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Socio-economic and Institutional Factors Affecting the Adoption of Improved Breeds of Small Ruminants in Nigeria

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Abstract

The current paper examines the socio-economic and institutional factors affecting the adoption of improved breeds of small ruminants in Nigeria. Data were collected from one hundred and fifty (150) farmers through a multi-stage random sampling procedure from five Local Government Areas in Ondo State. Data retrieved were subjected to both descriptive and inferential statistics. Results showed that 68.7%of the farmers were between 31 and 50 years of age with 96.0%level of literacy. Results of the logistic regression model show that age of respondents, household size and feeding expenditure decrease the odds of adopting improved sheep and goats. However, results further reveal that adoption of improved small ruminants is positively impacted by herd size, farmer's monthly income, level of education, monthly visitations by extension agents and sources of information. The study, therefore, suggests that government should pursue policies that will promote level of education, herd size, income and extension services of small ruminants' keepers.

Keywords*: Socio-economic, binary logistic regression, small ruminants, Nigeria*

JEL Classification*: Q22 C25 C13 C83*

Nijerya'da Geliştirilmiş Küçükbaş Hayvan Irklarının Benimsenmesini Etkileyen Sosyoekonomik ve Kurumsal Faktörler

Özet

Bu çalışma, Nijerya'da geliştirilmiş küçükbaş hayvan ırklarının benimsenmesini etkileyen sosyoekonomik ve kurumsal faktörleri incelemektedir. Kullanılan veriler, Ondo eyaletindeki beş yerel yönetim alanından çok aşamalı rastgele örnekleme prosedürü yoluyla yüz elli (150) çiftçiden toplanmıştır. Elde edilen veriler hem tanımlayıcı hem de çıkarımsal istatistik yöntemlerine tabi tutulmuştur. Veriler çiftçilerin yüzde 68,7'sinin 31-50 yaşları arasında ve yüzde 96'sının okuryazarlık düzeyine sahip olduğunu göstermiştir. Lojistik regresyon modelinin sonuçları ise, katılımcıların yaşının, hanehalkı büyüklüğünün ve beslenme harcamalarının, geliştirilmiş koyun ve keçi ırklarının benimsenme olasılığını azalttığını göstermiştir. Buna karşın çalışma sonuçları, iyileştirilmiş küçükbaş hayvanların benimsenmesinin sürü büyüklüğü, çiftçinin aylık geliri, yayım acenteleri tarafından yapılan aylık ziyaretler ve bilgi kaynakları tarafından pozitif yönde etkilendiğini ortaya koymuştur.

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Bu nedenle çalışmanın, küçükbaş hayvan yetiştiriciliğinde büyük ölçeği, gençlerin katılımını ve yayım hizmetlerini teşvik edici politikalar izlemesi gerektiğini öne sürdüğü söylenebilir.

***Anahtar Kelimeler**: Sosyo-ekonomik, ikili lojistik regresyon, küçükbaş hayvan, Nijerya*

***JEL Sınıflandırması**: Q22 C25 C13 C83*

1. Introduction

Agriculture is the leading sector in term of employment generation in Nigeria. The percentage of labour participation in agriculture as a share of total workforce in Nigeria is approximately 35.1% in 2019 (Trading Economics, 2019). There are four major agricultural subsectors in Nigeria which comprise of crop production, livestock, forestry and fisheries. Livestock is the second largest contributor to the agricultural gross domestic product. It significantly contributed about 1.73% to the real gross domestic product in 2018 (Central Bank of Nigeria CBN, 2018). Livestock is an important source of food (protein) for many people throughout the world, from the Mediterranean to the Caribbean, from South Africa to South Asia. They also provide useful skins, and in some countries, valuable hair (Food and Agriculture Organization [FAO], 1990: 64). The majority of households in the savannah and the sub-humid zones of Africa own some livestock, be it cattle, sheep and / or goats, in addition to poultry. These animals contribute substantially to the quality of human diet as well as to the household economy (International Livestock Research Institute ILRI, 2005).

Livestock production is a very important segment of agriculture. It is referred to as one or more domesticated animals being raised in agricultural settings to produce commodities such as food, employment and income to the rural farm families. Livestock may be raised for subsistence or for profit (Enechi et al., 2012: 5). Not only do they play a significant role in socio-cultural aspects of the people but also, help to balance human nutrition (Adam et al., 2010: 39-66). Furthermore, Baruwa (2013: 44-50) also reported that livestock helps to boost the food security of a household, often being the only asset possessed by a poor family. In difficult situations, such as crop failure or family illness, sheep and goats can be sold and proceeds realized from it can be used to purchase food and drugs for family. Many resource-poor farmers have equally used income raised from sales of goats and sheep to sponsor their wards at schools. Among animals that make up livestock in Nigeria, small ruminant animals comprising sheep and goats, constitute the farm animals largely reared by families in the country agriculture's system. Nigeria has a population of 76 million goats and 43.4 million sheep (FMARD, 2017: 1-60).

