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Poultry Farmers' Adaptation to Climate Changes in Niger State, Nigeria

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ABSTRACT

This study investigated Poultry Farmers' Adaptation to Climate Changes in Bosso and Chanchaga Local Government Areas of Niger state. Eighty poultry farmers were selected using purposive random sampling technique and were interviewed with the aid of well structured questionnaire. The Data collected were analyzed using descriptive statistics and multiple regression models. The result shows that 60% of respondents perceived that there has been an increase in temperature while 55% perceived that rainfall has been irregular and unpredictable. Majority (48.8% and 43.8%) of respondents could not really indicate whether there has being changes in drought and relative humidity conditions respectively. The major adaptation measure against climate change was the use of ice blocks in the drinking water of the birds. The result of the multiple regression analysis shows that house hold size, farming experience, non-farm income and number of birds were positively significant to the choice of adaptation measures. It was therefore recommended that poultry farmers in the study area need to expand their farm size to cope with climate change.

INTRODUCTION

Livestock production especially poultry is very sensitive to environmental stress. According to Akwaja, 2006 most studies have neglected livestock production especially poultry production- an important source of animal protein, farmers employment and income. Poultry production could be highly sensitive to climate variability and weather extremes such as droughts, flood and severe storms (Osuji, 2006).

Adaptation to climate change refers to efforts to reduce system's vulnerabilities to climate. According to Intergovernmental Panel on Climate Change (1996), adaptation is concerned with responses to both negative and positive effects of climate change. It refers to any adjustments-whether passive, reactive, or participatory-that can respond to anticipated or actual consequences associated with climate change. Adaptation can be spontaneous or planned, and can be carried out in response to or in anticipation of changes in conditions. Many scientists and policy makers see adaptation as a powerful option by which to reduce the negative impacts of climate change or take advantage of the positive effects. As Burton (1996) pointed out, there are six reasons to adapt to climate change now:

1. Climate change cannot be totally avoided;
2. Anticipatory and precautionary adaptation is more effective and less costly than forced, last-minute, emergency adaptation or retrofitting;
3. Climate change may be more rapid and more pronounced than current estimates suggest, unexpected events are possible;
4. Immediate benefits can also be gained by removing maladaptive policies and practices;
5. Climate change brings opportunities as well as threats.

Some attempts have been made in recent past to identify determinants of adaptation measures among arable crop farmers in Nigeria; but that is not the same with livestock production especially among poultry farmers. The goal of the study is therefore to provide further insights into farmer's perceptions regarding changes in climate, adaptation options and the determinant of their adaptation measures as well as barriers to adaptation measures, using

poultry farmers in Bosso and Chanchaga Local vernment Areas of Niger State.

METHODOLOGY

study was conducted in Niger state. This state is ated between latitude 8°22N and 11°30N and longitude N and 7°20E. The state shares a common rnational boundary with the Republic of Benin at una in Borgu Local Government Area of the state. ently the state covers a total land area of 74,244sq.km bout 8% of Nigeria's total land area. This makes the e the largest in the country (Niger state GIS). iculture is the backbone of the economy of Niger e, more than 80% of the population depends either ctly or indirectly on it for their livelihood. The study es between latitude 9°37¹N and longitude 6°32¹E in Guinea savannah Region of Niger state. They have a an precipitation of 1312mm with an average perature of 27.3°C (81°F) and average monthly perature of 5.5°C, maximum temperature of 37°C (99°F) March and minimum temperature of 19°C (66°F) in cember. The mean relative humidity of the town is 9% and the average sunshine per day is between 3.6 rs in August and 9.2 hours in November (Climate np. info, 2011). The primary data were collected rough structured questionnaires, interviews and rsonal observation through interaction with the ltry farmers. A total number of 80 poultry farmers re chosen using purposive random sampling hnique.

escriptive statistics such as means, frequency tribution, and percentages was used to describe mers' perception of climate change and adaptation easures while multiple regression models was used to entify determinants of poultry farmers' adaptation rategies.

Multiple Regression Model

This was used to determine the socio-economic factors influencing the choice of the adaptation measures used by the poultry farmers. The model can be written as;

$Y = f(X_1 \ldots\ldots \ldots X_{n)}$ ..... Implicit form

$Y = \delta + \delta X_{1+} \delta X_2 \ldots\ldots\ldots\ldots\ldots\ldots\ldots \delta X_{n+} U$ .....Explicit form

Y = Adaptation index

X_1 = Poultry farmer's age (years)

X_2 = Farmer's educational level (years)

X_3 = Poultry farmer's household size (No.)

