DETERMINANTS OF MEDICINAL PLANTS USAGE FOR TRADITIONAL HERBAL MEDICINE AMONG VILLAGERS LIVING AT THE PERIMETER FENCE OF INTERNATIONAL INSTITUTE OF TROPICAL AGRICULTURE (I.I.T.A) IBADAN, OYO STATE, NIGERIA

Abstract

The study was designed to access the determinants of medicinal plants for traditional herbal medicine among villagers living at the perimeter fence of International Institute of Tropical Agriculture (I.I.T.A), Ibadan, Oyo State, Nigeria. Multistage sampling procedure was adopted for the study. A total number of four hundred and eight respondents comprising of farmers, hunters, herbalists and herb sellers were randomly selected and interviewed using copies of well structured questionnaire. Data were analysed using descriptive statistics, Probit and Tobit regression analysis. The study showed that the average age of farmers and hunters was 55 and 57 years while the average age of herb sellers was 43 and herbalist 63 years. Majority of the respondents pooled together are male, married with average age of 55 years and house hold size of 7 members. The larger percentage of them were native of the study area, not educated, not employed, but having the monthly income between 12,000- 20,000 naira and closer to the forest by 1-9 km. The study further revealed that there was significant relationship between the use and intensity of use of medicinal plants for tradition herbal medicine and factors that determine it. Variables such as age, religion, sex, believe in traditional herbs, forest medicinal plants used in treating any ailment in the past, nearness to the forest, presence of health care medical centre, poverty status and income were significant at 1% probability level. Household size and occupation was significant at 5% level while location was significant at 10% level of significant. The study therefore recommends that conservation and domestication of these valuable medicinal plants should be a priority to prevent their loss and ensure continuous supply to people that needs them.

Keywords: Medicinal plants, Traditional herbal medicine, Uses, Variables, Villages, Respondents, Stratified, Probit and Tobit

Introduction

Human beings, through intuition, have invented the art of healing systems, which are mostly based on medicinal plants. These medicinal plants are accredited with mystical and supernatural powers of healing. They are used widely across the world for primary health care and also in modern drug discoveries. It is estimated that more than 13,000 species of Medicinal and Aromatic Plants (MAPs) are used in traditional medicines and herbal cosmetics throughout the world (Wilkinson, *et. al*., 2002).

Herbal medicine has been defined differently by various people. According to Kamboj (2000), "herbal drugs constitute only those traditional medicines which primarily use medicinal plant preparations for their therapy". Lucas (2010) also defines herbal medicine as "the use of plant products to treat or prevent a disease". Nsowah-Nuamah *et. al*., (2004) suggests that the treatment of herbal practitioners usually "takes the form of herbs, plant preparations, and prayers. The World Health Organization (WHO) defines herbal medicine as "a plant-derived material or preparation with therapeutic or other human health benefits which contains either raw or processed ingredients from one or more plants (WHO, 2000a, 1998). However, the WHO Regional Office for Africa (2004) uses the term "traditional medicine" as a synonym for herbal medicine and defines it as "the use of indigenous medicinal and aromatic plants, animal parts, or organic and inorganic materials for preventive and therapeutic purposes.

Traditional medicine continues to play an important role in improving and maintaining health in developing countries (Cunningham *et. al*., 2008). Traditional medicine is defined as 'diverse health practices, approaches, knowledge and beliefs incorporating plant, animal, and/ or mineral based medicine, spiritual therapies, manual techniques and exercises applied singularly or in combination to maintain well-being, as well as to treat, diagnose or prevent illness' (NNMDA, 2008; WHO, 2002; 2005). Policies for the integration of traditional medicine into public health care systems have to varying extents been formulated in some countries (WHO, 2001) and the share of the population using traditional medicine are reported to be as high as 40% in China and 80% in Africa (WHO, 2002). In Nigeria, there has been a reasonable and noticeable shift from the earlier preference in favour of orthodox medicine to greater acceptance of traditional (herbal) medicines as in many other countries worldwide (Akunyili, 2003). Over 90% of Nigerians in rural areas and 40% in urban areas depend partly or wholly on traditional medicine (Osemeobo and Ujor 1999).

Traditional medicine is generally considered highly available and accessible to people in developing countries (Anyinam, 1987). This high use of herbal medicines may be due to accessibility, affordability, availability and acceptability of traditional medicines by majority of the populace in developing countries (Elvin-Lewis, 2000). Consequently, poor and marginalized people are commonly assumed to be most reliant on traditional medicine for their healthcare (Cunningham *et. al*., 2008). Differences in reliance have also been observed between rural and urban areas (Chaturvedi *et. al*., 2009).

