Nigerian J. Anim, Sci. 2024, 26 (1): 75-88

Assessment of food security status of small ruminant producing households in Ogun state, Nigeria

[1*]**Coster, A.S.,** [2]**Akintunde, O. K.,** [1]**Afolayan, S. A.,** [1]**Ayodeji, O.O. and** [1]**Oloyede, T.O**

[1]*Department of Agricultural Economics and Farm Management, Federal University of Agriculture, Abeokuta, Ogun State, Nigeria*
[2]*Department of Agricultural Economics and Agribusiness Management, Osun State University, Osogbo, Osun State, Nigeria*

Corresponding author: *costeras@funaab.edu.ng Phone: +2348023016643*
Target Audience: *small ruminant producers, rural communities and policy makers*

Abstract

The study *was carried out to assess the food security status of small ruminants (sheep & goat) producing households in Ogun State. A total of 120 small ruminant producing households were selected through a multistage sampling procedure from Ilaro Agricultural Development Zone (ADP) in Ogun State. Data were analyzed using descriptive statistics, Ordinary Least Square (OLS) and Logit regression model. Result showed small ruminant production is male dominated, with an average age of 47 years and average household size of 5 persons. 29.2% of the household head had no formal education. 47.5%, 13.3% and 39.2% of the farmers reared goats only, sheep only and both sheep and goats, respectively. OLS result indicated that small ruminant production were influenced by gender ($p<0.01$), age ($p<0.01$), credit access ($p<0.1$), off- farm income ($p<0.05$), management system (($p<0.05$), and prevalence of diseases outbreak ($p<0.01$). Analysis of food security status revealed that food security incidence, gap and severity were 0.62, 0.278 and 0.07 respectively. Logit regression result showed that the relevant and significant factors that determined household's food security status were gender, household size, credit access, off-farm activities and herd size. It is concluded from the study that, majority of the farmers were living below the food security line and that small ruminant production contributes positively to household food security status. The study recommended policy intervention that provides credit support, disease prevention and control mechanism for small ruminant farmers.*

Key words: food security; households; logit regression; small ruminant

Description of problems

Food security is widely acknowledged to be a complex phenomenon. A number of indices that track hunger and its eradication efforts have made it easier to comprehend the problem, track its progress, and set goals for both domestic and global political action [1]. It is challenging to define and measure food security. According to [2] there is food security "when all people have physical, social, and economic access to sufficient, safe, and nutritious food that

meets their dietary needs and food preferences for an active and healthy life at all times." Many people in sub-Saharan Africa do not have this status. Patrick et al. [3] reported that food security has three central concepts: food availability, food access, and food utilization yet it was still not a universally accepted tool of measurement. The access component of food security, or the factors influencing a household's capacity to be food secure, was the main focus of this study. For the vast majority of families who suffer from food insecurity, malnutrition, and deficiencies in micronutrients, small-scale agriculture is their main source of income.

In Nigeria, the ownership of small ruminants differs from households, and community. The common small ruminants found in many villages and rural communities in Nigeria are sheep and goats. Livestock contributes to rural economies in a variety of ways, including supplying food for subsistence, bolstering complementary activities like the supply of manure or draft power, acting as a hedge against fluctuations in other sources of income during the year, and offering certain assets [4]. As noted by [5], the communities' non-livestock owners could also gain from them by having their dung collected for free, getting gifts of milk and meat, and having their arable land ploughed. According to [6], small ruminants hold significant value in a diversified approach that endeavors to mitigate market and climate-related risks while optimizing the utilization of accessible resources. Sheep and goats are among the most common small ruminants in Nigeria's rural, urban, and peri-urban areas, accounting for about 63.7% of all grazing domestic animals in the country [7]. However, the small ruminant production enterprise is faced with challenges and associated risks which had made a lot of private investors to stop or reduce their investment in small ruminant production. Rural people, particularly smallholder farmers also consider the risks associated with a farming activity [8]. Risks in livestock keeping arise from uncertainty about outbreak of diseases, death or theft of the animals and in turn pose a threat on the food security of the country. The benefits of keeping a particular species of livestock can be perceived differently by livestock keepers depending on their attitude towards risk. In this context, it was reported by [9] that one of the government's policies was to encourage the private sector economy to concentrate on the production of poultry, swine, small ruminants, and micro livestock. The role of small ruminant production cannot be overemphasized in the economy of Nigeria, since majority of Nigeria diets contain meat produced from small ruminants. Considering the nature of its marketability and value, small ruminant production is a lucrative enterprise in livestock production with many benefits that could help the producing household and the community to achieve food security if appropriate production system is being adopted. Therefore, it becomes imperative to examine the factors influencing small ruminant production and assess the food security status of the producing households in the study area. This will guide policy interventions by government to achieve the cardinal focus of SDG 2 (creating a world free hunger by 2030). The ongoing rise in hunger and food insecurity, which is caused by a complex interplay of factors, requires immediate attention and coordinated global efforts to address as a critical humanitarian challenge.

