EFFORTS OF MEDICINAL PLANT COLLECTORS ON CONSERVATION OF FREQUENTLY HARVESTED MEDICINAL PLANTS IN OLOKEMEJI FOREST RESERVE, NIGERIA

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ABSTRACT: The significance of medicinal plants to rural livelihood in the provision of affordable health care as well as management and conservation of these resources cannot be overemphasized. In spite of the income being generated from medicinal plant collection many plant parts such as roots or bark used as medicinal materials are destructively extracted. A study was carried out in Olokemeji Forest Reserve, Ogun state to identify the existing medicinal plant species, their uses and contribution to the socio-economic development of the collectors as well as to explore conservation efforts of the respondents. One hundred copies of questionnaire were purposively administered to elicit information on the conservation efforts of medicinal plant collectors. Data were subjected to inferential statistics. Fifteen medicinal plant species which were frequently harvested from the study area according to the respondents include; *Alstonia boonei, Rauvolfia vomitoria, Newbouldia laevis, Kigelia Africana, Senna siamea, Anogeissus leiocarpus, Celtis zenkeri, Albizia lebbeck, Abrus precatorius, Azadirachta indica, Khaya ivorensis, Trichilia emetica, Olax subscorpioidea, Gmelina arborea* and *Hildegradia barteri.* These plants were used to cure various diseases (migraine, malaria, convulsion, jaundice, hemorrhoids among others). *Alstonia boonei* was the most valued species in terms of the amount the respondents were willing to pay for conservation with 10.4% of the total valuation. The Chi-square ($p<0.01$) result showed relationship between socio-economic variables and willingness to pay for conservation. The significant variables were age, gender, marital status, religion, occupation, major income and minor income.

Keywords: socio-economic, medicinal plant collection, conservation, uses.

I INTRODUCTION

Medicinal plants are various plants used to cure disease or relieve pain and believed by some to have healing properties or in veterinary practice for therapeutic or prophylactic purposes (Tyler and Foster, 1999). Medicinal plants include a wide range of species used as natural medicines, condiments, dyes, or ornaments (Dachler and Pelzmann, 1999). Medicinal plant species are an important component of NTFPs (Non Timber Forest Products) which play a vital role in providing subsistence and cash income to a large part of the world's population, particularly in developing countries (Arnold and Ruiz, 2001). Quite a number of countries rely on these medicinal plants for the health and well being of its population, but the market demand has led to an increased pressure on the natural resources that lend to the production of some of these plants. Demand for medicinal plants is increasing in both developing and developed countries due to growing recognition of natural products being non-narcotic, having no side-effects, easily available at affordable prices and sometime the only source of health care available to the local population (Arceusz *et al*, 2010).

There are three ways in which plants have been found useful in medicine. First, they may be used directly as teas or in other extracted forms for their natural chemical constituents. Second, they may be used as agents in the synthesis of drugs. Lastly, the organic molecules found in plants may be used as models for synthetic drugs. Historically, the medicinal value of plants was tested by trial and error, as in the Doctrine of Signatures (Tyler *et al*., 1999).

The most serious proximate threats when extracting medicinal plants generally are habitat loss, habitat degradation, and over harvesting.The potential of isolating beneficial drugs from plants, however, has prompted large pharmaceutical companies to contribute to the conservation of the forest. Biologists have called for more careful study of medicinal plants, especially regarding their capacity for sustainable harvesting. Medicinal plant conservation strategies need to be understood and planned for based on an understanding of indigenous knowledge and practices (Berkes *et al*, 2006).

Today many medicinal plants face extinction or severe genetic loss, but detailed information is lacking. For most of the endangered medicinal plant species no conservation action has been taken. For example, there is very little material of them in genebanks. Also, too much emphasis has been put on the potential for discovering new wonder drugs, and too little on the many problems involved in the use of traditional medicines by local populations. For most countries, there is not even a complete inventory of medicinal plants. Much of the knowledge on their use is held by traditional societies, whose very existence is now under threat. Little of this information has been recorded in a systematic manner (Starr *et al*., 2011).

