heritage is part of Uganda's intangible heritage. Uganda promotes the intangible heritage derived from Uganda's ratifying of the 2003 UNESCO Convention for Safeguarding of Intangible Cultural Heritage (Scovazzi 2015) on May 13, 2009, and passing the Traditional and Complementary Medicines Act 2019 (Ministry of Health 2019). Thus, medicinal plants combine both the natural and the cultural heritage. In this regard, Uganda ratified the 1972 UNESCO Convention concerning the protection of the world natural and cultural heritage on November 20 1987.[1] Despite the dual heritage component of medicinal plants as natural and cultural heritage, the emphasis is on the cultural heritage aspect of the medicinal plants as used to treat ailments and how the skills are administered and passed on from generation to generation.

Indigenous plant species in Africa potentially play a central role in addressing livelihood concerns such as food insecurity, medicine and other associated benefits (Aliyu *et al.*, 2020). Though plants fulfil our daily needs ranging from food, building materials, clothing and crafts to ornaments, the emphasis is on the medicinal plants. All flora has healing properties in Africa, as discovered over generations through trial-and-error methods (Ssozi *et al.* 2016). Medicinal plants are formally a primary source of health care (Kamatenesi & Oryem 2005). In the recent past, most traditional healers engaged in educative avenues (formal and informal), which enhanced research for knowledge and quality of herbal medicines. However, many experiences on several species of flora are still held mainly by a few, as culturally this was the preserve of older people or those given spiritual powers to do so. This is not strange since "in Africa, traditional medicine encompasses herbalism and spiritualism" (Gumisiriza *et al.* 2021:3). Such beliefs have made it at times a secret knowledge. Making herbal medicine and medicinal plants secret could partly be due to the negative connotation associated initially with herbal medicine as satanic due to the introduction of Christianity (Informant E). However, the financial incentives are currently motivating an increasing interest in acquiring indigenous medicinal plant knowledge among the broader community (Otieno and Analo 2012).

Several factors cause challenges of conserving indigenous medicinal plant knowledge. These include the death of the older people who are custodians of indigenous culture, migrations, regional conflicts and urbanisation, among other causes (Kyoshabire *et al.* 2017). The UBOS (2018) statistics revealed that by 2016/17, 15.8% of the rural households had to travel five kilometres or more to access health services, which left most of them with no choice other than to use herbal medicines. The trend has even changed so that even if there is conventional treatment in hospitals, many Ugandans prefer to use herbal medicine from medicinal plants. For instance, there has been a low uptake of the COVID 19 vaccine (Bongomin *et al.* 2021) in preference for herbal medicine. For example, the rush for covidex herbal medicine escalated its cost following its approval by the Uganda National drug authority as a relieving treatment for the symptoms of COVID 19. This means that herbal medicine from medicinal plants is no longer a last resort but a priority. The popularity of herbal medicine could be "in an explicit

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effort to counter the dominant development discourse to show that the indigenous peoples possess unique systems of knowledge that can serve as the basis for more successful development interventions" (Dove 2006:195) or their efficacy.

The primary sources of medicinal plants include bushland, home gardens, grasslands and forests (Namukobe *et al*. 2011). Though some grow on the roadside, in the wildness, in mud, riverside and wasteland areas (Parthiban *et al*. 2015), others are domesticated in the form of flowers, vegetables, construction poles and fencing materials. The domestication of medicinal plants is sometimes done knowingly or unknowingly for both terrestrial and aquatic medicinal plants. Aquatic plants are either floating or grow from underneath the water. The aquatic medicinal plants are usually found in wetlands and sometimes in rivers/ by riversides, and in most cases are harvested using boats or with protective gear. Medicinal plants could be climbers, standalone plants, and others that grow on other plants. Agea *et al*. (2007) noted that climbing plants are also little studied in Uganda despite being a vital component of the forest and their use by local communities mainly for medicinal purposes.

Medicinal plants are used in syrups, powders, infusions and ointments (Ghorbani, 2014). The conventional methods of plant medicine preparation include: boiling, chewing, pounding, cooking, roasting and smoking. According to Kamatenesi & Oryem (2005) and Tugume *et al*. (2016), leaves are the most commonly used plant parts, a finding that agrees with data from Buliisa, yet Kamatenensi *et al.* (2011) suggest that roots dominate the parts of plant most used. Other parts used include roots, bark, flowers, fruits, stems, seeds, pods and buds. Rural households depend heavily on medicinal plants, though issues still arise with sustainability due to destructive harvesting methods. This is because to get some medicinal plant parts for use the entire plant is often destroyed.

Some harvesting methods reduce the abundance of some plant species and they may be driven to extinction if not controlled. For example, Tugume & Nyakoojo (2019) and Tugume *et al.* (2016) proposed that the medicinal plant species used are collected from various habitats, especially wild bush, using several harvesting techniques that are very destructive and pose conservation challenges. Hence the need for a clear understanding of the distribution and abundance of the species can guide plans for its conservation *in situ*, realise its full potential for sustainable exploitation (Aliyu *et al*. 2020), and incorporate traditional knowledge on the different medicinal plants in cultural heritage management. In addition, some environmental impact assessment reports for oil exploration have mentioned the existence of this intangible heritage. For instance, the Architecture, Engineering, Construction, Operations, and Management (AECOM) report stated that medicinal plants are natural resources in shrubs, trees and herbs (Eco and Partner 2015: 159). Therefore, medicinal plants offer alternative remedies to compensate for the lack of primary public health care for many people in developing countries such as Uganda; they have been used by humans since prehistoric times (Batugal 2004).

Botanists, biodiversity managers and environmentalists have conducted studies on plants. For instance, in Uganda, Katende *et al.* (1995), Bukenya-Ziraba *et al.* (1997); Kakudidi *et al.* (2000); Tabuti *et al.* (2003); Ssegawa and Kasenene (2007); Galabuzi (2008) and Tabuti (2008) examined medicinal plants but without focusing on the heritage aspect and specifically Buliisa district. While Galabuzi (2008); Galabuzi *et al.* (2016) concentrated on medicinal plants that treat malaria, Galabuzi *et al*. (2015) looked at biodiversity issues in southwestern Uganda. Bakamwesiga *et al*. (2000); Basemera (2003); Pomeroy (2000); Pomeroy & Tushabe (2004); examined the treatment of tuberculosis. On the other hand, Bunalema, Obakiro, Tabuti and Waako (2014) researched the use of medicinal plants to form pesticides, yet Mwine (2019) worked on antifungal medicinal plants .

Anywar *et al*. (2020) and Lamorde *et al*. (2010) examined medicinal plant species used by herbalists to boost people's immunity to HIV/AIDs. The regional distribution of the studies on plants also shows the neglect of Buliisa, where the current study was undertaken. For instance,

Anywar *et al.* (2016) worked in northern Uganda; Tabuti (2008) in eastern Uganda, specifically at Budiope, (Mwine 2009) concentrated on Masaka, while Galabuzi (2008) and Galabuzi *et al.* (2015 & 2016) documented plants in Sango Bay, while (Kakudidi *et al*., 2015) worked in southwestern Uganda, yet Okello & Ssegawa (2007) focused on the Apac district., Nanyunja (2003) worked in Lake Mburo and Rubaare grasslands in addition to Sango Bay. At the same time, Nanyunja & Baguma (2005) examined indigenous knowledge in Uganda, emphasising forestry rather than medicinal plants. Kamatenesi-Mugisha & Oryem-Origa (2007) looked at medicinal plants used for inducing labour, Tabuti *et al.* (2010) looked at medicinal plants used to treat tuberculosis and related diseases. It is against this existing literature that there is a need to explore indigenous knowledge heritage in medicinal plants. The current literature shows that while research has been undertaken on medicinal plants in Uganda, this has not been the case for Buliisa, which is the focus of this paper. This necessitated identifying the types of medicinal plants, how they are administered for treatment, the mode of transmission and conservation challenges and mitigation measures.