Traditional and herbal medicine has taken the new name, complementary and alternative medicine (CAM). CAM refers to those therapeutic and diagnostic disciplines that exist largely outside the institutions where orthodox or modern health care is provided (Shaikh and Hatcher, 2005). On the other hand, the University of Maryland Medical Center (2010) gave a definition of herbal medicine as "plant's seeds, berries, roots, leaves, bark, or flowers for medicinal purposes. Herbs that are used for medicinal purposes come in a variety of forms. Active parts of a plant may include leaves, flowers, stems, roots, seeds, and berries (Woolf, 2003). They may be taken internally as pills or powders, dissolved into tinctures or syrups, or brewed in teas and concoctions.

Medicinal plant is defined as any substance with one or more of its organ containing substances that can be used for therapeutic purposes or which can be used as precursors for the synthesis of antimicrobial drugs (Sofowora, 1982, 1984). It is estimated that there are about 250, 000 – 500, 000 species of plants on earth (Borris, 1996), of which a relatively

small percentage (1-10%) of these are used for food by humans and animals. It is possible that more serve medicinal purposes (Moerman, 1996).

Medicinal plants contain numerous biologically active compounds such as carbohydrates, proteins, enzymes, fats and oils, minerals, vitamins, alkaloids, quinones, terpenoids, flavonoids, carotenoids, sterols, simple phenolic glycosides, tannins, saponins, polyphenols, to mention a few which have medicinal activities.

In African countries, approximately 80% of the population uses traditional medicine for the treatment of various diseases and ailments like malaria, typhoid, ulcer, skin diseases, diabetes, reproductive problems, aches and pains for various socio-cultural & economic reasons (Ajose, 2007). In Nigeria, the majority of citizens still uses medicinal plants and visit traditional medicine practitioners for their health care need (Odugbemi, 2006). It was reported by WHO that in Nigeria, the ratio of Traditional Health Practitioners to the population was 1:110, while the ratio of Medical Doctors to the population was 1:16, 400 (African Health Monitor, 2003). This gives credence to the fact that people patronize Traditional medicine practitioners (TMPs) for their primary health needs more than orthodox medical doctors.

In Nigeria, the use of medicinal plants for traditional and// or herbal remedies have become more popular in the treatment of minor ailments, and also on account of the increasing costs of prescription drugs in the maintenance of personal health and well-being, and the bio prospecting of new plant derived drugs. Based on current research and financial investments, medicinal plants will, seemingly, continue to play an important role as a health aid (Hoareau and DaSilva, 1999; Moerman, 1996). In spite of the millions of chemical compounds currently synthesized in the laboratory, and available for screening for action of therapeutic value, natural products, particularly of plants origin remain the most important sources of new drugs (Odugbemi, 2006). Indeed, the market and public demand for these traditional and/ or herbal remedies has been so great that there is a great risk that many medicinal plants today, face either extinction or loss of genetic diversity. The factors that determine the use of medicinal plants for traditional herbal medicine are not know, it is on this premise that this research was carried out to access the determinants of medicinal plants for traditional herbal medicine among respondents of the study area.

The specific objectives are to: (i) describe the socio-economic characteristics of the respondents. (ii) Determine the factors that affect the use of medicinal plants for traditional or herbal medicine by the respondents and (iii) determine the level or intensity of medicinal plants usage for traditional or herbal medicine by the respondents.

Hypothesis of the study

The hypothesis of the study is stated in the null form is as follows:

Ho: There is no significant relationship between the medicinal plants usage for traditional herbal medicine and the factors that determine it.

Ho: There is no significant relationship between the intensity of medicinal plant usage for traditional herbal medicine and the factors that determine it.

Methodology

Study area: The study areas are the villages by IITA perimeter fence in Akinyele Local Government area of Ibadan, Oyo State, Nigeria. The Local Government Council is bounded on the East by Lagelu Local Government, on the North by Afijio Local Government, on the

South by Ibadan North Local Government and on the West by Iddo Local Government. The whole Local Government Council area is five hundred and seventy five square kilometers (575km^2). The average annual rainfall is about 1200mm and ecological zone type is forest savanna. The major occupations of the people residing in the area are farming, carpentry, trading, marketing, food processing as well as carving work. Crop such as cassava, maize, yam, pepper, cucumber, water melon, tomatoes and okroa are mostly grown in the area. IITA is located at longitude 7^0 30' 8''N, latitude 3^0 54' 37''E and 243m above sea level (Tenkouano and Baiyeri, 2007). In 1965, the Federal Government of Nigeria allocated some 1000 hectares of land for the establishment of the main IITA campus. Prior to the acquisition of land by IITA through the Federal Government of Nigeria, there are patches of secondary forest which serves as a means of livelihood to the villagers in the area. The most extensive land use pattern was arable and tree crop and about 3000 people lived in about twenty eight villages scattered in this area. These villages where relocated to the perimeter fence of IITA where there are expanse of secondary forest. At the period of this study, only seventeen villages exist at the perimeter fence of I.I.T.A and the secondary forest had been taken over by development leaving patches of scattered forest in the area.

