

Original Article

Diversity, Community Knowledge, Attitude, Perceptions, and Challenges Facing Medicinal Plants in Masingini Forest Reserve, Zanzibar, Tanzania

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Abstract - Medicinal Plants (MPs) are widely recognized as valuable pharmaceutical sources for the treatment of various illnesses in developing nations. In most of Zanzibar's communities, the diversity of medicinal plants is decreasing due to excessive usage and insufficient environmental conservation efforts, which may result from inadequate knowledge, attitude, and perception regarding conservation issues. The study aimed to identify common medicinal plant species present at Masingini Forest Reserve, community knowledge, attitudes, perceptions concerning conservation, and challenges facing Medicinal Plants. The study was conducted at the Masingini forest reserve, Zanzibar, Tanzania, and the surrounding villages. Using stratified random sampling techniques, 200 respondents were selected. The study used a cross-sectional design with Focus group discussions, a questionnaire, and observation as data collection methods. Data analysis was performed using SPSS, version 23, a computer program. The study discovered thirty-one (31) plant species commonly used for medicinal purposes. Additionally, the findings showed that most participants possessed substantial knowledge as well as positive attitudes and perceptions regarding medicinal herbs. Furthermore, the study also revealed several threats facing medicinal plants; the majority of respondents, 66(33%), said deforestation, 50(25 %), improper harvesting practices, 25(12.5%), sand mining, 12 (6%), soil erosion, and 47(23.5%) climate change. Furthermore, the study investigated the harvesting methods employed. It was found that the majority of participants, 84(42%), stated that people employed the extraction of fruits, seeds, leaves, barks, and roots, followed by 77(38.5%) uprooting, and 39(19.5%) used to cut the top and branches. The results among harvesting methods were statistically significant ($p < 0.05$) across the harvesting methods. The study recommends measures to promote the conservation of medicinal plants, such as replanting medicinal species, enforcing laws and policies to protect them, monitoring harvesting practices, and educating communities on the importance of preserving medicinal plants.

Keywords - Medicinal plants, Conservation, Forest.

1. Introduction

Most human treatments, whether they are administered in or out of hospitals, are based on medicinal plants [1]. This aspect of treatment is regarded as a key to improving health and quality of life [2]. Using medicinal plants effectively in various forms of therapy promotes better health sector performance [3]. Apart from offering benefits for the environment, economy, and culture, plants are used indirectly by therapists, including physicians, as a component of their primary treatment for various illnesses [4]. Inability of conventional antibiotic therapy to quickly cure illnesses in communities has led to a growing understanding of the use of medicinal plants because they have active ingredients (bioactive components) that perform a quick change in therapy and can significantly aid in the development of treatments [5]. There is unmistakable proof that most community members

experience little or negative outcomes after pursuing conventional therapy over an extended period of time [6]. Furthermore, several chronic conditions were difficult for conventional therapy to treat, resulting in severe side effects and difficulties that compelled the therapeutic application of medicinal herbs [7]. It is predicted that the majority of the global population depends on plants for their principal health requirements, particularly in developing countries. Countries where access to modern healthcare may be limited [8]. Beyond traditional use, medicinal plants contribute significantly to the pharmaceutical industry. Many modern drugs have been derived from phytochemicals found in plants, including well-known examples such as aspirin from *Salix alba* (willow bark), morphine from *Papaver somniferum* (opium poppy), and artemisinin from *Artemisia annua*, used to treat malaria [9]. Moreover, the increasing global interest in natural and holistic health has led to a renewed appreciation of herbal



medicines, prompting scientific investigations into their efficacy, safety, and bioactive compounds [10].

In Europe, medicinal herbs have greatly expanded since society has undoubtedly discovered that plants are incredibly powerful in diagnosing and treating a wide range of illnesses and infections [11]. In India, many communities have just recently started treating their illnesses using herbal treatments. This is because India is renowned for its abundance of medicinal plants and for having preserved the variety of flora that is found throughout the wooded areas of the country [12]. In Saudi Arabia, the government struggled to find alternative medicines to treat various illnesses affecting people's health [13]. Special medical schools of traditional health were initiated to teach people how to treat illnesses with medicinal plants. In Africa, different nations are promoting awareness of the prevalent medicinal plants cultivated across the continent in communities, especially in rural areas [14]. According to reports, these plants are the most effective at curing a wide range of illnesses and offer excellent medicinal qualities in therapeutic systems [15]. For instance, the government of Ethiopia introduced a strict rule that requires the conservation of natural areas. Natural habitat is the chief source of medicinal remedies for many individuals, which is the primary justification for conservation [16]. Thus, as important sources of medicinal plants, some important natural habitats, including riverbanks, woodlands, cultivated lands, bush lands, forest regions, home gardens, and grasslands, are conserved with care [17].

