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Research Article

# Seasonality and Production of Poultry Meat in Owerri Urban South-Eastern Nigeria

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## Abstract

The study examined seasonality and poultry meat production in Owerri urban, South eastern Nigeria. Therefore the study focused on effects of seasons on production of poultry meat. Quasi experimental research design was employed in the study. Data on rainfall, temperature, relative humidity and birds sold (meat produced) was collected for a period of 16 years (2004-2019). Results shows, that poultry meat production revealed a weak correlation with temperature and relative humidity (-0.74 and-0.62) respectively and an R-square of 64.7% which shows higher production of poultry meat in the rainy seasons. The trend analysis revealed variability in poultry meat production across the seasons of the year for the span under study (2004-2019). In conclusion, seasons of the year have effects on production of poultry meat in the study area within the period under investigation. It is recommended that farmer's should adequately feed their birds and maintain good sanitation/hygiene for improved production.

**Keywords:** Meat; Poultry; Seasonality; Variation

## Introduction

Poultry is a primary supplier of eggs and meat and as a source of income and employment as well as socio-cultural values [1]. Poultry production has been a feature of human society for thousands of years to ensure that it continues to make positive and sustainable contribution to human society. It is essential that poultry production and marketing are tailored to local condition and associated value chains, maximize nutrient cycling and efficient utilization of all products and maintain genetic diversity [2]. Production of poultry generally and its production in particular make substantial contribution to relieve the protein insufficiency, about 80% of poultry production in Africa is found in rural and peril-urban areas where birds are raised in small numbers by the traditional extensive or semi - intensive, low input, low output systems [3]. Poultry production in Nigeria is an important component of the livestock sub-sector and has developed to the level of enterprise, involving thousands of birds that provide employment, income, animal protein for rural and urban dwellers as well as manure for production of crop [4]. Poultry plays an important role for alleviating challenges associated with poverty in Nigeria (food security and malnutrition) and significantly contributes to women's income and help meet some level of household protein needs [5]. Poultry birds are efficient converters of feed to egg and meat within a short period of time and in terms of nutritive value, poultry egg ranks second to cow milk [5]. Ambient temperature significantly influences the survivability and performance of poultry production. As ambient temperature increase to 34ºC the mortality due to heat is significantly high in meat type chicken by 8.49%, while the feed consumption of the chickens decrease from 108.3g/bird/day at 31.6ºC to 68.9g/bird/day at 37.9ºC thus reducing egg production [6]. Poultry flocks are particularly vulnerable to seasonal changes because there is a range of thermal conditions within which animals are able to maintain a relatively stable body temperature in their behavioural and physiological activities [7]. In Nigeria there are two seasons, dry and rainy seasons. The rainy season begins by April and lasts till October whereas the dry season begins November and lasts till March [8]. These seasons have their various effects not only on living things, poultry inclusive but also on non living things [9]. In tropical environment, conditions affecting the performance productivity and health of birds includes temperature, relative humidity, rainfall and sunshine prevailing at a given time which affects livestock productions that contribute significantly to human source of food [10,11]. This study therefore aim's at investigating if seasons of the year have effects on production of poultry meat in the study area.

## Materials and Methods

### Study location

Owerri, the Imo State capital lies at the intersection of six major roads of regional importance namely: Aba road, Okigwe road, Mbaise/Umuahia road and Orlu road. It is located within latitude 5°25′10N and 5°30'15N and longitude 7°10E and 7°40'E and occupies a land area of about 104 square kilometers. It lies within the humid tropical climate with annual rainfall and temperature of over 2000 mm and 20ºC respectively. Owerri occupies a land area of about 104 square kilometers.

### Method of data collection

The study deployed the quasi experimental research design. Climatological data on rainfall, temperature and relative humidity was collected from Nigerian Meteorological Agency (NIMET) Sam Mbakwe, International Cargo Airport Imo State. Data on number of birds sold (meat produced) was from Ministry of Livestock Development Owerri for a period of 16 years respectively. Data was analyzed using Pearson's moment correlation, stepwise regression and linear regression to ascertain variations in meat production across seasons from 2004-2019. The analysis was done using statistical package for social sciences (Spss version 21).

## Results and Discussion

The table 1 shows monthly climatic data of maximum temperature, minimum temperature, mean temperature, relative humidity, total rainfall and birds sold (meat produced).

