# Livestock farmers' involvement in goat production in Aniocha north local government area of Delta State, Nigeria

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**Abstract** The study assessed the level of livestock farmers' involvement in goat production in Aniocha North of Delta State, Nigeria. The obtained results showed that most of the farmers were not involved in goat production. The reasons adduced for non-involvement of farmers in goat production was the destructive nature of goats (mean = 4.87), stealing (mean = 4.85), diseases (mean = 4.84), poor management (mean = 4.78), shortage of food (mean = 4.70) and cost of purchase of initial stock (mean = 4.64). The t-test indicated that there was a significant difference between total revenue and cost of rearing at $p < 0.05$. The result of the logit regression showed that only two of the variables, flock size and household size, were significant in determining the respondents' involvement in goat production. It was recommended among others that farmers in the study area should be enlightened on the benefits of keeping goats.

**Keywords**: Goat, Farmers, Logit regression, Involvement, Likert scale, Delta State

## Introduction

The peculiar problem of most developing countries are besieged with limited food supply (FAO, 2015). This is more critical particularly with foods of animal origin, which provide the much-needed animal protein. Although there has been tremendously expanse and increased in the production and consumption level of animal products over the years which are expected to continue if this problem persists (FAO, 2014; FAO, 2009). The state of nutrition of the Nigerian population is predominantly affected by inadequate protein intake both in quantity and quality. Nigeria is faced with the problem of malnutrition particularly in terms of protein intake (World Bank and Nutrition, 2017; Ozoka, 2018; Elamin, 2010). The food and Agricultural Organization (FAO, 2014) recommended 20 g of animal protein consumption per person per day or 7.3 kg per year to effectively fight against malnutrition and under-nourishment. Inadequate consumption of the required animal protein which is attributed to high prices of meat has faced to malnutrition. Conventional animal protein sources have not been able to meet the demand. The per capita intake of high-quality animal

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protein is too low in Nigeria (Yusuf, 2012). Nigeria's total meat production is put at 810,000 tons for a population of over 150 million which is equivalent to an index of 15g/ head (Yusuf, 2012). Consequently, it become imperative that sources of animal protein should be diversified. The population of livestock in Nigeria in 2016 from the 2011 National Agricultural Sample Survey indicated that Nigeria had an estimated 19.5 million cattle, 72.5 million goats, 41.3 million sheep, 7.1 million pigs and 28,000 camels, 145 million chickens, 11.6 million ducks, 1.2 million turkeys and 974, 499 donkeys (Ogbeh, 2016). Despite this large livestock, the supply of animal protein to the ever-increasing human population in Nigeria has remained low. Thus, malnutrition is very prevalent in Nigeria due to the falling protein intake especially of animal protein food sources (Adekunmi *et al.,* 2017). Although small ruminants like sheep and goats are increasingly becoming a major source of animal protein in Nigeria, contributing over 30% of meat consumption in the country (Britton, 2003) the level of rearing is currently not ascertained. Ruminants can contribute significantly to protein consumption, and goat production can be a part of this contribution. Goat is a multi-functional animal and has a significant role in the economy and nutrition of landless small and marginal farmers in the whole country. Goat can easily survive in even adverse and harsh environment in low fertility lands where no crops can be grown (Casey and Van Niekerk, 1988).

Goat meat is a great source of protein and it is very tasty, nutritious and healthy. There are several merits and importance of goat production. Apart from meat, the goat also produces milk which has some medicinal advantage over cow's milk (Fevrier *et al.,* 1993). They are small size compared to cattle, which contribute to their wide distribution and easy management among women and children who provide bulk labor in small family farms.