Data Collection and Sampling Methods: A multistage sampling procedure was adopted for this study. All the seventeen villages by IITA perimeter fence were purposefully selected because of the following reasons (i) the villages were once located on the area were IITA is presently located (ii) the closeness of the villages to IITA forest and (iii) the presence of forest patches in all the villages. These villages are namely Lagbe, Akinola, Ofakun, Alaraba, Olodo, Laniba, Oloro, Oyafi, Adetoyebi, Awumoro, Aba Oso, Ajanbata, Olosun, Falao, Oluana, Adeogun and Idi-ose. Respondents were stratified into four major groups in each of the village: namely farmers, hunters, herb sellers and herbalist. Within each stratum, a random selection of six respondents was carried out making twenty four respondents in each village and a total number of four hundred and eight respondents in all the seventeen villages. Interview was conducted for each of the respondents with the aid of questionnaires and responses were recorded.

Data Analysis: Data were analyzed with descriptive statistics such as tables, frequency, percentages and means to summarize the socio economics data. Probit model was used to determine factors affecting the use of medicinal plants for traditional or herbal medicine by the respondents and **Tobit regression analysis was used following Adesina and Zinnah (1993), Goodwin and Mishra (2004), El Osta *et. al.*, (2004), whose works were built on Tobit (1958) to determine the intensity of medicinal plant usage for traditional and/ or herbal medicine.** Probit is an estimating model that emerges from the normal distribution function. It is useful in regression that involves binary response of 0 and 1 (Gujarati, 2004).

The model is specified implicitly as follows:

$P_1 = P_r (Y_1 = 1) = P_r (U_1 > Uo_1) = F_1 (X_1 ß)$ ---------- equation 1

P_1 = Probit notation

X = Matrix of the explanatory variables included in the model

X_1 = Age of the respondents (Years),

X_2 = Believe in traditional herb (BTH) (Yes= 1, 0 otherwise),

X_3 = Religion (Traditional religion= 1, 0 otherwise),

X_4 = Sex (Male= 1; 0 otherwise),

X_5 = Forest medicinal plants used in treating any ailment in the past (FPUTAP) (Yes= 1, 0 otherwise),

X_6 = Nearness of respondents to the forest medicinal plants (Distance in km),

X_7 = Household size (Actual number of household members),

X_8 = Occupation

X_9 = Level of education (years of schooling),

X_{10}= Marital status

X_{11}= Location of the respondent (Rural area= 1, 0 otherwise),

X_{12}= Presence of health care centres (PHCC) - Hospital (Yes= 1, 0 otherwise),

X_{13}= Nativity of the household (native= 1, 0 otherwise),

X_{14}= Poverty status of the respondent (PSR) (Poor= 1, 0 otherwise).

X_{15}= Income (₦)

ß = Vector of parameter to be estimated

P_r = Probability function of using medicinal plants for traditional or herbal medicine (1, 0 otherwise)

F (X_1 ß) = Cumulative distribution function for random error term (U_1) evaluated at X_1 ß

- Explicitly, the probit is specified as:

$P_1 = P(FAD = {}^1/_x) = b_0 + b_1 x_1 + b_2 x_2 + \ldots\ldots b_{15} x_{15} + e$ …… equation 2

Where P (FAD = $^1/_x$) = Probability decision of using medicinal plants for traditional or herbal medicine (1, or 0 otherwise)

$b_1 – b_{15}$ = Maximum likelihood estimates.

$X_1 – X_{15}$ = Explanatory variables as defined in the implicit form of the Probit model above.

e = error term

The conceptual Tobit model can be specified as;

$$y_i^* = X_i\beta + \varepsilon_i \quad \text{..... equation 3}$$

$$y_i = y_i^* \quad \text{if} \quad y_i^* > 0$$

$$y_i = 0 \quad \text{if} \quad yi^* \leq 0$$

y_i is the observed dependent variables indicating the level or intensity of use of medicinal plants, y_i^* is the latent dependent variables, x_i is the vector of the independent variable, β is the vector of coefficients, ε_i is assumed to be independently normally distributed: $\varepsilon \sim N(0, \delta)$ and therefore $y_i \sim N(X_i\beta, \delta)$.

The extent or intensity of utilization of medicinal plant (yi) was measured using likert scale of Never = 0, rarely = 0.2, sometimes = 0.4, frequent = 0.6 and always = 0.8.