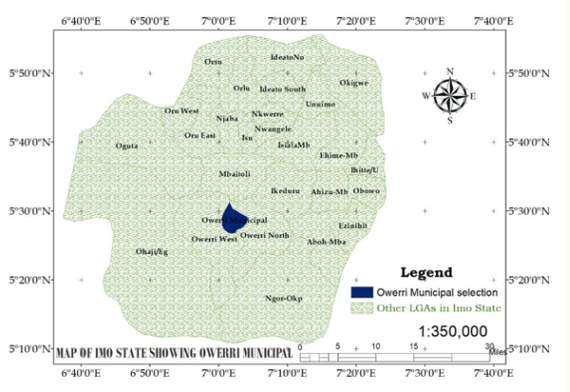


**Figure 1:** Map of Imo State showing the study area.

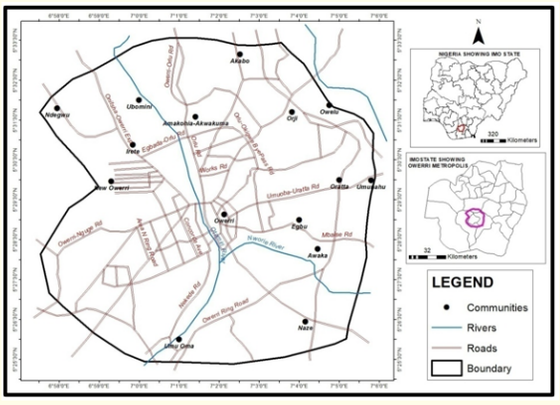


**Figure 2:** Map of Locations in the study area.

| Months | Max Temp (°C) | Mini Temp (°C) | Mean Temp (°C) | Relative humidity (%) | Total rainfall (mm) | Number of birds sold (Poultry meat) |
|---|---|---|---|---|---|---|
| JAN. | 31.7 | 18.1 | 24.9 | 56.6 | 22.1 | 138.3 |
| FEB. | 34.4 | 22.9 | 28.7 | 68.9 | 40.2 | 238.2 |
| MARCH | 34.7 | 21.9 | 28.3 | 76.3 | 85.6 | 259.8 |
| APR. | 33.8 | 23.3 | 28.6 | 71.4 | 168.4 | 287.9 |
| MAY | 32.4 | 23.1 | 27.7 | 80.6 | 272.5 | 265.9 |
| JUN | 32.6 | 22.7 | 27.6 | 85.6 | 296.5 | 238.7 |
| JUL | 30.1 | 22.6 | 26.4 | 87.3 | 342.7 | 691.6 |
| AUG | 30.0 | 22.4 | 26.5 | 85.4 | 359.7 | 245.3 |
| Sept | 31.5 | 22.6 | 26.8 | 85.2 | 339.1 | 250.6 |
| OCT. | 31.7 | 22.6 | 27.2 | 79.1 | 219.6 | 241.6 |
| NOV. | 32.9 | 21.3 | 27.1 | 69.9 | 55.6 | 311.4 |
| DEC. | 33.5 | 21.0 | 27.2 | 69.4 | 42.6 | 251.2 |

**Table 1:** Monthly climatic data and poultry egg and meat between 2004-2019.

Source: Author's computation 2019.

The months of rainy season (April-October), shows higher rainfall amount at 168.4 mm, 272.5 mm, 296.5 mm, 342.7 mm, 359.7 mm, 339.1 mm, and 219.6 mm which corresponds to higher meat production at 287.9, 265.9, 238.7, 691.6, 245.3,250.6 and 241.6. While the months of dry season (November- March), shows, lower rainfall at 890.1 mm, 5755.9 mm, 242.3 mm, 203.2 mm and 1200.9 mm with a decline in poultry meat production at 311.4, 251.2, 138.3,238.2 and 259.2 number of poultry meat produced. Also relative humidity in the months of rainy season (April-October) concise with months of increased meat production in the study area.

## Effects of season on poultry meat production

Results shows, temperature and relative humidity which are indicators of seasons shows statistically significant relationship with poultry meat but relative humidity has a direct significant relationship at p-value of 0.030. The correlation of -0.74 shows that, the higher the temperature the lower the relative humidity. Correlation value of -0.625 shows the lower the relative humidity (which implies higher temperature) then the lower the poultry meat. Stepwise regression model was carried out to ascertain which predictor variable has more effect on poultry meat production. The regression model obtained from the first step of the stepwise regression revealed that, relative humidity explained about (0.391*100) 39.1% of the variations in poultry meat. In the second step of the stepwise regression, mean temperature was added into the model and it increased the R-square value to 0.647 which means that the combination of relative humidity and temperature explains about (0.647*100) 64.7% of the total variations in poultry meat per month.

