



AWARENESS OF CLIMATE CHANGE ADAPTATION STRATEGIES AMONG POULTRY FARMERS IN WESTERN ZONE OF BAUCHI STATE, NIGERIA

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ABSTRACT

The study examined the awareness of climate change adaptation strategies among poultry farmers in Western Zone of Bauchi State, Nigeria. A multi-stage sampling technique was used in selecting 120 respondents. Data were collected using structured questionnaire and analyzed using descriptive statistics and linear regression. The findings show that a substantial proportion (46.7%) of the respondents were within the ages of 28-40 years with a mean age of 36 years. Half (50.8%) of the respondents had tertiary level of education and majority (76.7%, 76.7%) rear chicken and had a flock size of 200 birds respectively. Majority (83.3%) of the respondents were aware of climate change and the major adaptation strategies used to mitigate climate change were trees planting (\overline{X} =4.4), access to information on climate and weather (\overline{X} =4.3), provision of ventilated houses (\overline{X} =4.2), provision of better hygiene (\overline{X} =4.2), and creating space (\overline{X} =4.1). The result from linear regression revealed that age and sex were negative and significant (P<0.05) factors influencing respondents' awareness on climate change effect on poultry birds. It can be concluded that majority of poultry farmers were aware of climate change. In addition, Age and flock size were the major factors influencing the adoption of climate change mitigation strategies. It is recommended that there is need to intensify awareness campaigns to poultry farmers on how to mitigate the effects of climate change on poultry production.

Keywords: Awareness, Adaptation, Strategies, Poultry, Farmers

INTRODUCTION

Climate change is the effect of long-term changing climatic conditions which is caused, among other human activities, by carbon dioxide and carbon monoxides released from incomplete burning of fossil fuels; deforestation and methane emission from animal dungs, rice fields, landfill sites, agricultural chemicals and pesticides (Eneji et al., 2020). Climate change is intimately linked with agriculture, its impacts on livelihoods and economies depend on agriculture which have been recorded in many places (Ullah et al., 2018). By implication, the poor are the most vulnerable to climate change because of their dependence on agriculture as mainstay of livelihood. Though a global issue, climate change impacts are felt differently across the world (Matemilola et al., 2019). Farmers may adapt to the altering conditions of climate change with the aid of climate-smart agricultural practices including conservation agriculture and agroforestry while also lowering greenhouse gas emissions and boosting production (Akande & Ajayi, 2019). Awareness is the first step toward effective adaptation, influencing the likelihood that farmers will take preemptive or reactive measures to mitigate climate change (Adeyemo, et al., 2022). Farmers who are well-informed are more likely to take proactive measures such as modifying housing structures, adjusting feeding schedules, using resilient poultry breeds, and adopting climate-smart practices (Eze et al., 2023). Farmers who are aware of climate change and its impacts are more likely to adopt coping strategies such as improved housing for poultry, use of resilient breeds, changes in feeding and watering schedules, and adoption of biosecurity measures (Umeh & Okonkwo, 2022). Conversely, low awareness is linked to passive attitudes, maladaptation, or dependence on emergency relief (Adeyemo et al., 2022). Moreover, awareness enhances the effectiveness of extension services, encourages community-level planning, and facilitates the uptake of climate-smart innovations. According to the IPCC (2022), increasing climate literacy among smallholder farmers is essential to achieving long-term adaptation and resilience. Nigeria's economy heavily depends on agriculture, which is being negatively impacted by climate change in ways, including altered rainfall patterns and an increase in extreme weather events





(Akande & Ajayi, 2019). Nigeria is experiencing several environmental problems because of climate change, including altered weather patterns, increasing sea levels, and a decline in biodiversity (Ogunwale *et al.*, 2018). Natural catastrophes like floods and droughts are becoming more frequent and severe because of climate change, which is having catastrophic effects on infrastructure and communities (Ibe *et al.*, 2018).