Materials and methods

Study area

The study area is Buliisa district. Buliisa was formed from part of the Masindi district in 2006 along the shores of Lake Albert. The Buliisa district borders Nwoya and Nebbi districts in the North, Masindi district in the East, Hoima district in the South and the Democratic Republic of Congo in the West. (Figure 1).
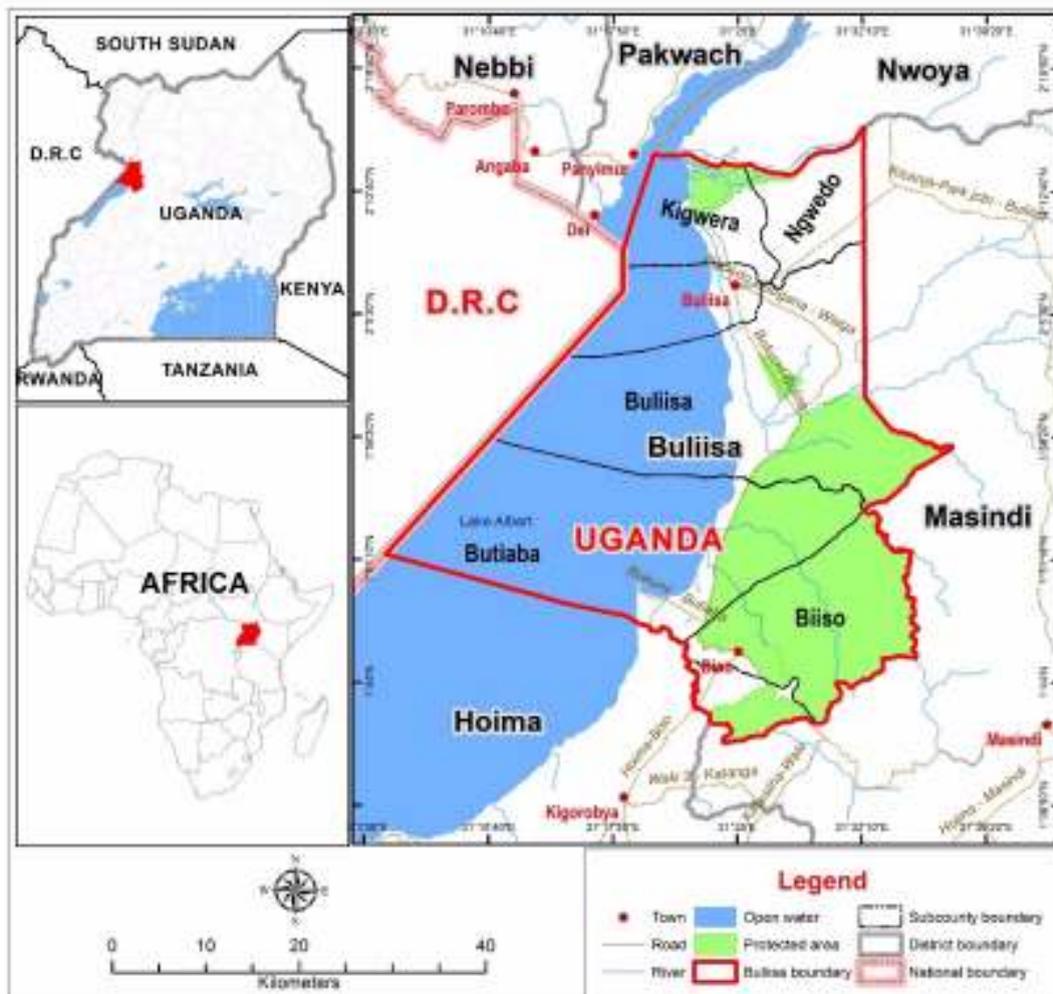
Figure 1. Buliisa District

Buliisa is "surrounded by Lake Albert, the Albert Nile, game reserves/park and Budongo forest, meaning that the bigger part of the district is within the Murchison falls national park, Bugungu game reserve and Budongo forest" (*https://buliisa.go.ug/content/district-one-oldest-uganda-originally-it-consisted-rakai*). The location of Buliisa explains the diversity of medicinal plants. Furthermore, the location of the Buliisa district along Lake Albert also makes it part of the Albertine Graben. The latter is a biodiversity hotspot in Uganda where medicinal plants have been used for a millennium, from the pre-colonial, through the colonial and even in the post-colonial periods, though many of the plants and their uses are not well documented (Owuor *et al.* 2006).

Data collection

The study utilised both primary and secondary data. Primary data was obtained from archaeological pedestrian transect surveys from December 2016 to July 2017 and February 2019. An unsystematic archaeological survey was used, given the nature of the terrain characterised by hilltops, valleys, game reserves, and water bodies. Therefore, an archaeological survey was conducted in areas with shorter grasses, footpaths and erosion gullies. The walkover surveys involved visual observation with the guidance of herbalists, photographs of the findings and locations recorded with a GPS. This author marked eighty medicinal plant sites containing 477 trees, shrubs and grass species using a hand-held Global Positioning System (GPS). Selected samples of medicinal plant parts were collected from the field and analysed by a professor of botany at Makerere University to identify the plant species, family name and form. To establish the local names, uses, and administration, interviews were held with 50 herbalists, and three focus group discussions purposively with selected elders, herbal medicine administrators and heritage organisations within Buliisa. The sampled people were elders and heritage conservators, either individuals, groups or organisations. The key informants and focus group participants assisted in identifying the local names, uses, administration and knowledge transmission of the medicinal plants.

Secondary data from a comprehensive literature review from multiple internationally recognised databases on medicinal plants, specifically from Uganda, supplemented the primary data. For instance, a Google scholar search for medicinal plants in Buliisa yielded 598 results, some of which were considered and used. Secondary data was also obtained from the review of the archaeology and heritage sections of the cultural heritage impact assessment reports. The desk-based assessment described the historical development of the study area, placing it in context to predict its medicinal plant cultural heritage potential; to anticipate the type, character and broadly indicate modes of administration and transmission from generation to generation.

Medicinal plant categorisation and analysis arose from the medicinal plants marked with the GPS and entered into an Excel sheet to make simple calculations, graphs and tables. These were then sorted to develop the frequencies of occurrence to establish the dominant species. Finally, the sampled medicinal plants were packed in newspapers and sent to the laboratory to identify their species, life forms and family names. These were then matched with the interviews and focus group discussions on establishing the plant species used as medicine, how they are administered, the state of conservation, transmission and challenges of protecting this indigenous knowledge and mitigation measures.

A total of 50 people were interviewed; 35 of the participants were male, while 15 were female. The dominant age of the respondents ranged from 40-50, representing 15 participants, while the Bagungu are the dominant ethnic group.

Table 1. Demographic characteristics of the respondents

Gender of respondents	Males	Female		
Total	35	15		
Age groups	30-40	40-50	50-60	60-70
Total	10	15	12	13
Ethnicity	Bagungu	Alur		
Total	38	12		

Ethical considerations

Ethical approval for this study was obtained from the Bunyoro Kitara Ministry of Culture since Buliisa is part of the Bunyoro-Kitara Kingdom. Further permission was obtained from the Bunyoro Kitara Kingdom representative in Buliisa. The leader of traditional medicine practitioners was also consulted, and then the Local council (LC1) chairperson of each village was visited: mainly Kasinyi, Kisomere, Avogera and Uduk II. The data was collected with the assistance of the Bugungu Heritage and Information Centre that was well conversant with the cultural values of the people of Buliisa. The participants filled in informed consent forms and the identity of the participants was omitted to maintain confidentiality.

Results and discussion

Types of medicinal plants identified in Buliisa

The examination of the types of plants used for medicinal purposes showed that the Buliisa district has a diversity of flora that local people have depended on for many years. This concurs with Tchacondo's (2012:92) suggestion that "plants have formed the basis of traditional medicine that was used thousands of years ago by human beings". Several reasons are advanced for the popularity of medicinal plants, such as the provision of low cost and accessible primary health care to the rural poor in Bunyoro Kitara areas (Focus Group Discussion (FGD) 1). Mahwasane *et al.* (2013), too, who noted that traditional healers are usually within the patient's vicinity and are aware of the patient's culture and environment and so charge nominal fees. At the sampled 80 locations, 477 medicinal plants were identified, of which a sample of 40 medicinal plant species was analysed further to establish their species, family name and lifeform as indicated in Table 2.

Table 2. Selected medicinal plant species, families and life forms from Buliisa

	Species	Family Name	Lifeform
1	*Asystasia gangetica (L.) Andersson*	Acanthaceae	herb
2	*Solanum incanum L.*	Solanaceae	herb
3	*Ocimum basilicum L.*	Lamiaceae	herb
4	*Asparagus africanus Lam.*	Asparagaceae	herb
5	*Senna occidentalis (L.) Link*	Caesalpinioideae	herb
6	*Amaranthus dubius Thell.*	Amaranthaceae	herb
7	*Hoslundia opposita Vahl*	Lamiaceae	shrub
8	*Sesamum angustifolium (Oliv.) Engl.*	Pedaliaceae	herb
9	*Lannea schweinfurthii (Engl.) Engl.*	Anacardiaceae	tree
10	*Commicarpus pedunculosus (A. Rich.) Cuf.*	Nyctaginaceae	scrambler

11	*Leptadenia hastata (Schum. & Thonn.) Decne*	Apocynaceae	climber
12	*Persea americana Mill.*	Lauraceae	tree
13	*Cucurbita maxima Lam.*	Cucurbitaceae	runner
14	*Sansevieria dawei Stapf (Dracaenaceae)*	Asparagaceae	herb
15	*Sesamum angustifolium (Oliv.) Engl.*	Pedaliaceae	herb
16	*Azima tetracantha Lam.*	Salvadoraceae	shrub
17	*Albizia zygia (DC.) Macbr.*	Mimosoideae	tree
18	*Thevetia peruviana (Pers.) Schum.*	Apocynaceae	shrub
19	*Phyllanthus amarus Schum. & Thonn.*	Euphorbiaceae	herb
20	*Azadirachta indica A. Juss.*	Meliaceae	tree
21	*Oxygonum sinuatum (Meisn.) Dammer*	Polygonaceae	herb
22	*Rhamnus prinoides L' Herit*	Rhamnaceae	shrub
23	*Chenopodium opulifolium Koch & Ziz*	Chenopodiaceae	herb
24	*Jatropha curcas L.*	Euphorbiaceae	tree
25	*Euphorbia hirta L.*	Euphorbiaceae	herb
26	*Acacia sieberiana DC.*	Mimosoideae	tree
27	*Astripomoea malvacea (Klotzsch) Meeuse*	Convolvulaceae	herb
28	*Caralluma sp.*	Apocynaceae	herb
29	*Cyphostemma serpens (A. Rich.) Discoings*	Vitaceae	climber
30	*Commelina africana L.*	Commelinaceae	herb
31	*Hoslundia opposita Vahl*	Lamiaceae	shrub
32	*Sesamum angustifolium (Oliv.) Engl.*	Pedaliaceae	herb
33	*Ximenia americana L.*	Olacaceae	tree
34	*Boscia salicifolia Oliv.*	Capparaceae	shrub
35	*Kigalia africana (Lam.) Benth.*	Bignoniaceae	tree
36	*Amaranthus graecizans L.*	Amaranthaceae	herb
37	*Achyranthes aspera L.*	Amaranthaceae	herb
38	*Crateva adnsonii D.C.*	Capparaceae	tree
39	*Commelina benghalensis L.*	Commelinaceae	herb
40	*Bidens pilosa L.*	Asteraceae	herb

