Determinants of Use of Medicinal Plants for the Treatment of Small Ruminants' Diseases in Imo State, Nigeria

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Abstract: The study analyzed the determinants of use of medicinal plants for the treatment of small ruminants' diseases in in Imo State, Nigeria. The contributions of small ruminants in rural livelihoods and the rising importance of alternative medicine necessitated the study. Two hundred and forty small ruminant farmers selected using multistage sampling procedure participated in the study. Data were collected using interview schedule and the variables were analyzed using percentage and mean score. The hypothesis was tested using multiple regression model. Results showed that rashes (73%), cough (69%) and retained placenta (69%) were the most prevalent diseases in the area. Eighteen indigenous plant species were identified as being used in the treatment of diseases among which were *Psidium guajava* (45%), *Mangifera indica* (44%), *Afromomummeiegueta* (41%) and *Amaranthus hybridus* (40%). The most popular methods of preparation/administration included squeezing (95 people), chewing (36 people) and grinding (20 people). The hypothesis showed thatage, marital status, educational level, herd size, sources of information, annual income, source of credit and major occupation determined the use of indigenous plant species for treatment of livestock diseases by the farmers. It was recommended that socioeconomic characteristics of farmers be considered while promoting the use of indigenous medicinal plants.

Keywords: Socioeconomic determinants, farmers, medicinal plants, use, treatment, small ruminant, animal diseases, Nigeria

Introduction

The recent growing popularity of organic and natural products has encouraged the use of traditional medicine. According to Niyak*et al.* (2011) the problems of modern medicinal systems such as pharmacologic high costs, the use of non-renewable resources such as fossil resources and environmental pollution by pharmaceutical industries for making drugs have boosted the popularity of herbal medicine. Medicinal preparations derived from natural sources especially from plants have been in widespread use since time immemorial. Although the strategies that herbal practitioners use to prevent illness or restore health in their patients (humans and livestock) differ in the many and varied herbal traditions across the planet, their effects do not differ widely (Ali *et al.*, 2010). According to Nirmal *et al.* (2013) about 80% of the people in developing countries still rely on traditional medicine for their healthcare and that of their animals. Overall, international trade in medicinal plants and their products was US$ 60 billion in the year 2000, with average annual growth rate of 7% and was hoped to reach $US5 trillion in 2050 (Government of India, 2000). Malaysia for example allocates $500 million yearly to traditional medicine. In the US, it is $US2.7 billion whereas it is $US80 in Canada, Australia and United Kingdom (Aydin *et al.*, 2008).

Reasons such as affordability, accessibility and ease of preparation make traditional medicines popular(Welz *et al.*, 2018). Aydin*et al.* (2008) noted that these factors differ from place to place. In developing countries, the use of traditional medicine is believed to be influenced by its efficiency and economic viability of the methods. In developed countries, it is thought to be influenced by the ease of accessinginformation about the side effects of chemical drugs. In Nigeria, Ogunsola and Egbwale (2018) reported that lack of medical facilities, poverty, affordability, accessibility and inherent trust in the practice are some reasons for its continued use.

In Imo State, many people have relied on small ruminants for their sustenance (Nwachukwu &Berekwu, 2020; Anyanwu *et al.*, 2020). Also, several livestock farmers have depended on traditional medicine for the treatment of their animal diseases due to the high cost of modern medicine(Mahomoodally, 2013,Sawadogo *et al.*, 2012. While socioeconomic factors have been found to influence the uptake of agricultural technologies and practices by farmers (Olayemi *et al.*, 2020; Austin, *et al.,* 2020; Farid *et al.*, 2015) a few studies have validated or refuted this in livestock production. Based on this research gap, the study was designed to determine the socioeconomic factors

influencing the use of medicinal plant species in the treatment of small ruminant diseases in Imo State, Nigeria. Specifically, the study determined the prevalence of small ruminant diseases in the area, identified indigenous medicinal plant species used in the treatment of small ruminant diseases andascertained the methods of preparation/administration of the herbal remedies.

Hypothesis

There was no significant relationship between the socioeconomic characteristics of the respondents and their use of indigenous medicinal plants for the treatment of small ruminant diseases.

Materials and method

The study was conducted in Imo State, Nigeria. Only Imo State was used in the study due to limited availability of resources. The state is among the five states in southeastern, Nigeria. The state lies within latitudes 4°45'N and 7°15'N and longitude 6°50'E and 7°15 E and occupies a land area of 5,100 Km^2 (Nwajiuba, 2002). It is bordered by Abia State to the east, River Niger and Delta State on the west, Anambra State to the north and Rivers State to the south. It is divided into three agricultural zones namely Owerri, Okigwe and Orlu and has 27 local government areas (LGAs).Each zone is further divided into blocks and circles.The state like some other states in Nigeria is known for small ruminant production with sheep and goats being the common animals produced (Anyanwu *et al.*, 2020). Small ruminants serve as source of food, income and a poverty alleviation strategy.

