CLIMATE-SMART STRATEGIES AND WEST AFRICAN DWARF GOAT (WADG) PRODUCTION IN SOUTHWEST NIGERIA

***Ogunwande, I.O., Arifalo, S.F. and Esan, M.O.**
Department of Agricultural and Resource Economics, Federal University of Technology Akure, Ondo State.
*Corresponding email: ioogunwande@futa.edu.ng

ABSTRACT
Global warming leads to climate change which places adverse effects and intense pressure on the entire global environment. The study investigated the climate-smart strategies on West African Dwarf Goats (WADG) production in southwest Nigeria using the sample size of 150 respondents reached through employing a multistage sampling procedure and were interviewed using copies of well-structured and pretested questionnaires. The results revealed that goat farmers were educated, experienced with fairly large household size. The herd size owned by the farmers were significantly influenced by experience (1.25; $p<0.05$), veterinary drug (0.15; $p<0.01$), management method (0.19; $p<0.05$) and extension contact (0.06; $p<0.05$). The use of sprinkled water and raised bedding among others were used by farmers to assuage the effect of climate change in the hot and cold weather respectively. It is recommended that training on climate change should be organized for WADG farmers for proper management of their farms.
Keywords: Climate Change, Production, Multiple Regression, WAD goats

INTRODUCTION

Production of different types of goats is prevalent in the southwest Nigeria but the major interest of farmers lies in the rearing of West African Dwarf Goats (WADG) due to its exceptional performance which comprises high survival rate, traits of environmental adaptation, excellent conversion of feed to flesh, optimal fecundity rate and high docility (Hassan *et al,* 2015). WADG is a good source of protein supplier in human diet and its flesh is medically recommended for consumption for human at various ages and stages of development owing to its low cholesterol content and tenderness (Koluman and Solanikove, 2018). Also, it is a good source of skin and fur which are of industrial use. Climate change is a resultant effect of global warming which is so pronounced everywhere globally and the need to bring this under control or mitigate the effect is paramount. The change in climate reflects vividly in the area of high temperature, flooding, river overflow, abnormal rainfall distribution, intensity and variability and harsh sunshine with harsh radiation coupled with excessive heat (Simisola & Torimiro, 2006; Food and Agricultural Organization, 2017). Increase in the climate change and the attendant reduction in the population of WADG in the study area informed the need to carry out this study. The need to understand how climate affect livestock production is very critical for the successful performance of the livestock industry. Arising from the foregoing, the study seeks to describe the socioeconomic characteristics of the respondents; assess some climate-smart strategies used by farmers to counter the effect of climate change on livestock production and determine the factors influencing the herd size of WADG production.

MATERIALS AND METHODS

Study Area

The study was carried out in southwest Nigeria. The area has six states which comprises Ondo, Oyo, Lagos, Ogun, Ekiti and Osun lies between *longitude 2°31 ' and 6°00 ' E and latitude 6°21 ' and 8°37 ' N.* Southwest Nigeria is bounded in the North by the middle belt states, in the East by Delta and Edo States, in the West by Republic of Benin and in the South by the Atlantic Ocean. The southwest Nigeria comprises mangrove swamp, rainforest, guinea savanna and derives savanna with a population of about 35million (NPC, 2006). It has a population of about 50 million forming more than 22% of the national population. The average annual rainfall and temperature in the southwest are 1150mm and $\pm 26^0$C respectively. Livestock that are commonly reared in the region are goats, sheep, poultry and pig to mention but a few. The soil across the region is moderately weathered and supports different types and varieties of crops and produces luscious vegetation as feed for livestock.

Source of Data and Instruments of Data collection

Data used for the study were mostly from the primary source and they were collected through the use of well-structured and pre-tested copies of questionnaire. Among the salient data collected were age, household size, herd of goats owned by farmer, expenses on feed, expenses on housing, method used in combating climatic effect and the management method used by the farmers.

Sampling Technique
The respondents accessed and interviewed were selected using a multistage sampling procedure. In the first stage was the purposive selection of Oyo State among the six existing states in the southwest due to high concentration of goat farmers in the area. In the second stage was the purposive selection of Ogbomoso and Oke-Ogun zones from the existing five Agricultural Development Programme (ADP) zones in the state due to a large number of active goat farmers in the areas. In the third stage was the random selection of three communities from each of the zones forming six communities, and, in the fourth stage was the random selection of twenty-five goat farmers from each of the communities forming a total of 150 respondents.