The analysis in Table 2 suggests that herbs were the dominant plant types, at 52.5%, followed by trees at 22.5%, then shrubs with 15%, climbers had 5%, and a runner and scrambler at 2.5% each, respectively (Figure 2). The data in Figure 2 means that most of the medicinal plants in Buliisa belong to the herb lifeform, hence the term "herbal medicine". Gumisiriza *et al.* (2021) also confirm, with 35.8% of their collection, that herbs are the dominant source of herbal medicine.
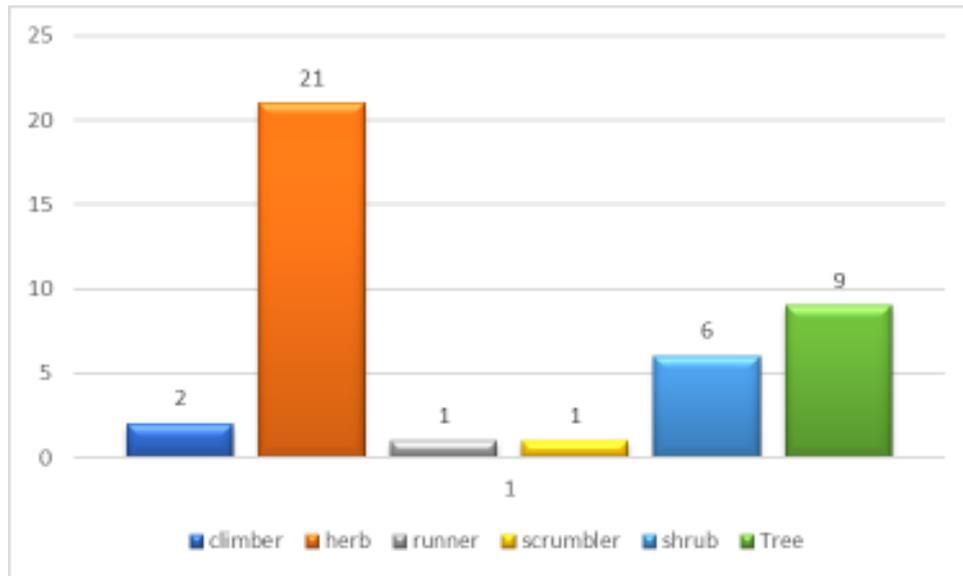
Figure 2. Medicinal plant lifeforms in Buliisa

The examination of the dominant medicinal plants on a sample at 94 sites suggests that in Buliisa, cactus was the dominant plant at 27 locations, followed by aloe vera (22), false-marula (*Lannea Schweinfurthii (Engl.) Eng)(musingabakazi)* (13), *mukubyakubya* (9), *Myriophyllum (kulumbero) and mbumbuula at four sites each*, and then amarula trees, Mubogola Nzegu and mango at two each and the least frequent were mutoora and nongo, with one each (Figure 3).
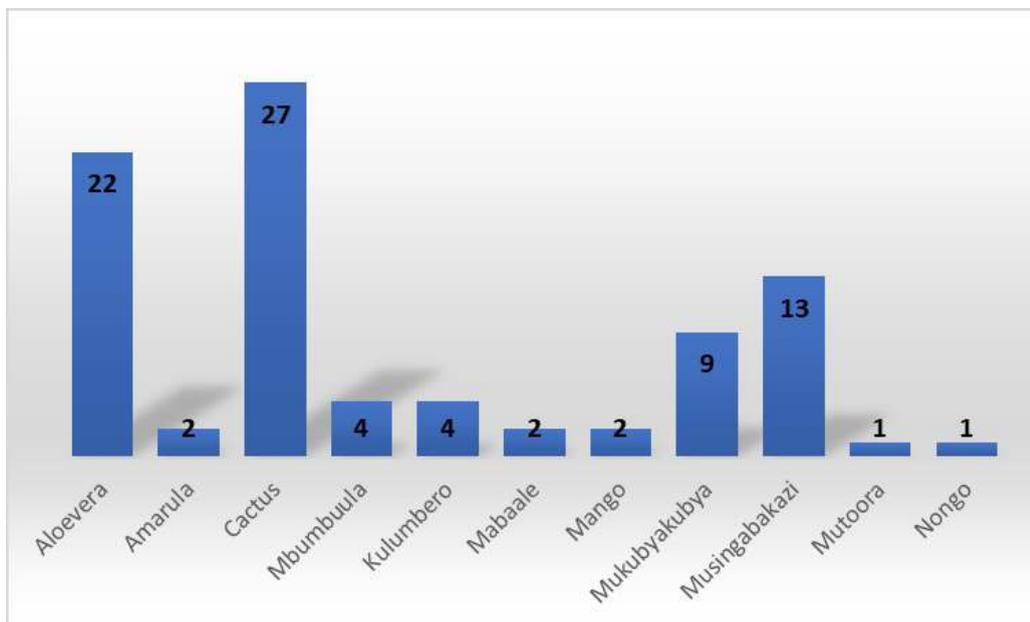
Figure 3. Frequency of medicinal plants at the sites

Aloe vera (Figure 4) has widely been used the world over and cures several diseases, especially malaria. Aloe vera was identified either in isolation or with other plants, as shown in Figure 3. Given its medicinal value, Nandal and Bhardwaj (2012:59) suggested that "aloe vera is a wonder plant with health benefits that hardly any part of the human body remains uninfluenced by its healing touch since it acts as a natural fighter against all sorts of infection, an efficient

antioxidant, helps in treating all digestion related problems, heartburn, arthritis, stress, diabetes, rheumatism pain, asthma, cancer, AIDS".

Figure 4. Aloe vera plant

Other medicinal plants identified included: *kamunye*, *Myriophyllum (kulumbero)*, false-marula (*Lannea Schweinfurthii (Engl.) Eng) or Musingabakazi*, neem tree, mango and *Mubogola Nzegu*. These treat different ailments, such as kamunye that treats wounds, while *Myriophyllum (kulumbero)* treats the eyes and impotence. For example, in the treatment of impotence, *Myriophyllum* (*kulumbero*) (Figure 5) is combined with the false-marula (musingabakazi) tree leaves and bark.

Figure 5. Myriophyllum (Kulumbero) plant

Mubogola Nzegu (Figure 6) is another medicinal plant that treats infections that cause swellings of the legs, that the Baganda call *ettalo(cellulitis)*.

Figure 6. Mubogola Nzegu plant

The neem trees (*Azadirachta indica A. Juss*) are also common in Buliisa, and these cure several diseases, especially malaria and fever, as detailed in Table 3. Hence, according to Brahmachari (2004:409), the neem tree is "an omnipotent plant that is valuable and miraculous because almost all its parts including the stem, bark, roots, leaves, gum, seeds, fruits, flowers, are used as traditional medicine". Besides its therapeutical value, it also has insecticidal importance even in Buliisa, just like other parts of the world, like India, where it originated.

Mango (*Mangifera indica L*.) trees in Buliisa are also medicinal plants that provide delicious fruits. In addition, they treat coughs if one boils the leaves and the bark. Abdel-Mageed *et al*. (2014) have proposed that the "mango stem bark, seed, root and leaves are widely used in folk medicine to treat diarrhoea, skin diseases, diabetes, asthma and cough". Therefore, mango trees have "antimicrobial, anti-inflammatory, anti-atherosclerosis, antipyretic, antioxidant, antidiarrhoeal, anticancer, immunomodulatory, antidiabetic, enhancement recognition memory, and hepatoprotective activities" (Mageed *et al*. 2014: 2236).

Cactus (*Opuntia ficus-indica)* (Figure 7) is a "member of the succulent plant family Cactaceae" (Shetty *et al*. 2012:530) and was the most common plant in the area. Cactus (Figure 6) has varied types and uses in Buliisa district that include the treatment of calves, though also used for building material and fencing or boundary markers, which might explain why it is in plentiful supply. Data from Buliisa is confirmed by Omora *et al*. (2020:4), that the cactus prickly pear type can be used to treat "prostate, stomach, colon and rectum cancers".

