



**FACTORS INFLUENCING AWARENESS OF THE EFFECTS OF CLIMATE CHANGE ON
POULTRY PRODUCTION IN WESTERN AGRICULTURAL ZONE OF
BAUCHI STATE, NIGERIA**

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ABSTRACT

The study examined the factors influencing awareness of the effects of climate change on poultry production in Western Agricultural Zone of Bauchi State, Nigeria. Multi-stage sampling technique was employed in selecting 239 respondents for the study. Data were obtained through the administration of structured questionnaire and analysed using both descriptive and inferential statistics. The results revealed that majority (67.4% and 83.7%) of the respondents were male and married, with a household size and farming experience of 8 persons and 8 years, respectively. The findings also showed that majority (62.8% and 70.3%) of the respondents had tertiary education and were civil servants, with a mean annual income and flock size of ₦307,322.18 and 185 birds, respectively. The result further revealed that age, marital status, household size, annual income, access to extension, and frequency of extension contact were positive and significant ($P < 0.01$) in influencing level of awareness of the effects of climate change on poultry production in the study area. The major constraints faced by the respondents were inadequate capital (1st), inadequate information on climate change (2nd) and lack of government support (3rd), among others. The study concluded that age, marital status, household size, annual income, access to extension and frequency of extension contact were the factors influencing the level of awareness of the effects of climate change among the respondents in the study area. To stem the tide of climate change, extension services should develop and implement comprehensive climate change education programs tailored to poultry farmers and respondents' cooperatives should improve access to affordable credit, inputs, and technology for climate change adaptation, to mention few.

Keywords: Perception, Climate, Change, Poultry, Farmers

INTRODUCTION

Globally, agricultural production is vital to the general wellbeing of the populace because of its importance in the provision of food, income for farmers, raw material for industries, employment and foreign exchange for the nations. Livestock production includes poultry birds of different species that have been domesticated for the production of meat, egg, and other related products like manure (Momoh *et al.*, 2018; Mozdziak, 2019). When compared to other domesticated animals, poultry animals such as chickens, turkeys, quails, etc provide not only economic services but also significantly contribute to human food as a major supplier of meat, eggs, and raw materials to industries, source of income for people and source of employment (Agyare *et al.*, 2018). Products from poultry such as meat and eggs provide a potential source for meeting the basic and dietary needs of humans (Food and Agriculture Organization of the United Nation, 2023). The climatic environment is one of the many limiting factors of production efficiency in tropical and subtropical areas, and the poultry feed intake is depressed when the ambient temperature rises (Dumas *et al.*, 2016). Climate change influences how diseases are spread globally, has an impact on how poultry are fed, and encourages disease outbreaks, all of which have a negative impact on the amount of meat and eggs produced by poultry as well as on production costs. Temperature decreases the amount of feed that poultry birds consume since it takes more energy to maintain the heat caused by high temperature, hence, a decrease in the rate of feed intake. But wealthy nations have been able to lessen the negative consequences of climate change by using strategies such as natural advantage, high adaption



techniques, high technology, mechanized farming system, and wealth status (Akanwa and Joe-Ikechebelu, 2019).

Adaptation, perception of climate change, as well as its causes and effects, is important to trigger the adaptation process (Niles *et al.*, 2016). Unfortunately, lack of adequate knowledge and information were reported in previous studies as an obstacle to adaptation and, therefore, calls for quality, accurate and accessible information (Pandey, 2022). Knowledge is a critical ingredient and the most important input in the process of adaptation (Tripathi and Mishra, 2017).

The change in climate over the years has been having lots of impacts on the communities of the various nations of the world. Nigeria has been having its share of the impacts of climate change. These impacts are felt by the farmers of Nigeria and Bauchi State in particular. According to Ahaotu *et al.* (2019), hot climate can have severe impact on poultry performance, thus resulting to heavy economic losses on poultry production as a result of stunted growth. Akure and Afaka (2024) reported that farmers observed that thermal stress reduces feed consumption among birds. Ahaotu *et al.* (2019) stated that as the ambient temperature increased to 34°C, the mortality due to heat will be higher in broilers by 8.4%.

