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A Binary Logit Estimation of Factors Influencing Awareness about Grasscutter Farming among Rural and Sub-urban Households in Kwara State, Nigeria

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Abstract Hunting of grass cutter for food in Nigeria is unsustainable due to serious challenges posed to the ecosystems, adequate bush meat supply and human health. To enhance sustainable exploitation, grass cutter farming is desirable but large percentage of the population still lack awareness about grass cutter rearing. This study was aimed at investigating factors influencing awareness about grass cutter farming in Kwara state. A two–stage sampling technique was used to select 540 participants from rural and sub-urban households for the study. Descriptive statistics and binary logistic regression model were used to analyze the data. The results showed that the respondents had an average age of 46 years with an average family size of 7 persons. Majority (77%) of the respondents were males. The Nagelkerke R^2, explained 80.9% of the total variation in awareness of households. The coefficient of age, gender, household size, education, and access to credit with the t-values of -2.333, 1.959, 2.000, 2.235 and 13.832 respectively were all found to be critical in explaining awareness among the sampled households. Based on the findings of this study, it was recommended that any intervention strategy on grass cutter farming by government and international development agencies should have a capacity-building component center on educating households about the management practices and livelihood merits of farm grass cutters. Increase awareness through media should be promoted and policies like loan schemes that would substantially improve households' access to use and acquisition of credits should be encouraged.

Keywords: *grasscutter, awareness, farming households, gender, sustainability, regression*

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1. Introduction

Livestock production is critical to the economic development of any nation due to its impact on food security, employment generation and poverty alleviation. The farming and utilization of indigenous wildlife species such as grasscutter (*Thryonomys swinderianus*) could play a significant role in improving the living standards of rural and sub-urban households in Nigeria. This is because of the 40,000 tonnes of grasscutter meat consumed in West Africa annually, only a small proportion was provided through farming [1]. Grasscutters are the biggest African rodent after the crested porcupine (*Hystric cristata)* measuring up to 60 cm, and weighing between 2 kg and 6 kg [2]. The rodents are herbivores that feed on forages and can adjust to different diets, so feeding is comparatively easy [3]. They can breed throughout the year, annually producing two litters consisting of two to six offspring and have the gestation period of five months [2]. In spite of these desirable attributes for domestication, they are aggressively hunted for by hunters through trapping and bush burning with consequent destruction of grass lands and wooden savannahs and the gradual decrease of wild grasscutter population.

To enhance proper growth and development grasscutters must be fed with balanced diets. The feed ingredients include forages such as guinea grass (*Panicum maximum*), sugar cane (*Saccharum spp)*, elephant grass (*Pennisetum purpureum)* and giant star grass (*Andropogon gayanus*), tubers, grains, agro-industrial by products, crop residues and compounded rations in pellets [4]. Grasscutters are able to change the highly cellulosic materials into valuable animal protein [5]. The digestion of fibre in the gut of the herbivore results in the production of volatile fatty acids (VFAs) which are absorbed across the epithelial membrane [6]. VFAs account for much of the metabolizable energy supply to the animal [7].

Grasscutter is the most widely sold bush meat in Nigeria [8,9]. As such, the prospect of grasscutter farming is very bright and encouraging. The meat is low in cholesterol, conferring health benefits to the consumers [4] and highly valued for its savory taste [10]. It has become a preferred choice of animal protein, hence grasscutter meat is three to four times more expensive than beef [11]. In Nigeria, a matured grasscutter sells for between $18.50 and $30.90 [12]. Grasscutter meat is socially and

culturally acceptable with no religious taboos against its consumption and it is a microlivestock in high demand. Rearing the stock in captivity ensures conservation, enhances sustainable exploitation of the species and provides unique opportunity to minimize environmental damage. Furthermore, it will prevent the risk of exposure of grasscutter to fruit bat known to serve as vector for a viral disease dangerous to humans.

