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USE OF CLIMATE-SMART PRACTICES AMONG SMALL RUMINANT FARMERS IN KWARA STATE

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ABSTRACT

*This study describes the demographic characteristics of small ruminant farmers, identify farmers' information sources on climate-smart practices, identify the climate-smart practices used and the constraints to use of climate-smart practices. One hundred and eighty (180) small ruminant farmers were randomly selected for the study. Analytical tools such as descriptive; frequency, mean, percentages and inferential statistics; linear multiple regression were used to analyze the data. The result revealed that 56.1% of the small ruminant farmers were male, mean age of 40.1 years with mean of 6.2 years in small ruminant production. The most used climate-smart practices were stocking species that are tolerant to harsh weather conditions (mean=3.4), water conservation (mean=3.2) and use of weather forecast information (*2.7±1.09*). Difficulties in the provision of adequate feed for small ruminants during the dry season (mean = 4.3) was the highest-ranked constraints inhibiting the use of climate-smart practices. The result of the linear multiple regression analysis showed that age, level of education, rearing system were the determinants of the use of climate smart practices among the ruminant farmers. This study thus recommends the provision of adequate information on how to use climate smart practices effectively and training on how to produce feed such as hay or silage for feeding ruminant animals during dry season.*

Keywords: *Climate change, smart practices, Use, Small ruminant animals and feed*

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INTRODUCTION

Globally, climate change is having an impact on every sector, including agriculture. Its effects are loss of biodiversity, increased frequency of extreme weather events and rising sea levels (Bolan, et al., 2024; Abdulrahman, et al., 2023). In addressing this global challenge, concerted efforts from businesses, individuals and Governments around the world. It is a strategy for adapting agriculture to the new realities of climate change and ensuring global food security.

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The Climate Smart Small Ruminant Production strategy employs strategies to boost small ruminant production's stability and resilience, assisting farmers in mitigating the risks associated with climate change (Ifabiyi, et al 2022). Climate smart small ruminant production practices are agricultural strategies that improve national food security, increases productivity, ensuring sustainability, while reducing or eliminating greenhouse gas emissions, building resilience, and increasing productivity in a sustainable manner.

Climate smart small ruminant production approach serves as a guide for the necessary changes to agricultural systems. Given the need to jointly address food security and climate change (Ojo and Baiyegunhi, 2020)

Climate-smart small ruminant production practices are projected to improve food security, adaptive capacity and to mitigate the effects of climate change. In smallholder farming systems, among resource-poor people, commonly found in Nigeria (Dhakal et al., 2021).

Throughout the world, sheep and goats are classified as small ruminants. They account for over 50% of domesticated ruminants and are vital sources of income and livelihood for farmers, particularly those in developing nations like Nigeria (Hiwot et al., 2020). Tropical Africa is home to one-third of the world's goats and one-sixth of the world's sheep which account for 17% of tropical Africa's total domestic ruminant biomass (Ani et al 2024). Production of small ruminants supports livelihoods and food security in developing nations like Nigeria. Nigeria is said to have the largest small ruminant herd in Africa followed by Sudan, Chad, Ethiopia, and Kenya (Aminu et al 2021) which are mainly indigenous breeds, accountings for about 42.1 million sheep and 76 million goats (Ani et al 2024). The Gross production value of goat and sheep meat in amounted to $1.6B in 2022 (IndexBox, 2024).

In Nigeria, small ruminants play crucial and significant roles during festive seasons, both in rural and urban centres (Banjoko et al 2021). However, climate change negatively affects animal production, including sheep and goats because of the effects of rising temperatures, feed unavailability, increased disease out breaks which has posed an increased risk of famine due to overall decrease in small ruminant production (Abdulrahman, et al., 2023; Ifabiyi et al 2022).