Farmers also commonly reported that climate change leads to drought conditions and negatively affects animal health, increasing mortality rates while reducing productivity in terms of both meat and egg production (Akure and Afaka, 2024). In light of this, the researcher investigated the factors influencing awareness of the effects of climate change on poultry production in western agricultural zone of Bauchi State, Nigeria.

The broad objective of this study was to determine the factors influencing level of awareness of poultry farmers on climate change effects on poultry production in Western Agricultural Zone of Bauchi State, Nigeria, while the specific objectives were to:

- i. describe the socio-economic characteristics of the respondents;
- ii. assess the perceived effects of climate change on poultry production in the study area;
- iii. identify the constraints to climate change mitigation strategies in the study area.

METHODOLOGY

The Study Area

The study was conducted in Bauchi State, Nigeria. Bauchi State is located in the northeast part of the country. It lies approximately between 9°3 and 12°3 North and longitude 8°50–11°50 East. The State shares boundaries with Yobe and Gombe to the East; Taraba and Plateau to the South; Kaduna to the West and Kano and Jigawa to the North (Bose *et al.*, 2020). Bauchi State covers a total land area of 49,259.01 km² which is about 5.3% of the total land mass of Nigeria, out of which only 34,481 square kilometers is under cultivation. It has a total population of 8,308,800 people in 2022 (NBS, 2023). The area experiences both dry and rainy seasons with a maximum rainfall of about 700 mm per annum in the North to about 1300 mm per annum in the South. The mean monthly temperature ranges from 29.2°C in July and August to 37.6°C in March and April. The mean daily minimum ranges from about 11.7°C in December and January to about 24.7°C in April and May. The State is characterised by two distinct vegetative zones which include Northern Guinea Savannah and Sudan Savannah (BSADP, 2013).

The Western Zone of the Bauchi State Agricultural Development Programme (BSADP) comprises seven Local Government Areas; namely: Alkaleri, Bogoro, Bauchi, Dass, Kirfi, Tafawa Balewa, and Toro. The population of the zone is 1,977,379. The zone is located in the Northern Guinea Savannah and is situated between latitudes 9°30' N and 12°03' N, and longitudes 8°50' E and 11°37' E of the Greenwich Meridian. The zone has a land area of 24,270,701 km², with approximately 8 million hectares of cultivable land, of which only 1 million hectares is being utilised. The average rainfall distribution in the zone ranges from 600-1200mm, with a rainy season lasting for about 170 days. The temperature ranges from 9.1°C in Dec/Jan to a maximum of 40.5°C between April/May. The major crops cultivated in the area include Sorghum, Maize, Rice, Groundnuts, Soya Beans, Cowpea, and Onion during the rainy season and crops such as Tomato, Onion, Melon, and Amaranthus during the dry season (Maigari *et al.*, 2023).



Sampling Technique and Sampling Size

Multistage sampling technique was employed in selecting the respondents. In the first stage, a purposive sampling was used to select four (4) Local Government Areas (LGAs) out of seven (7) in the zone with highest concentration of poultry farmers. The selected LGAs were; Toro, Tafawa Balewa, Dass and Bauchi. In the second stage, a simple random sampling was used in selecting two districts in each of the selected LGAs. These districts were; Jama'a and Toro districts (Toro LGA); Lere and Bununu (Tafawa Balewa LGA); Wandu and Dass (Dass LGA); Zungur-Galambi and Bauchi districts (Bauchi LGA). Finally, 239 respondents were proportionally (13.56%) and randomly selected as respondents for the study.

Percentage Selected = $\text{Sample Size} \div \text{Sampling Frame} \times 100$

Table 1: Sampling Technique and Sampling Size

LGAs	Districts	Sampling Frame	Sample size
Toro	Jama'a	187	25
	Toro	237	32
Tafawa Balewa	Lere	198	27
	Bununu	214	29
Dass	Wandu	145	20
	Dass	275	37
Bauchi	Zungur-Galambi	217	30
	Bauchi	289	39
Total		1,762	239

Method of Data Collection

Primary data were used for the study and were collected using structured questionnaires administered to the respondents. The questionnaire was divided into sections, with each aimed at achieving an objective of the study. The sections in the questionnaire recovered socio-economic characteristics of the farmers, sources of information, mitigation strategies adopted and constraints associated with the adopted mitigation strategies in the study area.