X_4 =Years of experience (Years)

X_5 = Non Farm Income (₦)

X_6 = Total number of birds (No)

X_7 =Total Value of birds (₦)

X_8 =Farmers' access to credit (₦)

U= Error term

Four functional forms, namely the linear, semi-logarithmic, double logarithmic, and exponential functional forms were used .The explicit forms of the used functional forms were specified as:

1. Linear: $Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + U$
2. Cobb-Douglas/ Double Logarithm: $InY = Inb_0 + b_1InX_1 + b_2InX_2 + b_3InX_3 + b_4InX_4 + b_5InX_5 + b_6InX_6 + b_7InX_7 + b_8InX_8 + U$
3. Semi-Log $Y = Inb_0 + b_1InX_1 + b_2InX_2 + b_3InX_3 + b_4InX_4 + b_5InX_5 + b_6InX_6 + b_7InX_7 + b_8InX_8 + U$
4. Exponential: $InY = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + U$

RESULTS AND DISCUSSION

Poultry farmers' perception of climate change

Temperature changes

Table 1 shows that majority (60%) of respondents perceived that there has been an increase in temperature while 25% perceived that there has been a decrease in temperature. The more a poultry farmer perceived climate change, the better he will be able to adopt appropriate adaptive measures to mitigate the effects. This is important because according to ICAR (2010), temperature fluctuations and increased sunshine intensity has a

negative consequence on poultry production resulting in high mortality of the chickens, low egg production and low feed intake with low production. On the other hand about 14% of the poultry farmers do not know whether there has been a change or not.

Table 1: Perception of changes in temperature

Perception	Frequency	Percentage
Decreased	20	25.0
Increased	48	60.0
The same	1	1.2
Do not know	11	13.8
Total	80	100.0

Source: field survey, 2012

Rainfall changes

The results of changes in rainfall perception as shown in table 2 shows that poultry farmers perceived long term changes in rainfall. 45% of the respondents perceived rainfall to be decreasing. 42.5% thought otherwise, an increase in rainfall and 12.5% said they do not know. On the other hand, 55% of the respondents said that rainfall was irregular and unpredictable. 8.8% felt it was regular and predictable and 28.8% said they do not know while 7.4% said it was the same.

Table 2: Perception of changes in rainfall

Perception	Frequency	Percentage
Decreased	36	45.0
Increased	34	42.5
Do not know	10	12.5
Total	80	100.5
Rainfall pattern		
Irregular	44	55.0
Regular	7	8.8
The same	6	7.4
Do not know	23	28.8

Source: field survey, 2012.

Perception of changes in drought conditions.

Table 3 shows 18.8% perceived drought conditions to be decreasing, 31.2% felt that it was increasing, this is agreement with the findings of Salami and Matthew, 2009 in which they found out that the regularity of drought periods has been among the most notable aspects of Nigerian climate in recent years particularly in the drier regions in the North. However, minority (1.2%) said the drought conditions had remained the same over the years while majority (48.8%) does not know.

Table 3: Perception of changes in drought conditions

Drought	Frequency	Percentage
Decreased	15	18.8
Increased	25	31.2
The same	1	1.2
Do not know	39	48.8
Total	80	100.0

Source: field survey, 2012

Perception of changes in relative humidity

The results in table 4 shows that 30% perceived relative humidity to be decreasing, 17.4% of respondents went for increasing while 8.8% felt that the relative humidity has remained the same and 43.8% had no opinion on the matter.

Table 4: Perception of changes in relative humidity

Relative humidity	Frequency	Percentage
Decreased	24	30.0
Increased	14	17.4
The same	7	8.8
Do not know	35	43.8
Total	80	100.0

Source: field survey, 2012.

Poultry farmer's adaptation measures to climate change.

Adaptation measure is a very important component in response to climate change. Without adaptation, climate change is generally disastrous to agricultural sector. The measures used by the poultry farmers to increase in temperature, changes in rainfall, drought conditions and relative humidity are examined as follows.

Poultry farmers' adaptation strategies to temperature changes.