Studies have shown that anthropogenic disturbances such as heavy logging, grazing, over and improper extraction of forest products, and the conversion of forested land to other forest-use types might affect the availability of some forest products on which the local people depend such as medicinal plants (García-Montiel and Scatena, 1994). Forest structure is both a product and a driver of ecosystem processes and biodiversity, and if it changes due to natural or anthropogenic disturbances, there may be

consequences for other forest components (Foster *et al*., 1997). Developing markets for natural products, particularly those that are harvested from the wild, can trigger a demand that cannot be met by available supplies (Timothy, 1998). Hence, efforts of medicinal plant collectors towards conservation of plant species frequently harvested in the derived savanna of Olokemeji Forest Reserve were examined. This will contribute knowledge to meeting the growing demand of medicinal plants without disrupting their recovery potentials.

II MATERIALS AND METHODS

2.0 Description and socio-economic background of the study area

This study was conducted in Olokemeji forest Reserve situated on Latitude 7º 25' - 7 º 28' and Longitude 3 º 35' - 3 º 40' in the derived savanna zone; which is about 32 km west of Ibadan and 35 km northeast of Abeokuta in southwestern Nigeria. The forest reserve lies on the margin of the lowland rain forest and derived savanna zones (Keay, 1952). The mean total annual rainfall is highly variable, ranging between 781 and 1789mm over a period of five years, while the mean annual number of rainy days is about 105. The mean maximum and minimum temperatures are 32.3^{0}C and 21.7^{0}C respectively. The parent material consists of colluvial deposits. The soils are derived from old crystalline rocks (Ola-Adams and Adegbola 1982).

Forest-use types studied include; Re-growth forests, Derived woodland, Reforested area and Secondary forest.
Re-growth forest: this area is currently regenerating after heavy logging.

Derived woodland: this refers to area under high grazing pressure, where people frequently collect fodder and medicinal plants. This part of the reserve is close to villages and contributes a major portion to the livestock fodder consumption.

Secondary forest: this is an area which has re-grown after a major disturbance such as fire or timber harvest until a long enough period has passed so that the effects of the disturbance are no longer evident.

Reforested areas: this refers to formerly degraded areas planted with tree species (mainly teak and Gmelina).