The Western Agricultural zone of Bauchi State, Nigeria is a significant hub for poultry farming contributing to the local economy and food security. However, climate change poses a substantial threat to poultry production, with rising temperature, changing precipitation pattern, and increased frequency of extreme weather events affecting farm productivity and livelihood (Akande & Ajayi, 2019). Adaptation strategies are practical measures taken by poultry farmers to mitigate the adverse effects of climate change. These strategies can be categorized into technological, managerial, and structural adaptations (Adelekan, 2022; Eze et al., 2024). Technological adaptations might include improved poultry breeds and climate-resilient housing systems (Adelekan, 2022). Managerial adaptations could involve changes in feeding practices and health management, while structural adaptations might encompass alterations in farm infrastructure and water management systems. Socio-economic factors play a crucial role in shaping farmers' perceptions and their capacity to adopt adaptation strategies. These factors include income levels, access to resources, education, and extension services. For example, higher income levels and better access to agricultural extension services have been shown to enhance the adoption of climate-smart practices (Abdulkareem et al., 2023). Conversely, limited resources and low education levels may constrain the ability to adapt effectively (Akinola et al., 2023). Therefore, the study examined the awareness of climate change among poultry farmers in Western Zone of Bauchi State, Nigeria.

METHODOLOGY

STUDY AREA

THE STUDY WAS CONDUCTED IN WESTERN AGRICULTURAL ZONE OF BAUCHI STATE, NIGERIA. THE ZONE HAS SEVEN (7) LOCAL GOVERNMENT AREAS (LGAS) THAT INCLUDE ALKALERI, BAUCHI, BOGORO, DASS, KIRFI, TAFAWA BALEWA AND Toro. The Zone Is Located Between Latitude 9° 3' And 12° 3' North And LONGITUDE 8° 50' AND 11° EAST. (NATIONAL BUREAU OF STATISTICS [NBS], 2021). THE AREA COVERS A LAND AREA OF 23,247 SOUARE KILOMETERS WITH A PROJECTED POPULATION OF 2, 797, 566 BY 2024 (JAAFAR ET AL., 2023). MAJOR ECONOMIC ACTIVITIES INCLUDE FARMING, LIVESTOCK REARING, AND TRADING. THE CROPS PRODUCED INCLUDE MAIZE, RICE, MILLET, SORGHUM, GROUNDNUT AND SOYABEANS, WHILE CATTLE AND POULTRY FARMING ARE MORE SIGNIFICANT IN RURAL HOUSEHOLDS (FOOD AND AGRICULTURE ORGANIZATION [FAO], 2022). THE VEGETATION SUPPORTS BOTH CROP PRODUCTION AND PASTORALISM (FOOD AND AGRICULTURE ORGANIZATION [FAO], 2022). THE REGION EXPERIENCES AN AVERAGE ANNUAL TEMPERATURE OF 27°C TO 32°C, WITH THE HOTTEST MONTHS OCCURRING BETWEEN MARCH AND MAY (NIGERIAN METROLOGICAL AGENCY [NIMET], 2022). ANNUAL RAINFALL RANGES FROM 900 MM TO 1,200 MM, MOSTLY CONCENTRATED BETWEEN MAY AND OCTOBER DURING THE RAINY SEASON (NIGERIAN METROLOGICAL AGENCY [NIMET], 2022).

Sampling Technique

A multi- stage sampling technique was used to select the respondents for this study. The first stage, involved the purposive selection of two (2) Local Government Areas (LGAs) (Bauchi and Toro) from the zone. This was because of the presence of high number of poultry farmers. The second stage involved purposive selection of three (3) communities from each of the selected LGAs making a total of six (6). In the final stage, 120 respondents were randomly and proportionately (65%) chosen from the selected communities as shown in Table 1.



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Table 1: Sample Size Selection Plan

LGAs	Communities	Sampling frame	Sample size (65%)	
Bauchi	Yelwa	46	30	
	Dawaki	40	26	
	Dan'iya	37	24	
Toro	Tilden Fulani	16	10	
	Magama	15	10	
	Rimin Zayam	30	20	
Total			120	

SOURCE: AUTHOR'S COMPUTATION, 2024

METHOD OF DATA COLLECTION

THE PRIMARY DATA FOR THE STUDY WAS COLLECTED THROUGH A STRUCTURED QUESTIONNAIRE WHICH WAS USED TO ELICIT INFORMATION FROM THE RESPONDENTS. DATA WERE COLLECTED ON SOCIO-ECONOMIC CHARACTERISTICS OF THE RESPONDENTS, AWARENESS OF CLIMATE CHANGE AMONG THE RESPONDENTS, AND RESPONDENTS' ADAPTIVE MEASURES TO MITIGATE CLIMATE CHANGE.