Method of Data Analysis

Data were analysed using both descriptive and inferential statistics. Descriptive statistics such as frequency, mean and percentage were used to achieve objectives i, ii and iii. This tool was employed to give a summary description of the data collected. The inferential statistics used was logit regression to determine the factors influencing respondents' level of awareness on climate change.

Model Specification

The logit regression statistic model is given as:

$$Y_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + \dots + e \quad (1)$$

Where;

Y_i = (Dependent variable which is awareness of the effects of climate change)

β_0 = is the constant term

β_1 to β_p are coefficients relating to explanatory variables of perception.

e = is the error term.

Y = Climate change awareness (Yes=1, No=0)

X_1 = Age of the respondents (years)

X_2 = Sex measured as a dummy variable (male=1, female=2)

X_3 = Marital Status measured as a dummy variable (single=1, married=2)

X_4 = Annual income (₦)

X_5 = Highest Educational Attainment: (primary=1, secondary=2, tertiary=3)

X_6 = Household size (number of people in the family).

X_7 = Farm size (number of birds)

X_8 = Farming experience (number of years spent in production)

X_9 = Access to extension services (Yes=1, No=0)



X_{10} = Number of extensions contact measured as (number of contacts)

X_{11} = Land acquisition (inheritance=1, others=2)

X_{12} = Membership of cooperative society measured as dummy variable (Yes=1; No=0)

X_{13} = Years of membership in cooperative society measured as (number of years spent in a cooperative society)

X_{14} = Type of labour (Family=1, Hired=2)

X_{15} = Occupation (civil servant=1, farming=2, others=3)

X_{16} = Access to credit measured as dummy variable (Yes=1, No=0)

e = Error term

RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Respondents

The result from Table 2 showed the socioeconomic characteristics of the respondents in the study area. The finding revealed that 31.45% and 30.1% of the respondents in the study area were within the ages of 41-48 and 33-40 years, respectively, with a mean age of 41 years. This finding implies that most of the respondents were within their active ages of production in agriculture, which indicates that poultry production is dominated by young farmers who are dedicated to optimum production for a better income and living standards. This is in line with the finding of Aroyehun (2023) who reported mean age of 44.69 years, which also agrees with Adesiji, Baba and Tyabo (2013) who reported the active age of 31– 40 years among poultry farmers in Ondo State Nigeria. This implies that poultry farming in the study area was dominated by young people within the productive age and work force that are strong and energetic to engage in poultry farming enterprise.

The finding further showed that majority (67.4%) of the respondents were male, while 32.6% of the respondents were female. This could be attributed to the normal male dominance in most agricultural production aspects, and the societal norm that male have the sole responsibilities of providing basic needs for the family. This agrees with the finding of Adereti *et al* (2021) who reported that majority of poultry farmers in Osun State were male, implying that there are more males practicing poultry farming than females, which could be due to the rigorous activities involved in the business.

The result also showed that majority (83.7%) of the respondents were married, while 15.9% and 0.4% of the respondents were single and widowed, respectively. This implies that there were more married poultry farmers among the respondents. The responsibilities they carried might be the reason why some of them were into the poultry farming. This is in line with the finding of Adereti *et al*. (2021) who reported that majority of poultry farmers were married, implying the significance of the poultry egg production in meeting the family needs and welfare.



Table 2: Distribution of Respondents According to Socioeconomic Characteristics (n=239)

Socio-economic Characteristics	Frequency	Percentage	Mean
Age			
25-32	41	17.2	41
33-40	72	30.1	
41-48	75	31.4	
49-56	42	17.6	
57 and Above	9	3.7	
Sex			
Male	161	67.4	
Female	78	32.6	
Marital status			
Married	200	83.7	
Single	38	15.9	
Widowed	1	.4	
Household size			
1-3	19	7.9	8
4-6	89	37.2	
7-9	37	15.5	
10-12	70	29.4	
13 and Above	24	10.0	
Educational level			
Secondary	73	30.5	
Tertiary	150	62.8	
Qur'anic	16	6.7	
Annual income			
150,000-280,000	133	55.6	307,322.18
281,000-411,000	93	38.9	
412,000-542,000	4	1.7	
543,000 and Above	9	3.8	
Method of land acquisition			
Inheritance	109	45.6	
Purchase	24	10.0	
Rent	72	30.1	
Leasehold	34	14.3	
Flock size			
15-192	137	57.3	185
193-370	86	36.0	
371-548	2	.8	
549-726	1	.4	
727 and Above	13	5.5	

