

Determinants of likelihood and extent of adoption of medicinal plants used for the treatment of cattle diseases in Fufore Local Government Area, Adamawa State, Nigeria

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ABSTRACT: The study analyzed the determinants of likelihood and extent of adoption of medicinal plants used for the treatment of cattle diseases in Fufore Local Government Area, Adamawa state, Nigeria. Semi-structured questionnaire was used to collect personal data of cattle herders, adoption pattern of the medicinal plants by the respondents and constraint against effective utilization of the medicinal plants by the respondents. Frequencies, percentages, mean and probit regression analysis were used to analyze the data collected. Results of the research revealed that cattle herding in the study is dominated by young adults (71.03%) of between 30 to 59 years of age, majority (75.70%) did not attain formal education, and had 31 years average herding experience. About 94.39% of the respondents were married with average family size 8 people. Majority (85.05%) of the respondents have more 50 heads of cattle with only 11.21% who had at least extension visit once in 6 months. Result of adoption pattern revealed that 90.65% of the respondents adopted both medicinal plants and modern veterinary drugs in treatment of cattle diseases. The coefficient of age (4.8784), family size (0.1675), experience (1.2239) and number of cattle (0.0202) had positive and significant effect on the adoption of medicinal plants. Similarly, marginal effect of the variables determining adoption of medicinal plants by the respondents shows that age (0.0252), family size (0.0008), experience (0.0063) and number of cattle (0.0001) were positively related. Indiscriminate felling of trees, bush burning and concealment of knowledge were the major problems faced by the respondents. It was recommended that, conservation of medicinal plants, documentation and promotion of indigenous knowledge by encouraging research activities is required in the study area. Both community and concerned authorities should enforce laws that prohibit indiscriminate cutting of trees and bush burning so as to curb the looming danger of losing value medicinal plants. Research institute should investigate to ascertain the precise dosage of herbs to be used in the treatment and control of cattle diseases.

Keywords: Adoption, cattle, Fufore, medicinal plants, Nigeria.

INTRODUCTION

Medicinal plants are being used for the treatment of various cattle ailments by the local peoples since earliest times. It has been practiced since time immemorial because it was the only medical system accessible to the majority of people living in remote areas most especially in the developing countries (Moonga and Chitambo, 2010). It is a recognized fact that plants are the most important source of ethno-veterinary medicines (Harun-or-Rashid et al., 2010). The use of medicinal plants to treat various

diseases in cattle has been part of human culture since ancient times.

Agriculture is Nigeria's largest and important sector of the economy. Between 70 to 80% of the nation's population of over 200 million are engaged in crop production and livestock industry as their major occupation. Among all the livestock species domesticated in Nigeria, cattle is the single most prominent and the most important in terms of animal protein supply (Bourn, 1993). They provide

continuous sources of essential food products – meat, milk, and other dairy products throughout the year. It sustains the employment and income of millions of people in rural areas and generates animal power and organic manure for arable farming mainly in the sudano-sahalian ecological zones of the country. The sale of cattle and cattle products provides the major source of cash income to the pastoralists for the purchase of consumer goods (Usman et al., 2017). Over 90% of the country's cattle are owned and herded by the Fulani pastoralists, most of whom are nomadic, semi-settled or trans-human (Ikhatua, 2000).

Majority of these cattle farmers rely on traditional health care practices to keep their animals healthy as most of these medicinal plants have been used for centuries in the management and prevention of a wide range of cattle diseases. According to Alhaji and Babalobi (2015), farmers are known to treat their livestock diseases with medicinal plants (herbs) and other traditional practices before the advent of modern medicine. These practices remain relevant despite the advancement of modern veterinary medicine particularly in rural areas (Mafimisebi et al., 2012). The knowledge is used to provide economical solutions to improve productivity of animals and reduction in poverty of the poor farmers (Usman et al., 2017). The practices are designed for either therapeutic or prophylactic use in cattle diseases. Therefore, the knowledge of cattle herders forms the foundation for and complements the success of all sustainable animal health care programmes in Nigeria.