In Eastern African Nations, Medicinal plants are a key component of treatment for several tribes that have advanced to the point where they treat using traditional therapies and medicinal plants [18]

Several studies have been conducted on traditional medicine, which is mostly extracted from plant leaves, bark, and roots. Local practitioners treat a variety of illnesses with traditional medicines. Among these illnesses are cancer, skin conditions, headaches, nausea, asthma, malaria, and bad eyes [19]. Furthermore, the study identified a number of plant varieties utilized as medications for various illnesses. Management actions stated, including seed protection, community training, and adherence to devastating harvesting methods [20]. Moreover, overexploitation of the medicinal trees poses a threat to the sustainability of medicinal tree species [21]. Masingini Forest in Zanzibar is one of the island's most ecologically significant forest reserves, rich in biodiversity [22]. However, the forest is under increasing threat from human activities that lead to the degradation of forest ecosystems. This may be caused by inadequate knowledge associated with the sustainable use of medicinal plants [23]. Despite ongoing conservation efforts by government and non-governmental organizations, many of these initiatives fail to fully engage the local communities, who are the primary users and custodians of forest resources,

so the lack of community involvement and awareness may hinder the effectiveness of conservation strategies [24]. Currently, there is insufficient understanding of the level of knowledge, attitudes, and perceptions held by these communities regarding the importance of conserving medicinal plants and forest biodiversity. Without this understanding, conservation programs risk being top-down and disconnected from local realities, potentially leading to poor community participation and unsustainable outcomes.

Although some ethnobotanical research has been conducted in Zanzibar, much of it is generalized or focused on more widely studied regions, leaving Masingini Forest relatively under-researched. Specifically, there is a lack of integrated studies that examine the diversity of medicinal plants alongside the socio-cultural dimensions of conservation, namely, the Knowledge, Attitudes, and Perceptions (KAP) of local communities toward sustainable forest use and preservation. Existing studies tend to focus either on plant species or on general conservation efforts, but rarely do they explore the link between biodiversity conservation and local traditional knowledge systems in a comprehensive manner.

The gap in understanding how community attitudes and behaviour toward conservation represents a significant barrier to implementing effective and inclusive environmental management policies. Furthermore, there is inadequate information about the diversity of medicinal plants at Masingini Forest. These issues underline the urgent need for scientific validation and integration of traditional knowledge towards conservation. Understanding of medicinal plants is thus essential for sustainable use.

The study aimed to identify common medicinal plant species present at Masingini Forest Reserve, community knowledge, attitudes, perceptions concerning conservation, and challenges facing medicinal plants.

2. Materials and Methods

2.1. Study Site

The investigation was conducted in Zanzibar, United Republic of Tanzania. At Masingini Natural Forest Reserve (MNFR) and nearby villages, Masingini Natural Forest Reserve (MNFR) is located in the Urban West Region of Zanzibar. It lies approximately 8 kilometers east of Zanzibar stone Town, Zanzibar. Its elevation is around 120 meters above sea level. The woodland is 566 hectares in size. The Masingini Forest was established in the 1950s. The rich, nutrient-rich deep soil of Masingini, in contrast to the majority of Zanzibar's woods, provides a favorable environment for a variety of plants to thrive. Therefore, the location is representative of all other locations where medicinal plants are typically used. Additionally, the location demonstrates how most people use the plants and animals that are removed for various medicinal purposes. (Figure 1).