Figure 7. Cactus used for the treatment of animals

Administration of herbal medicine from medicinal plants in Buliisa district

Other than identifying the types of medicinal plants, diseases treated, and lifeforms, it was crucial to examine the administration of herbal medicine based on the plant types and the results as presented in Table 3. *"The use of herbal medicine has a very long history that corresponds to the Stone Age"* (Ozioma & Chinwe 2019: 191) and "herbal medicine is as old as humanity himself since it predates the modern homo sapiens". For instance, archaeologists "found pollen and flower remains dated 60,000 years in Iraq, while the evidence in China dates to 8,000 and Mesopotamia 5,400" (Tyler 2000: 447). In Uganda, the history of herbal medicine can be traced since the pre-colonial period (Kakooko and Kerwagi 1996), and it is a form of intangible heritage used in many parts of Uganda. For example, in Buliisa, where the key languages are Lugungu and Alur, medicinal plants are administered in several ways. Though almost all parts of the plants are used when administering herbal medicine, the perception of the local individuals in Buliisa suggests that leaves are the most commonly harvested parts (FGD1). Other plant parts used include roots, bark, stem, fruits, flowers, buds or a combination of these parts. Kamatenesi *et al*. (2011) in Oyam District in Northern Uganda identified roots as the most commonly used parts of the medicinal plants, while Gumisiriza *et al*. (2021) in Western Uganda suggest that the leaves instead

are dominant. The divergence concerning which plant parts are commonly used is not strange, bearing in mind that many medicinal plants are used as concoctions that sometimes require mixing several plant parts. Therefore, medicinal plants are administered in combinations of two or more species. This is the case for *Alibizia coriaria*, where the flowers and young leaves of *Mukunkulu* and *Musisye* are pounded, and then the juice is dropped in the cleaned ear. The use of combined plants is clear from the 57 plant species in Table 3.

Figure 8. Albizia coriaria Welw. ex Oliv. (DC.0 J.F. Macbr. (Musisiye)

Table 3. Selected medicinal plant species and administration of herbal medicine

S/N	English/ botanical name	Local Plant name	Disease (s) cured	Administration
1	Wild plum (*Ximenia Americana*)	Musumu/ Ulemu	Syphilis (*isumu*) and gonorrhoea (n*ziku*)	Boil fresh roots until they turn red and take half a cup for at least four days.
2	Bark cloth fig tree (*Ficus natalensis*)	Mutoma/ Yeni bong	It is used to treat vegetarianism	Pound the strings and mix with meat for the vegetarian to eat
			Bedwetting Grind the strings and boil, then drink	
			Worms (nzoka za munda)	Grind the strings and boil, then drink
			Syphilis (*isumu*)	Mix the strings with the roots and leaves of another plant, locally called *alungu*. Add two cups of water and cook until the water reduces to one cup. The patient then takes that one cup at once.
3	False-marula (*Lannea Schweinfurthii (Engl.) Eng*)	Musingabaka zi	Syphilis (*isumu*)	Boil the bark for about 30 minutes, drink at least a full cup per day for four days.
			Poison	Boil the bark together with those of *musisye,* and drink ½ a cup. In case it is poisoning, the patient is expected to vomit.
			Boils in the stomach (intra-abdominal swelling)	Cook the bark and drink while still warm.
			Sterility	Take the bark and leaf infusion
4	Sausage tree (*Kigelia Africana*)	Mulolo/yagu	High blood pressure	Pound the pod-like fruit while fresh and then mixed with cold water and take a full cup per day for five days.
				Boil the fruit pieces and drink one cup per day for five days.
			Syphilis (*isumu*)	Dry the leaves and fruit in the sun for about 2 hours and then mix them with the bark and strings of the fig tree. Water is added thrice, and the patient takes a cupful for three days.
5	Eurasian watermilfoil (*Myriophyllum spicatum. L*)	Kulumbero	Not eating fish	Pound leaves, sieve and cook mixed with the *ngasia* fish
			Fire burns (*bihoto bya mworo*)	Pound leaves, sun-dry, and pound again and sieve before applying to the wounds.
			Poor eyesight	Swallow ripe seeds
			Painful eyes	Swallow fresh seeds
			Boils in the stomach (intra-abdominal swelling)	Cook the roots and drink
			Hernias (*nzoka zahansi*)	Boil roots mixed with traditional salt and drink.

6	Robusta Coffee (*Coffea canephora*)	Mwani	Diarrhoea	Boil pounded roots, then sieve and drink
7	Aloe vera (*Aloe barbadensis miller*)	Bisakiso	Snake bite	Drink the juice of Aloe Vera
			Malaria	Boil the leaves and take
			Asthma	Boil the leaves
8	Sodom Apple (*Solanum incanum*)	Ntobotobo/ Uchok	Fresh wounds	Apply the sap from the seeds to the affected area.
			Boils around pelvis (*Kizimba nyarwekika*)	Rub a mixture of soil from a dead anthill in a ripe Sodom apple on the boil when it is still immature.
			arthritis (*Mwonzo*)	Make juice from a ripe Sodom apple and mix with little salt, and leak.
			Painful throats	Make juice from a ripe Sodom apple and mix with a little salt, and lick.
			Hearing problem	Apply cooked flowers mixed with ghee on in the ear.
			Stomach pain	Boil roots and drink ½ a cup twice a day.
9	Amarula (*Sclerocarya birrea*)	Mutora	Syphilis	Boil the roots mix with those of *ntwa* and *mulaliki,* then sieve and drink.
10	Blackjack (*Bidens pilosa*)	Bukura	Eye problem	Squeeze the leaves and add some water and apply droplets to the eyes
			Salpingitis	Boil the leaves mixed with those of *Kajungayakwiri* and drink.
			Kiraka	Squeeze the leaves and rub or tie around the affected part.
11	Tomato (*Solanum lycopersicum*)	Nyanya	Worms in children	Make juice and give to children
12	Tomato (*Solanum lycopersicum*) and Onion (*Allium cepa L.*)	Nyanya na butunguru	Tinea corporis (Bimpalampa)	Mix the two and rub on the affected part
13	Cassava (*Manihot esculenta*)	Ngura	Kyogeramusahimu mubiri (increasing blood)	Boil the leaves for six minutes and mix with lemon juice
14	Stomata in Boerhavia (*Nyctaginaceae*)	Byata bya messi	Kizimba (boil) makes it get ready for cutting prematurely.	Squeeze the leaves on the boil
			Ibanu (mastitis)	Mix leaves with *kinyumba kya nyindoli* and water and drink.

15	Sweet potatoes (*Ipomoea batatas*)	Byata/kata	Running stomach (dysentery)	Boil leaves and take ½ or a full cup.
			To neutralise poison	Pound or squeeze the leaves and give to the patient to drink.
			Snakebite	Pound or squeeze the leaves and drink (first aid).
16	Climbing nettle (*Tragia brevipes Pax*)	Kasiha/ayila	Nzoka (worm infection - Helmithiasis)	Boil the roots after pounding or chew the raw roots.
			Sexual dysfunction	Chew the raw roots.
			Kasambandwa (tonsillitis)	Boil the roots and sieve. Then mix the water sieved with ghee and drink.
17	Coffee senna (*Senna occidentalis*)	Sagalamusansi	Nzoka (stomach pain)	Boil the leaves and pound, then sieve and drink at least one cup per day
			Ringworms	Pound the roots and mix with kerosene and rub on the affected part.
			Urinary infections	Pound the leaves, mix with water and drink a cup.
18	Butter-berry (*Hoslundia opposita Vahl.*)	Mbumbula	Deworming	Boil the leaves and leave it to cool, then drink a cup per day for three days
			Syphilis	Pound the roots and boil, then drink a cup per day for a week
			Fresh wounds (cuts)	Squeeze and apply the juice to the affected area.
			Mwozo (Appendicitis)	Squeeze the leaves and mix with water, then drinks ½ a cup until one is relieved.
19	*Lannea Schimperi* (A. Rich.) Egl.	Muguzandwa	Sexual dysfunction	Chew the bark together with coffee beans.
20	Tea (*Camellia sinensis*)	Majani	Nose bleeding	Drop the processed tea leaves in hot charcoal and cover with a cloth and then inhale the smoke.
21	Pumpkin (*Cucurbita moschata*)	Binyagambu/ Tyende ussusa	Poison	Pound or squeeze the leaves and then drink
22	Pigweed (*Amaranthus* spp.)	Dodo	Injury to the eye (eye trauma)	Squeeze the juice and drop it in the affected eye.
23	Black thorn (*Acacia mellifera*)	Mukalasima	Sexually transmitted disease in children (*Mbeija*)	Boil the roots and the drink a cup per day for three days.
24	Albizia (*Alibizia coriaria Welw.ex Oliv*)	Musisye/ Yen uberi	Cough	Chew the bark of the tree
			Otitis media (infection of the ear)	Pound the flowers and young leaves mixed with *Mukunkulu,* then apply droplets of the mixture to the cleaned ear.
			Poison	Boil the bark mixed with those of *Musigabakazi* and drink ½ a cup. The patient is expected to vomit the poison.