METHOD OF DATA ANALYSIS

Data for the study were analyzed using descriptive and inferential statistics to achieve the research objectives. Descriptive statistics such as; frequency, percentages and mean were used to achieve objectives i, ii, and iii. Inferential statistics such as linear regression model was employed to achieve objective iv.

Descriptive Statistics

Descriptive statistics such as; frequency, distribution, percentages, and mean were used to achieve objectives i, ii, and iii.

Mean score

Mean score was also used to achieve objectives ii and iii. Five points mean score was used and coded as follows; Strongly agreed = 5, agreed = 4, undecided = 3, disagreed = 2, and strongly disagreed 1 with mean score threshold of > 3.0 and above showed that adaptive measures were effective, while a threshold of < 3.0 indicates adaptive measures were not effective.

$$M = \frac{\Sigma X}{N}$$

Where;

M = Mean

 $\sum = Sum$

 $\overline{X} = Raw Score$

N = Number of Cases

Inferential statistics

The linear regression model was used to determine the relationship between climate change awareness and socio-economic characteristics of poultry farmers. The model is expressed as:

$$Y = 0 + 1 X1 + 2 X2 + 3 X3 + 4X4 + 5X5 + 6X6 + 7X7 + 8X8 + 9X9 + 10X10 + e$$
 ...(1)

The model is mathematically expressed as:

$$Y = 0 + 1X + e$$
 ...(2)

Where:

Y = Awareness of climate change among poultry farmers (yes = 1, no = 0)

 $X_1 = Age (Years)$

 $X_2 = Sex (1 = Male, 2 = Female)$

 X_3 =Marital status (1= Married, 2 = Single, 3 = Divorced, 4 = Widowed)

 X_4 = household size (1 = 1-5, 2 = 6-10, 3 = 11-15, 4 = 15-20, 5 = 20 above)

 X_5 = Source of income (1 = Personal savings, 2 = Loan, 3 = Salary, 4 = Relatives, 5 = others)

 X_6 = Education level (1 = None, 2 = Qur'anic Education, 3 = Adult Education, 4 = Primary Education, 5 = Secondary Education, 6 = Tertiary Education)





 X_7 =Types of poultry reared (1 = Turkey, 2 = Chicken, 3 = Ostrich, 4 = Guinea Fowl)

X₈= Flock size (Number of birds)

 X_9 = Sources of capital (1 = Personal saving, 2 = Loan, 3 = Salary, 4 = Relatives)

 X_{10} = Sources of information (1 = Farmers, 2 = Friends, 3 = BSADP, 4 = Mass media, 5 = Extension agents, 6 = Cooperative societies, 7 = Agro dealers)

0 = Intercept

1 = Slope

e = Error term

RESULTS AND DISCUSSION

Quantitative Socio-economic Characteristics of the Respondents

The result in table 2 described the socio-economic characteristics of the respondents which is an important component of the study. The finding shows that 46.7% of the respondents were within the ages of 30-39 years. In addition, 26.7% and 19.2% were found to be within the ages of 20-29 years and 40-49 years respectively, with a mean age of 36 years in the study area. This finding implies that most of the respondents were within their active ages of production, this is a good indicator that youth are venturing into poultry production and this translate that agricultural production will improve as farmers are believed to be educated and willing to adopt modern farming techniques especially in coping the effects of climate change in poultry production. This age group is particularly significant in agricultural practice and climate action, as they are more likely to be open to innovation and adaptive strategies (Ajaero & Anorue, 2022).

Majority (86.7%) of the respondents had a household size of 1-12 persons and a good number representing 36.7% had a household size of 7-12 persons with a mean household size of 8 members. in the study area. This finding implies that most of the respondents had a relatively small household size which could be connected to the fact that most of them were young farmers. This agrees with Ojo and Baiyegunhi (2020) who noted that moderate household sizes tend to adopt more sustainable practices, as they have manageable consumption needs and labor for poultry-related tasks.