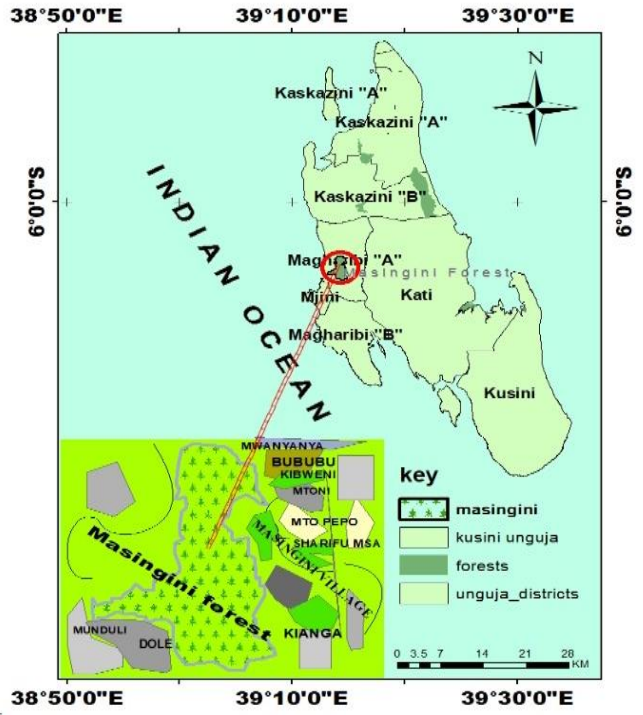


Fig. 1 Masingini Forest Reserve

2.2. Study Design

A cross-sectional research approach was used in the study.

2.3. Sampling

The study employed the simple random sampling technique to select respondents from the population of 400

2.3.1. Sample size

The sample size for respondents was calculated in accordance with the formula proposed by [22]. With 5% marginal error and a 95% confidence level for a total population of 400

$$n = \frac{N}{1 + N(e^2)}$$

Where n = sample size, N = population size, e = sampling error

The sample size was 200 respondents, including 20 Traditional medical practitioners, 40 Forest Officials, and 140 Traditional medicine consumers.

According to the formula:

The respondents' sample size was:

$$n = 200$$

2.4. Data Collection

An observation method was utilized to discover common medicinal plants found at the Masingini Forest Reserve.

A questionnaire was employed to evaluate the knowledge, attitude, and perception of individuals regarding the use of Medicinal Plants (MP) and to find out the challenges encountered by medicinal plants.

2.5. Data Analysis

Data analysis was performed by means of SPSS V.26. Medicinal plant species were grouped according to their botanical families. Descriptive statistics, including frequencies, distributions, and percentages, were calculated for each variable and presented in tables and graphs. Microsoft Word and Excel were used to generate visual representations such as bar charts and scatter plots. Statistical significance was assessed using p -values where applicable.

3. Results and Discussion

3.1. Medicinal uses of Plant Species Found at Masing Forest Reserve

The current study revealed 31 medicinal plants in Masingini forest and their medicinal uses, highlighting both their potential contribution to contemporary medicine and their significance in indigenous healing practices (Table 1).

Table 1. Medicinal species found at the Masing forest reserve

Sn	Scientific name (Local name)	Diseases treated
1	Milicia excelsa (Mvule)	Asthma, cough, stomach-aches, gonorrhoea, and fatigue.
2	Elaeis guineensis (Mchikichi)	Skin diseases, gonorrhoea, stomach pain, and wounds
3	Suregada zanzibaresis (Mdimu msitu)	Fever, blood pressure, fungus, diabetes, hernias, pneumonia, and chickenpox,
4	Parinari curatellifolia (Mbura)	Diabetes, liver disorders, toothaches, wounds, eye, ear infections, and pneumonia
5	Eucalyptus robusta (Mkaratusi)	Fever, cold sores, wounds, burns, diabetes, and bladder infections
6	Erythrophleum saveolensis (Mwavi)	Colds, headaches, and snake bites
7	Senna petersiana (Mpingaume)	Diabetes, stomach aches, and constipation. menstrual cramps, sexually transmitted infections,
8	Tectona grandis (Msaji)	Headaches, colds, diarrhea. Wounds and constipation.
9	Gmelina arborea (Mmellina)	Cough, toothache, and joint pain.