All small ruminant farmers in the state constituted the population for the study. Multi-stage sampling procedure was used to select the sample for the study. The first stage was the selection of 60% of extension blocks from each of the three zones in the state. This gave rise to 6 extension blocks for Owerri, 9 for Orlu and five 5 for Okigwe zones. These number of blocks were randomly selected from the zones. The second stage involved theselection of 3 circles from each of the selected blocks, using simple random sampling technique which gave rise to 27 circles for Orlu, 18 circles for Owerri and 15 for Okigwe zone. In the third stage, with the ADP listing of households, four small ruminant farmers were selected from each of the circles using sampling random sampling technique. This gave a sample size of 108 farmers for Orlu, 72 farmers for Owerri and 60 farmers for Okigwe, totaling 240 farmers for the study.

Data were collected from primary sources with the aid ofstructured interview schedule. The variables were analyzed using mean and percentages. The hypothesis was tested using multiple regression analysis represented mathematically as:

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, e)$where
Y = use of medicinal plants (measured on a 5-point Likert scale of)
X_1 = Sex (Male = 1, Female = 2)
X_2 = Age (Years)
X_3 = Marital status (Singel = 1, Married = 2, Divorced/Separated = 3, Widowed = 4)
X_4 = Educational level (Educated = 1, uneducated = 2)
X_5 = Household size (No. of persons)
X_6 = Herd size (No. of animals)
X_7 = Farming experience
X_8 =Membership of social organizations (Yes = 2, No = 1)
X9 = Source of information (religious organizations = 1, age grades = 2, farmers fora = 3, farmers' council = 4, ADP contact farmers = 5, social club = 6, market associations = 7, cooperatives = 8)

RESULTS AND DISCUSSION

As represented in Table 1, study result shows that greater proportions (42.5%) of the farmers were within the age bracket of 36 - 53 years. The mean age was 50.9 years. This result suggeststhat the farmers are ageing. According toChitura*et al.* (2018) older people are risk-aversive and would prefer to continue with a practice they already know. This mindset might be attributed to the complexity of modern veterinary medicine which makes it difficult for local people to apply. The farmers were mostly male (52.9%) while 47.1% werefemale, 86.3% of the farmers were

married, 7.5% were single, 4.6% were widowed, 1.2% were divorced and 0.4% were separated. Marriage provides opportunity for sharing of agricultural information

Also, the majority (97.8%) of the farmers acquired one form of formal education or the other while 2.1% had no formal education. The high literacy level among the farmers may have accounted for their willingness to use traditional remedy for the treatment of their animals. In general, the result implies that the small ruminant farmers have basic education needed for better and faster understanding of the use of medicinal plant in small ruminant animal healthcare and other agricultural innovations. Acquisition of education also enhances decision-making abilities of the farmers.The majority (68.8%) of the farmers had 5 - 10 persons in their household. The mean household size was 8 persons. It could be inferred that the farmers have a large household size which could be a source of cheaper labour and relevant information.

A greater proportion (27.5%) of the farmers had farmed for more than 23 years and above. The mean farming experience was about 16 years. This implies that the farmers have gained reasonable experience in the use of medicinal plants for small ruminant animal healthcare and can give useful information about their use and effectiveness. According to Anning and Dickson (2017) long history of traditional medicine use allows users to ascertain the safety or otherwise of the formulations. The majority (57.5%) of the respondents took farming as their major occupation. However, the other 42.5% had trading and other business activities as their major occupation, while engaging in small ruminant production and other farming activities.Diversification of sources of income could be a safety net in times of natural disasters. Undertaking more than one economic activity helps to absorb shocks arising from uncertainties. When one activity fails, the farmer can rely on the others.

The majority (55.0%) of the small ruminant animal farmers were further shown to own less than 10 animals, 25.4% owned 10-20 animals, 7.9% owned 21-40 animals while 5.8% owned 41-60 and 61 and above respectively. The mean herd size was 18 animals. This implies that the farmers are small-scale livestock farmers. Small-scale farmers are characterized by the lack of resources which might cause difficulty to adopt costly technologies. This can encourage the use of medicinal plants in the treatment of livestock diseases because it is less expensive. The majority (68.0%) of the farmers belonged to religious-based organizations, 57.5% were ADP contact farmers, 41.3% belonged to age grades, 32.9% belonged to cooperative societies, 24.2% to farmers' fora, 22.5% to social clubs, 20.4% to market associations while 7.9% belonged to farmers' councils. Social organizations have proven to be crucial avenue for sharing/disseminating agricultural information. They also promote interactions among farmers and offer extension agencies an opportunity to get their information across at a cheaper cost. Farmers who belong to social organizations are most likely to share information concerning their experiences and wealth of knowledge and give members the chance of benefiting.