25	Diamond flower (*Oldenlandia corymbosa*)	Kamakundu/ Acak	Ringworms	Scrub the affected area with the leaves alone or mixed with paraffin.
			Asthma	Boil the leaves and drink a cup 3 times a day for at least three days.
26	Pencil tree (*Eurphobia tricali*)	Bikoni/ Akirajok	Haemorrhoids and swellings	Apply the sap to the affected area
			Syphilis	Boil the roots drink, especially in the evening.
27	Papaya (*Carica papaya*)	Kipapali	Cough	Burn the dry leaves and mix their ash with local salt, and leak.
			Impotence	Drink a cup of boiled mixed roots of male paw-paw and cactus.
			Syphilis	Boil the male paw-paw roots, sieve and drink.
			Abortion (*kwomola*)	Boil the roots and drink
28	Uganda Coral (*Erythrina Abyssinica*)	Mudontino	Syphilis	Boil the barks and drink thrice per day for at least five days. Alternatively, use water from the boiled bark to wash the privates in case of wounds.
29	Asystasia gangetica	Biraranyama	Pterygium (*Kinyama kya muliiso*)	Squeeze and drop the liquid in the affected eye.
			Bone fracture	Apply to the affected area
			Lower back pain	Pound and scrub the affected area
30	White galled acacia (*Acacia sieberiana DC.*)	Mutiti /otyepu	Diarrhoea	Mix water in pounded acacia, then sieve and drink.
31	Bamboo (*Arundinaria alpine*)	Ndondi	Sexual dysfunction	Boil the shoot and roots and drink three times a day.
32	Banana plantain (*Musa sp.*)	Kitoki	Bad body odour	Squeeze the leaves in the cold water and bathe with them.
33	Mango (*Manggifera indica*)	Muyembe	Sexual dysfunction	Boil the fruit holders and leaves and drink.
			Fire burns	Pound the raw mango and dry it, then apply the flour to the wound.
			Bloating (*Nda gyechikiri*)	Pound the barks or roots and then boil and either drink or smear on the stomach.
			Fallopian tube (Nsiki mu bakali)	Cook the leaves and drink until better.
			Cough	The patient chews the leaves.
34	Tamarind (*Tamarindus indica*)	Munonde	Cramps (*Karuma*)	Add water to the pounded flowers, sieve and drink.
			Running stomach (dysentery)	Pound and mix with water, then sieve and drink
			Obesity	Mix the ripe fruits with water, then squeeze and drink

35	Red nongo (*Albizia zygia (D.C) J.F. Macbr.*)	Munongo	Pimples (Bintu bihuluka mumubiri)	Boil the roots while covered and then bathe.
			Black eye spot (Kasanga mu liiso)	Put the roots in water and then squeeze the droplets in the affected eye.
36	Desert date (*Balanites aegyptiaca (Linn) Del.*)	Mutete	Salpingitis (*Nsiki*)	Boil the bark mixed with 2½ cups of water until it remains as one cupful and drink three times a day for three days
			Mosquito repellant	Burn mixed raw and ripe fruits with leaves inside the house.
			Body cracks (Mubiri gu kwatika)	Pound and mix with smearing jelly and apply
			Kidney disease (*Nsigo*)	Cook the fruits and drink.
37	Cotton (*Gossypium spp.*)	Pamba	Nose bleeding	Burn the harvested cotton and inhale the smoke
			Cholera	Pound the leaves, sieve and drink.
38	Bitter leaf (*Vernonia amygdalina*)	Kibirizi	Helmithiasis (*Nzoka*)	Boil or squeeze raw or boiled leaves and drinks a cup once.
39	Witch weed (*Striga hermontheca*)	Nswiga (with small leaves)	Angular chelatis (*Bitukuti*)	Boil and eat the leaves as a sauce.
40	pigeon pea (*Cajanas cajan*)	Nkuku	Bihaga (leprosy)	Boil the roots mixed with the roots of *mwitankoko*
41	Orange (*Citrus X sinensis*)	Muchugwa	Headache	Boil the leaves and drink.
			Lack of appetite (anorexia)	Boil the leaves and drink.
			Red eyes	Boil the leaves and drink.
42	Eucalyptus (*Eucalyptus globulus*)	Mukalatusi	Bleeding in women after birth (postpartum haemorrhage)	Boil the roots and drink.
			Mucus remover relieves nasal and bronchial congestion, eases sore throats and coughs, and fights infection	Boil the leaves mixed with the bark and steam.
43	Neem tree (*Azadirachta indica*)	Nimu	Malaria	Squeeze the leaves mixed with water and drink.
			Asthma	Boil the leaves take half a cup twice a day for five days and after ¼ cup per day for five days.

44	Spear grass (*Imperata cylindrica)*	Sojo	Tinea corporis (Bimpalampa)	Pound the fresh leaves, sun-dry them and mix with body jelly and then apply to the affected part in the morning and evening after bathing.
45	Parasite plant (grows on another tree)	Ngurukiri	Helminthiasis (nzoka)	Boil the leaves and drink.
46	Velvet leaf willow (*Combretum collinum Fresen*)	Murama/ Mukolyo/ Mukoora	Chicken Pox (Birama)	Boil the leaves and bathe.
47	Passion fruit (Passiflora edulis)	Butunda	Inducing contractions	Women in labour chew the roots
			Diarrhoea	Boil the leaves, sieve and give the patient a quarter of a cup daily until it stops
48	Prickly pear cactus (*Opuntia ficus-indica)*	Bikakwata baseri/ Byawoli	Impotence	Get the cactus roots, boil them together with that of a male paw-paw, and the patient takes one cup once.
49	Tobacco (*Nicotiana tabacum*)	Tabba	Cough	Boil the leaves and sieve them and give the patient ¼ a cup twice a day.
50	Shittim Wood (*Acacia hockii*)	Mugandu	Asthma	Pound the roots.
			Nyinabo	Pound the roots mixed with *musumu* roots.
51	African soapberry (*Phytolacca dodecandra*)	luhoko	Cracked feet (*Nkyakya*)	Apply either leaves or fruits by scrubbing the feet.
52	Lucky nut or yellow oleander (*Thevetia peruviana*)	Bunyunya	Abortion (*kwomola*)	Boil the roots and drink.
53	Jackfruit (*Artocarpus heterophyllus*)	Jack	It initiates milk let down in animals and human beings	Cut and boil the young fruits and drink.
		Butaisa	To align/fix/set broken bone or dislocation.	Uproot and boil then and then apply to the affected part
54	Moringa (*Moringa oleifra*)	Moringa	Cough and chest pain	Boil the roots, sieve and drink three times per day
			Neutralises snake bites	Chew the roots and swallow the liquid as often as possible or rub some juice from the roots on the affected part.
			Stimulating a child to walk	Rub on the lower part of the baby's feet.

	Hibiscus (*Kosteletzkya adoensis* (*A*.Rich.) Mast)	Mpeere	Bilehe bya mumeeso (Pimples)	Boil the leaves mixed with leaves of *mbumbula*, *kajungayakwiri* and *bukuura* and ghee. Sieve and cool and then smear on the affected area, especially at night.
55			Watery wounds in the children or fungal infections (*gahote gakuluwa biizi-biizi*)	Pound the leaves together with *mbumbula* and bathe the child.
56.	Capers (*Capparis erythrocarpos Isert*)	Mutungatunga	Mutwe gwa Kicumu (sinusitis)	Drop the juice from its fresh seed in the nose of the patient

Preparation of medicinal plants to be used as herbal medicine

Another objective of the study was to examine the nature of the preparation of the medicine. "Preparation entails extraction and determination of quality and quantity where medicinal plants are extracted for consumption as herbal or traditional medicine" (Abubakar and Haque 2020:1). The medicinal plants "are used as raw or boiled" (Informant A). Medicinal plants could be cooked, such as *Ximenia Americana* which treats syphilis and gonorrhoea (Table 2). Different parts are cooked, such as roots, bark, flowers and leaves, as elaborated in Table 2. For instance, the false-marula (*Lannea schweinfurthii (Engl.) Eng) (musingabakazi)* tree bark is boiled for the treatment of boils or swellings, poisoning and syphilis. Other common medicinal plants in Buliisa are the *Kigelia Africana* (sausage tree) (Figure 9), where before boiling, it is pounded or dried. This then shows that several processes are completed before even boiling. Other than boiling, some are taken raw, especially for those that are squeezed, such as blackjack (*Bidens pilosa*) that is applied to the eyes and in the treatment of wounds.

Figure 9. *Kigeri Africana or sausage tree (mulolo)*

Namakobe *et al*. (2011) suggested that *Bidens Pilosa* (black jack) is one of the most familiar medicinal plants for the treatment of wounds since it has microbial and anti-inflammatory properties. Another example is *Solanum incanum* (thorn apple) (Figure 10) used to treat injuries after squeezing and then being applied to the wound. This confirms the findings from the Oyam district in northern Uganda, where Kamanetesi *et al*. (2011) identified crushing and extraction using cold water and burning to get ashes as forms of preparation of herbal medicine.

Figure 10. Sodom Apple (Solanum incanum)

In Buliisa, some medicinal plants are used while still in a raw form while others are boiled (refer to Tables 3). Natural medicinal plants treat external wounds, bacterial infections and fungal infections. To extract chlorophyll before application, sometimes saliva, water, paraffin, ash, salt and soot are mixed. Traditional healers give powdered herbal medicine, always mixed with jelly to smear on the body, or use it in hot water or sometimes sauce (Informant E). Chlorophyll from medicinal plants chewed treats internal parts or is sometimes boiled alone or with other plants to make syrup. Others are dried and crushed into powder or pounded using quartz stones or motors, respectively (refer to Table 3).

The medicinal plants are roasted and applied to the affected area while at relatively high temperatures, especially those used on swollen parts and dislocated areas/joints (FGD2). To get phytochemical compounds that are very effective from medicinal plants, mothers either chew and spit into the mouth of babies or crush and squeeze the plants to ensure that the chlorophyll goes to the mouth.