Livestock accounts for one third of Nigeria's agricultural contribution to Gross Domestic Products [GDP], providing income, employment, food, farm energy, manure, fuel and transport. These are also one of the major sources of revenue for the government. Traditional livestock production in Nigeria is varied and complex.

Livestock, especially ruminants, are the most efficient users of uncultivated land and can contribute substantially to crop production (ILRI, 2005). In addition to the supplying of protein, livestock serves as a source of farm power in the northern savanna zone and organic manure to boost crop production, as well as their efficient utilization of otherwise unusable plants to produce meat, milk and other products (ILRI, 2005).

The challenges facing livestock industry in Nigeria are numerous. According to Bamaiyi (2013: 54-66), that increased pressure on grazing land, ineffective livestock marketing system, inadequate capital and production credit, inconsistence in government agricultural policies, high cost of livestock equipment, drugs, vaccine, and livestock feeds are major constraints to the development of livestock. Others are lack of efficient and hygienic livestock processing facilities, slow cattle growth and low milk yield and trans-boundary animal diseases in addition to migratory pests. But the greatest challenge in achieving food security in Nigeria so far has been inadequate funding as a paltry 3% of the budget was allocated to the sector up to 2007 while the provision was upped to only 7% in the year 2008 because of the ominous food inadequacy signal staring the Federal Government in the face (Ruma, 2008: 3). With the increase in human population especially in developing countries like Nigeria, there is a lot of demand for animal protein supplies. These demands are far from being met (Okuneye, 2002: 16-22).

In Nigeria, there is no rural home without at least one species of livestock, particularly goats and sheep or a local bird. Given this scenario, why then is the neglect of livestock extension? Anyanwu (1987: 2) noted that the reason could be attributed to the fact that many of the farmers are into crop production. According to Adekunle and Igodan (1990: 2-4), since the conception of extension services in 1910 in the South and 1912 in the Northern Nigeria, respectively, emphasis has been on crop production. Therefore, there is the need to change the orientation and perception of people towards livestock production. Animal breeding which is the application of scientific knowledge to the genetic improvement of animals has evolved from the beginning. Genetics provides the foundation principles which could guide animal breeding practice.

However, plans and programmes to improve the genetic merit of livestock must be drawn heavily on conditions from statistics, biochemistry, physiology, economics and other disciplines (Legates and Everett, 1990: 8-9). The task in animal breeding is two folds; to select the most desirable animals based on the prediction of genetic merit and to produce superior genotypes by combination of genetics through breeding plans and systems of mating. In the developing countries, there are several breeds of small ruminants with low potency. Windock International (1983: 116) opined that small ruminants in developing countries are less productive than those in developed countries.

FAO (2015)'s report is also in line with the earlier findings of Windock International (1983: 116) that most of the local breeds in Africa have poor genetic quality. It concludes that attempt to improve indigenous type by cross-breeding

have not been successful under traditional management system. Some of the exotic breeds of goats identified for this study are: Angora, Saanen, Ango-Nubian, Toggenburg and Alphine. Also, for sheep are Dorper, Blackhead, Persian, Merino and Wensleydare (ILRI, 2005). However, as versatile as livestock is, to the nations' economy and food security, many farmers are still used to rearing the indigenous breeds of animal types. Thanks for scientific breakthroughs that have developed improved breeds of such animals with better quality of products, vitality and longevity. The contributions of small ruminant animals to the food basket of Nigeria in term of meat and milk and the priorities given to their sustainability are disproportionate. It is therefore necessary to find out factors that constrain the adoption of high breeds of goat and sheep.

The main objective of this study is to examine the influence of socio-economic and institutional factors on the adoption of improved breeds of small ruminants in Ondo state, Nigeria. Specifically, the study is to: profile the socioeconomic characteristics of small ruminants' keepers; identify institutional factors influencing the adoption of improved breeds of small ruminants and examine farmers' perception on acceptability of improved small ruminant animal.

A number of empirical studies have been conducted particularly on the economics of livestock production, yet the impact of these researches in developing countries Nigeria inclusive, falls short of the total volume of researches conducted on small ruminant animals. For examples, an earlier study conducted in Nigeria showed that yearly income, education, farm size, source of credit, membership of association and type of livestock were major predictors of adoption rate of livestock management system (Mafimisebi et al., 2006: 183-186). In India, weight, sex and breed of small ruminant animals were found to be major determinants of their sale prices (Shivakumara, et al., 2019: 621-625). The study by Abdullahi et al. (2019: 1-13) reported that the sale return from sheep and goats is positively impacted by number of animals held per week. Offor et al. (2018: 7-11)'s study showed that age, household size, income and rearing experience determine production of small ruminants in Abia State, Nigeria. Similar study reported by Dossa et al. (2008: 581-592) concluded that gender, ethnicity and perception of risk related to species are major determinants of rearing goat and sheep in Southern Benin, though in Tunisia, flock size, education and off-farm were identified as factors affecting the adoption of innovative technologies by livestock holders (Dhraief et al.,2019: 1-18).