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Durbin-Watson |
|---|---|---|---|---|---|
| 1 | .625[a] | .391 | .330 | 1980.88512 | |
| 2 | .843[b] | .711 | .647 | 1437.88065 | 1.727 |
| a. Predictors: (Constant), Relative humidity and mean temperature measured over the months | | | | | |
| b. Dependent Variable: The total meat produced by the poultry birds over the months | | | | | |

**Table 2:** Regression model summary.

| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 25200616.263 | 1 | 25200616.263 | 6.422 | .030[b] |
| | Residual | 39239058.654 | 10 | 3923905.865 | | |
| | Total | 64439674.917 | 11 | | | |
| 2 | Regression | 45832168.130 | 2 | 22916084.065 | 11.084 | .004[c] |
| | Residual | 18607506.787 | 9 | 2067500.754 | | |
| | Total | 64439674.917 | 11 | | | |

**Table 3:** ANOVA For Regression.

The regression models obtained in table 4 is statistically significant since the Sig. values of 0.30 and 0.04 in table 5 are all less than alpha level of 0.05.We therefore conclude that relative humidity and temperature have effect on poultry meat production in the study area within the years under investigations.

The stepwise regression model obtained from the statistically significant regression coefficient is as follows:

*poultrymea t = 81941 .267 -191 .175* temperature e - 312 .399 *relative humidity + error*

## Trends of seasonal variations in poultry meat production

The trend analysis shows seasonal variation in poultry egg and meat produced for the months of January and July for the span under investigation. The months of January represents the dry season while the months of July represents the rainy season for a period of sixteen years (2004- 2019).The mortality plot also was used to access outbreak of poultry disease.

Figure 3 and figure 4 indicates the trend analysis for monthly meat production for January and July for all the years under investigation.

The trend analysis in figure 4 (January) and figure 5 (July), shows an upwards and increasing trend in July for poultry meat across the years under study. While January shows a gradual increase in trend for the years under investigation. The months of January for the period under study revealed a trend equation of y=0.010x - 304.3 with an $R^2$ of 0.080. Whereas the months of July revealed a trend equation of y=0.040x - 1402 with an $R^2$ of 0355.

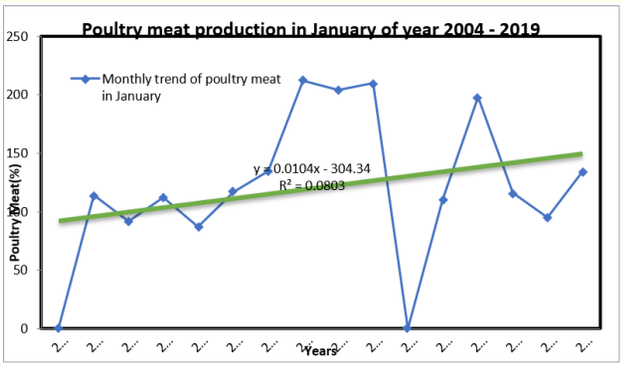


**Figure 3:** Trend analysis of Poultry meat productions in the month of January for all the year.

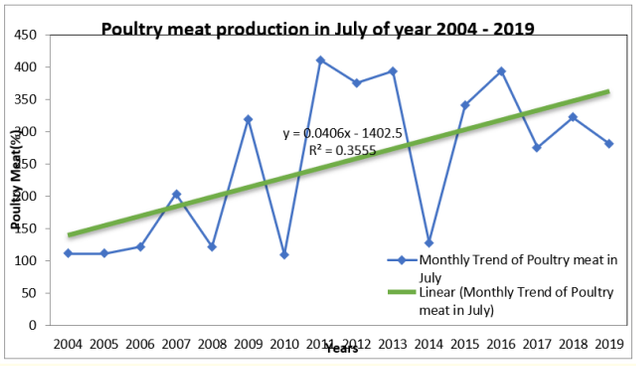


**Figure 4:** Trend analysis of Poultry meat productions in the month of July for all the year.

## Conclusion

The correlation analysis between temperature, relative humidity, rainfall and poultry meat, was carried out and a weak negative correlation of (-0.74 and-0.62) was seen with mean temperature and relative humidity which are indicators of seasons. This implies that the higher the temperature, the lower the relative humidity and the lower the relative humidity which means higher temperature then the lower the production of poultry meat. The co-efficient of determination (CD) obtained which is in percentage revealed that 64.7% of variations in total number of poultry birds sold (poultry meat) which means, the combination of relative humidity and temperature explains about (0.647*100) 64.7% of the total variations in poultry meat per month.

## Recommendations

It is recommended that the following points be taken into consideration. There is need for farmers to adequately maintain proper feeding of their birds, adopt of proper roofing methods for their pen houses and appropriate stocking of birds for free movement and space which may adversely affect birds across seasons.

## Competing Interest

Authors have declared no competing interest exists.

## Author's Contributions

This work was carried out in collaboration among all authors. Author ANU designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Author OUO managed the analyses of the study. Author NCB and ORN managed the literature searches, while author APA helped with the discussions. All authors read and approved the final.

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