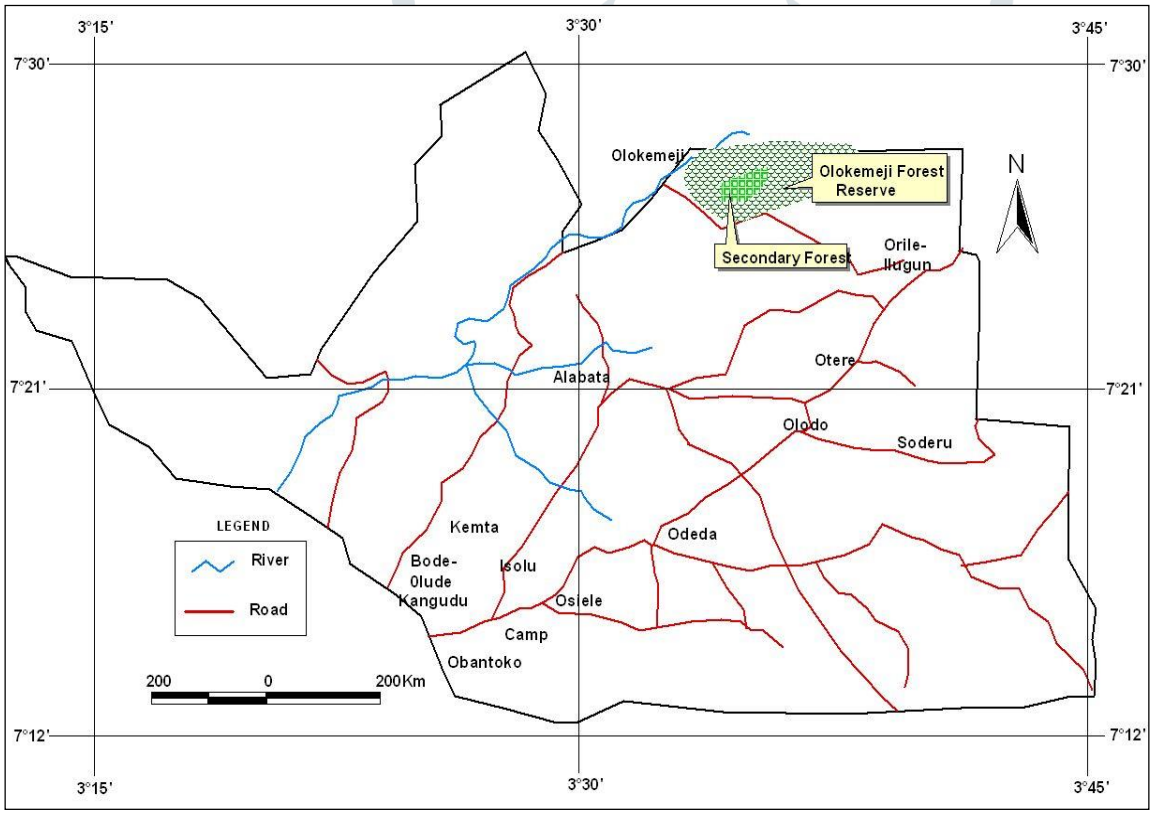

Figure 1: Map of Parts of Ogun State, showing Olokemeji Forest Reserve

2.2 Sampling method

The method used to collect information began by a fieldwork with a focus on identification and collection of frequently harvested medicinal plants. One hundred questionnaires were administered to the local collectors using purposive sampling method to examine their willingness towards conservation of medicinal plants and gather information on medicinal uses of these plant species.

2.3 Data collection

In order to determine the way medicinal plant collector perceived the derived woodland as their source of medicinal plants, 9 positive statements validated perceptional statements against a 5-point likert scale rating ranging from Strongly Agreed (5), Agreed (4), Undecided (3), Disagree (2) and Strongly Agreed (1).

Data about medicinal plants and (collectors) respondents including local and English names of plants, respondent age, occupation and education were collected during face-to-face interviews.

2.4 Data Analysis

Data were analyzed with Statistical Package for Social Sciences (SPSS version 17.0.1) and subjected to inferential analysis.

2.5 Contigent valuation

The monetary value elicitation procedure adopted in this study is willingness to pay (WTP) format. Respondents were asked to state the amount they are willing to pay for conservation of medicinal plant species frequently collected in the study area. A payment card was presented to each respondent with different values of money.

Mean elicited WTP for conservation:

$$WTP = \sum \frac{fx}{n}$$

Where ∑ = Summation, F = frequency of respondents, x = conservation values in ₦, n = Number of sampled respondents who expressed WTP.

The aggregate estimate value of the medicinal plants: AEV = WPx, AEV = Aggregate Estimate Value, W = Willingness to pay, Px = Estimated population of the people in the study area.

Multiple Regression was used to identify the factors affecting willingness to pay for conservation of medicinal plants.

Multiple Regression model is of the form;

$$Y = b_0 + b_1X_1+b_2X_3+b_3X_3+b_4X_4+\ldots\ldots+b_9X_9+eij$$

Where, Y = Willingness to pay (WTP), b_0 = constant, $b_1 – b_{10}$ = Coefficients of $X_1 – X_2$, X_1 = Age, X2 = Gender, X3 = Marital status, X4 = Religion, X5 = Education, X6 = Residency, X7 = Occupation, X8 = Major income (₦), X9 = Minor income (₦) and Eij = error term.

Chi-square test

Chi-square test was used to determine the relationship between socio-economic characteristics of medicinal plant collectors and their willingness to pay for conservation of medicinal plant species.

$$\chi_c^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

Where; χ^2 = Pearson's cumulative test statistic, which approaches χ^2 distribution, O_i = an observed frequency, E_i = an expected (theoretical) frequency, assorted by the null hypothesis and n = the number of cells in the table

III RESULTS

3.1 Frequently collected medicinal plant species in the study area

Table 1.1: Medicinal plant species frequently collected from the study area and their uses