Past studies show that factors affecting small ruminant animals are location-specific. It varies from country to country and region to region. However, an investigation into the effects of socio-economic and institutional factors on adoption of improved breeds of small ruminants is still lacking. The implication is that relevant information necessary to formulate policy strategies on small ruminant animals is still scanty. This present paper, therefore attempts to add to the existing

literature on adoption and food security studies to fill the vacuum created by the past researches.

It is also pertinent to ask if farmers are not aware of improved breeds. If they do, why are they not raising improved breeds of small ruminants? The decision to adopt a technology is a complex process. Farmers will have to weigh the benefits and consequences associated with individual technology package before adopting to see if the advantages in the present innovation outweigh the existing technology. A number of factors are interplayed when it comes to adoption or non-adoption. Therefore, such factors could be economic, institutional, environmental and cultural related factors.

The rest of this paper is organised as follows. Section 2 discusses theoretical framework, while Section 3 presents materials and methods used. The results of the findings are interpreted and discussed in section 4 while section 5 presents the conclusion and recommendations for further policy.

2. Theoretical Framework

2.1. Random Utility

Utility is a benefit a ruminant keeper *n* can derive from choosing an improved ruminant *i* from a choice set of alternative *J*. Every farmer is assumed to be a rational decision maker relative to his/her choice. Consider a livestock keeper *n* who is confronted with the adoption decision on improved small ruminant animals, the decision to adopt or not of such a technology can be described as a discrete choice. The decision of individual to adopt the innovation depends on his perceived utility about the product and the farmers' characteristics. The utility maximizing behavior of the farmer is reached when the utility associated with option *i* exceeds the utility he/she can derive from not adopting an innovation. Mathematically, adoption will only occur if

$$U_{ni} > U_{nj} \qquad \forall_j \neq i \tag{1}$$

where, U_{ni} is the utility of individual n adopting i

U_{ij} = is the utility of individual *n* for adopting alternative j

But let us consider a researcher who is investigating a discrete choice. The choice of the individual depends on many factors. Some of the factors are observable and some are not observable. This utility decomposes into various components that depend on factors that are observed the researcher. The observed factors normally include the farmers attributes and the characteristics of the technology while the other part of the equation is the unobservable attributes that are considered less important in this study. The linear form of this model can be written as

$$U_{ni} = \beta z_{ni} + \varepsilon_{ni} \tag{2}$$

We can deduce equation (3) from 2 as

$$z_{ni} = z(X_{ni},\ S_n) \tag{3}$$

From equation (3), z_{ni}= a vector of observed variables relating to alternative *i* for individual household that depends on the attributes of the alternative, X_{ni} = vectors of attributes describing interaction between alternatives *i* and *j*, respectively. S_n = vector of individual characteristics that influence his/her choice. β= is the vector of the coefficient of observed variables while ε_{ni} = vector of random component that captures the effects of all unobserved variables that affect individual choice Bateman et al. (2002)

The conditional probability of his choice then becomes.

$$=P(i/C_n) = P_r\left(\bigcap_{j\neq i} \beta z_{ni} + \varepsilon_{ni} > \beta z_{nj} + \varepsilon_{nj},\right) \quad (4)$$

$$=P\left(\bigcap_{j\neq i} \varepsilon_{nj} - \varepsilon_{ni} < \beta z_{ni} - \beta z_{nj},\right). \quad (5)$$

Given β, the choice probability is the probability that $\varepsilon_{ni} - \varepsilon_{nj}$ are below the respective quantities$\forall_{j\neq i}$: $\beta z_{ni} - \beta z_{nj}$. Different choice models depend on the assumption about the distribution of error term for all *i* and different treatment of β. In this study, we assume that our random component is logistically distributed.

3. Methodology

The study was conducted in Ondo state, Nigeria. The State has a population of 3.4 million people (National Population Commission [NPC], 2006). With respect to the climate of the state, it is tropical with two distinct seasons of rainy and dry seasons. The study area is characterized with moderate temperature between 23^0-26ºC (Adejumo, 2008: 91). The state is divided into 18 Local Government Areas (L.G.As). The state is blessed with 12 diurnal sunshine hours and annual rainfall varies from 2,000mm in the southern parts to 1,150mm in the northern extremes. Sequel to the favourable climate condition of the state, the people engage in livestock production such as Cattle, Sheep, Goat, Piggery, and Poultry.