Goat can also serve as insurance against crop failures because they can quickly be converted to cash in terms of financial needs. They also have an important drought survival strategy especially in marginal cropping areas where mixed farming is prevalent. The female goat (nanny) is a prolific and veritable engine in production, kidding every six months, an average and bearing 2-3 kids per parturition, thus producing more than 4 kids every year from age of about 18months hence goat can expand until they form a major part of the family capital assets (Peacock *et al*., 2005). It has been generally asserted that one way to increase protein intake in food consumption in Nigeria is for farmers to embark on homestead livestock production (Nielsen, 2007). The recognition of the critical role of the livestock sector in economic development cannot be overemphasized. The shortage of animal protein is severe in Nigeria probably because of the failure of the goat sub-sector to expand, to meet the current demands of the growing population.

The current estimation indicates that the average daily per capita supply of animal protein for Nigeria is less than 20% of the recommended level (Nielsen, 2007). Small ruminants like goats are believed to hold the key to satisfying the protein supply-demand gap.

Despite the endowed ecological zone with an abundance of green pastures nearly all the year-round, Delta state is reported to hold the least population of goats in Nigeria compared with other states. The issue now is the production of goats equally low in Aniocha North? Since 2002, no study on the involvement of farmers in goat production has been carried out in Delta State in general and Aniocha North in particular.

It was important to investigate the level of involvement of livestock farmers in goat production in the study area. This would help to understand the state of affairs in goat production in the study area.

**Materials and methods**

The following research questions thus arise:- what is the level of farmers' involvement in goat production in Aniocha North, Delta state? What contribution does the keeping goat make to the income of the farmer? Are returns associated with goat production commensurate with the cost of production? What are the likely constraints to the keeping of goats?

The following null hypotheses were tested: **$Ho_1$:** The profit of the goat farmers is not significantly different from zero.**$Ho_1$:** Farmers' socio-economic characteristics do not affect goat production. The major objective of the study is to examine livestock farmers' level of involvement in goat production in Aniocha North of Delta State. The specific objectives were to describe the socio-economic characteristics of livestock farmers in the study area, to determine the various types of livestock kept by the farmers, the various breeds of goats kept in the area, the sizes of flocks of goat farmers, to ascertain the gross margin of the goat farmers and ascertain the constraints facing goat farmers in the study area.

The study area was the Aniocha North Local government area. The local government area is predominantly inhabited by Delta Ibos. Their major occupation is farming at the subsistence level. The headquarters is in the town of Issele-Ukwu. Aniocha North local government area is bounded on the north by the Ika-northeast local government area and on the east by Oshimili north local government area. The local government area lies within longitude $(6.48^074')$ east and latitude $(6.35^045')$ north of the equator. It has an average elevation of 270 meters (886 feet). Aniocha North local government area falls within the tropical rainforest zone. The rainy season is between April and October. It experiences an annual rainfall of 1500 to 2250mm. The monthly sunshine is 3.8bars and the average daily temperature is $28^0C$. It has an area of 406 km$^2$ and a population of 104,711

at the 2006 census. Aniocha north is made up of three (3) clans, namely, Idumuje, Ezechima and Odiani clans (NPC, 2006).

The sample size comprised 180 respondents which were selected through a multi-stage sampling technique. First, three communities were chosen using a simple sampling technique from each of the three clans, making a total of 9 communities. Thereafter, 20 respondents were chosen randomly from each of the selected communities, making a total of 180 respondents. However, only 175 of the questionnaires were found to be useful for analysis.

Data for this study were collected from both primaries. The primary source of data was collected by the use of a well-structured and validated questionnaire. The secondary sources were obtained from journals, agricultural development programme (ADP) zonal office and other published and unpublished materials relevant to the study.

Measurement of variables: the personal characteristics of respondents were determined by requesting them to indicate their age, educational level, farm size, and years of farming experience, and contact with extension agents. Livestock farmers' level of involvement in goat production will be determined by making a list of livestock farmers' activities from which the respondents will be asked to identify the livestock production they are into. Those in goat production will be scored (1) and (0) for those not involved in goat production.