Materials and Method

Study area

The study was carried out in Ogun State, which has a total land area of 16,409, 26 square kilometers and is situated in the southwest region of Nigeria, is entirely tropical. Its borders are as follows: the Benin Republic to the west; Lagos State and the Atlantic Ocean to the south; Ondo State to the east; and Oyo and Osun State to the north. Ogun State has a tropical climate, with the rainy season beginning in March and ending in November, and then the dry season. The state's mean yearly rainfall varies from 128 cm in the southern region to 105 cm in the northern region. July has an average temperature of 23oC, while February has an average temperature of 32 oC. The state's central region is covered by a belt of rain forests, while the northern portion mostly consists of derived savannah vegetation. The state's geographical area is made up of savannah land in the northwest that is ideal for raising cattle as well as vast areas of fertile soil that are good for agriculture. Along with large forests, rivers, lagoons, rocks, mineral deposits, and an oceanfront, there are other features. The State has population of 3,751,140 and 20 local government area [10]

Sampling procedure

The sampling techniques employed for this study was multi stage sampling technique. In the first stage, Ilaro zone was purposively selected from the four zones of Ogun State Agricultural Development Programme (OGADEP) due to large concentration of small ruminant production among the rural communities in the zone. In stage two, two blocks were randomly selected from the zone i.e Ado-Odo and Ipokia blocks. In the third stage, seven cells (four cells from Ado-Odo and three cells from Ipokia) were selected proportionate to the size of the blocks. Lastly, one hundred and third five (135) small ruminant producers were randomly selected proportionate to the size of the population of small ruminant farmers, out of which, fifteen of the questionnaires were found unsuitable for analysis, thus a total of 120 questionnaires were analysed and reported for the study.

Analytical technique

The analytical tools used in this study were descriptive statistics, Ordinary least square regression (OLS), FGT food security index, and logit regression.

Descriptive Statistics was used to analyse the socio-economic characteristics of small ruminant producers in the study area, such characteristics including age, sex, marital status, household size etc., years of experience etc.

Ordinary Least Square (OLS) regression

OLS regression analysis was used to determine the factors influencing small ruminant production. The multiple regression equation was estimated using four functional forms namely: linear, semi log, exponential and double log.

Model specification

Where;
Y = Small ruminant production (herd size)
X1 = Gender of Herd owners (1 = male, 0 = otherwise)
X2 = Age (years).

X3 = Household size (number of persons living in the same house and eating from the same pot)
X4 = Education (years)
X5 = Access to credit (1= yes, 0= no)
X6 = Income from small ruminant production (Naira)
X7 = Off-farm income (Naira)
X8 = Management system (1= extensive, 0= otherwise)
X9 = Production experience (years)
X10 = Prevalent of disease outbreak (number of occurrence)
e = disturbance error term, assumed to be independently and normally distributed.
β_0 ---β_{11} = Co-efficient of regression estimate
X_1 ---- X_{10} = independent variables

Foster-Greer-Thorbeeke (FGT) Model

The analysis in this study used the per capita household expenditure as a measure of welfare and for determining the insecurity line.

[11] index was used to determine insecurity levels among the respondents. It is generally given as:

$$P = \frac{1}{N}\sum_{i=1}^{q}\frac{(z - yi)\,\alpha}{z} \quad \text{---------- (2)}$$

Where:

P = Foster, Greer and Thorbecke index ($0 \leq P \leq 1$)
N = total number of respondents i.e. farm households sampled
q = number of respondents below the insecurity line i.e. insecure people
z = the insecurity line
Yi = per capita household expenditure of the ith respondent.
α = non-negative insecurity aversion parameter (0, 1 or 2). The analysis of the insecurity status of the households were decomposed into the three indicators i.e. prevalence of insecurity (P0), insecurity depth (P1) and severity of insecurity (P2).