The Nigerian government through Fadama Agricultural agency started the pioneering work on domestication of grasscutter in 2010. The Fadama Development Project is part of a National Programme being co-financed with loans from the African Development Bank (ADB) and the World Bank (WB), packaged along with this is the World Bank sponsored Global Environmental Fund (GEF), a grant which was expected to address critical ecosystem issues. Interested farmers were trained and provided with a seed stock of a male and a female grasscutters (mostly captured from the wild). Trained extension workers supervised the performance of the animals. The aim was that the research findings could be applied directly by farmers and that both rural and urban households could rear grasscutters in their farms either on a small or large scale. Despite these incentives, coupled with the economic benefit that accrues from its sales, field observation indicated that many farmers failed to adopt the initiative. In addition, there is a paucity of technical information regarding practical skills in grasscutter farming in Kwara state where effort had been made to promote grasscutter production. This study therefore, determined factors influencing awareness about grasscutters farming in the state.

2. Materials and Methods

2.1. Area of Study

The study was done in Kwara State situated in the North Central zone of Nigeria. The state is located on latitudes 7°45N and 9°30N and longitudes 2°30E and 6°25E. The land area is about 32,500 square kilometers and shares boundaries with Niger, Kogi, Ondo and Osun states. It also shares an international border with republic of Benin. The population of Kwara state stood at 2.73 [13]. About 90 percent of the rural populace is involved in farming and Yoruba, Fulani, Batunu, Nupe, Bokobanu and Gambari are the main ethnic groups in the state [14].

There are two main climatic seasons; the dry and wet seasons. The vegetation is made up of the wooden and rain forest savannah that are well suited for livestock production. Wildlife species commonly found in the state includes: rabbit, grasscutters, squirrel, antelope etc. Kwara State is made up of four zones based on ecological characteristics, cultural practices and administrative convenience. These are: Zone A: Baruteen and Kaima Local Government Areas (LGAs); Zone B: Edu and Patigi LGAs; Zone C: Asa, Ilorin East, Ilorin West, Ilorin South and Moro LGAs; and Zone D: Ekiti, Ifelodun, Irepodun, Offa, Oyun, Isin and Oke-Ero LGAs.

2.1.1. Sampling Methods and Data Collection

One of the major criteria to use when deciding on sample size is the extent to which the sample is distributed in the same way as the population. Secondly, the size of questionnaire; which was structured to capture the objectives of the study. Eight LGAs were randomly selected out of the 16 LGAs in the state. The list of all villages and sub-urban communities in all the 8 LGAs obtained from Agricultural Development Projects (ADPs) was used as the sampling frame for this study. Proportionate stratified sampling was then used to select villages, sub-urban communities and farming households across the 8 LGAs to make up a sample size of 540 respondents. Stratified random sampling was used because it allows all variations in the population to be represented in the sample thus reducing the sampling error. Furthermore, it offers an opportunity for even spatial coverage while taking into consideration the aspect of randomness. However, this technique demands prior information about the population under the study, which in this case the researchers had. By suburban this study refers to residential buildings located at the outskirt of a major town.

2.1.2. Analytical Techniques

Data were analyzed using descriptive statistics and binary logistic regression model. The descriptive statistics was employed to describe the socio-economic as well other pertinent information as it regards to grasscutters farming**.** The logit model was used to identify factors influencing the awareness of households about grasscutters farming. Apart from the fact that the model is homoscedastic, the probabilities are bounded between 0 and 1. The model was chosen because the dependent variable is dichotomous and is computationally easier to calculate. The Logit model is a binary model with mutually exclusive and exhaustive outcomes. The dependent variable is the awareness of farmers about grasscutter farming, which is one if yes, and zero if otherwise. According to [15] and [16], the model specification gives rise to a system of two probabilities as:

$$Prob\left(Y_{i=j}\right) = \Sigma^{2} \frac{e^{\beta jXi}}{e^{\beta kNi}} \quad (1)$$

Where J = 0 or 1.