The explanatory (x_i) variables include:

X_1 = Age of the respondents (Years),

X_2 = Believe in traditional herb (BTH) (Yes= 1, 0 otherwise),

X_3 = Religion (Traditional religion= 1, 0 otherwise),

X_4 = Sex (Male= 1; 0 otherwise),

X_5 = Nearness of respondents to the forest medicinal plants (Distance in km),

X_6 = Distance of health services centers (DHSC) (Km),

X_7 = Household size (Actual number of household members),

X_8 = Occupation

X_9 = Level of education (years of schooling),

X_{10} = Marital status

X_{11} = Location of the respondent (Rural area= 1, 0 otherwise),

X_{12} = Nativity of the household (native= 1, 0 otherwise),

X_{13} = Poverty status of the respondent (PSR) (Poor= 1, 0 otherwise).

X_{14} = Income (₦)

Result and discussion

Socio economic characteristics of the respondents: Table 1 shows the socio- economic characteristics of the respondents. The average age of farmers and hunters was 55 and 57 years while the average age of herb sellers was 43 and herbalist 63 years. The highest age group was found between 41- 60 years for farmers, hunters and herb sellers with 67.65%, 68.63% and 60.78% respectively while 64.71% of herbalist had the highest age between 61-80 years. The age of an individual determines his/ her utilization of medicinal plants for traditional herbal medicine. The use of medicinal plants increases with age.

The percentage of farmers that were male was 85.29 while 14.71% were female. 100% of hunters and herbalist were male while herb sellers had 100% female. 71.32% of the total respondents were male while 28.68% were female. A higher percentage of the males will use medicinal plants for traditional herbal medicine. This can be explained by a larger household size in male headed households, where medicinal plants would have to be used for traditional herbal medicine as curative measure in order to minimize cost.

Majority of the respondents were married with hunters' respondents having the highest value of 96.08% followed by herbalists 95.10%, farmers and herb sellers had 94.12% and 92.16% respectively. 94.36% of the total respondents were married, 2.21% were single, 2.45% and 0.98% were widower and widowed respectively. The married respondents will use medicinal plants for traditional herbal medicine. This is explained by a large sized household in the case of married respondent where medicinal plants is preferred to reduce the amount of income spent on curative measures.

The highest household size was found in the group of 6-10 for all the categories of respondents, herbalist had the highest household size of 77.45%, followed by hunters, herb

sellers and farmers with 71.57%, 64.71% and 60.78% respectively. 68.63% of the total respondents had household size between 6-10, 12.99% had family size within 11-15 while only 18.38% had it between 1-5. The larger the household size the greater the use of medicinal plants for traditional herbal medicine. A large household will prefers medicinal plants in treatment of ailments because of its affordability and the inability of the household to purchase prescriptive drugs.

The percentage of the respondents that were not educated was 97.06%, 86.27%, 68.63% and 67.65% for hunters, herbalist, herb sellers and famers. Only 22.55%, 21.57%, 12.75% and 1.96% farmers, herb sellers, herbalist and hunters had primary six educations while 9.80% of famers and herb sellers, and 0.98% of hunters and herbalist had secondary school education. The total number of respondents that were educated both primary and secondary school education was 20.10% while 79.90% of them were not educated. An individual with no or low level of education will use medicinal plants for traditional herbal medicine, this is due to the number of years for which the respondent has been exposed to formal education while an individual with higher level of education prefers orthodox medicine because of its ease of consumption, storability and carriage.

Majority of the respondents interviewed were native of the area with a value of 89.71% while 10.29% were non native residing in the area. The native are expected to use medicinal plants for traditional herbal medicine than non native. This is because the native are well familiar with medicinal plants in their environments with their curative values.

The nearness of the respondents to the forest showed that 86.27% of famers, 83.33% of herbalist, 66.67% herb sellers, and 37.25% of the hunters were closer to the forest with a distance of 1-3 km. The percentage of hunters, herb sellers, herbalists and farmers that were closer to the forest by 4-6 km were 48.04%, 24.51%, 11.77% and 13.73% respectively. Only 14.71%, 8.82%, and 4.90% of hunters, herb sellers and herbalist were closer to the forest by 7-9 km. 68.38% of the total respondents were closer to forest by 1-3 km while 24.50% and 7.12% of them had forest closer to them by 4-6 and 7-9 km respectively. The closer the forest to the respondents the greater the use of medicinal plants for traditional herbal medicine

In term of employment, all the herb sellers' respondents were not employed apart from selling of herbal plants, they formed 100%. The percentage of unemployed herbalist, farmers and hunters were 87.25%, 79.41% and 39.22% respectively while 60.78% of hunters, 20.59% of famers and 12.75% of herbalists were employed. The result pooled together showed that 76.47% of the respondents were not employed while only 23.53% were employed. The unemployed respondents are likely to use medicinal plants for traditional herbal medicine because of its affordability and availability.