Source: Field survey, 2024

The result further revealed that 37.2% and 29.3% of the respondents had a household size of 4-6 persons and 10-12 persons. The finding also showed that 15.5%, 10% and 7.9% of the respondents had a household size of 7-9, 13 and above and 1-3 persons, respectively with a mean household size of 8 persons. This finding implies that most of the respondents had relatively large household size which could result to family labour for poultry production among the respondents in the study area. This aligns with the findings of Abubakar *et al.* (2020) who reported that majority of poultry farmers belonged to households with 1–5 members, with others having household sizes ranging from 5 to 10 members. Given that household size serves as a proxy for labor availability, this distribution has important implications for the adoption of improved agricultural practices, as larger households may possess greater capacity for labor-intensive innovations.



The result further showed that majority (62.8%) of the respondents had tertiary education, while 30.5% and 6.7% of the respondents had secondary and Qur'anic education in the study area. This finding implies that most of the respondents had attended one form of education or the other which can help in understanding the effects and causes of climate change in the study area. This agrees with the findings of Adepoju and Osunbor (2018), who posited that the positive effect of years of education on adaptation to climate change implies that farmers with higher number of years of education are more likely to adapt to climate change better than farmers with lower number of years of education. A probable reason is that educated farmers, because of their exposure, are likely to be more aware of the various management adaptation strategies that could be employed in mitigating the negative impacts of climate change.

The result from Table 3 indicated that more than half (55.6%) of the respondents had an annual income of ₦150,000-₦280,000 and 38.9% of the respondents had an annual income of ₦281,000-₦411,000. The finding also showed that 3.8% and 1.7% of the respondents had an annual income of ₦543,000 and above and ₦412,000-₦542,000 with a mean annual income of ₦307,322.18. This finding implies that most of the respondents had relatively good annual income which could be sufficient to meet up with their family needs in the study area. The result further showed that 45.6% and 30.1% of the respondents acquired their land through inheritance and rent. This implies that there is still a deep-rooted reliance on customary land tenure systems as many people still acquire land through inheritance. According to Gaddis *et al.* (2018), inheritance is the primary means by which individuals acquire land. This trend aligns with wider regional patterns where inheritance is a key means to property ownership, especially for men, and this is usually influenced by legal, cultural and other customary practices.

The finding also indicated that 14.2% and 10% of the respondents acquired their land through leasehold and purchase. This finding implies that most of the respondents had access to the primary factor of production in agriculture. The finding further showed that more than half (57.3%) of the respondents had flock size of 15-192 birds while 36% of the respondents had flock size of 193-370 birds in the study area. The result also showed that 5.4%, 0.8% and 0.4% of the respondents had flock size of 727 and above, 371-548 and 549-726 birds, respectively; with a mean flock size of 185 birds in the study area. This finding implies that most of the respondents were small scale poultry producers with few numbers of birds which can be easily managed and controlled by the respondents.

Factors Influencing Level of Climate Change Awareness among the Respondents

The result from Table 3 showed the factors influencing the level of awareness on climate change among the respondents in the study area. The results revealed that age (3.21) was positive and significant ($P < 0.01$) in influencing the level of awareness on climate change, which implies that increase in age will lead to an increase in level of awareness on climate change and vice-versa. This finding implies that respondents that grow older tend to have higher level of awareness on effect of climate change on poultry production, which also helps them in coping and mitigating the effects of climate change in the study area. Adeyonu *et al.* (2021) noted that age would positively influence farmers' ability to perceive and manage risks, as older farmers tend to have more experience in poultry farming, enabling them to identify and mitigate risks such as disease outbreaks and market fluctuations. Adepoju and Osunbor (2018) reported that the age of poultry farmers had a positive and significant effect on management adaptation strategies, implying that a year increase in the age of the respondents will increase the likelihood of farmers employing the management strategies by 1.1% relative to no adaptation strategy.