Species	Local name	English name	Family	Utilised organ	Uses
Alstonia boonei	Awun, ahun	Pattern wood	Apocynaceae	Root, bark, leaves	Yellow fever, menstrual disorder, arthritis, breast development, anthelmintics, antidote and malaria fever.
Rauvolfia vomitoria	Asofeyeje	Serpent wood	Apocynaceae	Bark, root, leaves,stem bark	Malaria, hypertension, nervous disorder, jaundice, fever, diarrhea, dysentery, mental disorders, anthelmintics and scabies
Newbouldia laevis	Akoko	Tree of life, fertility tree	Bignoniaceae	Bark, leaves, root	Infertility, round worms, elephantiasis, dysentery, malaria, convulsions, migraine, cough, yellow fever, stomach-ache, and hernia.
Kigelia africana	Pandoro	Sausage tree	Bignoniaceae	Root, stem bark, fruits, leaves	Malaria, dysentery, rheumatism, kidney disorders, gonorrhoea, haemorrhage, spleen infection, astringent, cough.
Senna siamea	Gedu, tanko-tanko	Senna, cassod tree	Fabaceae	Flowers, leaves, seed extract bark,exudate	Hemorrhoids, constipation treatment, fungal infection treatment.
Anogeissus leiocarpus	Ayin,marike	Axlewood	Combretaceae	Bark, leaf, seed	fever, skin diseases
Celtis zenkeri	Ita	Celtis	Ulmaceae	Root, leaf, twig, bark, seed	Lower back pain, joint pain, pain killer
Albizia lebbeck	Igbagbo	Silk flower,lebbeck	Fabaceae	Seed, Leaf, twig, bark	Astringent, mouthwash, river-blindness, gonorrhoea
Abrus precatorius	Oju-ologbo	Rosary pea,love nut	Fabaceae	Root, leaf, seed	Poison antidote, colds, cough, convulsion, rheumatism, conjunctivitis,contraceptive,antimicrobials,aphrodisiac, ulcer, anaemia and poison antidote.
Azadirachta indica	Dongoyaro	Neem tree	Meliaceae	Leaf, twig, bark, seed	Malaria, jaundice,syphilis,anthelmintics, skin disease, eczema, ringworm, sore throat
Khaya ivorensis	Oganwo	African mahogany	Meliaceae	Stem, root, bark	Jaundice, anthelmintic, emmenagogue, skin diseases, anaemia, arthritis, malaria,
Trichilia emetica	Asapa, Isin-Oko	Poor man's kola	Meliaceae	Root, seed, leaf	Purgative, cough, chest congestion, mouth wash, snake-bite antidote
Olax subscorpioidea	Ifon	Stink ant forest	Olacaceae	Root, leaf, stem, bark, twigs	Yellow fever, jaundice, guinea worm, venereal diseases,mental disorders,toothache.
Hildegradia barteri	Okurugbedu	Hildegradia	Sterculiaceae	Bark	Epilepsy
Gmelina arborea	Igi melina	Gmelina,parrot's beak	Verbenaceae	Root, leaf	Antipyretic, stomach disorder, cough, gonorrhoea,

Table 1.1shows Fifteen medicinal plant species which were frequently harvested from the forest reserve according to the respondents include; *Alstonia boonei, Rauvolfia vomitoria, Newbouldia laevis, Kigelia Africana, Senna siamea, Anogeissus leiocarpus, Celtis zenkeri, Albizia lebbeck, Abrus precatorius, Azadirachta indica, Khaya ivorensis, Trichilia emetica, Olax subscorpioidea, Hildegradia barteri,* and *Gmelina arborea*. It was reported that these plants are being used locally used to treat various ailments as stated in Table 1. Most of them are woody species and the parts commonly used include barks, roots, flowers, exudates, leaves and stems. The understorey species among them include *Abrus precatorius* and *Trichilia emetica* while some are planted in their homestead to ensure freshness and reduce moisture content loss.

These fifteen species belong to 9 families with Fabaceae and Meliaceae recording highest number of species (3 species each), Bombacaceae, Combretaceae, Olacaceae, Sterculiaceae and Verbenaceae had lowest number of species with one species from each family (Table 1.1).

3.2 Factors affecting willingness of the medicinal plant collectors to pay for conservation

Table 2.1 : Social-economic characteristics of medicinal plant collectors

Variables	Frequency	%	Mode
Male	10	10	
Female	90	90	Female
Total	100	100	
Age			
21 – 30	27	27	
31 – 40	47	47	31 - 40
41 – 50	26	26	
Total	100	100	
Marital Status			
Single	0	0	
Married	73	73	Married
Divorced	13	13	
Widow	14	14	
Total	100	100	
Religion			
Islam	61	61	Islam
Christianity	24	24	
Traditional worshiper	11	11	
Non-believer	4	4	
Total	100	100	
Educational level		21	
No formal education	21	21	
Primary education	51	51	primary
Secondary education	24	24	
Tertiary	4	4	
Total	100	100	
Household size			
2-4	22.00	22	
5-7	73	73	5-7
8-Above	5	5	
Total	100.00	100	
Residency Status			
Native	53	53	Native
Non-native	47	47	
Total	100	100	