56.86% of famers, 44.12% of herb sellers, 36.27% of hunters and 5.88% of herbalists had income ranges between 4, 000 to 12, 000 naira. The percentage of hunters, herb sellers, famers and herbalist that had their income ranges between 12, 000 to 20, 000 naira were 58.82%, 55.88%, 43.14% and 20.59% respectively. Only 52.94% and 20.59% of herbalist had their income ranges from 28, 000 to 36, 000 naira while 4.90% of hunters had it between 20, 000 to 28, 000 naira. 44.61% and 35.78% of the total respondent had their income ranges between 12, 000- 20, 000 and 4, 000- 12, 000 while 14.46% and 5.15% had it between 20, 000-28, 000 and 28, 000-36, 000 respectively. The lower the employment and income, the greater the use of medicinal plants for traditional herbal medicine. This is because of relative cheapness of medicinal plants compared to orthodox drugs.

Determinants of medicinal plants usage for traditional herbal medicine by the respondents: Table 2 showed the result of factors that affect the use of medicinal plants for traditional herbal medicine by the respondents. From the table, eight out of fifteen variables had significant coefficients. These include religion (X_3), sex (X_4), forest plant used in treating any ailment in the past (X_5), nearness to the forest (X_6), occupation (X_8), presence of health care centers (X_{12}), poverty status of the respondents (X_{14}) and income (X_{15}). The significant and positive determinants of medicinal plants usage for traditional herbal medicine by the respondents include sex, medicinal plants used in treating any ailment in the past, nearness to the forest, occupation, poverty status and income. In other words, enhancing these variables enhances the likelihood of respondents to utilize medicinal plants for traditional and herbal medicine. According to Omonona *et. al*., (2012), age, sex, and accessibility were significant and positive determinant of consumer preference for medicinal plants in Oyo metropolis Nigeria. Furthermore, significant and negative determinant of respondents utilization of medicinal plants for traditional herbal medicine include religion and presence of health care centre. However reducing these variables will enhances the respondent's likelihood of utilizing medicinal plants for traditional herbal medicine. Also, according to Omonona *et. al* (2012), primary education and household head education are significant and negative determinants of consumer preference for medicinal plants in Oyo metropolis, Nigeria. The log-likelihood ratio (LR) statistics of the entire model is -144.54722 and is significant at 1% level of significance, meaning that the overall model is significant and the null hypothesis is rejected. The coefficients of significant variables are explained thus:

Religion (X_3) is significant at 1% level of significance. It has a negative relationship with medicinal plant usage for traditional herbal medicine (-1.014154) which implies that a non-traditional religion respondents is likely not to use medicinal plants for traditional herbal medicine.

Sex (X_4) is significant at 1% level of significance. It has a positive relationship with medicinal plant usage (0.4111003). This means that a male respondents or a household headed by male is likely to use medicinal plants from the forest for traditional herbal medicine since such a household is likely to be large. This is because of the relative cheapness and availability of the medicinal plants.

Forest medicinal plants used in treating any ailment in the past (X_5) is significant at 1% level of significant. It has a positive (0.649201) relationship with medicinal plants usage. This means that respondent that has used medicinal plants in the treatment of a particular illness in the past are likely to continued using it.

Nearness to the forest (X_6) is significant at 1% level of significant. It has positive (0.2661395) relationship with medicinal plant usage. This means that the closer the respondents to the forest greater the likelihood of using the medicinal plants for traditional herbal medicine.

Occupation (X_8) is significant at 10% level of significant. It has positive (0.1385835) relationship to the medicinal plants usage. This means that the closer the relationship of respondent's occupation to the forest, the more likelihood will be the respondents to use forest medicinal plants for traditional herbal medicine.

The coefficient of educational level (X_9) is negative (-0.0208478) but not significant meaning that the level of education of an individual reduces the use of medicinal plants for traditional herbal medicine. This agrees with the findings of Omonona *et. al*. (2012) which stated that the percentage of respondents that prefer medicinal plants is inversely proportional to the educational status; this is due to the number of years for which the respondent has been exposed to formal education. An individual with higher level of education prefers orthodox medicine because of its ease of consumption, storability and carriage. Rikke and Marie`ve (2015) stated that the use of traditional medicine significantly decreased with education of household head in the rural hills site as did use of medicinal plants in the rural hills site and the peri-urban site. Kroeger (1983**)** argued that formal education in developing countries is the strongest form of exposure to Western paradigms, and that educated people therefore tend to opt for allopathic medicine. Many other studies have documented this same trend (e.g. Ahmed *et. al*., 2000b; Pouliot, 2011; Sato, 2012b). The insignificant effect of education on the use of medicinal plants for traditional herbal medicine by the respondents could be explained by the relatively strong cultural ties to medicinal plants for traditional herbal medicine (Rikke and Marie`ve, 2015; Bhattarai *et. al*., 2010) and also could be due to the fact that majority of the respondents in the study area were not educated.