The study was conducted between July/September, 2019.A multi-stage sampling technique was employed to select small ruminants' farmers in this study. Five out of the eighteen Local Government Areas (LGAs) of Ondo State which are prominent in small ruminant production (sheep and goats) were purposively selected for this study. The Local Government Areas were Akure north, Owo, Ose, Akoko southwest and Okitipupa. A random sampling technique was used to select three communities from each LGA, making a total of 15 communities that were chosen. Each community was divided into five wards from which two were randomly selected. From each selected ward, five respondents were randomly interviewed, giving a total of 10 respondents per community and 150 for the study. Primary data was used for this study. The primary data were collected by interviewing farmers with a well-designed and pre-tested questionnaire to ensure its reliability. Data collected from the field survey were analyzed using descriptive and inferential statistics on SPSS version 25.

3.1. Econometric Model

i. Binary Logistic Regression Model

The binary logit/probit models are widely used economic tools in adoption studies with a dichotomous dependent variable such as adoption versus non-adoption. The choice between these two models is often based on computational convenience and easy interpretation of the parameter estimates through its odds ratio. The difference between logit and probit lies on the distribution of their functional forms and assumption builds around the disturbance term. Probit and logit usually give similar results when estimates are compared. The two modes can only be differentiated by considering the distribution of their dependent variables. Probit assumes that the dependent variable follows cumulative normal distribution while logit is logistically distributed. We, therefore, use binary logit model in this study because the dependent variable of the model is dichotomous. Secondly, the computation and interpretation are easy (Gujarati, 2003: 501). Several studies have used binary logit model to analyse data on adoption of technologies (see Dhraief et al., 2019: op cit; Johnson, Ajibefun and Adetarami, 2018: 99; Dossa et al., 2008, op cit; Ladular, 1990: 258-268). Following Guajarati (2003: op.cit), binary logit model is written as

$$\text{In}\left(\frac{\text{P}}{1-\text{P}}\right) = \text{Z}^{*}_{\text{i}} = \frac{1}{1+exp^{-(\beta_0+\beta_i X_i+\varepsilon_i)}} \quad (6)$$

Where, Z^*_i = latent dependent variable

$\ln\left(\frac{P}{1-\text{P}}\right)$ =Log of odds ratio of adopter/non-adopter

In = natural logarithm

P_i = Probability of adopting improved breeds of sheep and goat

1-P = Probability of not adopting improved breeds of sheep and goat

β_i = column vector of unknown parameters to be estimated,

β_0=constant,

X_i = a row vector of explanatory variables

The reduced form of equation (2) can be rewritten as

$$Z_i^{*} = \beta_0 + \sum_{k=1}^{J}\beta_j X_i + \varepsilon_i, \quad \begin{cases} if\ J > 0, & Z_i^{*} = 1 \\ otherwise & Z_i^{*} = 0 \end{cases} \quad (7)$$

ε_i = vector of unobserved random effect.

ii. Description, Measurement of Variables and A Priori Signs.

Z* = 1, if farmers adopt improved breed of small ruminant,

Z* =0, if farmers do not adopt improved breed of small ruminant.

X_1= Age of farmers (in year) (±)

X_2= Household size (in number) (+)

X_3= Level of education (number of years spent in schooling) (+)

X_4 = Herd size (number of animals available) (+)

X_5= Monthly income (₦, Nigeria currency) (+)

X_6 = Feeding expenses on animals (₦/kg) (-)

X_7 = Number of time an extension agent visited farmers (+)

X_8 = Membership of a group (yes = 1, 0 otherwise) (±)

X_9= Sources of information on improved breeds of Sheep and Goats (Extension agent = 1, 0 otherwise) (+)

ε_i = Error term[5]

4. Results and Discussion

4.1. Socio-economic Characteristics of Small Ruminant Animal Keepers

The results in Table 1 reveal that pools of 68.7% of the small ruminant keepers are between the ages of 31 and 50 years. This implies that they are in their middle aged thus showing that most of them are still very active in livestock production. Thus, 70.0% of the respondents are female households while 30.0% are male households. The dominance of the female over the male may be attributed to the fact that female have more time in keeping few numbers of small ruminants than their male counterparts in the study area. This is contrary to the findings of Faizal and Kwasi (2014: 309-321) and Offor et al. (2018: 7-11) that reported that more male farmers compared with female counterparts were principal keepers of sheep and goats in Northern Ghana and Abia State, Nigeria, respectively. However, 60.0% of the respondents are married. In addition, 50.0% have their family sizes of 1-5 people. 96.0% of the respondents have one form of education or the others, suggesting that respondents will be able to read and understand instructions require technical expertise in animal husbandry. Moreover, about 56.7% of the small ruminant keepers possess 1-10 herd size of sheep and goats. Thus, majority (79.3%) of the respondents fall within the range of less than ₦100,000 as their monthly income. In addition, majority (80.3%) of the respondents usually spend less than ₦10,000 on small ruminants' feeds, therefore, they may not be able to embark on large animal husbandry in the study area.