Length of Residence			
3-5	65	65	3-5
6-8	16	16	
9-Above	19	19	
Total	100	100	
Occupation			
Herb Selling	63	63	Herb Selling
Farming	17	17	
Trading	17	17	
Artisan	3	3	
Total	100	100	
Monthly Income from Major Occupation(₦)			
5,000-9,000	14	14	
10,000-14,000	23	23	
15,000-19,000	39	39	15,000-19,000
20,000-Above	24	24	
Total	100	100	
Monthly Income from Minor Occupation(₦)			
5,000-9,000	3	3	
10,000-14,000	37	37	
15,000-19,000	59	59	15,000-19,000
20,000-Above	1	1	
Total	100	100	

Table 2 revealed social-economic characteristics of medicinal plant collectors, 90% of the medicinal plant collectors were female. This implies that female dominates this occupation. Age distribution of the respondents shows that 47% were within the range of 31-40 years. It was also deduced that married people dominate this occupation of medicinal plant collection and selling as 73% of the respondents were married. The result also reveals that most of the respondents were Muslims (61%).

Moreover, 51% had primary education, 24% had secondary education, 4% had tertiary education and 21% had no formal education. This implies that the medicinal plant collectors are averagely educated. Household size of 5-7 range were 73%, 2-7 were 22% and 5% were >8 in number. About 53% of the respondents were native of Olokemeji (study area) and its adjoining villages out which 65% have been there for 3-5years, 19% claimed residency of $\geq$ 9 years, 16% had 6-8 length of residency while 47% were Non-native. However, 63% of the respondents reported that herb selling is their major occupation. On the average, 39% of them generated ₦15,000-19,000, 24% made ₦20,000 and above, 23% realized ₦10,000-14,000 3% while 14% generated ₦5,000-9,000 on monthly basis. This suggests that medicinal plants from forest-use types can be used to generate sustainable income. Among those of them who have occupation (minor), 59%, 37%, 3% and 1% generated ₦15,000-19,000, ₦10,000-14,000, ₦5,000-9,000 and $\geq$ ₦20,000 respectively (Table 2.1).

Table 3.1: Monthly Elicited monetary and monthly Aggregate Values of Medicinal Plant species

Species	**Total Monthly elicited value (₦)**	**Percentage (%)**	**Monthly WTP (₦)**	**Population of Medicinal plant collectors**	**Monthly Aggregate value (₦)**
Alstonia boonei	11300	10.4	117.71	100	11770.83
Rauvolfia vomitoria	10800	9.93	112.5	100	11250
Newbouldia laevis	9300	8.56	85.42	100	8541.66
Kigelia africana	9000	8.28	78.13	100	7812.5
Senna siamea	8200	7.55	82.8	100	8229.17
Anogeissus leiocarpus	8100	7.45	93.75	100	9375
Celtis zenkeri	7900	7.27	96.88	100	9687.5
Albizia lebbeck	7500	6.90	73.96	100	7395.83
Abrus precatorius	7500	6.90	78.13	100	7812.5

Azadirachta indica	7100	6.53	60.42	100	6041.67
Khaya ivorensis	5800	5.34	84.38	100	8437.5
Trichilia emetica	5500	5.06	54.17	100	5416.67
Olax subscorpioidea	5200	4.78	57.29	100	5729.17
Hildegradia barteri	4300	3.96	44.79	100	4479.17
Gmelina arborea	1200	1.10	12.50	100	1250
	108700	**100**	**1132.3**		**113229.2**

From Table 3.1, it was shown that most of the respondents (40.6%,) indicated ₦200 as their modal elicited value, 27.1% of the respondents had ₦300 as their elicited value, 18.8% were recorded for ₦400 as their elicited value, 10.4% of the respondents had ₦100 as their elicited value while 3.1% (lowest percentage) of them were willing to pay ₦500. The result could be attributed to the fact that most of the respondents were low income earners.

Table 3.1 presented the monthly elicited monetary and monthly aggregate values of the medicinal plant species recorded in the study area. All medicinal plant species were valued at ₦108700.00. The total monthly aggregate values of the fifteen species is ₦113229.20.However, *Alstonia boonei* was the most valued with 10.4% of the total valuation, followed by *Rauvolfia vomitoria* (9.93%) and *Celtis zenkeri* (8.56%) while *Gmelina arborea* was the least valued species (1.10%).