Analytical Tools
Descriptive Statistics
Socio-economic characteristics of the respondents was analysed using descriptive statistics that comprise the standard deviation, percentages frequency counts and means.

Multiple Regression
Multiple regression was used in determining the herd size of goats owned by the farmer. Following Olayemi (1998) and Damodar *et al* (2012), the tool is explicitly stated as follows:

$Q = \beta_0 + \beta_1X_1 + \beta_2X_2 + \ldots + \beta_nX_n + e_i$ where Q= Dependent variable; β= parameters to be estimated; X_1-X_n: Independent variables; e_i= Error term
Q= Herd size of goats owned, X_1= Experience (in years), X_2= Education (in years); X_3= Gender (Male=1; otherwise= 0); X_4= Veterinary cost (in Naira); X_5=Type of feed (Grass=1; otherwise= 0); X_6= Cost of feed (in Naira); X_7= Management method (Extensive=1; otherwise= 0); X_8= Extension contacts (Yes=1; No= 0); X_9 = Incidence of Disease (Low=1; High= 0)

Likert Scale Rating
The five-point Likert Scale Rating (LSR) to assess the climate-smart strategies used by farmers to counter the effect of climate change on livestock production. These are defined as: 5 = Strongly effective, 4 = Effective, 3 = Undecided, 2 = ineffective, 1 = Strongly ineffective. The scores were then calculated as follows:

i. Weighed Score (WS) = 5n + 4n + 3n + 2n + 1n = Total Score for each constraint where n = Frequency of each constraint for each rating
ii. Mean Score (MS) = $\frac{Total\ Score\ of\ Each\ Contraint}{Total\ Number\ of\ Respondents}$

RESULTS AND DISCUSSION
Socioeconomic Characteristics of the WADG Farmers
Table 1 revealed that female farmers outnumbered their male counterparts in the production of goats. This might be due to the sedentary and simple nature of the job. The majority (78.8%) of the farmers attained advanced age of above 40 years. This result suggests that the keeping of WADG was for income generation for the farmers who either wanted an alternative income source or the physically weak farmers who were not capable of carrying out the strenuous job. The experience of the farmers indicated that the majority (75.0%) had the least experience of 11 years which suggests that the farmers who invested in WADG had vast experience to cope with the venture and this will assist to a greater extent in the efficient management of the available resource for optimal output.
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Table 1: Socioeconomic Characteristic of WADG Farmers

Var.	%	Var.	%	Var.	%	Var.	%	Var.	%
Gender		*Age (in years)*		*Exp. (in years)*		*Household Size*		*Education (in yrs)*	
Male	31.2	≤20	11.0	≤10	15.0	≤6	11.0	NFE	21.7
Female	68.8	21-40	10.2	11-20	31.5	7-10	56.4	Prim.	42.3
		41-60	42.4	21-30	42.5	>10	32.6	Sec.	25.0
		>60	36.4	>30	11.0			Tert	11.0
Total	100.0		100.0		100.0		100.0		100.0

Source: Field Survey, 2025. Note: Var.=Variable; %=Percent, Exp=Experience

Household size revealed that most (56.4%) of the respondents had 7-10 members while 32.6% had more than 10 members. This result indicates that 89% of the households had more than 6 members, suggesting that most of the WADG keeping farmers had more household members for which catering for their needs adequately required more hands and this is synonymous with family labour. The result on the education of WADG farmers indicated that most (42.3%) had secondary education, while overall, 78.3% were found to be educated. It is suggested by

this result that, education goes a long way in assisting farmers to combine the resources at their disposal efficiently for optimal conversion of feed, especially, to flesh

Determinants of the Herd size of WADG Owned by the Farmers

Double log equation was selected as the lead equation in the determinants of herd size of WADG farmers and the years of experience, veterinary drug, management method, extension contacts and incidence of diseases were found to significantly and positively influenced the herd size of the WADG raised by the farmers. The F-value (15.2; $p<0.01$) revealed that the model had a good fit and very appropriate for the estimate. As indicated by the adjusted R-square, 59.6% of the explanatory variables explained the dependent variable. Experience (1.25; $p<0.05$) helped the farmers to harness the available resources to increase the herd size of goats. Veterinary drug (0.15; $p<0.01$) for both preventive and curative were administered for the efficient performance which increased the herd size of goats. Management method (0.19; $p<0.05$) was also critical in the increase of the performance of the farmers as its efficiency resulted in positive result. Extension contact (0.06; $p<0.01$) also gave a vital contribution which increased herd size as the technical information through training the farmers was found to yield a fruitful result. The incidence of disease was found to be low. The state of low disease infection increased the performance and health of WADG and paved the way for increased herd size of the individual farmer.