Several studies were conducted on ethno-veterinary practices; however, these studies dwell mainly on ethno-veterinary potentials of common herbs in Enugu state, Nigeria (Aiyeloja and Bello, 2006); participatory epidemiology of ethno-veterinary practices Fulani pastoralists used to manage contagious bovine Pleuropneumonia and other cattle ailments in Niger state, Nigeria (Alhaji and Babalobi, 2015). In Adamawa state for instance, the studies were mainly on indigenous control methods of disease and parasites among pastoralists communities in the State (Usman et al., 2017) and traditional methods of livestock diseases management among herders in Adamawa state, Nigeria (Usman et al., 2015) without recourse to the factors affecting the adoption of medicinal plants used for the treatment of cattle diseases despite abundance of the medicinal plants, knowledge and capacity in areas of the medicinal plants and diseases management by the herders that go beyond identification and efficacy test of the herbs which needs to be analyze and documented. It is in this regard that this study analyzed the determinants of likelihood and extent of adoption of medicinal plants used for the treatment of cattle diseases in Fufore local government area, Adamawa state, Nigeria. Therefore, this research attempted to provide answers to the following research questions:

1. What are the socio-economic characteristics of the respondents?
2. What are the adoption patterns of the medicinal plants by the respondents?
3. Do the socio-economic factors of the respondents influence the adoption of the medicinal plants by the respondents? And
4. What are the constraints affecting the respondents?

Objectives of the Study

The main objective of the study was to analyze the determinants of likelihood and extent of adoption of medicinal plants used for the treatment of cattle diseases in Fufore Local Government Area, Adamawa State, Nigeria. The specific objectives of the study were to:

1. describe the socio-economic characteristics of the respondents;
2. identify the adoption pattern of the medicinal plants by the respondents;
3. ascertain the socio-economic factors that influence the adoption of the medicinal plants by the respondents and
4. identify the constraint affecting the respondents.

METHODOLOGY

Study area

The study was conducted in Fufore Local Government Area, Adamawa State, Nigeria. It is one of the twenty-one Local Government Areas of the State. It lies between latitude 9° 13'N and 15° 00'N of the equator and longitude 12° 30'E and 13° 40' E of the Greenwich meridian. The study area has a total land mass of about 4,162.5km² with a population of 209,460 people (NPC, 2006). The estimated population based on the 2.9 percent yearly increment stands 301,739 as at 2019. The study area has an average maximum temperature of 40°C and minimum of 20°C (World Weather Online, 2019). The annual rainfall of the study area varies between 750 to 1000 mm with a mean annual relative humidity of 70%. The major crops grown in the study area includes; rice, sorghum, groundnut, guinea corn, cowpea, vegetables of different kinds. Fishing and livestock farming are also part of the major occupation of the people in the study area (Adebayo and Tukur, 1999).

Source of data

The primary data was obtained with the aid of questionnaire which was administered to 107 cattle

herders. The information obtained were on the socio-economic characteristics of the respondents (which include age of the farmer, gender, level of education, herding experience, household size and number of cattle); adoption pattern and the constraint affecting the respondents.

Sampling technique

Snowball sampling technique was used to select 107 cattle herders in the study area. All the 107 herders were administered with questionnaire and information obtained were used for the analysis.

Analytical techniques

Descriptive statistics such as frequency, percentage and mean were used to analyze objectives i, ii and iv while, Probit regression was used to analyzed objective iii. Probit model have been extensively used by agricultural production and farming systems economists for studying and analyzing farmers' adoption and diffusion of agricultural innovations for long. Probit model is based on a cumulative normal distribution function which is symmetric around zero with variance equal to one. In Dass Nigeria, Anthony (2018) used Probit analysis to identify the socio-economic characteristics of cotton farmers that affects the use of pesticides. Kamai (2016) also used Probit regression model to find out the factors influence to adoption of artificial insemination (AI) by farmers. It is known that the dependent variable is dichotomous so, Ordinary Least Square (OLS) could not be used. The model specification is stated as:

$$A_i = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + U_i$$

Where: A_i = Farmers adoption of medicinal plants (If adopted = 1; Otherwise = 0), α = Intercept, $\beta_1 - \beta_6$ = Coefficients of the respective variables, X_1 = Age (years), X_2 = Education (Years of schooling), X_3 = Family size (in number of people living and feeding together), X_4 = Farming experience (in years), X_5 = Number of cattle owned, X_6 = Extension contact (number) and U_i = Error term