10	<i>Calophyllum inophyllum</i> (Mtondoo)	Skin, eye infections, ulcers, and malaria
11	<i>Rauvolfia mombasiana</i> (Mwango)	Tuberculosis, asthma, malaria. Constipation, skin diseases, and stomach
12	<i>Ceiba pentandra</i> (Msufi)	Chronic fever, scabies, coughs, diarrhea, diabetes, edema, dizziness, and gum pain.
13	<i>Searsia natalensis</i> (Mlapaa)	Gonorrhea, colds, coughs, heartburn, asthma, and stomach pain,
14	<i>Searsia longipes</i> (Mchengele)	Cancer, hepatitis, asthma, fever, coughing, diarrhea, stomach-aches, and snake bites.
15	<i>Annona senegalensis</i> (Mtopetope)	Stomach-aches headaches. Liver digestive disorders and stomach discomfort.
16	<i>Gonatopus boivinii</i> (Wangadume)	Skin conditions, headaches, and fevers.
17	<i>Casuarina equisetifolia</i> (Mvinje)	Diabetes, constipation, cough, diarrhea, dysentery, stomach ulcers, acne, and throat infections
18	<i>Salacia elegans</i> (Mkwikwi)	Gonorrhea, asthma, joint discomfort, weight loss, thirst, and menstruation, hormonal and metabolic balance.
19	<i>Terminalia catappa</i> (Mkungu)	Diarrhea, cancer
20	<i>Vernonia amygdalina</i> (Mlong'e wa pori)	Menstrual discomfort, wounds, UTIs, yellow fever, bacterial infections, cancer, and kidney disease.
21	<i>Euclea natalensis</i> (Mdaa)	Headaches, TB, skin infections, diabetes, STDs, stomach issues, and prostate infections.
22	<i>Bridelia micrantha</i> (Mkarati)	Anaemia, diabetes, asthma, diarrhea, and stomach pain.
23	<i>Ricinus communis</i> (Mbono)	Fevers, headaches, syphilis, diabetes, constipation, and liver problems.
24	<i>Cassytha filiformis</i> (Mlangamia)	Urinary tract infections, diarrhea, and ulcers.
25	<i>Tamarindus indica</i> (Mkwaju)	stomach, throat, and constipation
26	<i>Maesopsis eminii</i> (Msisi)	Gonorrhea urinary tract infections.
27	<i>Triumfetta rhomboidei</i> (Mchokochore)	Scabies, eczema, fever, skin conditions, diarrhea, and ulcers.
28	<i>Dissotis rotundifolia</i> (Mchenza ziwa)	Bilharzia, asthma, stomachaches, ulcers, malaria, dysentery, cough, diarrhea, and TB.
29	<i>Pterocarpus indica</i> (Mkaaga)	Nausea and vomiting
30	<i>Dodonaea viscosa</i> (Mkengeta)	Constipation, diarrhea, sore throats, stomachaches, and snake bites. Wounds and infections.
31	<i>Trema orientalis</i> (Mpesu)	Fever, cough, asthma, gonorrhea, toothache, and malaria.

The aforementioned plants were useful in the treatment of various diseases since they contain flavonoids, tannins, and saponins, which are among the plant's abundant phytochemicals, which may help explain their anti-inflammatory, antibacterial, and antimalarial qualities.

Demonstrating its versatility in ethnomedicine, decoctions or infusions produced from the leaves or bark are used as mouth rinses or supplied orally in many tribes. Its extensive use is indicative of both its therapeutic potential and its significance in regional medical practices.

Similar results were demonstrated by a study by [25] in 14 villages close to the Mabira Central Forest Reserve (CFR) in Central Uganda, revealing similar results. According to the study, 190 plant species were utilized to treat a variety of illnesses. Also, similar results were found in a study conducted by [26], which listed 16 kinds of medicinal plants that the indigenous inhabitants of the Alamut region in Qazvin Province, northwest Iran, frequently use. Each plant's botanical name, family, local (vernacular) name, and medicinal uses were all covered in detail in the study.

3.2. Community Knowledge, Attitudes, and Perception towards Medicinal Plants

Overall, 127 participants (58.5%) had knowledge about medicinal plants, as evidenced by their ability to respond to questions about the meaning, whereas 83 participants (41.5%) did not. The results were statistically significant between those who understood the meaning of MP and those who were unaware of it ($p < 0.05$). Furthermore, 105 (52.5%) of the participants had a positive attitude toward using MP, whereas 95 (47.5%) did not. The results showed no significant difference ($p > 0.05$.) When the respondents were assessed based on their perception of utilizing medicinal plants, of those who used MP, 116 (58 %) reported improvement, 56 (28 %) reported no recovery after utilizing, and 28 (14 %) reported an increase in sickness. The majority seemed to have a good perception since most of them recovered after using MPs. When asked what influenced them to use traditional treatments, of those who utilized MP, attitude, 64 (32 %) did so because MP had no negative effects, whereas 41 (20.5 %) did so because it provided rapid relief. 34 people (17 %) used MP because of cultural influence, as those medicinal plants were used by their ancestors; 131 people (65.5 %) used MP

because of religious influence, as Islamic medicine promotes the use of medicinal plants (traditional Islamic treatment); and 26 people (13%), for the price. Inquiries concerning adverse effects. Once more, 42 respondents (21 %) indicated that using MP has a variety of unfavorable impacts, while the majority (158 respondents, or 79 %) indicated that MP has no negative side effects ($p < 0.05$). The results showed no statistical significance. Inquiries concerning adverse effects.