Table 3: Socio-economic Factors Influencing Level of Climate Change Awareness among Respondents

Variables	Coef.	Std. Err.	Z	P> z
Age	3.429686	1.06969	3.21	0.001***
Sex	-27.07236	8.279729	-3.27	0.001***
Marital status	23.14615	6.720864	3.44	0.001***
Household size	2.724802	.7622043	3.57	0.000***
Educational level	-43.20091	12.46282	-3.47	0.001***
Occupation	-13.07346	4.15105	-3.15	0.002***
Farming experience	-.023942	.071943	-0.33	0.739
Annual income	.0001046	.0000345	3.03	0.002***
Access to extension	45.63248	12.67674	3.60	0.000***
Frequency of extension	3.492287	.8963782	3.90	0.000***
Access to credit	9.241613	3.637762	2.54	0.011**
Method of land ownership	-.0695514	.5007082	-0.14	0.890
Flock size	-.0424189	.0127254	-3.33	0.001***
Membership of association	-35.56418	9.961118	-3.57	0.000***
Years of membership	-3.665179	1.070553	-3.42	0.001***
Sources of labour	1.64706	1.75077	0.94	0.347
cons	-35.9819	18.22718	-1.97	0.048

Source: Field survey, 2024 ***,**Significant at (P<0.01, 0.05)

The result also revealed that marital status (3.44) was positive and significant (P<0.01) in influencing the level of awareness on climate change, which implies that increase in number of married respondents will lead to increase in level of awareness on climate change in the study area. This finding implies that married respondents with certain level of responsibilities will have higher level of awareness on climate change in the study area. The result further revealed that household size (3.57) was positive and significant (P<0.01) in influencing level of awareness on the effect of climate change, this implies that a unit increase in household size of the respondents will lead to increase in level of awareness of the effect of climate change on poultry in the study area. This finding implies that increase in number of persons per household will lead to increase in level of awareness on climate change, which is attributed to the fact that number of sources on climate change information increase with a unit increase in number of persons in the study area and vice-versa. Abubakar *et al.* (2020) observed that household size serves as a proxy for labor availability as larger households may possess greater capacity for labor-intensive innovations.

The finding further showed that annual income (3.03) was positive and significant (P<0.01) in influencing the level of awareness on climate change, which implies that a unit increase in annual income will lead to increase in level of awareness on climate change. This finding implies that annual income increase will lead to increase in respondents' willingness to obtain information on climate change so as to increase their income and living standards. The finding also showed that access to extension (3.60) was positive and significant (P<0.01) in influencing level of awareness on effect of climate change on poultry production among the respondents. This implies that increase in access to extension will lead to increase in level of awareness on climate change which is attributed to the major objective of extension service on educating farmers on improved agricultural practices and the impact of climate change on poultry and mitigation strategies to be adapted for a better and effective productivity level of their production.

The finding also revealed that frequency of extension contact (3.90) was positive and significant (P<0.01) in influencing the level of awareness of climate change. This finding implies that a unit increase in number of extension contact with extension agents will lead to increase in awareness of climate change and its effect on poultry birds. This is in line with a prior expectation that increase in number of extension contact will lead to increase in adoption of improved methods of production among the respondents in the study area. Adepoju and Osunbor (2018) opined that farmers with access to extension services were more likely to adopt management adaptation strategies because of their increased awareness of climate change as well as the different strategies that may be adopted to



mitigate the effects of climate change. The findings further showed that access to credit (2.54) was positive and significant ($P < 0.05$) in influencing level of awareness on climate change, which implies that increase in access to credit will lead to increase in awareness of climate change among the respondents. It is expected that increase in credit accessibility will lead to increase in awareness of climate change and adaptation of strategies so as to improve the production level and afford respondents the ability to repay the credit obtained in the study area.

On the other hand, the result also showed that sex (-3.27) was negative and significant ($P < 0.01$) in influencing the level of awareness on climate change among the respondents, which implies that increase in number female respondents will lead to decrease in awareness of climate change and its effect on poultry production. This could be attributed to the fact that male respondents had higher access to information through seminar and workshop attending within and outside the study area. This, however, is not in tandem with the finding of Adepoju and Osunbor (2018), who reported that sex had positive and significant effect on influencing poultry farmers' level of awareness on climate change, implying that male poultry farmers had a higher likelihood of using management adaptation strategies by 16.3% relative to no adaptation.