RESULTS AND DISCUSSION

Table 1 revealed that majority (71.03%) of the respondents were between 30 to 59 years of age with an average age of 47 years. This implies that a high percentage of the respondents were within economic productive age and are still active in herding and taking care of their cattle. The findings of the research corroborate that of Kolawole et al. (2007) in a study they conducted on ethno-veterinary practices amongst small-holder farmers in Ekiti state, Nigeria. Result in Table 1 also

revealed that only 24.30% of the respondents had formal education (out of which 20.56% had primary and 3.74% attained secondary education) while 75.70% of the respondents had no formal education. From the result, it can be seen that there was high level of informal education among the herdsman. This may not affect the utilization of the medicinal plants for the treatment of cattle diseases since it does not require reading and writing skills. About 91.59% of the respondents had more than 24 years of experience in cattle herding with the mean years of experience being 31 years. This result shows that respondents are well experienced in cattle herding. Experience brings more knowledge and specialization that increase farmers' rationality in the use of a technology. The result is in line with the findings of Babuba (2018) in a study he conducted on the medicinal herbs extracts widely used in the control of Helminthosis among rural livestock farmers of Ibi Local Government Area of Taraba State, Nigeria. He reported that majority of his respondents were more than 40 years herding experience.

Majority (94.39%) of the respondents were married with an average household size of 8 persons. Household members form one the sources of family labour and medicinal plants knowledge. The finding corroborates that of Nalule et al. (2011) who reported an average family size of 8 people among herdsman in the studies they conducted in Uganda. Number of cattle owned by the respondents was also presented in Table 1. About 14.95% of the respondents owned less than 50 heads of cattle, while 69.16% owned between 50 to 99 heads of cattle and only 8.41% owned more 149 heads of cattle. The result shows that majority (85.05%) owned more than 50 heads of cattle. Cattle serve as index of social prestige among the nomadic Fulani pastoralists apart from the economic gain. This could be the reason why they accumulated the cattle. Only 38.32% of the respondents had access to extension services. This implies that majority (61.68%) had no access to agricultural extension advisory services. Those that had extension visits are mostly herders closed to Local Government Headquarters and they had to personally call the extension workers to their herds mostly for vaccination. This may be due low number of extension agents in the state and mostly the extension workers preferred staying in town than visiting herders into bush (Bamaiyi, 2009).

Adoption pattern of vaccination by the respondents

Result in Table 2 indicated that 90.65% of the respondents adopted the use of the veterinary drugs with medicinal plants to treat cattle diseases while 9.35% adopted the use of the medicinal plants alone in the treatment of cattle diseases. It means that no respondent depends solely on the modern veterinary drugs to treat cattle diseases in study area but complement with the use with medicinal plants. Mafimisebi et al. (2012) observed that medicinal plant extracts are widely used in the treatment of various

Table 1. Socio-economic characteristics of the respondents (n = 107).

Variable	Frequency	Percentage	Mean
Age (years)			
30-39	13	12.15	47
40-49	16	14.95	
50-59	47	43.93	
60-69	31	28.97	
Educational level			
Non formal education	81	75.70	
Primary	22	20.56	
Secondary	4	3.74	
Farming experience			
<25	9	8.41	31
25-29	9	8.41	
30-34	11	10.28	
>34	78	72.90	
Marital status			
Married	101	94.39	
Single	6	5.61	
Family size			
1-5	39	36.45	8
6-10	63	58.88	
>10	5	4.67	
Number of cattle			
< 50	16	14.95	70
50-99	74	69.16	
100-149	8	7.48	
> 149	9	8.41	
Extension contacts			
Once in 6 months	12	11.21	
Once a year	54	50.47	
Not at all	42	38.32	

Source: Field survey data, 2019.

animal diseases by livestock farmers in a research they conducted on local knowledge and socio-economic determinants of traditional medicines' utilization in livestock health management in Southwest Nigeria. Medicinal plants play vital role in animal health care delivery as most of the clinical cases presented to the veterinarian would have been first treated with traditional remedies.