The presence of health care medical centre (X_{12}) is significant at 1% level of significant. It has a negative relationship (-0.4787627) according to the a priori expectation with the medicinal plants usage. This means that the presence of health care medical centre reduces the use of medicinal plants for traditional herbal medicine by the respondents.

Poverty status of respondents (X_{14}) is significant at 1% level of significant. It has a positive relationship (0.5132115) according to the a priori expectation with the medicinal plants usage. This means that the poorer the respondents the more the use of medicinal plants for traditional herbal medicine. Rikke and Marie`ve (2015) stated that richer households were more likely to use traditional medicine and medicinal plants in the peri-urban site and traditional medicine in the rural mountain site. Studies in developed countries have reported increased use of alternative medicine with rising incomes (Robinson *et. al*., 2009). For the rural hills site, Rikke and Marie`ve (2015) found a decreased likelihood of medicinal plant use for rich households, supporting the common assumption that traditional medicine is mostly relied on by the poor and disadvantaged (Kroeger, 1983; Shrestha and Dhillion 2003; WHO 2012).

The income of the respondents (X_{15}) is significant at 1% level of significant. It has a positive relationship as against the a priori expectation. This means that the higher the income the greater the use of medicinal plants for traditional herbal medicine by the respondents. According to Bright (2013), income is a strong predictor of herbal medicine utilization and is positively related to it. In most cases, having a lower income increases the use of herbal medicine, especially in developing countries like Ghana (Darko, 2009; Brown, 1992; Falconer *et. al*., 1992). On the hand, having a higher income increases the use of herbal medicine, especially in developed countries (Eisenberg *et. al*., 1993; McClennon-Leong, 1999). This is because herbal drugs are relatively expensive in developed countries.

Determinants of the level or Intensity of Medicinal Plants Usage for Traditional Herbal Medicine by the Respondents: This was analyzed by specifying and estimating a Tobit regression model. From table 3**,** nine variables determines the intensity of medicinal plants usage by the respondents, The variables are age (X_1), believe in traditional herb (X_2), religion (X_3), sex (X_4), nearness to the forest (X_5), household size (X_7), occupation (X_8), location of

the respondents (X_{11}), and poverty status of the respondents (X_{13}). According to Bright (2013), age, level of education and place of residence were background factors associated with the use of herbal medicine. The coefficient of variable X_1, X_2, X_5, X_8 , X_{11} and X_{13} were positive and significant at 1 percent level while X_8 was significant at 5 percent and X_{11} was significant at 10 percent probability level. This is in accordance with a priori expectation that as the rate of these variables increases, the intensity of medicinal plants usage for traditional herbal medicine will also increases.

The coefficient of X_3 (religion) and X_4 (sex) were equally significant at 1 percent level while variables X_7 (household size) was significant at 5 percent probability level but were negatively signed meaning that as these variables increases, the intensity of medicinal plants usage for traditional herbal medicine decreases. The coefficients of significant variables are further explained thus:

Coefficient of age (X_1) was positive sign as expected and significant at 1 percent probability level. The higher the age the greater the experience and the more the tendency of increasing the use of medicinal plants for traditional herbal medicine.

Coefficient of believe of the respondents in traditional herb represented by variable X_2 was positive sign as expected and significant at 1 percent probability level. Believe of the respondents in traditional herbs increases the intensity of use of medicinal plants.

Coefficient of religion (X_3) was negative sign as expected and significant at 1 percent probability level. The non traditional religions are less expected to use medicinal plants for traditional herbal medicine.

Coefficient of sex (X_4) was negative sign and significant at 1 percent probability level. This agreed with the findings of Fosu (1981) and Rathgeber and Vlassoff (1993) who found a significant relationship between sex and the use of herbal medicine.

The coefficient of nearness of the respondents to the forest (X_5) was positive sign as expected and significant at 1 percent probability level. The nearer the respondents to the forest the greater the likelihood of intensifying the use of medicinal plants for traditional herbal medicine.

Coefficient of household size (X_7) was negative sign and significant at 5 percent probability level. This shows that an increase in household size decrease the intensity of use of forest medicinal plants. Household head with formal education is associated with lower level of preference for medicinal plant usage for traditional herbal medicine. Thorsen (2015) reports that households headed by females have limited access to medicinal plants when those are collected far from the house

Coefficient of occupation (X_8) was positive sign as expected and significant at 5 percent probability level. The closer the relationship of respondent's occupation to the forest, the more likelihood will be the intensity of use of forest medicinal plants for traditional herbal medicine.