The estimated double- log, labelled equation 1, is given as follows:

Q= 6.15*** + 1.25**(Exp.) - 0.31(Gender) + 0.15***(Vet. Drug) - 0.28(Feed Cost)
(3.79) (2.40) (-0.61) (4.75) (-0.85)
0.19**(Mgt Method) + 0.06***(Ext. Cont.) + 0.45**(Inc. of disease) - 0.01(Inc. of pest) Eqn. 1
(2.62) (3.34) (2.52) (-0.07)

Diagnostics: *F-value=15.2*** R-square= 59.3 Adjusted R-square = 54.6 Sample size = 150*
Note: *Figures in parenthesis are t-values*
*** & ** are sig. levels @ 1% & 5% levels respectively.*

Assessment of Climate-Smart Strategies Adopted by the WADG Farmers

Table 2 shows the strategies adopted by the farmers in ensuring that the goats reared are shield from the vagary and effect of weather. Covering of the building with thatched roof as method of reducing heat penetration, hence the heat load on animals, which can reduce their performance was ranked first (MW=4.14-effective).

Table 2: Some Climate-Smart Strategies Adopted by WADG Farmers

Statement	SE	E	U	I	SI	MW	Rank
Sprinkling of corrugated iron sheet roof surface with water at the peak (of harsh) sunshine.	37.3	34.7	18.7	7.3	2.0	3.98	2nd
Covering of the building with thatched roof to reduce heat penetration and pave the way for low interior heat to avert heat load on animals.	62.5	27.5	1.5	3.5	5.0	4.14	1st
Warming the house using coal pot at the peak of cold weather to keep them warm.	29.3	40.7	19.3	9.3	1.3	3.86	5th
Provision of excessive water at the peak of harsh weather condition to reduce dehydration.	30.7	40.0	19.3	7.3	2.7	3.88	4th
Provision and raising of bedding at the peak of cold weather to avoid contact with wet floor and faeces	30.7	38.0	23.3	6.7	1.3	3.92	3rd
Feeds with high calorie are fed to the goats in the cold weather for internal heat generation to prevent pneumonia.	22.0	37.3	27.3	10.7	2.0	3.83	6th

Source: Field Survey, 2025 ***Note: SE-Strongly Effective; E-Effective; U-Undecided; I-Ineffective; SI-Strongly Ineffective***

The statement ranked second (MW=3.98-effective) was the sprinkling of the roof surface with water in order to reduce heat load within the house and prevent heat stress. Provision and raising of bedding at the peak of cold weather to avoid contact with wet floor and faeces was ranked third (MW=3.92-effective) prevent the body contact of the goat with the floor surface and avoid pneumonia and other related ailments. Provision of excessive water at the peak of harsh weather condition to reduce dehydration was ranked fourth (MW=3.88-effective).

The exposure of the goats to the sun in the dry spell period results in excessive loss of water to the atmosphere which can adversely affect the body water balance (homeostasis) and eventually leads to organs dysfunction. Warming the house using coal pot at the peak of cold weather to keep them warm was ranked fifth (MW=3.86-effective). Goats were kept warm under the excessive cold period in order to make them perform optimally under the adverse weather condition. Feeds with high calorie were fed to the goats in the cold weather for internal heat generation to prevent pneumonia was ranked sixth (MW=3.83-effective). It was strategical due to the frantic effort made by the farmers in making the internal organs function optimally and generate enough heat to shield the animals from the cold environment which might render them inactive and dull.

CONCLUSION

WADG farmers were mostly female, experienced, educated with relatively large household size. Management method, low incidence of disease(low) and veterinary drug among others contributed significantly to the herd size of farmers. The use of sprinkled water, raised bedding and warming of the interior house environment were strategically effective in keeping the animals perform optimally in terms of attaining the efficient performance frontier.

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