Majority (76.7%) of the respondents had a flock size of 200 birds and 10.8% had a flock size of 200-399 birds in the study area. A small proportion (8.3%, 4.2%) of the respondents had a flock size of 400-599, 600 and above with mean flock size of 170 birds. This finding implies that most of the respondents had relatively large number of birds which could be a motivating factor to adoption of climate change mitigation strategies since no farmer will risk losing many birds due to heat or extreme cold, hence most of the respondents will be vigilant especially with the weather condition which is key to bird survival production in the study area. This small to medium-scale categorization is in line with findings by Okorie and Umeh (2024), who highlighted that limited capital, poor infrastructure, and inadequate veterinary services are barriers to scaling up poultry operations in rural Nigeria.





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Table 2: Distribution of Respondents According to their Quantitative Socioeconomic Characteristics (n=120)

Socio-economic characteristics	Frequency	Percentage	Mean
Age			
20-29	32	26.7	
30-39	56	46.7	36
40-49	23	19.2	
50 and above	9	7.5	
Household size			
1-6	60	50.0	
7-12	44	36.7	8
13-18	7	5.8	
19 and Above	9	8.5	
Flock size			
200	92	76.7	
200-399	13	10.8	170
400-599	10	8.3	
600 and Above	3	2.5	

Source: Field Survey, 2024

Qualitative Socio-economic Characteristics of the Respondents

As shown in Table 3, 65% of the respondents were male, and 35% were female. This finding implies that most of the poultry farmers were male which implies that male dominate most of the agricultural production aspects in the study area. This male dominance is consistent with the findings by Adewumi and Adebayo (2022), who reported that men typically dominate poultry farming in northern Nigeria due to socio-cultural roles, land access, and household decision-making norms. However, the growing participation of women (35%) is an echoing trend identified by FAO (2023) that women's involvement in livestock and poultry farming is increasing, despite being in smaller-scale or subsistence operations. The finding further shows that more than half (54.2%) of the respondents were married and a good proportion, constituting 40.8% were single. This implies that a substantial proportion of the respondents had certain level of responsibilities. This agrees with the findings of Ojo and Ibrahim (2023), who observed that married individuals in agricultural households tend to have more stability and support networks, which can influence their level of involvement in climate-related decision-making.

The findings further reveal that half (50.8%) of the respondents had tertiary level of education, 35% had secondary education, a few number 7.5%, 5% and 0.8% had Qur'anic, adult, primary and non-formal education, respectively. This finding implies that most of the respondents had attended certain level of education in the study area. Eze *et al.* (2023) emphasized that education level significantly influences awareness and adoption of climate-smart agricultural practices. This also implies a strong potential for leveraging formal education in designing extension and climate communication strategies. The result also shows that majority (76.7%) of the respondent rear chicken and 17.5% rear turkey. A few numbers 4.2% and 1.7% of the respondent rear ostrich and guinea fowl. This finding implies that rearing chicken is more efficient, profitable and is high in demand especially during festive periods in the study area. This finding is in support with Okorie and Umeh (2024) who confirmed that broiler and layer poultry dominate the Nigerian poultry sector, reflecting both economic viability and cultural preferences and the presence of exotic birds like ostriches suggests a small but growing interest in diversified poultry systems.

The finding further shows that more than half (55.8%) of the respondents had personal savings s their major source of capital, 25% and 15.8% had salary and loan as their major source of capital for poultry production, small proportion 3.3% had relatives as their major source of capital for poultry production in the study area. This finding implies that most of the respondents had their





capital from a non-interest source which is preferable in agricultural venture which is mostly associated with high risk and long incubation periods. According to Ogunbode *et al.* (2023), the inability of rural poultry farmers to access formal loans restricts investment in climate-resilient infrastructure and modern production techniques.

More so, half (50%) of the respondents had fellow farmers as their major source of information on poultry production, 15%, 11.7% and 10% had extension agents, mass media and friends as their major source of information on poultry production, respectively. A few proportion 6.7%, 4.2% and 2.5% of the respondents had BSADP, cooperatives and agro-dealers as their major sources of information on poultry production, respectively. This finding implies that most of the respondents had different sources of information on poultry production which expose respondent to new techniques and methods of poultry production and climate change mitigation strategies in the study area. This finding agrees with Nnadi and Chukwu (2023) who noted that rural farmers rely heavily on peer networks due to limited extension coverage. Similarly, Ayanlade, and Morton (2017) emphasized the role of interpersonal communication in shaping adaptation responses, particularly in rural areas with limited access to formal sources like media or extension services. The finding further shows that 29.2%, 28.3% and 24.2% of the respondents were civil servants, livestock producers and farmers with 15% and 3.3% been traders and students, respectively. This finding implies that most of the respondents were engaged in agricultural production value chain which shows that a good number of the respondents could be familiar with poultry bird requirement in production especially regarding climate and weather requirement in the study area. Also, the significant proportion of civil servants and livestock farmers shows that poultry farming is often pursued alongside other income-generating activities, possibly as a coping strategy against economic volatility. This is in line with Ajaero and Anorue (2022), who found that diversified livelihoods enhance household resilience to climate change shocks.