Relationship between socio-economic factors and adoption medicinal plants

The socio-economic characteristics affecting the adoption

of medicinal plants to treat diseases of cattle by herders were determined by Probit regression analysis, which was presented in Table 3. The results revealed that the estimated coefficients of age (X_1), family size (X_3) herding experience (X_4), and number of cattle (X_5) had positive and significant impacts on the adoption of medicinal plants in the study area.

The positive and significant coefficient of age (X_1) implied that the older the respondent is, the more the probability of adopting the use of medicinal plants. This could be because age enhances farmer's ability to know alternatives methods of disease treatment and also to know why, when and where to get the medicinal plants, since herders age mostly goes with experience as most of

Table 2. Adoption pattern of medicinal plants to treat cattle diseases by the respondents.

Adoption pattern	Frequency	Percentage
Adoption of the veterinary drugs with medicinal plants	97	90.65
Adoption of medicinal plants practice only	10	9.35
Total	107	100

Source: Field survey data, 2019

Table 3. Maximum likelihood estimates of Probit model.

Variable	Coefficients	Standard Error	Z-statistics
Age (x_1)	4.87835	0.932545	5.23***
Education (x_2)	0.03110	0.036791	0.85 ^{NS}
Family size (x_3)	0.16748	0.057145	2.93***
Herding experience(x_4)	1.22388	0.253079	4.84***
Number of Cattle (x_5)	0.02023	0.009209	2.20**
Extension contact (x_6)	0.35446	0.660211	0.54 ^{NS}
Constant	0.16748	0.057145	2.93

Log likelihood = -57.920995; '****' and '**' represent significance at 1% and 5% level respectively.

them were born into the occupation (Babuba, 2018). Coefficients of family size (X_3) was positively and significantly related to the use of medicinal plants of cattle diseases at 10% level. This implied that, the higher the number of members of household of a respondent, the more the tendency of them using medicinal plants. This may be because members of the household may have the opportunities of getting new medicinal plants from different sources as a result of interacting with different people. Therefore, there may be availability of different medicinal plants to be used within the family. Members of a household in Africa form the bulk of the labour force. Hence, increase in household size guarantees labour for collection of medicinal herbs and subsequently increases the utilization of ethno-veterinary practices (Kolawole et al., 2007). Herding experience (X_4) was also significantly related to adoption of medicinal plants by the respondents at 10% level. This implied that as farmer's experience in herding cattle increases their possibility to adopt medicinal plants increases. Farmers with high herding experience tend to adhere to diseases management strategies than those with less experience. Experience brings about perfection in the use of a knowledge. In a study conducted by Kolawole et al. (2007) on ethno-veterinary practices amongst small-holder farmers in Ekiti State, Nigeria, they observed that respondents with more than 50 years of age were more experience in ethno-veterinary medicine and have more in-depth knowledge. They also observed that people with more than 40 years experience were more knowledgeable and appreciative of herbal medicine than young people.

Analysis of the result in Table 3 also shows that coefficient of number of cattle own by the respondents (X_5) was positive and statistically significant at 5% level. This

indicates that as the number of cattle owned by the respondents' increases, the more the likelihood of the herder using medicinal plants against diseases. This could be because there is tendency of having diseases occurrence among their herds most especially with extensive management system practiced by the nomadic cattle Fulanis. The positive sign of the number of cattle could be due to financial implications involved in the use of modern veterinary drugs most especially if large numbers of heads of cattle are infected, since local remedies are readily available and cheaper. Marabou (2012) reported a similar result in a study conducted on ethno-veterinary practices in Bour area, Central African Republic.