3.3 Factors affecting willingness to pay (WTP) for conservation of trees

Table 4.1: Regression Analysis of factors influencing willingness to pay (WTP) for conservation of medicinal plant species

Model	B	Standard Error	Beta	t	Significance
(Constant)	0.566	0.253		2.241	0.027
Age	0.001	0.004	0.025	0.245	0.807
Gender	0.012	0.072	0.018	0.165	0.869
Marital	0.077	0.029	0.283	2.648**	0.010
Religion	0.003	0.026	0.014	0.123	0.902
Education	-0.004	0.027	-0.018	-0.168	0.867
Residency	0.035	0.040	0.089	0.867	0.388
Occupation	-0.073	0.050	-0.323	-1.451	0.150
Major income	0.068	0.032	0.341	2.117**	0.037
Minor income	0.050	0.073	0.142	0.682	0.497

Dependent Variable: WTP ** Significance 5%
R^2 = 13.3

Table 4.1 Regression analysis carried out to determine the factors affecting willingness to pay for conservation of medicinal plant species. The factors (independent variables) regressed against willingness to pay (WTP) (dependent variable) are age, gender, marital status, religion, education, residency, occupation and income. Marital status (2.648**) and major income (2.117**) are the factors affecting willingness to pay (WTP) for conservation of medicinal plants. The coefficient for marital status (0.077) and major income (0.068) are positive, this means that major income will influence their decision to pay for conservation. Involvement of their spouses in the occupation will influence decision on willingness to pay for conservation. Similarly, the more the income the realized from medicinal plant species, the more the willingness to pay for conservation of those plants.

3.4 Relationship between socio-economic characteristics and willingness to pay (WTP) for conservation

Table 5.1: Test of Association between socioeconomic characteristics and willingness to pay (WTP) for conservation

Variable	**Chi-square**	**Df**	**p-value**
Age	56.940	18	28.87*
Gender	64.000	1	3.84*
Marital status	70.820	2	5.99*
Religion	45.360	3	7.82*

Residency	0.360	1	3.84ns
Occupation	82.240	3	7.82*
Major income	12.880	3	7.82*
Minor income	94.400	3	7.82*

Degree of freedom (Df) *p<0.01 – Significance level*

Table 5.1 displayed the socio-economic characteristics considered were age, gender, marital status, religion, residency, occupation and income. The chi-square (x^2) statistical analysis showed that there was significant association between socio-economic variables and willingness to pay (Table 5.1). There was no significant association between residency status and willingness to pay. It can be inferred that being a native or non-native has no influence on willingness to pay.

DISCUSSION

This study evaluated willingness of the medicinal plant collectors to pay for conservation as well as uses of the plants collected through questionnaires administration in the study area.

The analysis of the questionnaires administered showed a total of 15 plant species (leaves, barks, roots, twigs) frequently harvested in the study sites. Medicinal plant collectors harvest their plants from all the forest-use types examined except secondary forest. These plant species, 12 of which were woody species were found to serve for medicine, fodder, fuelwood, timber for income generation and other benefits (spiritual or therapeutic purpose). It was revealed that medicinal plant collection and selling is female dominated in the study area. This corroborates the study of Omobuwajo et al. (2008) who found that in Nigeria, selling medicinal plants is a profession to women. Marshall (2012) also found that 80 to 90 percent of traders in the market for medicinal plants in southern Africa are women, in which most of them are fulltime street market traders.

Young people dominate medicinal plant collection. Moreover, majority of the respondents were averagely educated and consequently positively influence willingness to payment for conservation of medicinal plants. In addition, majority of the respondents reported that herb selling is their major occupation. This suggests that medicinal plants from forest-use types can be used to generate sustainable income and this corroborates the findings of Okeke and Udofia (2009), who stated that medicinal plants serves as source of income and recorded monthly income of between ₦5000 and ₦12,000 from medicinal plants in a similar study.