If α = 0, the index become P0= q/n. This gives the head count ratio or the incidence of insecurity which is the percentage of respondents who are insecure i.e. whose per capita expenditure is below the insecurity line.

If α = 1, it reflects both incidence and depth of insecurity or the proportion of the insecurity line that the average insecure will require to attain to the insecurity line.

If α = 2, the index measures the severity of insecurity which is the mean of square proportion of the insecurity gap. When multiplied by 100, it gives the percentage by which an insecure household's per capita expenditure should increase to push them out of insecurity.

Logit regression model

In order to assess the food security status of small ruminant producing household sampled for this study, a logistic regression model was carried out. The model was chosen because of the dichotomous dependent variables and because the model has no restrictive distribution assumption.

The logistic (logit) probability function is given as

$$P_I = \frac{1}{1 + e - z_I} = f(Z) \quad \text{---------- (3)}$$

Where Pi is the probability that a producing household i (i = 1, 2 … n) was food secure. Index Zi is a random variable which predicts the probability of a producing household being food secure or non-food secure. The probability Pi in equation 3 is further transformed to give equation 4.

$$P_i = \frac{ez_i}{1 + ez_i} \quad \text{---------- (4)}$$

Therefore for the ith observation, a producing household was

$$Z_I = \frac{InP_i}{1 - P_i} \quad \beta_0 + \sum \beta_0 X \quad \text{---------- (5)}$$

Therefore, ln(P/1-P) = 1, if the producing household is food secure while ln(P/1-P) = 0, if otherwise Implicitly, the model is empirically estimated as:

Where;
Y = Food security status of small ruminant producing household (1= food secure, 0 otherwise).
X1 ---- X11 was as previously defined in equation 1
∂ 0 ---∂ 11 = Co-efficient of regression estimate

Results and Discussion

Table 1 presents the socioeconomic characteristics of small ruminant producers in the stud area. Result shows that 70.8% of the respondents were male and 29.2% were female. This implies that small ruminant production in the study areas were dominated by men. About 12.5% of the respondents were less than 30 years of age, 47.5% were between the age 31 and 50 years and 40% of the respondents were above 50 years of age. The mean age of 47.1 years indicates that small ruminant producers were mainly the middle aged group of the population. Majority (83.3%) of the respondents were married, 10.8% were single and 5.8% were no longer in marriage. This show an evidence of responsibility on the sampled respondents. The mean year of rearing experience implies that majority of small ruminant producers had been in the rearing business for long time, thus may use the accumulated years of rearing experience to improve the rearing practices and increase their productivity. Educational level of the sampled shows that 37.5% of ruminant producers had no formal education, 35% had primary school education and 27.5% had above primary education. This implies that majority of the respondents are literate which may positively enhanced their response ability to adopt new innovative technologies in farming practices introduced to them by the extension agents.

Table 2 presents the farm and institutional characteristics of small ruminant production in the study area. Result shows that the average herd size per household was 6.53, with nearly half of the respondents kept goat only, 13.3% kept sheep only and 39.2% kept both goats and sheep. Ruminant producers practiced the three management system known in literatures with variations i.e extensive, semi-intensive and intensive with 58.3%, 26.7% and 15% respectively. It was observed that extensive management system took higher percentage because of the high cost of concentrate feeds which is unaffordable by the ruminant farmers. This is in agreement with the findings of [12] and [13] who reported that majority of Nigeria farmers practiced extensive management system because it is simple and easy to manage with reduced feeding costs. However, grazing the sheep and goats on the entire pastures and free range system comes with its own disadvantages as the animal are exposed to predators, theft and diseases. The type of housing structures the respondents used to rear their animals reveals that majority (79.2%) are constructed from wooden material, 15% used concrete cement

Table 1. Socioeconomic characteristics of small ruminant farmers (n = 120)