[5] Note: In SPSS version 25.0, the exponential (Exp (β) of the slope coefficient β_j associated with the explanatory variables (X_1-X_9) is interpreted as the odds ratio (OR) of the occurrence of the events for an increase in each of the explanatory variables while holding other constant. A positive coefficient will always give an odds ratio greater than 1, otherwise less than 1.

Table 1: Socioeconomic Characteristics of Small Ruminants Farmers (n= 150)

Characteristics	Categories	Percentage (%)
Age	31-40 years old	30.7
	41-50 years old	38.0
Gender	Male	30.0
	Female	70.0
Marital status	Married	60.0
Household Size	1-5	50.0
Education	Primary School Education	52.7
	Secondary School Education	25.3
	Tertiary School Education	18.0
Herd Size	1-10	56.7
Monthly Income	Less than ₦100,000	79.3
Monthly Expenditure	Less than ₦10,000	80.3

*note: for monthly income and expenditure: US$1 = ₦380

Source: Field survey, 2019

4.2. Institutional Factors of the respondents

Our results in this study show that farmers' sources of information are mainly from fellow farmers (69.3%). Therefore, there should be more mobilization of extension agents to provide relevant information to the farmers with respect to improved livestock breeds.

Revelation from our results also shows that about 64.3% of the small ruminant keepers have no access to extension services while 35.7% have. Findings indicate that over 64.7% of the respondents are not visited at all by extension agents in the study area. Similarly, 24.7% of the respondents have contact in group with agricultural extension agents while on individual contact basis with extension agents accounts for 10.6 % of the total sample.

About 67.3% of the respondents are not members of any group while the remaining 32.7% belong to one form of association or the others. The reason for not being in any association may possibly be due to the lack of interest, lack of awareness or different in ideology.

4.3. Farmers' Perceptions on Acceptability of Improved Breeds

Information in Figure 1 shows the perceptions of small ruminant farmers towards acceptability of improved breeds of small ruminants, using five points Likert Scale of Strongly Agreed, Agreed, Undecided, Disagreed and Strongly Disagreed. There were ten statements in all. Values of 5,4,3,2 and 1 (and/or the reverse) were assigned depending on the working of the statement whether positively or negatively as depicted from the results below. Hitherto, percentages were used to score the statements.

The results indicate that 38.7% of the respondents are undecided to the first statement. This implies that many small ruminant keepers neither agreed nor disagreed that improved breeds give more yield than the local types.

Secondly, it was stated that period of parturition and maturity of improved breeds is too long; 30.0% and 28.0% of the respondents disagreed and strongly disagreed with the statement, respectively. Therefore, they believe that period of parturition and maturity of improved breeds is short, and this would influence their acceptability.

The third statement reads that local types are highly resistant to diseases than improved breeds; 38.7% and 42.0% of the respondents strongly agreed and agreed to the statement. The final judgment of this statement can be concluded that majority will not accept improved breeds with the belief that local ones are highly resistant to diseases.

In addition, based on the findings, 38.7% and 44.6% of the respondents strongly agreed and agreed, respectively to the statement that improved breeds are costlier than local types. This is a positive statement, with the affirmation that improved breeds are costlier. This implies small ruminant keepers may still accept improved breeds due to their value.

Furthermore, 32.7% and 40.0%of the respondents strongly agreed and agreed, respectively to the statement that improved breeds are too sluggish. As the majority fall to these categories, they may not accept improved breeds with this character.

Also, 28.0%of the respondents disagreed that local breeds have better taste. Moreover, 32.7%of the respondents are undecided to the statement that they would not bother themselves about improved breeds.

Also, the analysis in Figure 1 reveals that 22.7% and 27.3% disagreed and strongly disagreed, respectively to the statement that they could save more time and cost in production if they were to raise improved breeds. This is a positive statement, with the affirmation that improved breeds do not reduce time and cost of livestock production. This implies that they may not accept improved breeds.

In addition, 28.7%of the respondents could not on the statement that feeds for local breeds are more readily available. Finally, 76.7% of the small ruminant keepers strongly agreed that acceptability of improved breeds will jack up their income.

The general level of acceptability based on the assessment of all the ten statements, only three (3) statements were totally agreed with by the respondents. Since three statements were agreed with by the respondents, more enlightenment about the qualities and advantages of improved breeds of small ruminants is needed, and this can be achieved through the help of extension agents.