The finding also revealed that educational level (-3.47) was negative and significant ($P < 0.01$) in influencing the level of awareness on climate change and its effect on poultry birds, which could be attributed to the fact that most of the highly educated respondents had little or no time to attend seminars, workshop or field days where information on climate change is disseminated in the study area. This finding is not in line with a prior expectation as education is one of the essential ingredients that triggers adoption of agricultural technology. Adeyonu *et al.* (2021) noted that education level plays a critical role in the adoption of risk management strategies.

The finding also showed that occupation (-3.15), flock size (-3.33), membership of association (-3.57) and years of membership (-3.42) were negative and significant ($P < 0.01$) in influencing the level of respondents' awareness of effect of climate change, which implies that increase in number of occupations engaged by the respondents, flock size, membership of association and years of membership will lead to decrease in level of awareness on climate change and its effect on poultry production in the study area and vice-versa. This finding implies that as respondents' engagement in other occupation increases, their participation in poultry production and level of awareness on climate change decreases. Similarly, flock size was also negatively significant, implying that increase in number of birds will lead to decrease in level of awareness on climate change and its effect on poultry birds due large number of birds and activities required in feeding, cleaning and medication of the birds tends to deviate respondents' attention on climate change impact on the birds in the study area. On the other hand, membership of association and years of membership was negative and significant, implying that most of the respondents were not active members of association and had less number of years in membership which could be attributed to inadequate functional associations in the study area. Adepoju and Osunbor (2018) reported that more than half of poultry farmers were not members of any cooperative society and almost four-fifths did not have access to credit.

In addition, the finding revealed that farming experience, method of land ownership and sources of labour were not significant and had no influence on respondents' level of awareness on climate change and its effect on poultry production. This is in contrast with Adeyonu *et al.* (2021) who noted that years of experience would positively influence the choice of mitigation strategy against disease and financial risk, which in themselves can arise as a result of incessant egg glut on the farm or in the market.

Constraints to Climate Change Mitigation Strategies

The result from Table 4 shows the constraints faced by the respondents toward mitigating the effects of climate on poultry production in the study area. The findings showed that the major constraints faced by the respondents were inadequate capital, inadequate information on climate change and lack of government support which were ranked 1st, 2nd and 3rd, respectively. This finding suggests that although the respondents were aware of the effects of climate change on poultry birds and were willing to adopt mitigation strategies, they however, were constrained by one factor or



another in the study area, implying that poultry farmers in the study area are significantly disadvantaged in their ability to effectively respond to the impacts of climate change due to the mentioned constraints.

Table 4: Distribution of Respondents according to Constraints (n=239)

Constraints	Frequency	Percentage*	Rank
Inadequate capital	224	93.7	1 st
Inadequate information on climate change	215	90.0	2 nd
Lack of government support	209	87.4	3 rd
Inadequate extension agents	194	81.2	4 th
Inadequate policy support	188	78.7	5 th
Poverty	183	76.6	6 th

Source: Field survey, 2024 *Multiple response

The result also revealed that inadequate extension agents, inadequate policy support and poverty were also constraints to climate change mitigation strategies and were ranked 4th, 5th and 6th, respectively. This finding implies that most of the respondents were constrained by one factor or the other in mitigating the causes of climate change in agriculture in the study area. Akure and Afaka (2024) noted that farmers strongly associate climate change with several critical challenges affecting poultry farming. The study is also in congruence with the assertion of Munonye *et al.* (2023) who reported that most of poultry producers have poor knowledge, implying that majority of poultry farmers lacked the information necessary to implement mitigation measures for the prevention of the negative impact of climate change on poultry production.

CONCLUSION AND RECOMMENDATIONS

The study concluded that age, marital status, household size, income, access to extension and credit were the factors influencing the respondents' awareness on the effects of climate change. Similarly, inadequate capital, inadequate information on climate change and lack of government supports were some of the constraints faced by the respondents toward mitigating the effects of climate change in the study area.

Based on the constraints highlighted, the study recommended that;

- Extension services should develop and implement comprehensive climate change education programmes tailored to poultry farmers.
- Respondents' cooperative societies should improve access to affordable credit, inputs, and technology for climate change adaptation.
- Government should increase the number and capacity of extension agents specialising in climate change and poultry production.
- Extension agents should conduct regular trainings on modern ways of mitigating climate change in the study area.

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