The majority (85.8%) of the farmers were also shown to obtain credit from friends and relatives, 32.5% from religious organizations, 25.8% from age grades and social clubs, 24.2% from self-financing, 15.8% from farmers' cooperatives and 5.0% from Banks. This result implies that the farmers accessedcredit mainly from informal sources. The result also revealed the almost insignificant role commercial banks play in the provision of credit to small-scale farmers. Osabohien*et al.* (2020) observed that access to credit promotes agricultural production and lack of it may hinder the uptake of appropriate technologies. The result finally reveals that a greater proportion (43.8%) of the farmers earned ₦40,000 -₦130,000 yearly while just 7.1% earned more than ₦230,000 as annual income from small ruminant production. The mean annual income of the farmers was ₦87,325. This implies that the farmers earned above the minimum wage (₦30,000) in Nigeria. However, comparing it with the mean household size of the farmers shows that each household member earned about ₦10,000 monthly, which is below the minimum wage per capita in Nigeria. This can hardly be adequate for good living considering the economic condition of the country.

Table 1: Socioeconomic characteristics of the farmers

Socioeconomic characteristics	**F** **n = 240**	**%**	$\bar{X}$
Age (Years)			
< 18	**2**	0.8	
18 – 35	28	11.7	
36 – 53	102	42.5	50.9

54 – 71	93	38.8	
≥ 72	15	6.3	
Sex			
Female	113	47.1	
Male	127	52.9	
Marital status			
Single	18	7.5	
Married	207	86.3	
Widowed	11	4.6	
Divorced	3	1.3	
Separated	1	0.4	
Educational level			
Uneducated	5	2.1	
Educated	59	97.9	
Household size (No. of persons)			
< 5	54	22.5	
5 – 10	165	68.8	
11 – 16	15	6.3	8
17 – 22	4	1.7	
> 22	2	0.8	
Farming experience (Years)			
< 5	15	6.3	
5 – 10	54	22.5	
11 – 16	59	24.6	15.7
17 – 22	46	19.2	
> 23	66	27.5	
Major occupation			
Yes	138	57.5	
No	102	42.5	
Herd size (No. of animals)			
< 10	132	55.0	
10 – 20	61	25.4	18
21 – 40	19	7.9	
41 – 60	14	5.8	
60	14	5.8	
Social organization membership			
Religious organization	165	68.0	
Age grades	99	41.3	
Farmers' for a	58	24.2	
Farmer council	19	7.9	
ADP contact farmers	138	57.5	
Social club	54	22.5	
Market association	49	20.4	
Cooperative societies	79	32.9	

Source: Field Survey Data, 2021

Table 2 shows that animals were infested by many diseases. The most prevalent diseases included rashes (72.9%), cough (69.2%), retained placenta (68.8%) and wounds (65.8%). This finding implies a heavy burden on the farmersand stresses the need to control the diseases. Unigwe*et al.* (2016) noted that the prevalence of diseases has reduced the economic benefits of livestock production in Nigeria. Generally, diseases interfere with livestock productivity. The direct effects of diseases arehigh level of morbidity and mortality. Diseases can also lead to reduction in animal products like milk, meat and even the rate and number of offspring produced in a given time.

Livestock diseases can increase the cost of management, increase the risk involved in the enterprise and can transmit diseases to humans.

Table 2: Prevalence of small ruminant diseases

Diseases	F (*)	%
Rashes	175	72.9
Cough	166	69.2
Retained placenta	165	68.8
Wounds	158	65.8
Diarrhea	157	65.4
Pneumonia	141	58.8
Helminthosis	134	55.8
Foot rot	114	47.5
Sheep pox	107	44.6
Conjuctivitis	98	40.8
Contagious ecthyma	93	38.8
Anthrax	72	30.0
Blackquarter	38	15.8

Source: Field Survey Data, 2021

Indigenous medicinal plants used in treatment of small ruminant diseases

Table 3 shows that the farmers identified 18 plant species used in the treatment of small ruminant diseases. The result further revealed that some plants were used more than others. The popular plant species used by the farmers were *Psidium guajava* (45%), *Mangifera indica* (43.8%), *Afromomummeiegueta* (40.8%), *Amaranthus hybridus* (40%) and *Cymbopogon citrates* (39%). The result suggests that the farmers used a diversity of medicinal plants for the treatment of livestock diseases. Aziz *et al.* (2018) identified 73 medicinal plants that are used in the treatment of livestock diseases in Pakistan. There is the possibility of a plant treating more than one disease. This will reduce the scarcity of medicinal plants in the area since the farmers have an array of plants to select from.