Modes of transmitting indigenous medicinal plant heritage

While 30 participants inherited the knowledge as part of the family heritage, the majority (38) don't practise this as a full-time occupation (Figure 11). Regarding the method of transmitting indigenous knowledge of medicinal plants, Kokawro (2009) suggested that when the father is getting old or about to die, he gives instructions to the son, usually in the field, making it family heritage data from Buliisa. Kuteesa (2018:199) noted that "all traditional medical experts in

Uganda come from families where herbalism is famous, implying that they were born in a "laboratory". The modes of transmission in Buliisa, like in areas of southwestern Uganda (Gumisiriza *et al.* 2021), confirm oral transmission despite its challenge of lacking documentation that makes this intervention timely.
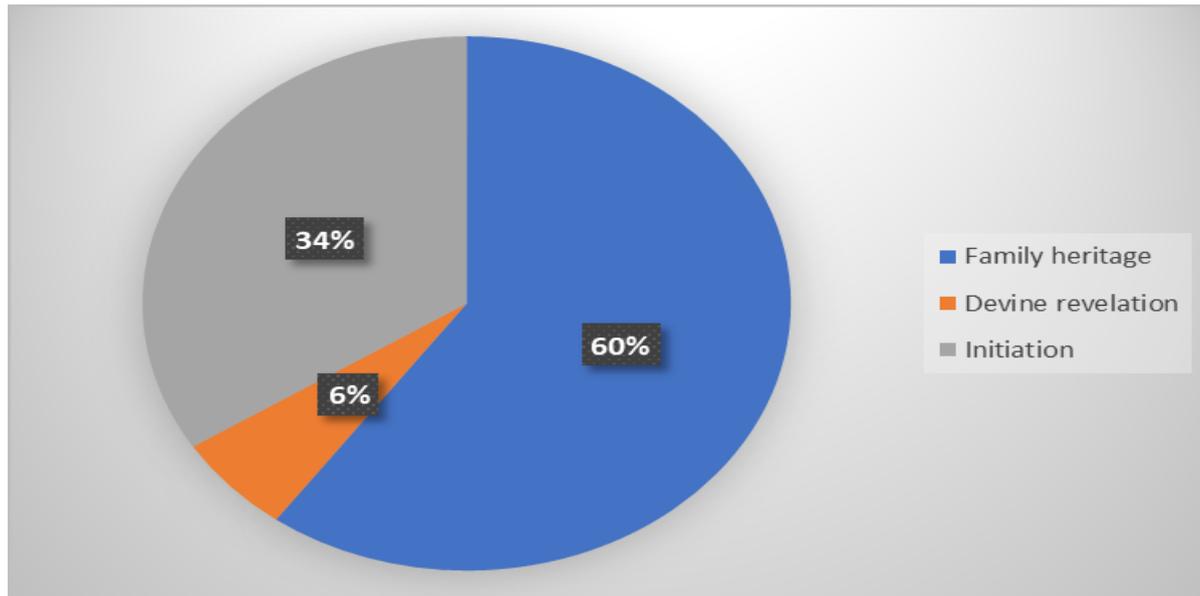
Figure 11. Transmission of indigenous medicinal plant knowledge

Other than the modes of transmission, an examination of the status of practice in Buliisa suggests that 38 take it as a part-time engagement while 12 have it as a full-time practice (Figure 12).
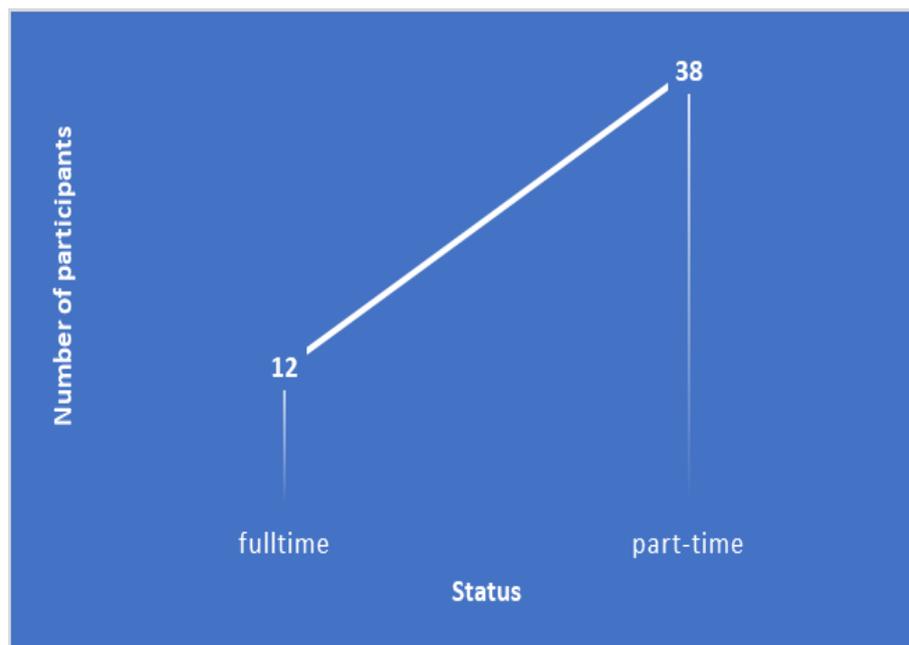
Figure 12. Status of practising indigenous medicinal plant administration

An examination of the herbal medicine heritage in Buliisa shows that many medicinal plants grow naturally. Some species of flora were planted for specific purposes by either a traditional healer or other individuals with extraordinary knowledge of the therapeutic importance of the plant (Informant C). However, those that herbalists planted to chase away spirits were scarce. Through dispersion, migratory birds and some animals played a role in distributing diverse plants, especially those that bear desirable fruits. Water flow contributed to the distribution of some of the plants, and sometimes wind could disperse them.

Challenges of sustainable management of medicinal plant heritage

Medicinal plants, by nature, are challenging to conserve, since, as earlier noted, their use depends on human beings who cannot stay forever since they die, and yet in most cases, they are kept as a secret held by individuals and families. In the Erute sub-county in Lira district, Oryema *et al*. (2010) realised that, unfortunately, many healers and users are unwilling to cultivate medicinal plants, similar to the situation in Buliisa. Other than not growing in many cases unintentionally, many plants are destroyed during harvesting the parts used for medicine (Okello and Ssegawa, 2007). The method of harvesting determines the rate of species depletion. Respondents reported no specific period of harvesting, but it was done whenever the need arose, irrespective of whether they were wet or dry. These unsustainable harvesting techniques include: harvesting entire plants or uprooting, yet some species are rare, especially for roots. Some people take away the whole plant even when it is young. Harvesting complete plants limits the multiplication of such species if harvested before dropping seeds and gradually contributes to losing such a species. These pose challenges to the conservation of indigenous knowledge concerning herbal medicine.

Harvesting challenges are exacerbated by heavy equipment, especially axes instead of pangas and knives. In harvesting the bark of the woody medicinal plants, grave injuries are caused to plants, making them lose much sap and eventually causes their death due to excessive stress. Excessive debarking also makes it easy for insects that feed on sap to drain the plants more and they have dried many plants, especially the backcloth tree. The harvesting challenges are addressed by Kamatenesi and Bukenya-Ziraba (2002:467) "Measures for sustainable harvesting of medicinal plants in Uganda such as domestication and propagation of medicinal plants".

Buliisa has another big challenge regarding the discovery of oil: at times, the oil facilities are in places where medicinal plants are thriving. According to the participants in this study, there is a fear that the oil activities may make some medicinal plants die out entirely, since some grow by themselves and were never planted (Informant G). Therefore, cutting medicinal plants due to oil activities threatens the sustainable management of this cultural heritage.

Christianity and Western education have frustrated the elderly who cannot document all the medicinal plants and their importance because this is not even correct culturally to expose some of the medicine. It is common whenever the topic is introduced, for the people in Buliisa to claim "I am saved", meaning they are Christians, and talking about medicinal plants is satanic (personal observation). Though most elders would want to pass on indigenous medicinal plant knowledge, the youth lack the enthusiasm to learn, and they consider themselves more educated due to the education acquired (informant from Bugungu Heritage and Information Centre).

Periodically, woody medicinal plants shed leaves and look dry to many people without knowledge of the growth properties of these plants. Shedding leaves happens in the dry periods purposely to minimise water loss through evapotranspiration. Shedding leaves give children and firewood collectors an advantage to cut most of the medicinal tree species. Charcoal burners have also exploited these growth characteristics. In line with this, Baranga (2007) shared similar

sentiments against destroying the Mabira forest in Uganda and its biodiversity due to charcoal burning.

Land-use changes such as agriculture, industrialisation, mineral extraction and urbanisation have decimated some plant species. Oil exploration activities could exacerbate the loss of diversity of flora. The medicinal plants are not just planted so that they can easily be replanted as shown above, which makes it problematic in Buliisa if these plants are destroyed and warrants the need to explore the intersection between herbal medicine heritage and developmental activities like oil exploration.