In Kwara State, small ruminant farmers face the pressing challenge of adapting to climate change impacts on their ruminant production. Sustainable pasture management, feed efficiency, and the utilization of climate-resilient goat and sheep breeds posed great challenge in small ruminat industry. In the same vein, Aminu et al (2021) noted non-availability of reliable and accessible information about small ruminant and use of climate-smart practices. This underscores the urgency to examine the use of climate-smart practices among small ruminant farmers in Kwara State. Although several studies (Jemberu et al., 2022; Rothman-Ostrow et al., 2020) have been conducted on livestock. However, little empirical data exists on the use of climate-smart practices by small ruminant farmers. This study thus aims to explore the use of climate-smart practices among Small Ruminant Farmers in Kwara State. The specific objectives were to describe the demographic

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characteristics of small ruminant farmers, identify farmers' information sources on climate-smart practices, identify the climate-smart practices use andidentify the constraints to the use of climate-smart practices among small ruminant farmers.

Hypothesis of the Study

Ho1: There is no significant relationship between socioeconomic characteristics of small ruminant farmers and use of climate smart practices.

Methodology

This study was conducted in Kwara State, Nigeria which has a total of 16 Local Government Areas with an estimated population of about 2,371,089 people. The State lies between longitude 40-60 East of the Greenwich meridian and latitude 80-100 North of the Equator. The State's overall land area is estimated to be 32,000 square kilometers which is about 6.54% of the nation's total land area. The State shares common boundaries with Oyo, Osun, Ondo, Niger, Ekiti, Kogi and Kebbi States of Nigeria. With an average rainfall pattern of 14995-15,000mm, the daily temperature of the state ranges between 21^0C-37^0C. The two main climatic seasons are the wet and dry while harmattan period is usually experienced from December to January. Generally, the natural vegetation is made up of the rain forests, Guinea savannah in the far north and a Fadama belt along the River Niger. The State's vegetation allows cultivation of several cash and food crops.

The socio-economic status of the farmers such as sex, marital status, were measured at the nominal level, while others such as age, household size, years of experience in ruminant production and monthly income, were operationalized at ratio level.

The source of information was measured on a 4-point Likert type scale of Always (4), Sometimes (3), Rarely (2) and Never (1). Usage of climate-smart practices was also measured on a 4-point Likert-type scale of Always (4), Sometimes (3), Rarely (2) and Never (1). A total of 11 climate-smart practices were developed for respondents to react to, having a minimum score of 11 and – maximum score of 44 points. The perceived benefit was captured on a 5-point Likert type scale of strongly agreed (5) to strongly disagreed (1) evaluating farmers' perceptions and belief of using climate-smart practices while the constraints was measured on 5-point Likert type scale of strongly agreed (5) to strongly disagreed (1) identifying the constraints inhibiting the use of climate-smart practices. A total of 180 small ruminant farmers were randomly selected from a registered list of 320 association member. Data were collected through interview schedule and analysed using Descriptive statistics such as percentages, frequencies, means, and standard deviations were used to analyse the data while inferential statistics such as linear multiple regression was used to test the hypothesis, with the model shown below:

$$\boldsymbol{Y = b_0 + bx_1 + bx_2 + bx_3 + bx_4 + bx_5 + bx_6 + bx_7 + e_i}$$

Where Y = Use of climate-smart practices (Frequency of use)

X_1 = Age (years)

X_2 = Gender (Male = 1, Otherwise, 0)
X_3 = Educational level (Educated = 1, Otherwise,0)
X_4 = Marital Status (Married = 1, Otherwise, 0)
X_5 = Rearing system (Semi-intensive = 1, Otherwise, 0)
X_6 = Years of experience (Years)
X_7 = Number of Animals (Number)

Results and Discussion

Demographic Characteristics of small ruminant farmers

The results revealed in Table 1 indicated that majority of the respondents (73.9%) were married with mean age of 40.1 years. This implies that small ruminant farmers are agile and economically active in the study area. This corroborates the findings of Ani et al., (2024) which reported small ruminant farmers as being in their young and active age. The results further revealed that more than half (56.1%) of the respondents were male indicating the predominant nature of small ruminant farmers by male as reported by Aminu et al., (2021). Almost all (94.29%) of the respondents had one form of education or the other, 6.2 years of experience in small ruminant production with majority practicing semi-intensive system of production. This is expected to have influence on the use of climate smart practices by small ruminants' farmers as stated by Ifabiyi et al., (2021). The semi-intensive system of rearing is contrary to the findings of Bolajoko et al., (2021) which revealed extensive system of raering by small ruminant farmers in Kwara State.