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Table 3: Distribution of Respondents According to their Qualitative Socioeconomic Characteristics (n=120)

Socio-economic characteristics	Frequency	Percentage
Sex		
Male	78	65.0
Female	42	35.0
Marital status		
Married	65	54.2
Single	49	40.8
Divorce	3	2.5
Widowed	3	2.5
Educational level		
Non-formal	1	0.8
Qur'anic	9	7.5
Adult education	6	5.0
Primary	1	0.8
Secondary	42	35.0
Tertiary	61	50.8
Types of poultry reared		
Turkey	21	17.5
Chicken	92	76.7
Ostrich	5	4.2
Guinea fowl	2	1.7
Sources of capital	-	,
Personal savings	67	55.8
Loan	19	15.8
Salary	30	25.0
Relatives	4	3.3
Sources of information		
Fellow farmers	60	50.0
Friends	12	10.0
BSADP	8	6.7
Mass media	14	11.7
Extension agent	18	15.0
Cooperatives	5	4.2
Agro-dealers	3	2.5
Major occupation		
Farming	29	24.2
Livestock rearing	34	28.3
Civil servant	35	29.2
Trading	18	15.0
Student	4	3.3

Source: Field Survey, 2024

Awareness of Climate Change Among the Respondents

The result from Table 4 describes the awareness of respondents on climate change and its effects on the environment in the study area. Among the surveyed farmers, 83.3% reported to have had on climate change. This high awareness rate aligns with global trends indicating increased public recognition of climate change particularly in regions vulnerable to climate impacts such as sub-Saharan Africa (Okoli *et al.*, 2023). Similarly, Nwobodo *et al.* (2022) found that over 80% of Nigerian rural farmers were aware of climate change and attributed it to observable environmental alterations such as prolonged dry seasons and flooding. The finding also shows that 46.7% of the respondents indicated that climate change awareness was very important on poultry production. This indicates that about 76.7% of respondents see climate change as significantly important, though a





small percentage remain different. This observation is consistent with research by Onyeneke *et al.* (2020), who noted that farmers with direct experience of erratic weather patterns were more likely to perceive climate change as a major concern.

Table 4: Distribution of Respondents According to Awareness on Climate Change (n=120)

Variables	Frequency	Percentage
Climate change awareness		
Yes	100	83.3
No	20	16.7
Level of importance on climate change		
Very important	56	46.7
Quite important	36	30.0
Not very important	17	14.2
Not important	11	9.2
Climate change affect environment		
Yes	102	85.0
No	18	15.0
Awareness on climate change prevention		
Yes	107	89.2
No	13	10.8

Source: Field Survey, 2024

The finding also reveals that majority (85%) of the respondents indicated that climate change had effect on the environment in the study area. This finding implies that respondent had good knowledge of the devastating effect of climate change on the society and poultry production as most of them were indicating that climate change had effect on the environment most affect poultry production in which the animals are highly sensitive to climate change especially increase in temperature. According to IPCC (2023), climate change has led to more frequent and intense environmental disturbances, and these changes are increasingly visible even to lay observers. More so, 89.2% of the respondents were aware of climate change prevention which implies that most of the respondents were aware of climate change prevention strategies especially on poultry production in the study area. This is in line with Ayanlade (2021) who reported that awareness of prevention measures is critical for behavioral change and policy support.