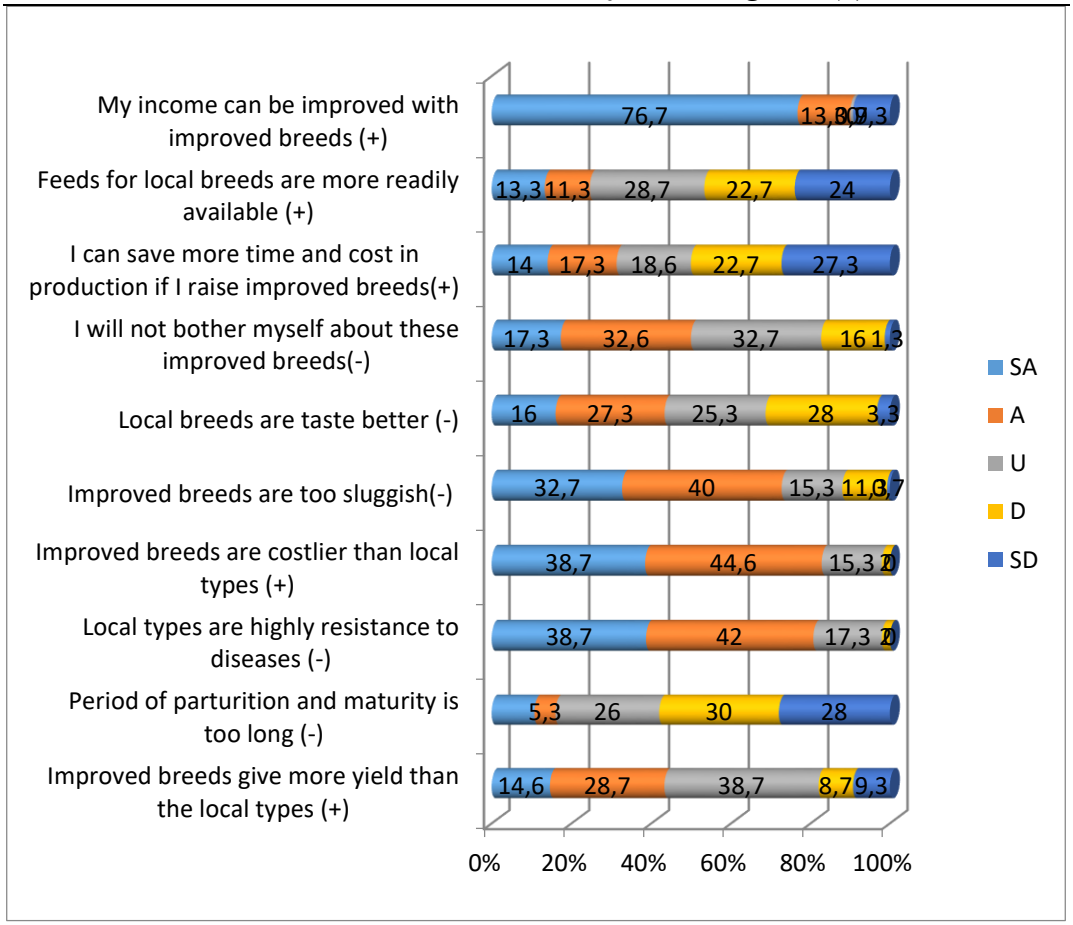

Figure 1: Farmers' Perceptions on Acceptability of Improved Breeds

Key for interpretation: SA= Strongly Agreed, A= Agreed, U=Undecided, D=Disagreed, SD= Strongly Disagreed, P= Positive Statement, N= Negative Statement, % = Percentage, Freq. = Frequency.

For marks assigned to positive statement (+ve): SA=5, A=4, U=3, D=2, SD=1.

Marks assigned to negative statement (-ve): SA=1, A=2, U=3, D=4, SD=5.

Source: Field survey, 2019

4.4. Logistic Regression Results for Factors Affecting Improved Breeds of Small Ruminants

Table 2 shows the parameter estimates and odds ratio estimated from binary logit model. A stepwise logistic regression method was employed to obtain key socio-economic and institutional factors influencing the adoption of improved breeds of sheep and goats. The F-statistics with a value of 112.344 and $p<0.01$ shows that all explanatory variables included in the model exerted a significant impact on the adoption of improved breeds of small ruminants. The Pseudo R^2 estimated in this model is 0.817 and the percentage correct classification is also 72%. The pseudo R^2

implies that about 81.7% of variations in adoption of small ruminants are explained by all variables fitted into the model using maximum likelihood estimation method (MLE) in the logistic regression model. To further confirm the suitability of using logit model in this study, the Hosmer and Lemeshow test was not violated with a p-value greater 5% probability level. Our discussion in this study is based on the odds ratios estimated from logit coefficients because the parameter estimates of logit model cannot be interpreted directly (Gujarati, 2003).