Small Ruminant Farmers' Sources of Information on the Use of Climate Smart Practices

As reflected in Table 2, radio (3.3±.96), fellow farmers (3.2±.88) and extension agents (3.1±.94) were reported as most use sources of information on the use of climate smart practices which ranks 1st, 2nd and 3rd respectively. It implies that, radio is the most used, followed by fellow farmers and extension agents. This may be explained by the reality that radio and fellow farmers are the available sources of information for small ruminant farmers. (Nwafor and Nwafor, 2022) reported radio broadcasts to be a veritable source of information because of its accessibility and availability. They further noted fellow farmer as an important medium where farmers exchange information. Although, extension agents is expected to be a preference for information source because they are regarded as major source of information for farmers because they are regarded as farmers' friend due to their level of acquaintance and interaction, they also have the responsibility of disseminating first-hand information (Subair et al., 2020) on climate-smart practices to ruminant farmers (Antwi-Agyei & Stringer, 2021; Abdulrahman et al., 2022; Ifabiyi & Abdulrahman, 2023)

Small Ruminant Farmers' Use of Climate-Smart Practices

The results presented in table 3 revealed that "stocking species that are tolerant to harsh weather conditions" (3.4±1.06), "water conservation" (3.2±.95), "use of weather forecast information"

(2.7±1.09) and "burry dead animals immediately" 2.6±1.19" were ranked 1st, 2nd, 3rd and 4th respectively. This implies that small ruminant farmers are conscious of the effect of climate change and the need to use climate smart practices to curb the effect. This finding is in line with that of Ifabiyi et al., 2021 which suggested that small ruminant farmers had come to terms with the reality of climate change and its detrimental consequences on production.

However, "regular composting of dropping to prevent release of greenhouse gases" (2.3±.99), "growing climate resistance forage crops that require less water and are adaptable to varying weather conditions"(1.5±.77), "farm insurance" (1.4±.62) and "recycling of crop residues for animal feed"(1.3±.55) were ranked 8th, 9th, 10th and 11th respectively. This implies that small ruminant farmers do not use these climate smart practices always and they are essential climate-smart practices for enhanced climate change adaptation in ruminant production (Ifabiyi et al., 2021).

Level of usage of climate-smart practices among small ruminant farmers

Categorically, the level of use of climate-smart practices among small ruminant farmers in the Kwara state is illustrated in Table 4, the table shows that majority of the respondents still use climate smart practices moderately (68.3%) indicating that not all the practices are fully utilized. There could be need for more sensitization of small ruminant farmers on the essence of using climate smart practices for enhanced ruminant production.

Constraints to the Use of Climate Smart Practices by Ruminant Farmer

The constraints to the use of climate smart farming are presented in Table 5. It revealed that "difficulties in providing adequate feed for small ruminants during the dry season" (4.3±1.06), "inadequate fund to invest in climate-smart practices" (4.2±.73), "inadequate information and extension services about climate-smart practices" (3.9±1.09) and "lack of access to quality seeds or planting materials for climate-resistant forage crops" (3.8±1.16) were ranked 1st, 2nd, 3rd and 4th respectively. This indicates the pressing areas inhibiting the use of climate-smart practices by small ruminant farmers in the study Area. This could be attributed to their inability to produce hay or forage for dry season feed for ruminant animals. The inadequate information and extension services could be linked to their lack of access to quality seeds for climate-resistant forage crops. As opined by Olorunfemi et al., (2021), extension information and services are crucial for effective use of climate-smart practices among farmers.

Demographic characteristics influencing use of climate-smart practices among small ruminant farmers.

As revealed in Table 7, the linear multiple regression result shows that 63% variation in the level of use of climate-smart practices is attributed to independent variables considered for this study. Age, level of education and small ruminant rearing system are positively significant at 1%, 5% and 1% respectively. This implies that the age, educational level and rearing system are the major factors that influence the use of climate-smart practices by farmers in Kwara State. This indicates

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that an increase in age increases the level of use of climate-smart practices by farmers. Similarly, the educated small ruminant farmers make use of climate-smart practices more than non-educated farmers. Furthermore, the semi-intensive system of rearing small ruminant production favour the use of climate-smart practices among farmers. This finding corroborates that of Mbanasor et al., (2024) which revealed the role education played in shaping farmers' decision to use agricultural innovations.