Ways of mitigating loss of medicinal plants

Mitigating the challenges of medicinal plant destruction would require a multiplicity of approaches, ranging from government policy as suggested by Katemenesi and Bukenya-Ziraba (2007) to cultural reorientation where the knowledge of medicinal plants is passed on from the old to the young through deliberate processes. Since the Cross-Cultural Foundation of Uganda has already empowered Buliisa through the formation of heritage clubs, these could be used to promote the heritage of medicinal plants. Other than that, some rare plants can be collected and planted in a specific area to avoid a total loss. However, there are problems with the propagation of some species of flora. Plants require attention to grow, and their propagation methods vary. According to one of the herbalists, they don't know how some of the plants were planted; they simply harvest them. The critical question concerns accessing this heritage reserve and its conservation. Related questions are: who should access them and how they should be kept and harvested? The location of the area would also raise concerns to the community. For example, aquatic plants would need artificial wetlands to create a conducive environment for their growth in the selected area if it lacks such. Therefore, the World Health Organisation (WHO) guidelines on good agricultural and collection practices for medicinal plants (*Organización Mundial de la Salud*, 2003) could be followed.

Conclusions and recommendations

Herbal medicine has been used since the origin of humanity and entails exploiting all parts of the plant such as the leaves, bark, flowers and roots. The plant parts could be used in isolation or in combination or together with other materials such as water, soil, and Vaseline, depending on the nature of the treatment. Medicinal plants in Buliisa can be taken as either raw or boiled, but at the same time, they are squeezed, dried or pounded but can also be taken orally or smeared on the affected parts in the case of wounds. The results from Buliisa also suggest that dosage is not very clear, and this is an area that should be investigated further. The custodians of the herbal medicine are mainly the elderly or those possessed with spirits, and thus, transmission is primarily on a family basis. The ownership of this knowledge is a threat in itself because many of those with this knowledge may not want to pass it on, but even those who are willing are frustrated by the attitude of the youth due to Western education where many spend time in schools and especially in boarding schools that take them away. Another setback to the transmission of medicinal plant knowledge is Christianity, where some believers regard this type of knowledge as satanic. However, this trend has changed because many people tend to turn to medicinal plant knowledge. After all, it is cheaper, readily available, and people tend to prefer this form of treatment even when conventional hospital treatment is available, as has been the case for COVID 19. Harvesting of herbal medicine is one of the critical challenges where at times the destruction happens unintentionally. When all parts are used, but even when only one part is used, it may lead to the destruction of the entire plant. Additionally development projects, especially oil, pose a threat to the medicinal plants. This study suggests a need to explore avenues of sustaining herbal medicine heritage amidst development projects in Buliisa District

since medicinal plants should be preserved for posterity as the people still appreciate herbal medicine heritage. Since many of the participants in Buliisa reported that most herbal medicines have no danger of overdose, the recommendation is to undertake more research to document the dosage and side-effects of the different medicinal plants used. There is also a need to compile a red list of the endangered species under threat and conservation concerns. Despite that, the study suffered from the limited knowledge of the local languages that might have hampered the comprehension of the information concerning medicinal plants in the area. However, attempts were made to make consultations, especially with the Bugungu Heritage and Information Centre.

This study has implications for herbalists in improving the quality of preparation and administration of medicinal products derived from medicinal plants to meet conventional therapeutic standards. For future generations, documenting indigenous intangible heritage knowledge is a priority, as is the conservation of medicinal plants and policy regarding the encouragement and reconciliation of heritage conservation and development.

However, some limitations should be noted, such as the inability to analyse all the sampled plants; there were translation language barriers that slowed the writing process, and lastly, the author's background in archaeology and heritage conservation may have influenced the flow by balancing plant knowledge and heritage conservation. Covid-19 also limited physical interaction with some informants.

Acknowledgement

References

Abdel-Mageed, W.M., Bayoumi, S.A., Chen, C., Vavricka, C.J., Li, L., Malik, A., Dai, H., Song, F., Wang, L., Zhang, J. and Gao, G.F., 2014. Benzophenone C-glucosides and gallotannins from mango tree stem bark with broad-spectrum antiviral activity. *Bioorganic & medicinal chemistry*, *22*(7):2236-2243.

Abubakar, A.R. and Haque, M. 2020. Preparation of medicinal plants: basic extraction and fractionation procedures for experimental purposes. *Journal of Pharmacy & Bioallied Sciences*, *12*(1):1.

Agea, J. G., Odur, S. O., Babwetera, F. & Kaboggoza, J. R. S. 2007. Abundance and utilisation of *Pyrenacantha sylvestris* in Budongo Forest Reserve, western Uganda. *African journal of ecology*, *45*: 107-111.

Aliyu Umar Husseini, Pius Mbuya Nina, Chomba Nevers Maxmillan 2020. Ecological Distribution of Sausage Tree (Kigelia Africana) In Murchison Falls National Park. *African Journal of Environment and Natural Science Research*. 3 (1): 50-62.

Anywar, G., Kakudidi, E., Byamukama, R., Mukonzo, J., Schubert, A. and Oryem-Origa, H., 2020. Medicinal plants used by traditional medicine practitioners to boost the immune system in people living with HIV/AIDS in Uganda. *European Journal of Integrative Medicine*, *35*, :101011.

Anywar, G., van't Klooster, C.I., Byamukama, R., Wilcox, M., Nalumansi, P.A., de Jong, J., Rwaburindori, P. and Kiremire, B.T., 2016. Medicinal plants used in the treatment and prevention of malaria in Cegere Sub-County, Northern Uganda. *Ethnobotany Research and Applications*, *14*, :505-516.

Baranga, D., 2007. Observations on resource use in Mabira forest reserve, Uganda. *African Journal of Ecology, 45*, pp.2-6. Bakamwesiga, H., Kasoma, P., Katabarwa, D. and Pomeroy, D., 2000. Conservation of biodiversity in the Sango Bay area, Southern Uganda. *Journal of East African Natural History, 89*(1):37-44.

Basemera, P.L. 2003. The use of indigenous knowledge in the conservation of biological diversity in Sango Bay, Rakai District, Uganda. Unpublished Master's thesis, Makerere University, Kampala, Uganda.

Batugal, P. 2004. Inventory and documentation of medicinal plants in 14 Asia Pacific countries. *Medicinal Plants Research in Asia, Volume 1: The Framework and Project Workplans*, 3.

Bill, P.M., 2003. Herbal medicine. *Chinese Medical Sciences Journal, 35*(3):195-206.

Bongomin, F., Olum, R., Andia-Biraro, I., Nakwagala, F.N., Hassan, K.H., Nassozi, D.R., Kaddumukasa, M., Byakika-Kibwika, P., Kiguli, S. and Kirenga, B.J., 2021. COVID-19 vaccine acceptance among high-risk populations in Uganda. *Therapeutic Advances in Infectious Disease, 8*:

Brahmachari, G., 2004. Neem – An Omnipotent. *Chembiochem, 5*:408-421.

Bunalema, L., Obakiro, S., Tabuti, J. R. & Waako, P. 2014. Knowledge of plants used traditionally in the treatment of tuberculosis in Uganda. *Journal of Ethnopharmacology, 151*(2): 999-1004.

Byarugaba, D., and V., Anyali 2019. Indigenous Medicinal Plants: Uganda's neglected economy, What next? In the *New Vision*, October 15 2019. 09:05 am.

Doro, E. and Kufakurinani, U. 2018. Resource curse or governance deficit? The role of parliament in Uganda's oil and Zimbabwe's diamonds. *Journal of Southern African Studies, 44*(1):43-57.

Eco and Partner 2015. EEA-1/EA-1A & EA-2 North Project –Environmental and Social Impact Assessment (ESIA) Scoping Report / Terms. *Tullow, Total Uganda Limited and CNOOC*.

Galabuzi, C. (2008). Conservation and local utilisation of key antimalarial medicinal plants in the Sango Bay area, southern Uganda. *Unpublished MSc Thesis, Makerere University Kampala*.

Galabuzi, C., Eilu, G., Mulugo, L., Kakudidi, E., Tabuti, J. R. S., & Sibelet, N. 2014. Strategies for empowering the local people to participate in forest restoration. *Agroforestry Systems, 88*(4):719-734.

Galabuzi, C., Nabanoga, G. N., Ssegawa, P., Obua, J., & Eilu, G. 2016. Responses to Malaria Incidence in the Sango Bay Forest Reserve, Uganda. *Human Ecology, 44*(5):607-616.

Gaoue, O.G., Coe, M.A., Bond, M., Hart, G., Seyler, B.C. and McMillen, H., 2017. Theories and major hypotheses in ethnobotany. *Economic Botany, 71*(3):269-287.

Gelb, A. and Majerowicz, S. 2011. Oil for Uganda – or Ugandans? Can cash transfers prevent the resource curse? *Center for Global Development Working Paper*, (261).

Ghorbani A. 2014. Clinical and experimental studies on polyherbal formulations for diabetes: current status and future prospects. *Journal of Integrated of Integrated Medicine*. 12: 336–45.

Kakooko, A.B. and Kerwagi, S.A., 1996. Medicinal plants in Uganda. In *First National Plant Genetic Resources Workshop: Conservation and Utilization. Mukono (Uganda). 9-11 Nov 1992.*

Kakudidi, E., Ayorekire, F., Ogwal-Okeng, J. and Anywar, G., 2015. Phytochemical Analysis and Screening of Ugandan Medicinal Plants for Antifungal Activity against Candida albicans. *International Journal of Tropical Disease & Health* 9(1):1-8.