The study portrayed that 72 (36 %) of participants indicated that medicinal plants were processed by boiling, 67 (35.5 %) claimed that they are produced by grinding, and 61 (35.5 %) said that they are prepared by drying, according to the survey. The statistical difference between the preparation methods was $p < 0.05$. Boiling is the most widely used method for preparing medicinal herbs. The result acquired for this question indicated that the boiling method was widely utilized since it is simpler than other approaches. It was inexpensive and prepared quickly. Consequently, it was easy to practice and free. Table 2.

Table 2. Community Knowledge, attitudes, and perception towards medicinal plants

Questions	Variable	f(%)	p-value
Do you know the meaning of MP?	Yes	117(58.5)	0.003307
	No	82(41)	
Have you ever used MP?	Yes	105(52.5)	0.233556
	No	95(47.5)	
What was the result after using it?	Improvement	116(58)	0.003307
	No improvement	56(28)	
	Increase illness	28(14)	
What influenced you to use traditional treatment?	Culture	39(19.5)	0.003307
	Religion	30(15)	
	Quick treatment	41(20.5)	
	No side effects	64(32)	
	Very cheap	26(13)	
Which methods are used to prepare medicinal plants?	Boiling	72(36)	0.00001
	Grinding	67(33.5)	
	Drying	61(30.5)	

Source: field survey, 2023

The aforementioned data thus indicates that the Zanzibar community is one of the East African communities that has a very good attitude toward the sustainable utilization of medicinal plants for healing. A study by [27] has proven that knowledge of medicinal plants and the social influence of herbalists were identified as the primary and secondary factors

influencing their use. Those who are more familiar with certain plants are more likely to use them for their therapeutic properties. Since herbalists are frequently seen as healers and authorities on natural medicines in their communities and the developing world, their social influence is significant when using medicinal herbs. The social acceptability and promotion of herbal medicine are aided by their expertise. According to [28], the main factors influencing the usage of medicinal herbs were their perceived utility in terms of consumer attitudes toward them, health advantages, absence of side effects, and health insurance coverage. [29] Similarly, the same results demonstrate that consumers believe in the promising potential of herbs but believe that conventional medications are more successful. In line with a current study [30], it was revealed that herbal medications were prepared in a variety of ways, with boiling being the most popular.

3.3. Challenges Facing Medicinal Plants

According to the study, Various obstacles were encountered with medicinal plants. The majority, 66(33%), remarked that deforestation was a major problem, which was done for the purpose of getting firewood and charcoal. Of participants, 50(25 %), responded that poor harvesting methods, such as removing plant barks, which disrupted the movement of food, removing roots, which caused the plants to fall, and removing leaves, ultimately caused the tree to die. Of respondents, 25(12.5%), said that sand digging for house construction was a major issue, which left the earth with poor soil that could not support the growth of plants. Of respondents, 12 (6%) answered that the biggest problem confronting medicinal plants in Zanzibar was soil erosion, which was caused by heavy rains, while 47(23.5%) responded that the biggest problem was climate change, which encouraged drought, which made some trees dry (Figure 2). The results on challenges facing medicinal plants showed high statistical significance ($p < 0.005$). This indicates that medicinal plants in Zanzibar were impacted in different ways, perhaps leading to the subsequent extinction of important plant species and causing issues for the community.