Table 5: Farmers adaptation measures against temperature changes

Adaptation strategies	Frequency*	Percentage
Putting ceiling fans in the poultry house	21	12
Putting ice blocks in the birds drinking water	48	27.4
Construction of opening head house for ventilation	21	12
Planting of trees around the poultry house	21	12
Grass or straw placed on roofing sheet	24	13.7
Use of asbestos roofing sheet rather than zinc	11	6.3
Introduction of anti-stress drugs	27	15.5
Selling off of birds	2	1.1
Total	175*	100.0

Source: field survey, 2012. Multiple responses*

Table 5 above shows the various adaptation strategies poultry farmers use against changes in temperature. This shows 27.4% of the respondents adopt the use of ice blocks in drinking water; this is followed by introduction of anti- stress drugs. Planting of trees, use of ceiling fans had 21%, making selling of birds the least option the respondents adopt to mitigate climate change.

Determinants of Poultry Farmers' Actual Adaptation Strategies

Farmers' decision to adopt specific strategies to climate change depends on some socio- economic factors. This study captured nine of the likely socio economic factors that may influence poultry farmers' choice of adaptation strategy.

Table 6: Estimated regression co-efficient of determinants of poultry production output

Factors/variables	Linear	Cobb-Douglas	Exponential	Semi-log
Constant	.3456711 (4.51)***	0.39271 (0.62)Ns	-0.61725 (-5.17)***)	1.211095 (2.55)***
Age (years)	-.0018604 (-0.90)Ns	0.635313 (-2.01)***	0.0008633 (0.27)Ns	-0.5057516 (-2.13***
Educational level (no)	-.0075234 (-2.45)***	-0.14035 (-1.62)Ns	-0.004978 (-1.04)Ns	-0.18253 (-2.80)***
Household size (No)	0.00772 (1.25)Ns	0.273311 (2.11)***	0.010223 (1.06Ns)	0.1806257 (1.86)**
Farming experience (years)	0.0050321 (1.26)Ns	0.107766 (0.82)Ns	-0.00201 (-0.32)Ns	0.0853112 (0.86)**
Non Farm Income (N)	1.10e-06 (1.01)Ns	0.1975 (2.18)***	2.82e-06 (1.67)**	0.1168776 (1.71)**
Number of birds (No)	0.0000178 (0.94)Ns	0.224434 (1.95)**	0.0000272 (0.93)Ns	0.1764173 (2.04)***)
Total value (N)	-1.14e-08 (-0.54)Ns	-0.258552 (-2.05)***	-1.91e-08 (-0.58)Ns	-0..1827245 (-1.92)**
Access to Credit	0.0677704 (2.14***)	0.004533 (0.03)Ns	0.0232567 (0.47)Ns	0.1298 (1.33)Ns
R^2	0.2350	0.2684	0.1145	0.3211
Adjusted R^2	0.1488	0.1493	0.0148	0.2106
F-ratio	2.73***	2.25***	1.15	2.91***

*** = Significant at 1% level of probability, ** = Significant at 5% level of probability, NS: Not significant.
(Figures in parenthesis are t-values)
Source: Field Survey data, 2012

Table 6 shows the result of the socio- economic factors affecting the choice of the adaptation strategies. The semi-logarithm function was selected as the lead equation based on these criteria: magnitude of coefficient of multiple determinations (R^2), appropriateness of the signs of regression coefficient and significance of F-values. The regression result as shown on table 6 indicated that about 32 per cent of the variability in adaptation measures was accounted for by the explanatory variables included in the model. The F-value which measures the joint significance of the entire explanatory variables in the model was 2.91 which were significant at 1% level of probability which confirms the suitability of the overall regression in the equation.

The regression signs for household size, farming experience, non-farm income and number of birds showed positive relationship with adaptation measures. This means that as these variables increases there is the likelihood that a poultry farmer will adopt more adaptation measures. On the other hand farmers age, educational level and total value of birds kept were significant but had negative relationship with adaptation measures. This implies that as these variables increases, the level of adoption of adaptation measures reduces. This results does not agree with the a priori expectations, it is expected that as the farmers grow older, has higher level of education and higher value for his enterprise; he will be able to adopt more adaption measures.

CONCLUSION AND RECOMMENDATIONS

Based on the results above, we can conclude that household size, farming experience; non-farm income and number of birds are the socio-economic factors that influenced poultry farmers' climate change adaptation measures.

Based on the outcome of this study, it is recommended that:

1. Poultry farmers should go into large scale production which may force them to improved agricultural technologies that have adaptive characteristics to climate change. Large farm sizes allow farmers to diversify their crop and livestock options and help spread the risk of loss associated with changes in climate.
2. Efficient and effective extension services should be provided to poultry farmers as this will encourage the adoption of new and improved practices based in changes in climatic condition.
3. Poultry farmers need to diversify their income to include non-farm income as this will help them cope with the effect of climate change.

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