The coefficient of location of the respondent (X_{11}) was positive sign as expected and significant at 10% probability level; this conforms to the statement made by Buor (1993) and Brown (1992) that herbal medicine is often used in the rural areas than the urban areas. This

is because rural residents have little or no access to orthodox medicine and find herbal medicine to be relatively less expensive (Buor, 1993; Brown, 1992). Traditional medicine use is more prevalent in rural than in town areas (Pillai *et. al.*, 2003; Chaturvedi *et. al*., 2009). Also, Bright (2013) found a significant relationship between place of residence and the use of herbal medicine.

Coefficient of poverty status (X_{13}) was positive sign as expected and significant at 1 percent probability level. The poor respondents are expected to intensify the use of forest medicinal plants for traditional herbal medicine. This is also because the medicinal plants are relatively cheap and available.

Conclusion and Recommendation

From the result of the study on table 1, it can be concluded that all the hunters' respondents are male and herb sellers are female while farmers and herbalist respondents are both male and female respectively. The average age of farmers and hunters was 55 and 57 years while the average age of herb sellers was 43 and herbalist 63 years. Majority of the respondents pooled together are male, married with average age of 55 years and house hold size of 7 members. The larger percentage of them were native of the study area, not educated, not employed, but having the monthly income between 12,000- 20,000 naira and closer to the forest by 1-9 km.

The most important factors that affect the use of medicinal plants for traditional herbal medicine by the respondents are religion, sex, forest plant used in treating any ailment in the past, nearness to the forest, occupation, presence of health care centers, poverty status of the respondents and income while the level or intensity of medicinal plants usage for traditional herbal medicine were determined by factors such as age, believe in traditional herb, religion, sex, nearness to the forest, household size, occupation, location of the respondents and poverty status of the respondents.

It is therefore recommended that conservation of these valuable medicinal plants should be a priority for the well-being and livelihoods of indigenous local communities and the society at large, which depend on these medicinal plants. Moreover, studies into the domestication of these medicinal plants, the types of plants, parts of plants used, efficacy and diseases cured should be investigated in the future. The documentation of plants and their therapeutic properties is an area that must be of interest to future researchers.

498 Table 1: **Socio- economic characteristics of respondents**
499

Socio economics characteristics	Crop farmers		Hunters		Herb sellers		Herbalist			
	Frequency	%age	Frequency	%age	Frequency	%age	Frequency	%age	Total	Percentage
Age										
21-40	5	4.90	1	0.98	40	39.22	-	-	46	11.27
41-60	69	67.65	70	68.63	62	60.78	33	32.35	234	57.35
61-80	28	27.45	29	28.43	-	-	66	64.71	123	30.15
81-100	-	-	2	1.96	-	-	3	2.94	5	1.23
Sex										
Male	87	85.29	102	100	-		102	100	291	71.32
Female	15	14.71	-	-	102	100	-	-	117	28.68
Marital Status										
Single	-	-	1	0.98	8	7.84	-	-	9	2.21
Married	96	94.12	98	96.08	94	92.16	97	95.10	385	94.36
Widowed	4	3.92	-	-	-		-	-	4	0.98
Widower	2	1.96	3	2.94	-		5	4.90	10	2.45
Household size										
1-5	39	38.24	4	3.92	29	28.43	3	2.94	75	18.38
6-10	62	60.78	73	71.57	66	64.71	79	77.45	280	68.63
11-15	1	0.98	25	24.51	7	6.86	20	19.61	53	12.99
Level of Education										
Primary six	23	22.55	2	1.96	22	21.57	13	12.75	60	14.71
Secondary	10	9.80	1	0.98	10	9.80	1	0.98	22	5.39
Not educated	69	67.65	99	97.06	70	68.63	88	86.27	326	79.90
Nativity										
Native	92	90.20	87	85.29	98	96.08	89	87.25	366	89.71
Non-native	10	9.80	15	14.71	4	3.92	13	12.75	42	10.29