Variables	Frequency	Percentage	Mean	SD
Gender				
Male	85	70.8		
Female	35	29.9		
Age (years)			47	14.1
<30	15	12.5		
31-50	57	47.5		
>50	48	40.0		
Marital Status				
Married	100	83.4		
Single	13	10.8		
No longer in marriage	7	5.8		
Household size (number)		5.92		2.75
1-5	47	39.2		
6-10	66	55.0		
>10	7	5.8		
Rearing experience (years)		9.68		8.72
1-10	70	58.2		
11-20	37	30.9		
>20	13	10.9		
Educational level (years)		14.9		5.6
No formal education	45	37.5		
Primary	42	35-0		
Secondary	21	17.5		
Tertiary	12	10.0		

Source: Field survey, 2022

materials and 5.8% used metal construction materials. The cheap costs of the wooden materials and the natural shade that provides protection from excessive rain and heat conservation were the reasons for the higher percentage of respondents opted for the wooden housing than others. 55% of the respondents sourced their initial stocks from neighbouring farms, 25% source the stocks from open market, 11.7% obtained the stocks through inheritance/gifts and 5% from research farms. This emphasizes that research farms where good breeds can be obtained were still at lower ebb of patronage by the farmers. Small ruminant farmers faces challenges of disease outbreak that adversely

affected their stock and threatening their livelihood during the course of the investigation. The most prevalence of these diseases is diarrhoea (50%) and Helminthiasis (30%). Others notable diseases that affected the flocks are; Pneumonia, dystocia, and stomatitis. Several control measures were adopted by the small ruminant farmers to mitigate the adverse effect of diseases outbreak on farm. 55% of the farmers relied on biosecurity method, 20.8% relied on vaccination method of control, 16.7% relied on cultural method and 29.2% of the farmers combined two or three measures. Combination of measures is a surest way of keeping the flock free of attack and safeguard the owner's investment. This agrees with the finding of [14]. Result show that both credit and extension agents supports were lacking among the small ruminant producers as 87.5% and 76.7% of the respondents did not have access to credit and extension agents, respectively in the study area.

Analysis of factors determining of small ruminant production

The Ordinary Least Squares (OLS) regression analysis was carried out to determined factors that influence small ruminant production in the study area. The study considered four different functional regression forms: linear, semi-logarithmic, exponential, and double logarithmic functions. The lead equation for the regression was determined to be the linear functional form. The estimation result is shown in Table 3. The lead equation was chosen based on the magnitude of R2, Adjusted R2, and the significance of the overall regression as determined by the F-ratio and the significance of the individual coefficients. The coefficient of determination (R2) was 0.649, indicating that the included variables were able to explain approximately 64.9% of the total variations in small ruminant production. The overall model regression is significant at the 1% probability level ($F= 4.33$, $P<0.001$). This indicates statistical significance for the combined effects of all the variables that were included. The results revealed that six out of the ten variables included in the regression model i.e gender, age, credit access, off-farm income, management system, and prevalence of disease outbreak were the relevant and significant variables that determine small ruminant production in the study area. The coefficient of gender was positively significant ($p<0.01$) with small ruminant production. This implies that increase in the number of male headed household by 1% will increase small ruminant production by 0.189%. This result is in agreement with the findings of [12, 15, and 16] and contrary to the finding of [17] who reported that female participate more in ruminant production than their male counterpart. The coefficient of age was positively related to small ruminant production and the relationship was significant at 1%. This implies that as household head increase in age, small ruminant production increases. This may be because the older men in rural areas derived pleasures in animals rearing as additional forms of wealth accumulation. This result is in consonants with the finding of [12, and 18] that small ruminant production increases with farmer's age. Similarly, [19] reported that as the age of ruminant producers advanced, there is likelihood of developing improved managerial skill for the management of animals for social and economic wellbeing of their households. The coefficient of credit access has a positive and significant ($p<0.1$) relationship with small

Table 2: Farm and Institutional characteristics of the respondents (n = 120)