Kakudidi, E.K., Bukenya-Ziraba, R., Kasenene, J., 2000. The medicinal plants in and around Kibale National Park in Western Uganda. *A Norwegian Journal of Botany*, *LIDIA* 5: 109–124.

Kamatenesi Mugisha, M. and Bukenya Ziraba, R., 2002. Ethnobotanical survey methods to monitor and assess the sustainable harvesting of medicinal plants in Uganda. *Plant conservation in the tropics: perspectives and practice*:467-482.

Kamatenesi-Mugisha, M. & Oryem-Origa, H. 2007. Medicinal plants used to induce labour during childbirth in western Uganda. *Journal of ethnopharmacology*, *109*(1):1-9.

Katende, A.B., Birnie, A. and Tengnäs, B.O., 1995. *Useful trees and shrubs for Uganda: identification, propagation, and management for agricultural and pastoral communities* (No. 10). Nairobi, Kenya: Regional Soil Conservation Unit.

Kelly, J.S. 2013. *Social choice theory: An introduction*. Springer Science & Business Media.

Kiiza, J., Bategeka, L. and Ssewanyana, S., 2011. Righting resources-curse wrongs in Uganda: the case of oil discovery and the management of popular expectations.

Kokwaro, J.O. 2009. *Medicinal plants of East Africa*. University of Nairobi Press. Nairobi.

Kuteesa, D.M., 2018. *Epistemological base of African traditional herbal medicine in Uganda*. *African Educational Research Journal* Vol. 6(3), pp. 197-202, September 2018

Kyoshabire, M., Katuura, E., Cunningham, A.B. and Hoeft, R., 2017. Medicinal plants and herbalist preferences around Bwindi Impenetrable National Park. *Journal of Medicinal Plants Research*, *11*(8):161-170.

Lamorde, M., Tabuti, J. R., Obua, C., Kukunda-Byobona, C., Lanyero, H., Byakika-Kibwika, P., ... & Waako, P.J. 2010. Medicinal plants used by traditional medicine practitioners for the treatment of HIV/AIDS and related conditions in Uganda. *Journal of ethnopharmacology*, *130*(1):43-53.

Lanzano, C., 2013. What kind of knowledge is 'indigenous knowledge'? Critical insights from a case study in Burkina Faso. *Transcience*, *4*(2):3-18.

Mahwasane, S.T., Middleton, L. and Boaduo, N. 2013. An ethnobotanical survey of indigenous knowledge on medicinal plants used by the traditional healers of the Lwamondo area, Limpopo province, South Africa. *South African Journal of Botany*, *88*:69-75.

Mbabazi, P.K., 2013. The oil industry in Uganda: A blessing in disguise or an all too familiar curse. *Claude Ake Memorial Lecture*.

Ministry of Health. 2019. Clarification on the Traditional and Complementary Medicines Bill in 2019.

Mwine, J., 2009. Pesticidal plants used in Masaka district of Uganda. *Journal of Science and Sustainable Development*, *2*(1):3-10.

Namukobe, J., Kasenene, J.M., Kiremire, B.T., Byamukama, R., Kamatenesi-Mugisha, M., Krief, S., Dumontet, V. and Kabasa, J.D., 2011. Traditional plants used for medicinal purposes by local communities around the Northern sector of Kibale National Park, Uganda. *Journal of Ethnopharmacology*, *136*(1):236-245.

Nandal, U. and Bhardwaj, R.L., 2012. Aloe vera: A valuable wonder plant for food, medicine and cosmetic use - a review. *International Journal of Pharmaceutical Sciences Review and Research*, *13*(1):59-67.

Nanyunja, R. K. 2003. Human perceptions of biodiversity loss in Uganda: case studies of Sango Bay, Lake Mburo national park and Rubaale grasslands. Working Paper Series 29. *International Livestock Research Institute*. Nairobi. Kenya.

Nanyunja, R. K., & Baguma, T. 2005. The role of indigenous knowledge in forestry assessment and monitoring in Uganda. In *Non-timber Forest Products—Traditional Products and Technologies. World Forest Congress, Brisbane Australia* : 76-85

Ogwang, T., Vanclay, F. and van den Assem, A., 2019. Rent-seeking practices, local resource curse, and social conflict in Uganda's emerging oil economy. *Land*, *8*(4):53.

Okello, J., & Ssegawa, P. 2007. Medicinal plants used by communities of Ngai Subcounty, Apac District, northern Uganda. *African Journal of ecology*, *45*: 76-83.

Olanya, D.R., 2015. Will Uganda succumb to the resource curse? Critical reflections. *The Extractive Industries and Society, 2*(1):46-55.

Oloka-Onyango, J., 2020. Courting the Oil Curse or Playing by the Rules? An Analysis of the Legal and Regulatory Framework Governing Oil in Uganda. *An Analysis of the Legal and Regulatory Framework Governing Oil in Uganda (June 6, 2020)*.

Omara, T., Kiprop, A.K., Ramkat, R.C., Cherutoi, J., Kagoya, S., Moraa Nyangena, D., Azeze Tebo, T., Nteziyaremye, P., Nyambura Karanja, L., Jepchirchir, A. and Maiyo, A., 2020. Medicinal plants used in the traditional management of cancer in Uganda: a review of ethnobotanical surveys, phytochemistry, and anticancer studies. *Evidence-Based Complementary and Alternative Medicine*, *2020*.

Organización Mundial de la Salud, World Health Organization and wiatowa Organizacja Zdrowia, 2003. *WHO guidelines on good agricultural and collection practices [GACP] for medicinal plants*. World Health Organization.

Oryema, C., Ziraba, R.B., Omagor, N. and Opio, A., 2010. Medicinal plants of Erute county, Lira district, Uganda with particular reference to their conservation. *African journal of ecology*, *48*(2):285-298.

Otieno, N.E. and Analo, C., 2012. Local indigenous knowledge about some medicinal plants in and around Kakamega forest in western Kenya. *F1000Research*, *1*:40.

Owuor, B.O., Kamoga, D., Kung'u, J. and Njoroge, G.N., 2006. *Some medicinal trees and shrubs of eastern Africa for sustainable utilisation and commercialisation*. Nairobi: World Agroforestry Centre (ICRAF).

Ozioma, E. O. J., & Chinwe, O. A. N. 2019. Herbal medicines in African traditional medicine. *Herbal Medicine*, *10*:191-214.

Pomeroy, D. and Tushabe, H., 2004. The state of Uganda's biodiversity 2004. *Makerere University, Kampala*.

Scovazzi, T., 2015. Intangible cultural heritage as defined in the 2003 UNESCO convention. In *Cultural Heritage and Value Creation* (pp. 105-126). Springer, Cham.

Sen, A., 1977. Social choice theory: A re-examination. *Econometrica: Journal of the Econometric Society*:53-89.

Shetty, A.A., Rana, M.K. and Preetham, S.P., 2012. Cactus: a medicinal food. *Journal of food science and technology*, *49*(5):530-536.

Ssegawa, P. and Kasenene, J.M., 2007. Medicinal plant diversity and uses in the Sango Bay area, Southern Uganda. *Journal of ethnopharmacology*, *113*(3):521-540.

Ssegawa, P., & Kasenene, J. M. 2007. Medicinal plant diversity and uses in the Sango Bay, Southern Uganda. *Journal of ethnopharmacology*, *113*(3):521-540.\

Ssozi, L., Kabiito, B., Byaruhanga, A. and Kanata, W., 2016. Documenting Baganda Ethno-medicine: A Step towards Preservation and Conservation. *Journal of Applied and Advanced Research*, *1*(2):15-22.

Tabuti, J. R., Kukunda, C. B., & Waako, P. J. 2010. Medicinal plants used by traditional medicine practitioners in the treatment of tuberculosis and related ailments in Uganda. *Journal of ethnopharmacology, 127*(1):130-136.

Tabuti, J.R., 2008. Herbal medicines used in the treatment of malaria in Budiope county, Uganda. *Journal of ethnopharmacology*, *116*(1):33-42.

Tabuti, J.R., Lye, K.A. and Dhillion, S.S., 2003. Traditional herbal drugs of Bulamogi, Uganda: plants, use and administration. *Journal of ethnopharmacology*, *88*(1):19-44.

Tchacondo, T., Karou, S.D., Agban, A., Bako, M., Batawila, K., Bawa, M.L., Gbeassor, M. and de Souza, C., 2012. Medicinal plants use in central Togo (Africa) with an emphasis on the timing. *Pharmacognosy Research*, *4*(2):92.

Tugume & Nyakoojo (2019). Ethno-pharmacological survey of herbal remedies used in the treatment of paediatric diseases in Buhunga parish, Rukungiri District, Uganda. BMC Complementary and Alternative Medicine 2019 19:353.

Tugume, P., Kakudidi, E. K., Buyinza, M., Namaalwa, J., Kamatenesi, M., Mucunguzi, P., & Kalema, J. 2016. Ethnobotanical survey of medicinal plant species used by communities around Mabira Central Forest Reserve, Uganda. *Journal of ethnobiology and ethnomedicine*, *12*(1):5-

Tyler, V.E., 2000. Herbal medicine: from the past to the future. *Public health nutrition*, *3*(4a):447-452.

Uganda Bureau of Statistics (UBOS), 2018. Uganda National Household Survey 2016/2017. Kampala, Uganda; *UBOS*.

Websites:

https://buliisa.go.ug/content/district-one-oldest-uganda-originally-it-consisted-rakai