Expanding equation 1:

$$Prob\left(Y_i = j\right) = \frac{e^{n_j x_i}}{e^{n_0 Xi} + e^{n_i x_i}}. \quad (2)$$

The equations above have interdeterminancy problem and need to be removed. This calls that we assume that n_0 in the denominator is zero i.e. $n_o = 0$. Then, $e^{n\,Xi} = 1$, hence

$$Prob(Y_i = j) = \frac{e^{n_j x_i}}{1 + e^{n_i x_i}} \quad (3)$$

$$Prob(Y_i = j) = \frac{e^{n_j x_i}}{1 + n^2 e^{n_k x_i}}.$$

Then, the probability of being users (j = 0 or 1) is:

$$Prob(Y_i = 0) = \frac{1}{1 + \sum_{k=1}^{2} e\beta k X_i} \quad (4)$$

$$Prob(Y_i = 1)\frac{e^{\beta 1 Xi}}{1+\sum_{k=1}^{2} e\beta k X_i} \quad (5)$$

Where βj is a vector of parameters that relate the explanatory variable Xi to the probability.

The variables used in the model are:

Y = Awareness about grasscutters farming which is 1 if yes and 0 if otherwise

X_1 = Age of the household head in years

X_2= Gender of the household head. Dummy variable, where the head is a male =1 or 0 otherwise

X_3 = Household size in number

X_4 = Education based on the number of years of schooling

X_5= Access to credit facilities, Yes =1 and 0 otherwise.

2.1.4. Definition of Variables

The dependent variable (Y) is the awareness about grasscutter farming. It takes the value of 1 if the household head is aware and 0 if otherwise.

Age of household head (X_1) was measured in years. Age a critical factor that could enhances productivity households. Household heads in their active ages are expected to be more productive and are more likely to be aware and adopt improve techniques than the aged

Gender of the household head (X_2). Dummy variable, where the household head is a male =1 or 0 otherwise. The males are likely going to be more involved than the females because of the aggressive nature of the animal.

The size of the household (X_3). This was based on the number of direct and depend ants of the household. It generally depicts labor availability. The more the household size the more likely members are aware and are willing to adopt improved techniques.

Education of household head (X_4) was measured as the number of years of schooling. Education is a social capital, which could increase household's ability to take good and well–informed production decisions.

Credit access (X_5). Dummy variable, it takes the value of 1 if the household head has access to credit and 0 if otherwise. Access to credit is expected to enhance awareness and adoption of improved techniques.

2.1.5. Determinants of Awareness and Adoption of Agricultural Technology

There exist vast literatures on factors determining the awareness and adoption of an agricultural technology. According to Loevinsohn et al. [17], farmers' decisions about whether and how to adopt new technology are conditioned by the dynamic interaction between characteristics of the technology itself and the array of conditions and circumstances. A more recent strand of literature has included social networks and learning in the categories of factors determining adoption of technology [18]. Some studies classify these factors into different categories. For example, Akudugu *et al.* [19] grouped the determinant of agricultural technology adoption into three categories namely; economic, social and institutional factors, while [27] classified them under human capital, production, policy and natural resource characteristics. Although there are many categories for grouping determinants of technology adoption, there is no clear distinguishing feature between variables in each category. Categorization is done to suit the current technology being investigated, the location, and the researcher's preference, or even to suit client needs [20]. For instance the level of education of a farmer has been classified as a human capital by some researchers while others classifies it as a household specific factor. Age is also assumed to be a determinant of adoption of new technology. Older farmers are assumed to have gained knowledge and experience over time and are better able to evaluate technology information than younger farmers [21,22]. On contrary age has been found to have a negative relationship with adoption of technology. This relationship is explained by Mauceri et al. [23] that as farmers grow older, there is an increase in risk aversion and a decreased interest in long term investment in the farm. On the other hand younger farmers are typically less risk-averse and are more willing to try new technologies. For instance, Alexander and Van Mellor [24] found that adoption of genetically modified maize increased with age for younger farmers as they gain experience and increase their stock of human capital but declines with age for those farmers closer to retirement.

3. Results and Discussion

3.1. Socio-economic Characteristics of the Respondents

Majority (77%) of the respondents were males and few (23%) were females. This is an indication that men are more involved in rearing grasscutters than their female counterparts (Table 1).

