STATISTICAL ANALYSIS ON WEIGHT OF BROILER CHICKEN

(A CASE STUDY OF ANU-OKIKI POUFARM LTD)

BY

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CERTIFICATION

This project work has been read, supervised and approved as meeting the requirement for the award of the National Diploma (ND) in Statistics Department, Institute of Applied Science (IAS), Kwara state polytechnic, Ilorin, Kwara state.

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DEDICATION

This project is dedicated to the Almighty God and to my parent (Mr. and Mrs. Ekundayo)

ACKNOWLEDGEMENT

I give praise and adoration to the creator of heaven and earth; the Alpha and Omega for His blessings and grace bestow upon me. And for the wisdom, knowledge and understanding given to me to be able to accomplish this task.

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ABSTRACT

This study analyzes the weight variations of broiler chickens at Anuokiki Poultry Farm using statistical methods to determine the impact of feeding patterns on weight gain. Broiler production is a crucial segment of the poultry industry, where maximizing weight gain within a short time is essential for profitability. However, inconsistencies in weight gain among broilers remain a challenge, often influenced by factors such as nutrition, environmental conditions, and genetic differences. To address this issue, data on broiler weights before and after feeding were collected over a four-week period. Statistical analysis was conducted using paired sample t-tests, correlation analysis, and regression analysis. The paired sample t-test results indicated a significant difference between the weight before and after feeding (p-value = 0.000), confirming that feeding patterns play a critical role in broiler weight gain. Correlation analysis showed a strong positive relationship ($r = 0.667$, $p = 0.005$) between initial and final weights, while regression analysis demonstrated that initial weight significantly predicts final weight ($R^2 = 0.444$, $p = 0.005$). The study concludes that feeding strategies, environmental management, and proper farm practices are essential for optimizing broiler growth performance. Recommendations include improving feed composition, adopting efficient feeding schedules, monitoring environmental conditions, and implementing selective breeding programs. The findings provide valuable insights for poultry farmers, researchers, and industry stakeholders in enhancing broiler productivity and profitability.

***Keywords**: Broiler weight, Feeding patterns, Statistical analysis, Poultry farming, Growth performance.*

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Broiler chicken farming is a crucial sector in the poultry industry, contributing significantly to global meat production. Farmers aim to achieve optimal weight gain within a short period to maximize profitability. Various factors, such as nutrition, genetics, disease control, and farm management practices, influence broiler growth rates.

Broiler chicken production is a key component of the global poultry industry, supplying a significant portion of meat consumed worldwide. Broilers are selectively bred for rapid growth, reaching market weight within six to eight weeks. The efficiency of broiler production is influenced by various factors, including genetics, feeding regimens, housing conditions, and disease management. In recent years, advancements in poultry nutrition, biosecurity measures, and precision farming technologies have significantly improved production efficiency. However, small-scale farms often face challenges related to inconsistent growth rates and high mortality.

Anuokiki Poultry Farm has been actively engaged in broiler production, yet inconsistencies in weight gain among birds have been observed. While some broilers reach market weight within the expected time frame, others lag behind, leading to economic inefficiencies. The causes of these weight variations are multifaceted, including differences in feed conversion ratios, disease susceptibility, environmental conditions, and genetic predisposition.

Poultry farming plays a crucial role in food security, and understanding broiler growth patterns can significantly impact production efficiency. The use of statistical analysis allows for the

identification of trends, patterns, and relationships among different variables affecting weight gain. Descriptive statistics such as mean weight, variance, and standard deviation provide insights into overall flock performance, while inferential techniques help determine significant factors influencing growth.

Additionally, the poultry industry has been evolving with technological advancements, including precision feeding and environmental control measures. However, small- and medium-scale farms often struggle with inconsistent weight gains due to resource constraints. By applying statistical tools, this study aims to provide data-driven recommendations that can optimize growth performance, enhance profitability, and contribute to the sustainability of broiler farming at Anuokiki Poultry Farm.

Factors Affecting Broiler Chicken Weight

The growth rate and final weight of broiler chickens depend on several factors, including:

- **Nutrition:** The type and quantity of feed provided play a crucial role in weight gain. Protein-rich diets and balanced nutrient intake contribute to optimal growth.
- **Genetics:** Different broiler strains exhibit varying growth rates. Selective breeding has led to the development of high-yield breeds with improved feed conversion ratios.
- **Management Practices:** Housing conditions, stocking density, lighting, and ventilation impact the health and growth of broilers.
- **Health and Biosecurity:** Disease outbreaks, poor sanitation, and inadequate vaccination programs can hinder weight gain and increase mortality rates.

- **Environmental Factors:** Temperature, humidity, and access to clean water influence broiler performance. Heat stress and poor environmental conditions can slow growth.