Socio economics characteristics	Crop farmers		Hunters		Herb sellers		Herbalist			
	Frequency	%age	Frequency	%age	Frequency	%age	Frequency	%age	Total	Percentage
Nearness to forest (Km)										
1-3	88	86.27	38	37.25	68	66.67	85	83.33	279	68.38
4-6	14	13.73	49	48.04	25	24.51	12	11.77	100	24.50
7-9	-	-	15	14.71	9	8.82	5	4.90	29	7.12
Occupation										
Farming	80	78.43	-	-	-	-	-	-	80	19.61
Hunting	-	-	88	86.27	-	-	-	-	88	21.57
Herb selling	-	-	-	-	77	75.49	-	-	77	18.87
Herbalist	-	-	-	-	-	-	96	94.12	96	23.53
Others	22	21.57	14	13.73	25	24.51	6	5.88	67	16.42
Employment										
Employed	21	20.59	62	60.78	-	-	13	12.75	96	23.53
Not employed	81	79.41	40	39.22	102	100	89	87.25	312	76.47
Income										
4000- 12,000	58	56.86	37	36.27	45	44.12	6	5.88	146	35.78
12,000- 20,000	44	43.14	60	58.82	57	55.88	21	20.59	182	44.61
20,000-28,000	-	-	5	4.90	-	-	54	52.94	59	14.46
28,000-36000	-	-	-	-	-	-	21	20.59	21	5.15
Willingness to pay										
Willing to pay	79	77.45	91	89.22	85	83.33	88	86.27	343	84.07
Not willing to pay	23	22.55	11	10.78	17	16.67	14	13.73	65	15.93

Source: Computed from Field Survey Data, 2016

Table 2: **Analysis of Determinants of Medicinal Plants Usage for Traditional Herbal Medicine by the Respondents using Probit Model**

Variables	Coefficient	Standard error	Z values	P> |Z| values
Age (X_1)	-0.0071317	0.0107504	-0.66	0.507
BTH (X_2)	2.18e-06	0.0000424	0.05	0.959
Religion (X_3)	-1.014154	0.275508	-3.68	0.000***
Sex (X_4)	0.4111003	0.1117633	3.68	0.000***
FPUTAP (X_5)	0.649201	0.1763329	3.68	0.000***
Nearness to forest (X_6)	0.2661395	0.0724038	3.68	0.000***
House hold size (X_7)	0.0326353	0.0436195	0.75	0.454
Occupation (X_8)	0.1385835	0.0728342	1.90	0.057**
Level of education (X_9)	-0.0208478	0.0245616	-0.85	0.396
Marital status (X_{10})	0.1185416	0.322819	0.37	0.713
Location of respondents (X_{11})	-0.652795	0.4480325	-1.46	0.145
PHCC (X_{12})	-0.4787627	0.1302914	-3.67	0.000***
Nativity of the household (X_{13})	-0.0001033	0.0000965	-1.07	0.285
Poverty status of respondents (X_{14})	0.5132115	0.1395006	3.68	0.000***
Income (X_{15})	0.0001362	0.0000238	5.73	0.000***
Constant	-1.137793	0.9822856	-1.16	0.247

Source: Computed from Field Survey Data, 2016.

*** Significant at 0.01, ** Significant at 0.05

Prob. >Chi2= 0.0000, LR chi2 (16) = 67.70, Pseudo R^2 = 0.1897,

Log likelihood = -144.54722, Number of obs. = 408

Table 3: **Analysis of Determinants of the Level or Intensity of Medicinal plants usage for Traditional Herbal Medicine by the respondents using Tobit Model**

Variables	Coefficient	Standard error	T values	P> |Z| values
Age (X_1)	0.003883	0.0009624	4.03	0.000***
BTH (X_2)	0.2341244	0.0375628	6.23	0.000***
Religion (X_3)	-0.2015844	0.0311281	-6.48	0.000***
Sex (X_4)	-0.408688	0.0254503	-16.06	0.000***
Nearness to forest (X_5)	0.1244676	0.0263149	4.73	0.000***
DHSC (X_6)	-0.0014127	0.0037257	-0.38	0.705
House hold size (X_7)	-0.0076084	0.0032877	-2.31	0.021**
Occupation (X_8)	0.0153784	0.0067273	2.29	0.023**
Level of education (X_9)	0.0030982	0.0020917	1.48	0.139
Marital status (X_{10})	0.0216682	0.0315034	0.69	0.492
Location of respondents (X_{11})	0.0494329	0.0296905	1.66	0.097*
Nativity of the household (X_{12})	-0.0094667	0.0295594	-0.32	0.749
Poverty status of respondents (X_{13})	0.1368722	0.0295149	4.64	0.000***
Income (X_{14})	2.19e-06	1.99e-06	1.10	0.272
Constant	0.4106552	0.0953051	4.31	0.000
Sigma	0.1300151	0.0046118		

Source: Computed from Field Survey Data, 2016.

*** Significant at 0.01, ** Significant at 0.05, * Significant at 0.10

Prob. >Chi2= 0.0000, LR chi2 (15) = 571.03, Pseudo R^2 = 7.1881,

Log likelihood = 245.79393, Number of obs. = 408

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