To determine the constraints faced by the livestock farmers in goat production, a list of constraints were provided and respondents were asked to indicate their perceived constraint on a 5-point Likert scale, with values, Likert scale with values 1 = not serious, 2 = not very serious, 3 = undecided, 4 = serious and 5 = very serious. The cut-off point is 3.0, which means the average value above this point is a serious constraint. Table 1 depicted some of the variables in the study and how they were measured.

**Table 1.** Measurement of variables

| Variable | Unit of measurement |
| --- | --- |
| Age | Years |
| Gender | Male = 1; 0, otherwise |
| Marital status | Married = 1; 0, otherwise |
| Education level attained | No of years spent in schooling |
| Farm size | Hectare |
| Farming experience | Years spent in farming |
| Contact with extension agents | Contact = 1; 0, otherwise |
| Involvement in Goat rearing | Dummy; involvement= 1; 0, otherwise |
| Constraints | 5-point Likert scale |

Source: Author's Design

*Method of data analysis*

The data generated for this study were analyzed with the use of descriptive and inferential statistics. Descriptive statistics such as mean, frequency count and percentage were used. Gross margin analysis was used to determine the profitability of the goat farmers. The formulated hypotheses were tested using the t-test and logit regression model.

The logistic regression model (Byerlee and de Polanco, 1986) was used for probability estimation such that a dichotomous variable is assigned to values. For instance, a response of Yes is represented by 1 (Yes=1) and No is represented by 0 (No=0). The model has both a dependent and independent variable. This model was used to test hypothesis 2. The logistic regression model is shown below:

$Y = Ln(P/1-p)$

$Ln(P/1-P) = b_0 + b_1X_1 + b_2X_2.....b_8X_8 + e$

Where,

$Y$ = dependent variables

$P$ = probability of respondent involvement in goat production

$Ln$ = natural logarithm function

$B_0$ = constant

$B_1\text{-}b_8$ = regressions coefficients

$X_1\text{-}X_8$ = Independent variables (age, gender.......etc)

The gross margin is the difference between total variable cost and total revenue or profit over variable cost (Emaziye and Ovharhe, 2020). The gross margin is mathematically computed as:

$GM = TR - TVC$

Where: GM = Gross Margin; TR = Total Revenue TVC = Total Variable Cost

**Results**

*Socio-economic characteristics of respondents*

The socio-economic characteristics of livestock farmers in the study area is shown in Table 2. The age of farmers ranged from 19 to 69 years. No farmer in the study area was below 19 years. It is indicated that teenagers in the area were not actively involved in livestock production. Therefore livestock production was an activity which carried out mainly by adults. Over 90% of the respondents were in their economically active. The majority of the respondents were males, about 68.6% of the farmers were males while the female gender farmer were 31.4%. The result of marital status showed that majority of the respondents were married (84.4%). This may be indicated that marital status was an important factor in livestock farming.

The result showed that 2.3% of farmers had no formal education, 25.7% respondents had finished primary school level of education, 51.4% farmers had finished secondary level of education and 20.6% farmers had finished tertiary level of education. This revealed that most goat farmers had finished secondary school level of education. Most of the respondents were experienced in the livestock farming business. In fact, 90% of the respondents had over 6 years of experience in the rearing of goats. This is the total number of livestock kept by the farmers. The result in succinctly indicated that most of the respondents (81.1%) operated as smallholders. Only 4.0% of the respondents kept over 100 animals (Table 2). The household sizes were fairly large. The majority of the farmers had between 1 to 10 household members. The mean household size was 7 persons which indicated that the farmers had moderate family sizes that were not too large or too small.