CONCLUSION AND RECOMMENDATIONS

It was concluded that small ruminant production is predominantly practiced by male within an active age. Radio was the major source of information used while stocking of ruminant specie that are tolerant to harsh weather conditions and water conservation were most use climate-smart practices with overall moderate level of use. The constraint to use of climate-smart practices were difficulty in providing adequate feed for small ruminants during the dry season, inadequate fund to practice climate-smart and inadequate extension information and services. Age, educational level and rearing system were found to influence the use of climate-smart practices among small ruminant farmers in Kwara State.

Recommendations

In response to the foregoing, the following were recommended:

1. Extension institutions should organize training for small ruminant farmers on alternative ways of providing feed for animals such as hay or silage during the dry season.
2. There is need for more sensitization on the use of climate-smart practices to ensure full usage
3. While organizing training for small ruminant farmers, factors such as age, educational level and the rearing system of animals should be put into consideration

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Table 1: Demographic Characteristics of Small Ruminant Farmers

Variables	Frequency (180)	Percentage	Mean±SD
Gender			
Male	101	56.1	
Female	79	43.9	
Age (years)			40.1±10.10
≤ 30	43	23.9	
31 – 40	66	36.7	
41 – 50	48	26.7	
Above 50	23	12.8	
Marital status			
Single	19	10.6	
Divorced	3	1.7	
Separated	4	2.2	
Widow/widower	21	11.7	
Married	133	73.9	
Level of education			
Primary	25	13.19	
Secondary	80	44.4	
Tertiary	66	36.7	
None of the above	9	5.71	
Religion			
Christianity	102	56.7	
Islam	78	43.3	
Type of ruminant reared			
Sheep	40	22.2	
Goat	133	73.9	
Others	7	3.9	
Years of experience			6.2±2.43
1 – 3	28	15.6	
4 – 6	76	42.2	
7 – 9	57	31.7	
10 and above	19	10.0	
Number of animals			
1 – 10	122	67.8	
11 – 20	57	31.7	
21 and above	1	0.6	
Rearing system			
Intensive system	28	15.6	
Semi-intensive system	85	47.2	
Extensive system	67	37.2	

Table 2: Sources of Information on the Use of Climate Smart practices

Sources	Always	Sometimes	Rarely	Never	Mean±SD	Rank
Extension agent	79(43.9)	58(32.2)	30(16.7)	13(7.2)	3.1±.94	3rd
Radio	98(54.4)	47(26.1)	20(11.1)	15(8.3)	3.3±.96	1st
Television	34(18.9)	65(36.1)	54(30.0)	27(15.0)	2.6±.96	5th
Social media	73(40.6)	50(27.8)	29(16.1)	28(15.6)	2.9±1.09	4th
Newspaper	5(2.8)	34(18.9)	82(45.6)	59(32.8)	1.9±.79	11th
Fellow farmers	74(41.1)	71(39.4)	24(13.3)	11(6.1)	3.2±.88	2nd
Local market	45(25.0)	42(23.3)	48(26.7)	45(25.0)	2.5±1.12	6th
Agricultural book	35(19.4)	41(22.8)	50(27.8)	54(30.0)	2.3±1.10	7th
Research Institute	21(11.7)	60(33.3)	35(19.4)	64(35.6)	2.2±1.06	8th
Agricultural show	30(16.7)	22(12.2)	49(27.2)	79(43.9)	2.0±1.11	10th
Agricultural equipment dealer	6(3.3)	27(15.0)	60(33.3)	87(48.3)	1.7±.84	12th