	Frequency	**Percentage**	**Mean**	**SD**
Herd size			6.53	4.85
Goat only	57	47.5		
Sheep only	16	13.3		
Both	47	39.2		
Management system				
Extensive	70	58.3		
Semi-intensive	32	26.7		
Intensive	18	15.0		
Housing type				
Concrete	18	15.0		
Wooden	95	79.2		
Metal	7	5.8		
Source of stocks				
Research farm	9	7.5		
Inheritance/gifts	14	11.7		
Neighbouring farm	67	55.8		
Open market	30	25.0		
Diseases Occurrence				
Stomatitis	3	2.5		
Pneumonia	11	9.2		
Helminthiasis	36	30.0		
Diarrhoea	60	50.0		
Dystocia	10	8.3		
Disease control measures				
Biosecurity	40	33.3		
Vaccination	20	20.8		
Cultural method	25	16.7		
Combined measures	35	29.2		
Credit access				
Yes	15	12.5		
No	105	87.5		
Extension contact				
Yes	28	23.3		
No	92	76.7		

Source: Field survey, 2023

ruminant production. This indicates that as farmer has access to credit supports it will expand their herd size with such additional cash flow hence increase their productivity. This corroborates the finding of [12] that credit facilities has multiplier effect on farmer productivities. Off-farm income has a positive and significant ($p<0.05$) relationship on small ruminant production. This indicates that income from other livelihood source provides a leverage for farmers to increase their flock size as the farm income are too weak to sustained the small ruminant production. The coefficient of management system practices by the farmers has a positive and significant influence on farmer's herd size. This implies that farmer who practice extensive system of management would take advantage of green pasture in their environment which practically reduces feeding expenses hence increased herd size relative to those that practice other forms of management system. Prevalence of diseases outbreak has a negative and significant ($p<0.01$) relationship on small ruminant production. This implies that as the frequency of diseases outbreak increases, it has the devastating effect of reducing herd size since goat and sheep are susceptible to various diseases such as Helminthiasis, diarrhoea, pneumonia etc most especially during the rainy season.

Table 3. OLS result of factors determining small ruminant production

Variables	**Coefficient**	**Std. error**	**t-value**	**p-value**
Gender	0.189***	0.029	6.51	0.000
Age	0.070***	0.016	4.37	0.000
Household size	-0.038	0.047	-0.99	0.335
Education	0.034	0.114	0.31	0.763
Credit access	0.240*	0.136	1.76	0.052
Farm income	0.0001	0.002	0.05	0.923
Off-farm income	0.486**	0.225	2.16	0.043
Management system	0.463**	0.166	2.08	0,050
Production experience	0.058	0.049	1.18	0.867
Disease outbreak	-.0.510***	0.145	3.51	0.004
Constant	0.677	0.250	4.51	0.000
R^2	0.4912			
Adj.R^2	0.4078			
Prob > F	4.311p< 0.000			

Source: Field survey, 2022
***Significant at 1% level; ** Significant at 5% level; * Significant at 10%

Analysis of food security status of small ruminant producing household

The small ruminant producing households' food security status in the study area were explained using the three indicators of food security: incidence of food insecurity (Po), food insecurity gap (P1) and severity of food insecurity (P2). The percentage of households that fall below the food insecurity line is indicated by the incidence of food insecurity; the amount that unsecured households fall short of the line is indicated by the food insecurity gap; and the severity of food insecurity indicates the percentage that an insecure household's per capita expenditure should increase to lift them out of insecurity. As shown (Table 4) the incidence of food insecurity among the small ruminant producing households in study area was (0.62) implying that 62% of the small ruminant producing households have consumption expenditure level below the food security line. The food security gap was 0.28 implying that the average consumption expenditure of the food insecure households was 28% less than the food security line. This gap represents the percentage of expenditure required to bring unsecured households below the food security line up to the food security line. The severity of food insecurity index was 0.07 which represents the worst among the unsecured small ruminant producing households who require the attention of policy maker in the distribution of the standard of living indicators, such as provision of palliatives, infrastructure, electricity, good road, health care services and income generating activities.