**Table 2**. Socio-economic characteristics of respondents

| Characteristics | Frequency (n=175) | Percentage (%) |
|---|---|---|
| Age (chronological year) | | |
| 18 – 27 | 40 | 22.9 |
| 28 –37 | 47 | 26.8 |
| 38 – 47 | 50 | 28.6 |
| 48 – 57 | 21 | 12.0 |
| Above 57 | 17 | 9.7 |
| **Marital Status** | | |
| Single | 35 | 20.0 |
| Married | 130 | 74.3 |
| Separated/widowed/divorced | 10 | 5.7 |
| **Educational Level** | | |
| No formal education | 4 | 2.3 |
| Primary education | 45 | 25.7 |
| Secondary education | 90 | 51.4 |
| Tertiary | 36 | 20.6 |
| **Farming Experience(years)** | | |
| Less than 5 | 18 | 10.3 |
| 6 – 10 | 75 | 42.9 |
| 11 and above | 82 | 46.9 |
| **Farm or Flock size (number)** | | |
| Less than 50 | 142 | 81.1 |
| 51-100 | 26 | 14.9 |
| More than 100 | 7 | 4.0 |
| **Household size (number)** | | |
| 1-5 | 60 | 34.3 |
| 6-10 | 100 | 57.1 |
| More than 10 | 15 | 8.6 |
| **Gender** | | |
| Male | 120 | 68.6 |
| Female | 55 | 31.4 |

**Source:** Field data

## Types of livestock kept by respondents

The various types of livestock kept by the farmers are presented in Table 3. The results clearly showed that the predominant livestock kept in the study area was chicken; as much as about 86.9% of the respondents kept chicken, whether local or exotic breeds. About 36.6% of the respondents keep goats, which indicated that the rearing of a goat was a prominent agricultural activity in the study area.

**Table 3.** Types of livestock kept by farmers in the area

| Type of livestock | Frequency*  (175) | Percentage (100) |
|---|---|---|
| Cattle | 2 | 1.1 |
| Goat | 64 | 36.6 |
| Sheep | 7 | 4.0 |
| Chicken | 152 | 86.9 |
| Other birds | 66 | 37.7 |
| Swine | 21 | 10.2 |
| Rabbit | 12 | 6.9 |
| Cane rat/other mini-livestock | 12 | 6.9 |
| Dog | 74 | 42.3 |

*Number greater than 175 due to multiple responses
 **Source:** Field data

## Breeds of goats kept in the study area

The different breeds of goats reared in the study area are shown in Table 4. The West African Dwarf goat was the most commonly raised goat breed in the study area. All the goat farmers (100%) in the study area kept this breed of goat. WAD is indigenous to the study area and had been reared from time immemorial. The red Sokoto (or Maradi) is further reared breed. About 15.6% of the livestock farmers kept this breed. Other breeds of goat included Sahel long-legged (9.4%), Anglo-Nubian (3.1%) and other unidentified breeds (20.3%).

**Table 4.** Breeds of goats kept by farmers in the area

| S/N | Breed | Frequency (64)* | Percentage (100) |
|---|---|---|---|
| 1 | West African Dwarf (WAD) | 64 | 100 |
| 2 | Sahel | 6 | 9.4 |
| 3 | Anglo-Numbian | 2 | 3.1 |
| 4 | Red Sokoto | 10 | 15.6 |
| 5 | Others | 13 | 20.3 |

*Total number greater than 64 due to multiple responses Source: Field data
*Level of respondents' involvement in goat production*

The level of the respondents' involvement in goat production was determined by the size of the flock of the farmers. The results in Table 5 clearly indicated that most of the respondents (78.1%) that reared goats which operated as smallholders. In fact, only 3.1% of respondents owned more than 100 goats.

**Table 5.** Size of a flock of goat farmers

| Size of Flock | Frequency (64) | Percentage (100) |
|---|---|---|
| 50 and below | 50 | 78.1 |
| 51-100 | 12 | 18.8 |
| More than 100 | 2 | 3.1 |

Source: Field data

### Gross margin analysis of goat farmers

The gross margin of goat farmers is shown in Table 6. . The results showed that the rearing of goats, averaged to be profitable. The cost spent per goat on housing, feeding/provision of water, medication, marketing/other expenses were N 784, N 1150, N 1020 and N 5780 respectively. From the gross margin analysis, it was evident that the total variable cost per goat was N8734 whereas the sale of one goat was N20,500. Thus, the gross margin of the farmers obtained per goat was N11,766 (the gross margin was calculated by subtracting the total variable cost from the total revenue).