Table 3: Use of climate smart practices by small ruminant farmers

Practices	Sometimes	Rarely	Never	Mean±SD	Rank
Stocking species that are tolerant to harsh weather conditions	18(10.0)	13(7.2)	22(12.2)	3.4±1.06	1st
Water conservation	60(33.3)	23(12.8)	15(8.3)	3.2±.95	2th
Use of weather forecasting information	51(28.3)	41(22.8)	33(18.3)	2.7±1.09	3th
Bury dead animals immediately	59(32.8)	16(8.9)	52(28.9)	2.6±1.19	4th
Rotational grazing	38(21.1)	20(11.1)	58(32.2)	2.6±1.27	5th
Provision of shade through Planting of trees to reduce heat stress	67(37.2)	32(17.8)	45(25.0)	2.5±1.08	6th
Rearing more than one species	49(27.2)	64(35.6)	41(22.8)	2.3±.99	7th
Regular composting of dropping to prevent release of greenhouse gases	54(30.0)	28(15.6)	79(43.9)	2.1±1.08	8th
Growing climate resistant forage crops that require less water and are adaptable to varying weather conditions	13(7.2)	39(21.7)	122(67.8)	1.5±.77	9th
Farm Insurance					
Recycling of crop residue	18(10.0)	55(30.5)	107(59.4)	1.4±.62	10th
for feed	8(4.4)	39(21.7)	133(73.9)	1.3±.55	11th

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Table 4: Level of usageof climate-smart practices by small ruminant farmers

Level (obtained score range)	Frequency (180)	Percentage (100%)	Mean
Low (11 – 23)	39	21.7	
Moderate (24 – 34)	123	68.3	29.4±5.83
High (35 – 44)	18	10.0	

Table 6: Constraints to the use of climate-Smart Practices by small ruminant farmers

Constraints	SA	A	UD	D	SD	Mean±SD	Rank
Difficulties in providing adequate feed for small ruminants during the dry season	115(63.9)	25(13.9)	22(12.2)	16(8.9)	2(1.1)	4.3±1.06	1st
Inadequate fund to invest in climate-smart practices.	62(34.4)	97(53.9)	15(8.3)	6(3.3)	0	4.2±.73	2nd
Inadequate information and extension services about climate smart practices	65(36.1)	57(31.7)	32(17.8)	23(12.8)	3(1.7)	3.9±1.09	3rd
Lack of access to quality seeds or planting materials of climate-resistant forage crops	64(35.6)	66(36.7)	25(13.9)	14(7.8)	11(6.1)	3.8±1.16	4th
Lack of Technical Knowledge	43(23.9)	69(38.3)	33(18.3)	33(18.3)	2(1.1)	3.7±1.07	5th
Lack of appropriate infrastructure and systems for rainwater harvesting	65(36.1)	51(28.3)	26(14.4)	27(15.0)	11(6.1)	3.7±1.26	6th
Difficulty in finding and using modern equipment that can help with climate-smart practice	5(19.4)	78(43.3)	28(15.6)	37(20.6)	2(1.1)	3.6±1.06	7th
Lack of awareness and understanding of how to interpret and apply weather forecasting information	44(24.4)	43(23.9)	31(17.2)	49(27.2)	13(7.2)	3.3±1.30	8th
Unavailability and access to climate-tolerant breeds	34(18.9)	53(29.4)	17(9.4)	36(20.0)	40(22.2)	3.0±1.47	9th
Unavailability of suitable tree species for providing shade	13(7.2)	40(22.2)	34(18.9)	54(30.0)	39(21.7)	2.6±1.25	10th

Strongly Agree (SA), Agree (A), Undecided (UD), Disagree (D) and Strongly Disagree (SD)

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Table 7: Linear multiple regression analysis of the relationship between socio-economic characteristics and the use of climate-smart practices.

Variable	Coefficients (β)	Std. Error	T	Sig.
(Constant)	31.045	3.688	8.418	.000
Age	-.153**	.053	-2.878	.005
Gender	.510	.538	.947	.345
Marital Status	.502	.343	1.463	.145
Level of education	1.691***	.750	2.254	.025
Rearing system	2.471**	.883	2.799	.006
Years of experience	-.406	.633	-.642	.522
Number of animals	1.372	.968	1.417	.158
Type of Ruminant	-.020	.607	-.032	.974

R square=0.635; R square adjusted = 0.620

** (sig at 1%), ***(sig at 5%)