Table 4. Determination of small ruminant producing household's food security status

Food security indices	Values
Incidence (P0)	0.62
Gap (P1)	0.28
Severity (P2)	0.07
Mean Per Capita Household Expenditure (MPCHE) (N)	63,592
Food Insecurity Line (2/3 MPCHE) (N)	42,394.7

Source: Computed from field data, 2022

Factors influencing small ruminant-producing households' level of food security

Table 5 presents the results of factors that determined the food security status of small ruminant households. Pseudo R2 indicates that the explanatory variables included in the model accounted for 45.6% of the variation in food security status of rural households; the likelihood function of the logit model was significant (Wald $\chi 2 = 48.61$, $p<0.000$), indicating the strong explanatory power of the model. Result shows that the significant variables are gender, household size, credit access, off-farm activities and herd size. The marginal effect of gender was positive and significant at 1%. This implies that food security status of households has a higher likelihood of been improved with male headed household than female headed. This result agrees with the findings of [20 and 21]. The marginal effect of household size was negatively signed and significant ($p<0.1$). This implies that increase in

household size by a unit will decrease food security status of households by 0.019 unit. The implication of this finding is that a large family size have a higher probability of been food insecure due to pressure and competition for the meagre resources endowment of the average household in our sample. This result supports the findings of [22 and 23]. The marginal effect of credit access has a positive and significant ($p<0.1$) relationship with small ruminant producing household's food security status. This agrees with the findings of [24] that credit help to smoothen consumption of household during food shortage. This implies that farmers who have access to credit were most likely to be food secure compared to farmers without access to credit. Small ruminant producing household that participated in off-farm activities has a higher likelihood of been food secured because the additional income generated increases the disposable income; hence the propensity to consume varieties of food increases. This result supports the findings of [25 and 26] who found that household engaged in more diverse production systems can also lead to more dietary diverse thus enhanced food security. The marginal effect of herd size shows a positive and significant ($p<0.05$) relationship on food security status of the household. This implies that increase in the herd size by a unit has a probability of increasing the food security status of household by 0.005unit.

Table 5: Determinants of food security status of small ruminant producing households

Variables	**Marginal effect**	**Standard. error**	**Z**
Gender	0.042***	0.015	2.81
Age	-0.008	0.007	-1.14
Household size	-0.019*	0.011	-1.73
Education	0.008	0.006	1.33
Credit access	0.165*	0.101	1.62
Off-farm activities	0.239**	0.110	2.16
Production experience	0.004	0.010	0.42
Herd size	0.005**	0.002	2.58
Constant	1.614***	0.465	3.47
LR chi2	48.61		
Prob>chi2	0.0000		
Pseudo R2	0.456		
Log likelihood	-166.43		

Source: Computed from Field Survey Data, 2022

***Significant at 1%, **Significant at 5%, * Significant at 10%

Conclusion and Applications

The study revealed that the main small ruminant animals kept in the study areas are sheep and goats reared under extensive, semi-intensive and intensive system of management.

Small ruminant production faces the challenges of diseases outbreak that were controlled by combination of measures such as biosecurity, vaccination and cultural methods.

Small ruminant production was influenced by factors such as gender, age of household head, credit access, off-farm income, management system and prevalence of disease outbreaks.

The major challenge of policy makers in rural areas is the issue of food insecurity. Findings showed that majority of the farmers were living below the food security line and that small ruminant production contributes positively to household food security status.

Our focus on food security is to ensure that when policies are being formulated, the needs of the most vulnerable and impoverished people are taken into consideration.

References

1. Clay, E. (2002). Food Security; concept and measurement. Paper for FAO Expert Consultation on Trade and Food Security: Conceptualising the Linkages. Rome.
Food and Agriculture Organization of the United Nations (2011). "The State of Food Insecurity in the World". Rome, Italy.
2. Patrick, W., Coates, J., Frongillo, E., Rogers, B., Swindale, A. and Bilinsky, P. 2006. "Measuring Household Food Insecurity: Why It's So Important and Yet So Difficult to Do." Journal of Nutrition 136(5): 1404S-408S.
3. Doward, A. A. (2005). A Guide to indicators and methods for Assessing the Contribution of Livestock Keeping to the Livelihood of the Poor. London: Department of Agricultural Sciences, Imperial College.
4. Shacleton, S. S. (2000). Re-valuing the Communal Land of Southern Africa: New Understandings of Rural Livelihoods. In ODI Natural Resources Perspectives.
5. Valdivia, C. M. (1996). Sociological and economic analysis of small ruminant production systems. Annual Report: University of Missouri, Columbia and Kenya SR_CRSP.
6. Gefu, J. O. (2002). Socio-economic considerations in small ruminant production. Manual for Small Ruminant Production in Nigeria, PP8-11.
7. Ellis, F. (1988). Peasant economics: farm households and agrarian development. Cambridge: Cambridge University Press.
8. Adegoroye, G. (2006, March 3). Public service reforms for sustainable development. The Nigeria Experience. A Keynote Address to the Commonwealth. Advance Seminar.
NPC (2006). Report of Nigeria's National Population Commission on the 2006 Census.
9. Foster, J., Greer, J., Thorbecke, E. (1984). A class of decomposable poverty measures. Econometrica 52, 761–776