**Table 6.** Gross margin analysis of goat farmers

| Costs (variable costs) | Amount (naira)/goat |
|---|---|
| Housing | 784 |
| Feeding/watering | 1150 |
| Medication | 1020 |
| Marketing cost/ others | 5780 |
| Total variable cost | 8734 |
| Total return (revenue) | 20500 |
| Gross margin | 11766 |

Source: Field data

### Constraints facing goat farmers in the study area

Goat rearing is bedeviled by several factors. The major culprit adduced for non-involvement of farmers as shown in Table 7. Goat production found to be destructive nature of the animal (mean = 4.87). Accordingly, it was ranked as the number 1 constraint, and other constraints militating against the keeping of goats included pilfering or stealing (mean = 4.85), diseases (mean = 4.84), poor management (mean = 4.78), shortage of food (mean = 4.70) and cost of purchase of initial sock (mean = 4.64).

**Table 7.** Constraints facing goat farmer

| Constraint | Mean | S.D | Rank |
|---|---|---|---|
| Destructive habit of goat | 4.87 | 0.57 | 1st |
| Problems of theft | 4.85 | 0.55 | 2nd |
| Diseases | 4.84 | 0.56 | 3rd |
| Poor management practices | 4.78 | 0.50 | 4th |
| Shortage of food | 4.70 | 0.62 | 5th |
| Cost of purchase of initial stock | 4.64 | 0.67 | 6th |
| Predators | 2.58 | 0.63 | 7th |
| Cultural factors | 2.51 | 0.59 | 8th |

Source: Field data. Likert scale: 1 = strongly disagree, 2 = disagree, 3 = undecided, 4 = Agree, 5 = strongly Agree

## *Test of difference between Revenue and Cost (Profit) of farmers*

The difference was determined by using a t-test (Table 8). The result of the t-test conducted obviously indicated that there was a significant difference between total revenue (N20500) and cost (N8734) of the farmers which was significant at $p<0.01$.

**Table 8.** T-test Result of difference between Revenue and Cost

| Variable | Mean value | Std. dev | t- value | Remark |
|---|---|---|---|---|
| Cost | 8734 | 27.45 | 3.144* | Significant |
| Revenue | 20500 | 65.78 | | |

*significant difference at 1% level

**Table 9.** Relationship between socioeconomic variables and respondents' involvement in goat production

| Variable | Coefficients | Standard error | Wald statistics | Sig. level |
|---|---|---|---|---|
| Constant | -20.197 | 20998.061 | 0.894 | 0.874 |
| Age | 0.005 | 0.031 | 0.042 | 0.87 |
| Gender | 0.001 | 0.002 | 2.65 | 0.112 |
| Marital status | 2.441 | 1.199 | 3.022 | 0.0721 |
| Level of education | -0.033 | 0.044 | 0.521 | 0.611 |
| Farming experience | -0.041 | 0.660 | 0.001 | 0.88 |
| Farm/flock size | 2.199 | 1.091 | 4.311 | 0.022** |
| Household size | 0.062 | 0.018 | 6.233 | 0.013** |

Log-likelihood ratio test statistics = 158.667; Nagelkerke $R^2$ = 0.412; Prediction capability of model = 69.9%; Log-likelihood = 213; **Significant at $P < 0.05$

### Relationship between the socio-economic characteristics of farmers and their involvement in goat production or farming

The relationship between some socio-economic variables and the respondents' involvement in goat production is depicted in Table 9. Result showed the indicators, magnitude and statistical significance of the estimated parameter for adoption using the logistic regression model (Table 3). The estimated log-likelihood was 213, the model correctly predicted 69.9% of the variation in the adoption behaviour of the farmers. The $R^2$ of 4.12 showed that the independent variables explained about 41% of the variation in the dependent variable (involvement in goat production).