Respondents' Adaptive Measures to Mitigate Climate Change

The result from Table 5 shows the adaptive measures use to mitigate climate change in the study area by the respondents. The finding reveals that respondents agreed on planting of trees $(\overline{X}=4.4)$, access to information on climate/weather $(\overline{X}=4.3)$, and provision of better hygiene $(\overline{X}=4.2)$, and construction of ventilated houses $(\overline{X}=4.2)$, creating space $(\overline{X}=4.1)$, and change in feed formulation were adopted mitigation strategies on climate change as indicated by mean score values above the threshold value of $(\overline{X}=3.0)$ in the study area. This finding implies that most of the respondents had adopted several strategies which help in mitigating climate change effects especially on poultry bird in the study area. These findings are consistent with Ojo *et al.* (2021), who assessed adaptive strategies among poultry farmers in South-Western Nigeria and reported high adoption rates of ventilated housing and tree planting as climate-resilient methods. Furthermore, Sadiq and Bello (2020) studied adaptation among livestock farmers in Kaduna State and found that access to climate information and better hygiene practices were rated highly (mean scores above 4.0). additionally, Olaniyi *et al.* (2019) highlighted the significance of decongested housing systems to reduce heat stress in poultry during dry spells in Northern Nigeria.





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Table 5: Distribution of Respondents According to their Adaptive Measures to Mitigate Climate Change

Variable	Mean	Remark
Planting of trees	4.4	Agree
Accessing information on climate and weather	4.3	Agree
Provision of better hygiene	4.2	Agree
Construction of ventilated houses	4.2	Agree
Creating spaces	4.1	Agree
Change in feed formulation	4.0	Agree

Source: Field Survey, 2024 X≥3.0; Agree. X<3.0; Disagree

The Relationship between Climate Change Awareness and Socioeconomic Characteristics of the Respondents

The result from Table 10 reveals that age (-.010) and sex (-.239) were negative and significant (P<0.05) factors influencing respondents' awareness on climate change effect on poultry birds. This finding implies that increase in age of the respondents will lead to decrease in climate change awareness on poultry which could be as a result old age leading to reduction in participation into agricultural activities, likewise increase in female participation in poultry production will lead to decrease in climate change awareness as a result of limited access to information by female farmers who might be restricted to seminars, workshop and field days organized on climate change awareness in the study area. This finding aligns with (Maguza *et al.*, 2023) who observed that older farmers tend to be less likely to adopt innovations compared to younger farmers.

On the other hand, the finding shows that marital status, household size, major occupation educational level, types of poultry reared, flock size, sources of capital and sources of information have no significant influence on climate change effect awareness among poultry farmers. This finding implies that increase or decrease on these variables will not affect climate change effect awareness in the study area. Other variables in the model, such as marital status, household size, educational level, and major occupation, show no significant influence (p < 0.05). While education shows a positive but non-significant relationship, this aligns with Abegunde *et al.* (2022) who observed that education sometimes increases awareness but doesn't always translate into action, particularly when structural barriers persist. The type of poultry reared and flock size also show no significant effect. This implies that regardless of poultry type or size, the driving factors are more socio-demographic than production-related. Furthermore, sources of capital and information were expected to play a larger role but are not statistically significant, hinting at potential inefficiencies or low-quality dissemination of resources and knowledge (Yila *et al.*, 2023).

Table 6: Relationship between Climate Change Awareness and Socio-economic Characteristics of the Poultry Farmers

Variables	В	Std. Error	Beta	T	Sig.
(Constant)	2.070	.416		4.981	.000
Age	010**	.004	251	-2.219	.029
Sex	239**	.108	233	-2.220	.029
Marital status	.028	.080	.038	.351	.727
Household size	.004	.009	.041	.425	.671
Major occupation	049	.043	112	-1.145	.255
Educational level	.037	.038	.094	.990	.324
Types of poultry reared	057	.090	061	627	.532
Flock size	-7.190E-5	.000	024	245	.807
Sources of capital	.023	.046	.048	.505	.615
Sources of information	027	.025	101	-1.063	.290

Source: Field Survey, 2024 Note: Significant ** p<0.05



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CONCLUSION AND RECOMMENDATIONS

It can be concluded that majority of poultry farmers are aware of climate change. In addition, Age and flock size were the major factors influencing the adoption of climate change mitigation strategies. Based on the findings of this study, it was therefore recommended that, there is need to intensify awareness campaigns to poultry farmers on how to mitigate the effects of climate change on poultry production. Regular capacity-building workshops should be organized on adaptive management practices and sustainable poultry farming under changing climate conditions.

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