Result in Table 4 shows the marginal effect of the variables determining adoption of medicinal plants by the respondents (age, family size, experience and number of cattle). This implied that if these variables were to be increased by 100%, the probability of adopting medicinal plants will increased by 2.52, 0.09, 0.63, and 0.01%, respectively (Table 4).

Constraints to adoption of medicinal plants for the treatment of cattle diseases

Table 5 presents the constraints that limit the effective adoption of medicinal plants to treat cattle diseases in the study area. About 98.13% of the respondents complained of indiscriminate feeling of trees for farming, building houses and fire wood. This problem had led to depletion of most trees and herbs that are sources of local medicine and sometime extinction of the medicinal plants. Usman et al. (2015) revealed that natural habitats of many valuable

Table 4. Marginal effect of the variables determining adoption of medicinal plants.

Variable	dy/dx	Standard Error	Z-statistics
Age (x ₁)	0.0252113	0.03182	5.23***
Education (x ₂)	0.0001607	0.00026	0.85
Family size (x ₃)	0.0008655	0.00123	2.93***
Herding experience(x ₄)	0.0063250	0.00821	4.84***
Number of Cattle (x ₅)	0.0001046	0.00015	2.20**
Extension contact (x ₆)	0.0018319	0.00431	0.54

**** and *** represent significance at 1% and 5% level respectively.

Table 5. Constraints militating against adoption medicinal plants.

Constraint	Frequency	Percentage
Indiscriminate feeling of trees	105	98.13
Bush burning	101	94.39
Concealment of knowledge	84	79.44
Improper Knowledge of dosage	83	77.57
Inadequate government recognition	80	76.63

*Multiple responses exist.
Source: Field survey data, 2019.

plants were been lost to other land uses or been degraded as a result of population pressure. The result in Table 5 also revealed that 94.39% of the respondents complained of bush burning. According to the respondents, most of the plants and shrubs used were destroyed by bush burning. Herders have to trek long distance that involved risking their lives in search of raw materials for the treatment of cattle diseases. Concealment of knowledge was another constraint that was revealed by 79.44% of the respondents. Most of the well knowledgeable people keep it to themselves; they only reveal to their trusted children or close confidants. This behaviour limits the availability of the knowledge and gradually may lead to extinction of the knowledge. Improper knowledge of dosage was complained by 77.57% of the respondents. The variation in prescription such as quantity to administer at a time and for how long is common among the custodians of the knowledge. As a result of this, there are cases of overdosing the herbal medicine. About 76.63% complained of inadequate Government recognition, even though there is traditional medicine board in the study area, little is done to encourage the custodian of the knowledge in terms of standardization, policy on intellectual property rights among others. According to Lowe et al. (2000), the components of ethno-medicine have long been ignored by many biomedical practitioners due lack of clearly defined chemical composition, dosages and toxicity of the plants used in ethno-medicine.

Conclusion

The findings of the research revealed that cattle herding in

the study was dominated by young adults, with low level literacy and average herding experience of 31years. About 85.05% of the respondents have more 50 heads of cattle with only 11.21% who had at least extension visit once in 6 months. Majority (90.65%) of the respondents adopted both medicinal plants and modern veterinary drugs in treatment of cattle diseases. Age, family size, experience and number of cattle had positive and significant effect on the adoption of medicinal plants. Indiscriminate feeling of trees, bush burning and concealment of knowledge were the major problems faced by the respondents.

It was recommended that, conservation of medicinal plants, documentation and promotion of indigenous knowledge by encouraging research activities is required in the study area. Both community and concerned authorities should enforced to laws that prohibit indiscriminate cutting of trees and bush burning so as curb looming danger of losing value medicinal plants. Research institute should investigate to ascertain the precise dosage of herbs to be used in the treatment and control of cattle diseases.

CONFLICTS OF INTEREST

The authors declare that they have no conflict of interest.

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