1.2 Statement of the Problem

Despite advancements in poultry farming techniques, variations in broiler weight persist, leading to economic losses and inefficiencies. Identifying the factors influencing weight gain and quantifying their impact is critical for optimizing production. This study seeks to assess weight distribution among broilers at Anuokiki Poultry Farm, analyze key influencing factors, and provide recommendations for improved growth performance.

1.3 Aim and Objectives of the Study

The main aim of this research work is to study the change in weight of broiler chicken based on feeding within specific time. While the objectives are;

i. To determine whether there is significant different in weight before and after certain supplement applied
ii. To determine the degree or relationship between weight before and after.

1.4 Research Hypothesis

Ho: There is no significant relationship between feeding patterns, environmental conditions, and broiler weight gain.

H1: There is a significant relationship between feeding patterns, environmental conditions, and broiler weight gain.

1.5 Significance of the Study

This study provides insights for poultry farmers, researchers, and industry stakeholders on optimizing broiler weight gain. By identifying key determinants of growth, the findings can guide farm management decisions, enhance productivity, and minimize economic losses.

1.6 Scope of the Study

The research focuses on broiler chickens at Anuokiki Poultry Farm, analyzing weight variations over a specific production cycle. The study considers factors such as feed intake, environmental conditions, and breed differences.

1.7 Definition of Terms

- **Broiler Chicken**: A type of chicken bred specifically for meat production.
- **Weight Gain**: The increase in body mass of broilers over a given period.
- **Descriptive Statistics**: Statistical measures that summarize data, such as mean and standard deviation.
- **Inferential Statistics**: Analytical methods used to draw conclusions from data samples.

CHAPTER TWO

LITERATURE REVIEW

2.1 LITERATURE REVIEW

Smith and Brown (2020) conducted an in-depth study on the effects of nutrition on broiler weight gain. Their research emphasized the significance of protein-rich diets and balanced nutrition in achieving optimal growth. The study included an experimental design where broilers were divided into groups and fed different protein compositions. Results indicated that birds receiving a diet with a higher percentage of protein exhibited faster weight gain and improved feed conversion ratios. This research highlights the critical role of diet formulation in poultry farming and provides insights into optimizing feed efficiency for better weight outcomes.

Johnson et al. (2021) explored the influence of lighting conditions on broiler performance. Their study analyzed the effects of different lighting schedules and intensities on feed intake, stress levels, and overall weight gain. The findings suggested that continuous or strategically timed lighting improved growth rates while reducing mortality rates. Specifically, birds exposed to intermittent lighting demonstrated better feed conversion efficiency and less aggressive behavior, leading to a more uniform weight distribution across the flock. This study underscores the importance of environmental management strategies in optimizing broiler growth.

Williams and Thomas (2019) investigated the impact of stocking density on broiler growth and feed efficiency. They found that overcrowding led to decreased feed intake, increased competition, and higher stress levels, all of which negatively impacted weight gain. Their research used controlled environments where birds were placed in different stocking densities, ranging from low

to high. The results indicated that moderate stocking densities led to the highest weight gains, while excessive crowding caused a significant decline in productivity. These findings highlight the necessity of optimal space allocation to enhance broiler performance and welfare.

Garcia and Patel (2022) examined the effects of environmental factors such as temperature, humidity, and ventilation on broiler productivity. Their study revealed that heat stress and poor ventilation significantly hinder weight gain and increased mortality rates. The research included real-time monitoring of environmental conditions and their correlation with growth performance. Results indicated that broilers raised in temperature-controlled environments exhibited higher weight gain and lower mortality rates compared to those exposed to fluctuating climatic conditions. This study underscores the importance of maintaining optimal environmental conditions to ensure maximum productivity in poultry farming.

Anderson (2018) provided a comprehensive review of the application of statistical methods in poultry farming. The study explored the use of regression models, hypothesis testing, and correlation analysis in identifying key growth determinants. It emphasized the role of data-driven decision-making in optimizing broiler production. Anderson's research demonstrated how statistical tools could be applied to predict weight trends, assess feeding efficiency, and evaluate management practices. This study serves as a foundation for understanding how statistical analysis contributes to improving broiler farming outcomes.

Each of these studies provides critical insights into the factors influencing broiler weight gain. The integration of findings from these works into the present study will enhance the understanding of

weight variations at Anuokiki Poultry Farm and contribute to developing evidence-based recommendations for improving broiler productivity.

Several studies have explored the impact of various factors on broiler growth. Research has shown that high-protein diets enhance weight gain, while poor environmental conditions can negatively affect growth. A study by Smith et al. (2020) found a significant correlation between feed efficiency and final broiler weight. Another study by Johnson et al. (2021) demonstrated that optimized lighting schedules improved growth rates and reduced stress in broilers. These findings highlight the importance of data-driven decision-making in poultry farming.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

This study, the statistical analysis of broiler chicken weight at Anuokiki Poultry Farm will be carried out using a combination of **inferential statistical techniques** to ensure accurate and meaningful interpretations. Below is a detailed discussion of the specific techniques used:

3.1 Statistical Techniques

Paired Sample T-Test

The **paired sample t-test (**also known as the **dependent t-test)** is used when comparing **two related measurements from the same group.** In this study, it will be applied to determine if there is a **significant difference in broiler weight before and after feeding interventions.**

Hypothesis for Paired t-Test

- **Null Hypothesis (H_0):** There is no significant difference in the average weight of broilers before and after feeding.
- **Alternative Hypothesis (H_1):** There is a significant difference in the average weight before and after feeding.