This may not be unconnected with the aggressive nature of the animal when poorly handled. The handling process required special training. Field survey revealed that farmers who have had prior training, handles grasscutter properly. Majority (87.2%) of the respondents were married, while few (12%) were still single. Very few, less than one percent each, were divorced and widowed, respectively. The average household size is 7 persons. Polygamous nature of the people probably explains the large family size recorded in the area. Household size is used as a proxy for labour because individual in the household is a potential source of labour. Their availability reduces labour constraints faced during the peak of the farming season. [25]. Field observation shows that married people are more willing and are interested in grasscutter farming. About 40%, 19% and 4% of the respondents had completed tertiary, secondary and primary school education respectively. Although 18% of the respondents had no formal education, majority (72%) of the respondents had various level of educational attainment. Higher educational attainment has been reported to enhance responsiveness, initiative and level of adoption of improved technologies of beneficiaries in developmental programmes. The result revealed that 79.6% of the respondents were Muslim while 20.4% were Christians. This greatly indicates the acceptability of grasscutter meat across all religious boundaries. Majority (70%) of the respondents indicated they were member#s of various local organizations and cooperative societies.

According to [26] cooperatives are vehicle for development since it provides informal credit to farmers.

Table 1. Socioeconomic characteristic of the respondents

Variable	Frequency	Percentage
Gender		
Male	416	77.0
Female	124	23.0
Marital Status		
Single	65	12.0
Married	471	87.2
Divorce	2	0.4
Widowed	2	0.4
Household Size		
1- 5	252	46.7
6- 10	198	36.7
11-15	90	16.6
Educational Level		17.8
No formal Education	96	17.8
Formal Education#	444	82.2
Religion		
Islam	430	79.6
Christianity	110	20.4
Membership of association		
Yes	386	71.5
No	154	28.5
Awareness about grasscutter farming	271	50.2
Yes	171	31.7
No	369	68.3
Source of information about grasscutter farming		
Friends	105	19.4
Educational Institution	71	13.1
Radio	24	4.4
Newspaper	61	11.3
TV	43	8.0
Source of grasscutter		
Own farm	33	6.1
Hunting	148	27.4
Trap setting	52	9.6
Market	209	38.7
Others	4	0.7
Preference for bush meat		
Grasscutter	271	50.2
Squirrel	95	17.6
Antelope	89	16.4
Rabbit	44	8.2
Others	41	7.6
Estimated Annual Income		
< 250,0000	226	41.8
251,000-500,000	129	23.9
501,000-1,000,000	110	20.4
>1, 000,000	75	13.9

Field survey, 2016.

About 32% of the respondents indicated they had heard about grasscutter farming before. This indicates that awareness about grasscutter farming is still low in the state. Training exercises and other efforts to popularize grasscutter farming among residents of rural and peri-urban suburbs should therefore be encouraged. About 19% of the respondents got to know about grasscutter farming from their friends, while 13.1% obtained the information from educational institution. Furthermore, 11.3% and 8.0% heard through radio and TV, respectively, very few (4.4%) indicated newspaper as source of awareness about grasscutter farming. Radio and TV are mass methods of innovation dissemination widely available amongst most people even at the rural level. Efforts to popularize grasscutter farming may be promoted using those media platforms that are rarely used.

Further analysis shows that about 39% and 27% of the respondents used to purchase grasscutter meat they consumed form the market, and through hunting, respectively. Few, about 10%, used to obtain theirs through trap setting, while very few (6.1%) obtained their grasscutter from own farm (i.e. through self-grasscutters farming). The above findings underscore the need for concerted efforts to popularize and empower rural and peri-urban dwellers on sustainable grasscutter farming. About 58.7% of the respondents utilized grasscutter for consumption only. Few (17.2%) indicated they engaged in both consumption and selling of grasscutter. Few (10.6%) of the respondents had ever engaged in grasscutter farming, while even fewer (8.7%) are currently engaged in it. The results indicate that grasscutter farming is still very uncommon among rural and peri-urban dwellers. Half (50.2%) of the respondents indicated grasscutter as the type of bush meat they often consumed. While about 47% indicated rabbit, 17.6% and 16.5% indicated squirrel and antelope as type of bush meat consumed respectively. These results confirmed grasscutter meat as relished delicacy; as such it was the most commonly consumed bush meat among the respondents.