Table 3: Plant species used in the treatment of small ruminant

Plant species	F(*)	%
Guava (*Psidium guajava*)	108	45.0
Mango (*Mangifera indica*)	105	43.8
Alligator pepper (*Afromomummeiegueta*)	98	40.8
African spinach (*Amaranthus hybridus*)	95	39.6
Lemon grass (*Cymbopogon citrates*)	94	39.2
Moringa (*Moringa oleifera*)	92	38.3
Utazi (*Gangronemalatifolium*)	90	37.5
Bitter kola (*Garcina kola*)	83	34.6
Lime (*Citrus aurantifolis*)	82	34.2

Black pepper (*Piper nigrium*)	78	33.3
Papaw (*Carica papaya*)	79	32.9
Camwood (*Baphia nitida*)	74	30.8
Bitter leaf (*Vernonia amygdalina*)	67	27.9
Neem (*Azadirachta indica*)	65	27.1
Indigo tree (*Indigofera tinctoria*)	58	24.2
Siam weed (*Chromolaena odorata*)	55	22.9
Goat weed (*Ageratum conyzoides*)	42	17.5
Scent leaf (*Ocimumgratissimum*)	38	15.8
Opete (*Costusafer*)	29	12.1
Alfalfa (*Medicago sativa*)	13	5.4

Source: Field Survey Data, 2021 * Multiple response

Methods of preparation and administration of the medicinal plants

Figure 1 showed that the medicinal plants were administered through several methods. The popular methods were squeezing (95), chewing (36) and grinding (20). However, mixing with ash was the leastused method. The method of administration could be determined by the nature of the animal, the type of disease, the plant part where the active ingredient is and sometimes the location. Eshetu *et al.* (2015) reported that administration of medicinal plants through various methods by traditional healers in Ethiopia. Farmers are believed to have explored the most efficacious way of preparing and administering herbal formulations over time. The dominance of squeezing might mean that it is the most efficacious method.