### Discussion

### *Socio-economic characteristics of respondents*

The research finding could be positively affected on goat production in the area as people in this age group were usually very energetic, thus they would be able to engage in the rigorous activities involved in goat rearing. Idrisa *et al.* (2012) and Jamilu *et al.* (2014) reported in their different studies that found the age of farmers in this group which could have a positive effect on agriculture. The majority of the respondents were males; about 68.6% of the farmers were males. Result was similar to the report of Oladeji and Oyesola (2008) which indicated male dominance in small ruminant production. This finding implies that men are the main owners of goats in the household. This may be resulted the societal customs and norms in Nigeria where males control household assets (Turkson and Naandam, 2006). However, this result is in contrast with the one reported by Fakoya and Oloruntoba (2009) which indicated a high female involvement in small ruminant production in Osun-state, Nigeria.

The result suggested that farmers had additional family members to contribute to household goat management practices. Besides, it may explain the rationale behind the positive relationship between animal ownership and married farmers (Fakoya and Oloruntoba, 2009). The result is corroborated by married small ruminant farmers observed by Ovharhe *et al*. (2020) in Delta State. Farmers need a large family to reduce the cost of farm labour. According to Marinda *et al*. (2006), education is crucial if farmers are to access and apply livestock technology appropriately and effectively raise livestock. The level of acquired knowledge is needed by the farmer through education determines the ability of such a farmer to make good decisions on investment. Mahanjana and Cronjé (2000) observed that goats farmers were quite experienced. This wealth of experience could assist them in making sound management decisions.

The small flock size may be concerned to the goats that being in extensive area to graze. The main reason is adduced by the respondents that the nearby land expanse was mainly used for growing food drops, thus limiting the available land that could be used for browsing by goats. This agrees with the report of Dixit and Singh (2014) who found the extent of grazing per goat to be a significant factor affecting flock size. Nwaiwu *et al.* (2012) had similar observations. This implies more people who assist on-farm and other household activities. Mahanjana and Cronjé (2000) reported that only about 10% of farmers kept goats. However, this finding is corroborated with the report of Gefu (2002) who asserted that small ruminants constitute an important feature of the animal production system in most rural community, and are widely distributed in the most communities in Nigeria. Other livestock is kept by farmers in the area were sheep (13.1%), swine (10.2%), rabbit (6.9%), other poultry (37.7%), mini-livestock (6.9%), dog (42.3%) and cattle (1.1%). This finding implies that goat production is poor management and few livestock farmers kept goats in the area.

Some goat farmers have begun to adopt this breed in the study area due to its economic benefits. However, the rearing of these breeds is very limited due to the environment is not very conducive for the rearing of these breeds. The Maradi goat is more adaptable than the other non-indigenous breeds. Again the multiple responses imply that some of the goat farmers kept mixed breeds. This is similar to the findings of Sanusi *et al.,* (2010) that goats and sheep were exposed to environmental hazards as a result of poor breeding methods, nutrition and housing among others in Bauchi Northeastern Nigeria.

The reasons for the predominantly small holdings by the goat farmers were partly found due to lack of extensive expanse of land where the animals that can browse, the destructive nature of goats and limited capital for expansion are attested by the respondents. The few farmers that had the financial resource were the ones operating on a medium/ large scale. The finding implies that goat production is predominantly found on a small scale basis. This means that for every N8,734 spent on each goat, the farmers earn N11,766. It indicated that goat production is profitable.

The regression resulted as portrayed by the regression coefficients showed that five out of the seven variables positively influenced farmers' involvement in goat production; two negatively influenced involvement in goat production. However, only two of the seven variables fitted in the model were statistically significant, namely, flock size and household size. It indicated that farmers with a larger flock size and lager household were likely to incline goat production. Farmers with larger flock size were more likely to be committed to the business of goat production as they likely earned their more income from goat production. Also, farmers with large household sizes were more involved than those with smaller households, as

the large household size would be furnished them to the labour required for the rigorous activities involved in goat production

## Acknowledgements

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