It was observed during reconnaissance survey to the study area that medicinal plants are being harvested by medicinal plant sellers without any thought of conservation on their part, thereby threatening the long-term survival of those plant species. The results revealed that majority of medicinal plant collectors in the study area were willing to contribute towards conservation of forest resources in different ways. Majority of respondents suggested that conservation levy of ₦200 monthly (₦2,400 annually) be paid to Ministry of forestry. Other ways through which the respondents partake in conservation of medicinal plants and other forest resources.include prevention of bush burning, prevention of illegal felling and excessive farming within the forest reserve.

In comparison with other species, *Alstonia boonei* was the most valued medicinal plant frequently collected across the forest-use types. This could be due to wide range of uses to which this plant is put. The bark of the tree is highly effective when it is used in its fresh form; however, the dried one could equally be used. Hadi and Bremner (2001) as well as Fakae et al, (2000) reported that therapeutically, the bark has been found to possess antirheumatic, anti-inflammatory, analgesic/pain-killing, antimalaria/antipyretic, antidiabetic (mild hypoglycaemic), antihelminthic, antimicrobial and antibiotic properties. On medicinal plant collectors' perception of conservation, majority of the respondents strongly agreed that medicinal plant species from forest-use types can be used to generate income.

As part of their contribution towards conservation, majority of medicinal plant collectors stated that they prevent bush burning, illegal logging and excessive farming in forest-use types.

The Chi-square analysis on socio-economic characteristics and willingness to pay (WTP) for conservation shows that the test was significant ($p<0.05$). It can be inferred that there is significant difference in the willingness of medicinal plant collectors to pay for conservation of the frequently harvested medicinal plant species.

There was no significant association between residency status and willingness to pay. It can be inferred that being a native or non-native has no influence on willingness to pay.

The coefficient for marital status and major income are positive, this means that major income will enhance their decision to pay for conservation. Involvement of their spouses in the occupation will influence decision on willingness to pay for conservation. Similarly, the more the income they realized from medicinal plant species, the more the willingness to pay for conservation of those plants.

CONCLUSION

This study also evaluated conservation efforts of the medicinal plant collectors as well as herb value of the plants collected through questionnaires in Olokemeji Forest reserve, Ogun State. The findings of the research can be concluded thus; fifteen medicinal plant species out of which 12 woody species were frequently harvested from the forest-use types examined except secondary forest. The species include *Albizia lebbeck, Alstonia boonei, Anogeissus leocarpa*, *Azadirachta indica*, *Khaya Ivorensis*, *Hildegradia barteri*, *Newbouldia laevis. Trichilia emetica, Celtis zenkeri, Kigelia africana*, *Olax subscorpioidea* and *Senna siamea*.

Those species are used in the treatment of different ailments. Majority of the respondents were educated and consequently not ignorant of the benefits of conservation of medicinal plants.. Most respondents harvested their medicinal plant from re-growth and re-forested areas. Majority of the medicinal plant collectors were willing to contribute towards conservation of forest resources most especially the medicinal plant species. However, most of the respondents suggested that the conservation levy be paid by medicinal

plant collector to Ministry of forestry. Other ways through which the respondents partake in conservation of medicinal plants were also identified; those include prevention of bush burning, prevention of illegal felling and excessive farming within the forest-use types. Modal elicited value for conservation of medicinal plants was ₦200 by majority of the respondents. *Alstonia boonei* was the most valued medicinal plant species.

This study also found that most of the respondents agreed that medicinal plant species from the reserve can be used to generate income. In addition, there is significant different in the willingness of medicinal plant collectors to pay for conservation of the species being frequently harvested in the study area. The most serious proximate threats when extracting medicinal plants generally are habitat loss, improper harvesting, habitat degeneration and over harvesting.

RECOMMENDATIONS

There is an indication from the findings of this research that the fifiteen frequently harvested plant species are good sources of medicine commonly used by the local people to treat various diseases. However, because of their heavy exploitation for medicinal purposes, they are not commonly available in their natural habitats. Therefore, the long term exploitation a real threat to the survival of these plant species.

Hence, efforts to reconcile medicinal plant collection with forest reservation should be a joint responsibility of forest managers and medicinal plants extractors.Cultivation of medicinal plants at commercial scale can proffer solution to major concerns of various stake holders in the sector. Non-destructive method of collection that will allow for quick recovery of medicinal plants be adopted. There is need for strategies for conserving medicinal plant species through policies that encourage sustainable supplies to meet the growing demands. Proper monitoring of medicinal plant collection in order to prevent site deterioration due to improper method of harvesting must be ensured.

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