As displayed in Table 2, out of nine (9) regressors postulated, eight (8) are found to have significant effects on the adoption of improved breeds of small ruminants. The predictors in the model are discussed as follows:

Age of respondents

Age of the respondent in this study has negative association with the adoption decision at the 1% level of significance. This result is consistent with the existing literature that older farmers are risk averse and have little interest in long term investment compared to young farmers. The estimated coefficient is negative (-0.208) and the corresponding odds ratio is 0.81. The implication is that an addition of one year to the age of the farmer, all things being equal, decreases the odds of adopting improved small ruminant animals by 19% (i. e. the percentage of one less 0.81) compared to the odds of non-adopter. This finding is similar to the finding of Dhraief et al. (2019: op cit)in Tunisia but contrary to the earlier study conducted in Southern Benin that an addition to age of farmer increases the odds of owning goat and sheep (Dossa et al., 2008: op cit). In the study, goats are commonly reared through extensive system where the owner gives little food especially the remnants or left over of their foods and allow them to walk around either within a fenced or fenceless building. Goats are believed to be stubborn, so the aged farmers may find it difficult to look for them especially when they fail to come back to their tents. However, the young farmers are physically strong to look for or chase and return them home. It is very difficult to get hold of goat unlike sheep when goat loses from where it is tethered. The male goat is an adventurous animal it is common with male goat to look for female goat outside its vicinity and, in the process many of them have gone astray. The older farmers may show little interest in adopting improved breeds.

Household size of respondents

The influence of household size on the adoption of small ruminants turns out to be negative at the 1% level of significance. The negative sign is contrary to our *a priori* expectation. We expect that the higher the family size, the greater the opportunity of having access to more family labour and hours at work in the routine management of small ruminant animals. The logit coefficient estimated is negative (-0.248), and the corresponding odds ratio is less the one (0.78) which indicates a decrease in the probability of adopting improved breeds of small ruminants. Thus,

an additional member to a household decreases the odds of adopting improved small ruminant by 22% (i.e. the percentage of one less 0.78) compared with a respondent with a large household size. The result fails to support the finding of Jera and Ajayi (2008) on logistic modeling of smallholder livestock farmers' adoption of tree-based fodder technology in Zimbabwe.

Education level of respondents

Education of respondents matters a lot in adoption of technologies because it creates awareness and takes away ignorance. Ability to read and write makes it easy to scrutinize and weigh future benefits associated with high or exotic breeds in small ruminant in our own case here. Result of educational level of household head is positively and statistically significant at 1% level of probability. The coefficient of the variable is theoretically consistent with our *a priori* expectation. The logit coefficient and odds ratio were 0.12 and 1.13, respectively. The odds ratio is greater than one which indicates that a farmer is more likely to raise improved breeds of goat and sheep. The result also implies that additional year a respondent spends in schooling, the odds of adopting improved breeds of small ruminant will increase by 1.13 times higher than the odds of uneducated farmers. The result here agrees with the finding of Dhraief et al. (2019: op cit) on adoption of innovative technologies.

Extension contact

Extension service is an institutional body linking research institutes and farmers together with the aim of taking current agricultural innovations from research point to farmers**.** The positive correlation between extension service and adoption of improved small ruminant breeds is expected. The coefficient is statistically significant at the 1% level. This finding reflects the dependability of farmers on agricultural extension workers on information. An additional extension visit received by a farmer will increase the odds of adopting improved breeds of small ruminants by 1.12 times the odd of non-visited farmer in the study area.

Sources of information on improved small ruminant

According to Agbamu (2006: 1), many studies in the developing countries have identified agricultural extension agents as the most important source of information to farmers on agricultural innovations. Sources of information had a positive influence on the adoption of improved breeds of small ruminants in the study area. The result is consistent with our earlier *a priori* expectation in this study. Adequate information is one of the major prerequisites for wide spread of acceptance of agricultural innovations. Agbamu (2006: 1) argues that farmers are well exposed to various sources of information like the use of radio, television, access to agricultural journals, newsletters and newspapers. These are expected to facilitate the acceptability of innovations than those that are not exposed to multi-media system. This implies that, the more the farmers have access to agricultural information, the higher the adoption of improved breeds of small ruminants. Similarly, an additional source of information received by small ruminant farmer, all things being equal,

will increase his/her odds of adopting improved breeds of small ruminants by 1.18 times the odd of farmers without an access to information in the study area.