10. Girei, M.I and Ayoola, J.B (2017). Socio- economic factors influencing small ruminant production in Adamawa State; Policy implications for livestock transformation in Nigeria. International Journal of Scientific & Engineering Research, 8(3): 1261-1272
11. Ajala, M.K, Lamidi,O.S and Otaru, S. M. (2008). Peri urban Small Ruminant Production in Northern Guinea Savanna Nigeria. Asian Journal of Animal and Veterinary Advances. 3 (3): 138-146
12. Musa, I.W., Sai`du, L and Abalaka, E.S (2012). Economic Impact of Recurrent Outbreaks of Gumboro Disease in a Commercial Poultry Farm in Kano, Nigeria. Asian Journal of Poultry Science, 6: 152-159.
13. Adams, F. and Ohene-yakyara, K. (2014). Socio- economic characteristics of subsistent small ruminant farmers in three region of northern Ghana. Asian Journal of Applied Science and Engineering. 3(8): 93-105.
14. Mabe, L. K., Antwi, M. A and Oladele, O. I. (2010). Factors affecting farm income in livestock producing communities of north-west province, South Africa. Livestock Research and Rural Development. 22 (8). http://www.lrrd.org/lrrd22/8/mabe22142.htm Retrieved July 3, 2023
15. Fakoya, E. O, and Oluruntoba, A. (2009). Socio-economics Determinants of small ruminant production among farmers in Osun State, Nigeria. Journal of Humanities, Social Sciences, and Creative Arts. 4(1):90-100.
16. Umunna, M.O, Olafadehan, O.A. and Arowana, A. (2014). Small Ruminants Production and Management System in urban area Southern Guinea Savanna: Asian Journal of Agricultural and Food Science. 2(2): 107-114.
17. Lawal-Adebowale, O. A (2012). Factors influencing small ruminant management in selected urban communities of Abeokuta, Ogun State. Nigerian Journal of Animal Production. 39(1): 218-227
18. Mallick D, Rafi M. (2010). Are female-headed households more food insecure?. Evidence from Bangladesh. World Development. 38(4):593–605. https://doi.org/10.1016/j.worlddev.2009.11.004. Accessed 15th December, 2023
19. Magaña-lemus, D., Ishdorj, A., Iii, C.P.R. and Lara-álvarez, J. (2016). Determinants of household food insecurity in Mexico. Agricultural and Food Economics. Vol. 4 https://api.semanticscholar.org/CorpusID:36816002 Accessed 18/02/2023
20. Asogwa, B.C. and Umeh, J.C. (2012). Food Insecurity Determinants among Rural Farm Households in Nigeria. Proceedings of International Conference on Ecology, Agriculture and Chemical Engineering (ICEACS'2012), Phuket pp. 206–211.
21. Okon, U.E., Frank, N.N., Etowa, E.B. and Nkeme, K.K. (2017). Household level food security status and its determinants among rural farmers in Akwa Ibom State,

Nigeria. Agricultural Science Research Journal. 7(10): 297 – 303

22. Tekle, L. and Berhanu K. (2015). Determinants of rural farm household food security in Boloso Sore District of Wolaita Zone in Ethiopia. Asian Journal of Agricultural Extension Economics and Sociology. 5 (2):57–68. https://doi.org/10.9734/AJAEES/2015/14833 Accessed 15th August, 2023
23. Adjimoti, G.O and Kwadzo, G.T.M (2018). Crop diversification and household food security status: evidence from rural Benin. Agriculture & Food Security, 7: 1-12 https://doi.org/10.1186/s40066-018-0233-x Accessed 22nd December 2023
24. Jones, A.D., Shrinivas, A. and Bezner-kerr, R. (2014). Farm production diversity is associated with greater household dietary diversity in Malawi: findings from nationally representative data. Food Policy. 46:1–12. https://doi.org/10.1016/j.foodpol.2014.02.001