Forty-six percent of the respondents indicated they could both read and write in their various local languages, while 43.3% could neither read nor write in these local languages. Similarly, 47% indicated they could read and write in English Language, while 45.7% could neither read nor write. Very few proportions of the respondents could neither read nor write, or could either write but unable to read in both English and respondents' local languages. These results display low literacy level of the respondents in both English and their local language. The finding underscores the necessity to provide educational guide on grasscutter, like pamphlets or fliers, in both English language and major local languages of the respondents.

3.2. Determinants of Awareness about Grasscutter Farming

Using the Nagelkerke R^2, The logistic model explains 80.9% of the total variation in awareness status of households (Table 2).

The coefficient of age, gender, household size, education, and access to credit with the t-values of -2.333, 1.959, 2.000, 2.235 and 13.832 respectively were all found to be critical in explaining awareness among the sampled households. Educational status of household head is positive and significantly influenced awareness at 5% level of probability. This implies that as the years of education of the household head increases, awareness also increases. This could be due to the fact that educated households are generally able to read newspapers, watch TV and listen to radio. Household size is positive and critically affected awareness at 5% level. This implies that

as the household size increases, the likelihood of creating awareness about grasscutter farming rises. This could be due to the fact that every person in the household is a potential source of labour. Furthermore, access to credit facilities was significant and positively related to the awareness at 1% level of probability. This implies that the more the households have access to credit facilities, the better the awareness and eagerness to adopt improved techniques. However, age of the household head is negative but important at 5% level. This suggests that awareness decreases with age. The youths are likely going to be more exposed and adopt new techniques than the aged. Lastly, sex of the household head is also important at 5% level. This connotes that male household heads are more interested in grasscutter farming than their female counterparts. This may be connected to the aggressive nature of the animal when poorly handled. Similarly, [25] made the same observation in poultry. The result of their work indicated that male household heads were potential adopters of exotic poultry breed than female farmers.

Table 2. Binary Logit Regression Model

Variables	Coefficients	Standard Error	t-value	Sig.
Constant	-3.242	0.860	-3.769***	0.000
Age (X_1)	-0.350	0.015	-2.333**	0.018
Gender (X_2)	0.868	0.443	1.959**	0.050
Household Size (X_3)	0.074	0.037	2.000**	0.045
Education (X_4)	0.076	0.034	2.235**	0.025
Access to Credit (X_1)	5.514	0.399	13.832***	0.000

Source: Data Analysis, 2017. ***parameter significant at 1%, ** parameter significant at 5%.

4. Conclusion and Recommendations

The level of awareness about grass cutter farming among the respondents is low in the area. Majority (77%) of the respondents were males with an average age and household size of 39 years and 7 persons respectively. Furthermore, 46% of the respondents indicated they could both read and write in their various local languages, while about 43.3% could neither read nor write in these local languages. Similarly, 47% indicated they could read and write in English Language, while 45.7% could neither read nor write. Very few could either write but unable to read in both English and respondents' local languages. Moreover, 39% and 27% of the respondents purchased grass cutter meat from the market and through hunting, respectively. Few, about 10%, used trap setting. The binary logistic regression explains 80.9% of the total variation in awareness of households about grass cutter farming. The coefficient of age, gender, household size, education, and access to credit with the t-values of -2.333, 1.959, 2.000, 2.235 and 13.832 respectively were all significant in explaining awareness among the sampled households. Based on the findings of this study, policies towards education as well as ensuring respondents easy access to both formal and informal sources of credits should therefore be encouraged to increase awareness among the respondents. Youths especially females should be well trained on proper management (handling) of grass cutters and policies that increases household size among respondents should be pursued to enhance productivity. Furthermore, concerted effort should be made to increase awareness level of grass cutter farming through media platforms, especially radio and TV.

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