Monthly income of respondents

Similarly, monthly income was positively and consistently related to adoption decision and thus shows that an additional income received by farmer, the probability of adopting improved breeds increases by 45% while the odds of non-adopters decreases. There is a tendency that the monthly income will increase and this will bring higher potential for the farmers to adopt improved breeds of small ruminants. Also, the more the farmers' monthly income increases, the more they would be able to afford the cost of improved breeds of small ruminants they desire. Capital is needed to purchase livestock equipment, drugs, vaccines and feeds required to raise improved breeds of small ruminants.

Feeding Expenses on goat and sheep

Feeding expenditure incurred on animal feeds has a negative influence on adoption of improved breeds of small ruminants at 1% level of probability. So, a reduction in the cost of feeding animals justifies the adoption of improved breeds of small ruminants in the study area, otherwise farmer will be less likely to adopt technology package of small ruminants because farmers adopt when they find out that benefits from new technology is greater than existing technology. The result indicates that a one unit increase in feeding expenditure, the probability of adopting improved small ruminant breeds decreases by 63% compared with non-adopter.

Herd size

The result in Table 2 shows that herd size controlled by farmers is an important predictor for adopting improved breeds of small ruminants. This variable is positively and significantly related to the adoption of improved breeds of small ruminant at the 1% probability level. The coefficient of herd size is 0.146 and the corresponding odds ratio of 1.157 is greater than one. The positive sign for this variable is theoretically and consistently agreed with the study *a priori* expectation. This implies that farmers with large scale of small ruminants are more likely to adopt improved breeds of small ruminants compared with farmers that have few ruminant animals. The result indicates that increasing herd size by a unit, *ceteris paribus*, the odds of adopting improved breeds will increase by 16% compared to non-adopter. The result is similar to the findings of Jera and Ajayi (2008) in Zimbabwe.

Table 2: Empirical Result of the Binary Logistic Regression Model.

Variable	Coeff.	Std.err.	Z-stat.	Exp(β) OR
Constant	3.31	0.298	11.10***	27.3

Age of respondent	-0.21	0.028	-7.43***	0.81
Household size	-0.25	0.030	-8.27***	0.78
Level of education	0.12	0.024	5.17***	1.13
Extension contact	0.11	0.021	5.43***	1.12
Membership of a group	-0.14	0.289	-0.49	0.87
Sources of information on improved breeds	0.16	0.033	4.94***	1.18
Monthly income	0.37	0.037	10.00***	1.45
Feeding expense on animals	-0.46	0.059	-7.75***	0.63
Herd size	0.15	0.027	5.41**	1.16
Model fit summary				
F-statistics	112.344***			
'% Correct classification	72.0			
McFadden' s Pseudo R^2	0.817			

-2Log likelihood = Omnibus test of model coefficients: χ^2= 61.22***, Hosmer and Lemeshow test: = χ^2 = 9.89 P = 0.331, ***, **, * Sig. at 1%, 5% and 10%, respectively.

Source: Field survey, 2019

5. Conclusion

This study is conducted on socio-economic and institutional factors affecting the adoption of improved breeds of small ruminants in Nigeria. Findings in the study showed that majority of the respondents are in their middle aged which indicates that most of them are still very active in small ruminant production. Our study also shows that female respondents dominate the rearing of small ruminants.

Most respondents are educated, suggesting that respondents would be able to read and understand instructions require technical expertise in animal husbandry and other management practices relevant to improved breeds of small ruminants. The findings show that ruminant keepers in the study area have access to extension services once in a month. However, farmers' sources of information are mainly through fellow farmers.

Further scrutiny of the results, show that most of the respondents earn a monthly income less than ₦100,000, this income is low relative cost of production and this study concludes that low income may constitute a stumbling block to the adoption of improved breeds of small ruminants. Farmers' monthly income plays significant roles in livestock production because, such income will determine the level of production and will also enhance the clienteles' level of judgment in adopting new improved breeds of small ruminants.

According to farmers' perception on acceptability of improved breeds of small ruminant, the majority of the respondent strongly agreed that adoption of improved

breeds will increase their income. But farmers fail to support that period of parturition and maturity of improved breeds of small ruminant is too long.

The study concludes that household size, herd size, level of education, farmer's monthly income, extension contact are factors that positively predicted adoption of improved breeds of small ruminants in the study area. The importance of education and high income cannot be overemphasized in agricultural project. Adoption of improved breeds of small ruminant relies so much on the level of education and better income in such that there will be higher return to compensate farmers' efforts. Frequent visitation of extension agent to his clientele, will help farmers to receive updated information on sheep and goat managements.

Based on our findings, it is therefore, recommends that policies and programmes that will promote education, extension services, level of income of small ruminant keepers, herd size and sources of information should be pursued by both government and private sectors. Therefore, the policies will motivate farmers to embrace improved breeds with good husbandry and effective management practices in order to revive degenerated and abandoned old methods of raising small ruminants for increased production. Also, the programmes will sustain and promote improve breeds of small ruminants production in Nigeria.

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