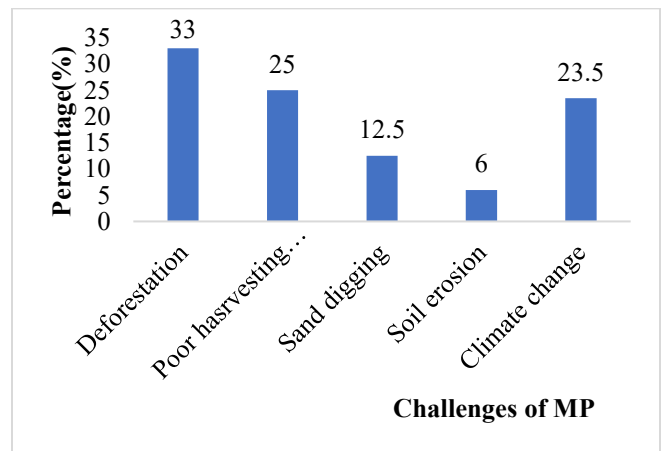


Fig. 2 Challenges facing medicinal plants

This study portrays that medicinal plants in *the* Masingini forest faced different challenges that put them in danger of extinction. Similar findings by [31] portrayed that medicinal plants encounter several difficulties, such as unsustainable harvesting, shifting cultivation, wildfires, and charcoal making. Low levels of medicinal plant production, a lack of government support for conservation, and a lack of local understanding of conservation.

According to [32], habitat loss and fragmentation seriously threaten medicinal plants. Natural habitats are being rapidly altered or destroyed as a result of growing infrastructure, deforestation, urbanization, and agriculture. Medicinal plants frequently have particular habitat needs, and their populations are at risk when those habitats are destroyed or fragmented. Fragmentation decreases population sizes, interferes with gene flow, and increases the possibility of local extinctions.

3.3.1. Harvesting Methods for Medicinal Plants

Furthermore, the study investigated the harvesting methods employed to harvest traditional medicines within the forest, the findings indicated that the majority of participants 84(42. %) stated that the primary method of harvesting medicinal plants was extraction of fruits, seeds, leaves, barks, and roots, followed by 77(38.5%) uprooting and 39(19.5%) stated that used to cut the top and branches of plants (Figure 3). The results showed statistically significant differences across the harvesting methods($p < 0.05$).

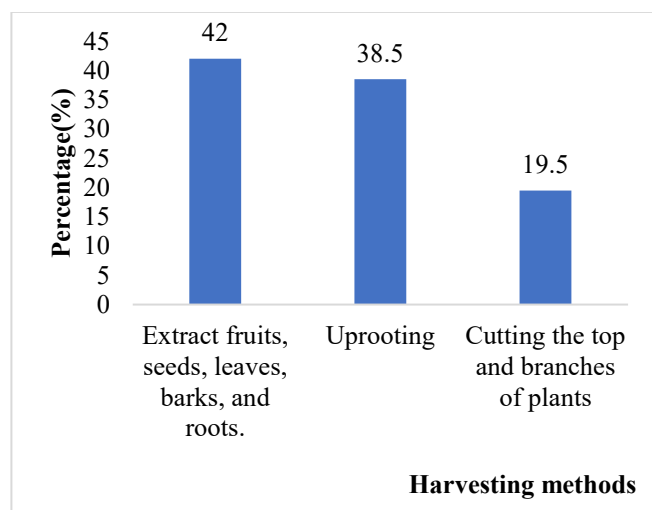


Fig. 3 Harvesting methods for medicinal plants

Similar findings were explained by [33], portraying that the main harvesting technique was chopping off portions of

the branches; similarly, the removal of stem bark was less common, and uprooting the entire plant was higher. To sum up, the majority of people around the Masingini forest harvest medicinal plants using unsustainable methods.

4. Conclusion

In summary, the Masingini Forest is an essential source of Medicinal Plants (MP) that treat a variety of chronic conditions. Because of its health benefits, the local communities place a great value on these plants. Notwithstanding its significance, environmental issues such as soil erosion, sand mining, unsustainable harvesting methods, and climate change are posing a growing threat to the forest's medicinal plants. These problems jeopardize the forest's general biodiversity and ecological balance.

4.1. Significance of the Study

The findings of the current study will significantly advance both the sustainable use of medical plants and environmental conservation. It will also help researchers in the field of medicinal plant science and environmental science. More specifically, it will help researchers find and extract active ingredients from the discovered medicinal plants so that they can be useful in curing a range of illnesses.

4.2. Recommendations

In order to preserve the Masingini Forest Reserve, the Forest Department should construct fences, establish buffer zones, and enhance security. Awareness of alternative energy sources and forest conservation should be encouraged among communities. One way to lessen dependency on forest resources for income generation is for the authority to encourage the establishment of small-scale enterprises and vocational training. Research on medicinal plants should be promoted.

4.3. Future Research

Future research should focus on counting each plant species to find abundance. More advanced methods should be employed to extract active ingredients for medicinal purposes.

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