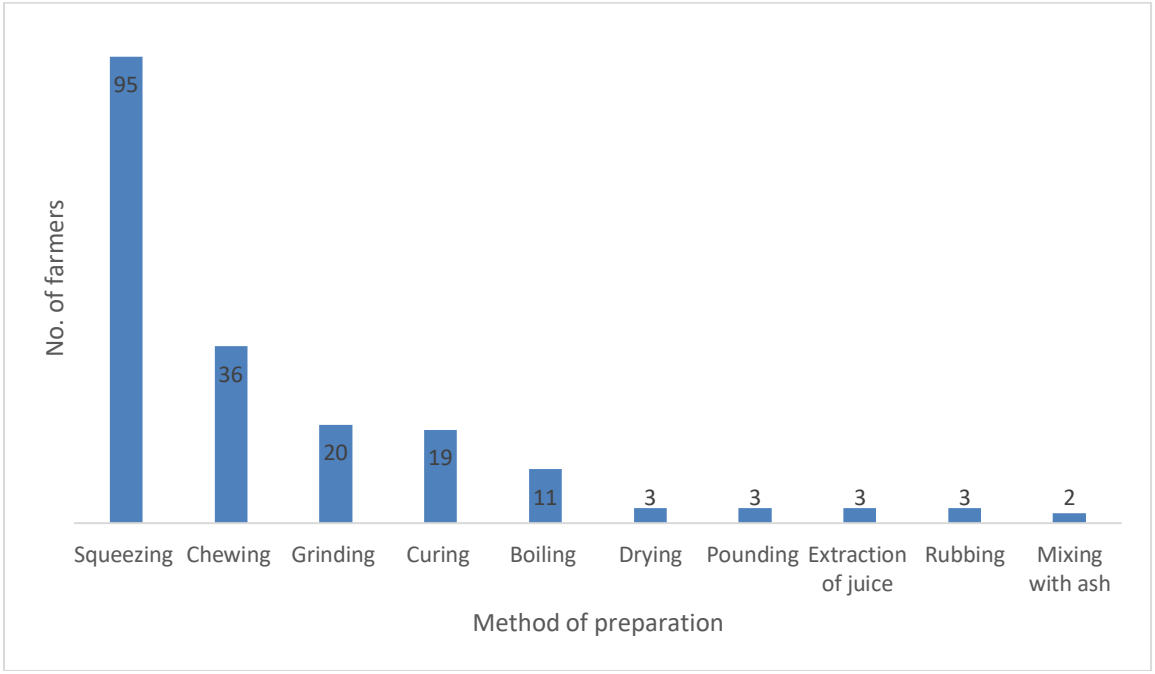

Figure 1: Method of preparation of medicinal plants

Socioeconomic determinants of use of medicinal plants

Table 4 shows that out of the four functional forms tested, the Cob-Douglas function emerged the lead equation because it had the largest number of significant variables, the highest R^2 value and the largest F-value. The result showed that the socioeconomic variables accounted for about 39% variations in the use of indigenous medicinal plants. The significant socioeconomic characteristics wereage (t = 3.20, p = 0.002), marital status (t = - 2.09, p = 0.02), educational level (t = 3.553, p = 0.04), herd size (t = 3.9, p= 0.003), source of information (t = -2.23, p = 0.05), annual income (t = - 2.88, p = 0.05), source of credit (t = -1.92, p= 0.02) and major occupation (t = 1.881, p= 0.04).

According to the result, the older the farmers, the more they used indigenous medicinal plants. Rehman *et al.* (2016) stated that older household heads are risk-averse and less likely to use modern technologies. This might have influenced the use of indigenous medicinal plants by the farmers. This is because they are easier to use and may not require high technicality. Education also had a positive relationship with the use of indigenous medicinal plants. This indicates that the more educated the farmers are, the more they used indigenous medicinal plants. Education enhances decision-making among farmers. It helps farmers to combine options as a way of optimizing profit. Herd size was found to have a positive relationship with the use of indigenous medicinal plants. Increasing herd size may imply higher cost of management. Therefore, the farmers may resort to local remedies for the treatment of their livestock diseases because they are relatively cheaper and easier to administer.

The result further revealed that the more the sources of information on indigenous medicine the lower their use by the farmers. This may be explained by the fact that the increasing number of information sources will expose farmers to better and more efficient alternatives for managing the diseases of their livestock. This may be counterproductive to the use of indigenous medicinal plants, leading to their disuse. Similarly, increasing sources of credit was found to produce opposite effects in the use of indigenous medicinal plants. Ordinarily, the more the farmers' sources of credit the more investments they are likely to make in the agricultural enterprise. Among the reasons for the continued use of local remedies by farmers is that they are relatively cheaper. Thus, as farmers' credit base receives a boost, they might begin the uptake of modern technologies which they were hitherto not using. And finally, occupation was found to have a positive relationship with the use of indigenous medicinal plants. Farmers who are primarily into the business would take up any technology that can enable them maximize profit since their entire life depends on it.

Table 4: Multiple regression analysis result

VARIABLE	COB-DOUGLAS
Constant	0.854
	(3.195)*
Sex(X_1)	-0.003
	(-0.122)
Age(X_2)	0.176
	(3.322)*
Marital Status(X_3)	-0.102
	(-2.087)**
Education Level (X_4)	0.128
	(3.553)*
Household Size(X_5)	-0.046
	(-1.121)
Herd Size(X_6)	0.087
	(3.878)*
Farm Experience (X_7)	0.003
	(0.123)
Memb. Of Soc. Org(X_8)	0.090
	(4.684)*
Source of Info(X_9)	-0.068

	(-2.822)*
Annual Income(X_{10})	-0.062
	(-1.915)***
Source of Fin. Aid(X_{11})	0.022
	(1.329)
Freq of Ext. Cont(X_{12})	0.052
	(1.887)***
Major Occupation(X_{13})	0.043
	(1.780)***
	(0.026)
R^2	39.6
F-Statistics	9.791
Standard Error	0.17041
N	240

* **$p \leq 0.01$, $p \leq 0.05$, $p \leq 0.10$**

Source: Field Survey Data, 2020

Conclusion

Traditional medicine has helped farmers in maintaining their health and that of their animals. Its popularity is based on the fact that it is relatively cheaper, readily available and easier to administer. This makes it affordable to resource-poor farmers who dominate livestock production in many developing countries. Overcoming them therefore may require an understanding of those farmer-related factors that influence their use. The following recommendations were therefore made based on the findings of the study: medicinal plants should be preserved and this can be achieved through legislations to protect them especially in the wild; the mostly used plant species should be protected and squeezing and chewing should be promoted as methods of preparation and administration of the medicinal plants to livestock.

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