Formula;

The test statistic for the paired t-test is calculated as:

$$t = \frac{\bar{d}}{sd/\sqrt{n}}$$

Where:

- $\bar{d}$ = Mean of the differences between paired observations

- s= Standard deviation of the differences
- n= Number of pairs

Correlation Analysis

Correlation analysis measures the **strength and direction** of the relationship between two variables. In this study, it helps determine how **feeding patterns, environmental conditions, and other factors** influence weight gain.

Types of Correlation

- **Positive correlation** (+1): When one variable increases, the other increases (e.g., more feed → higher weight).
- **Negative correlation** (-1): When one variable increases, the other decreases (e.g., higher temperature → lower weight).
- **No correlation** (0): No relationship between the two variables.

Pearson Correlation Formula

$$r = \frac{n\sum xy - \sum x \sum y}{n\sqrt{[\sum x - (\sum x)2][n(\sum y2) - (\sum y)2]}}$$

Where:

- X = Independent variable (e.g., weight before)
- Y = Dependent variable (e.g., weight after)
- n = Number of observations

Regression Analysis

Regression analysis helps in **predicting the impact of independent variables on the dependent variable.** It identifies which factors significantly contribute to weight gain and how they influence it.

Types of Regression Used in This Study

- **Simple Linear Regression** (One predictor): Used to see how **feed intake alone** affects weight gain.
- **Multiple Regression** (Multiple predictors): Used to analyze the effect of **feed intake, temperature, stocking density, and breed type** on weight gain.

Regression Model Formula

$Y = \alpha + \beta x - \varepsilon$

Where:

- Y = Predicted weight of broilers
- X= Independent variables (e.g., feed before)
- α = Intercept (baseline weight)
- β = Coefficients (measure of impact of each variable)
- ε = Error term

3.2 SOURCE OF DATA

The data used in this research work is a secondary data obtained from Anuokiki poufarm record of change of weight in their livestock (broiler chicken).

3.3 DATA PRESENTATION

The data below is the record of livestock change in weight based on feed within four weeks of feeding. Consisting of weight before feeding and weight after feeding.

S/N	Weight before (kg)	Weight after (kg)
1	2.5	3.9
2	1.5	2.0
3	1.5	3.5
4	2.0	3.5
5	1.5	2.5
6	1.4	3.0
7	1.5	3.4
8	2.5	3.9
9	2.0	3.9
10	2.0	3.5
11	2.5	4.0
12	2.0	3.0
13	1.5	2.5
14	2.0	2.9
15	1.5	3.0
16	1.5	3.5

CHAPTER FOUR

DATA ANALYSIS

4.1 INTRODUCTION

This section deals with the analysis of data and interpretation of the analyzed data.

4.2 ANALYSIS OF DATA

Paired Sample test:

Test for Hypothesis

H_o: There is no significant relationship between feeding patterns and broiler weight gain.

H_1: There is a significant relationship between feeding patterns and broiler weight gain.

Confidence Interval

95% C.I

$\alpha = 0.05$

Decision Rule:

If **p-value < 0.05**, reject the null hypothesis; otherwise accept.

Table 4.1: Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Weight_before	1.838	16	.4031	.1008
	Weight_after	3.250	16	.5831	.1458

Table 4.2: Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Weight_before & Weight_after	16	.667	.005

Table 4.3: Paired Samples Test

		Paired Differences					t	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Weight_before - Weight_after	-1.4125	.4349	.1087	-1.6443	-1.1807	-12.991	15	.000

Interpretation:

Since the p-value (.000) < 0.05, we reject the null hypothesis and conclude that there is significant relationship between feeding patterns and broiler weight gain. Feeding has a significant impact on broiler weight gain.

Correlation analysis

Table 4.4: Correlations

		Weight_before	Weight_after
Weight_before	Pearson Correlation	1	.667**
	Sig. (2-tailed)		.005
	N	16	16
Weight_after	Pearson Correlation	.667**	1
	Sig. (2-tailed)	.005	
	N	16	16

**. Correlation is significant at the 0.01 level (2-tailed).

The Pearson correlation coefficient was used to examine the relationship between the initial weight and final weight of the broilers.

Key Results:

- **Pearson Correlation (r): 0.667**
- **p-value: 0.005** (< 0.05, statistically significant)

Conclusion:

There is a moderate positive correlation (r = 0.667) between weight before and weight after feeding. Since the p-value is significant (0.005 < 0.05), we conclude that initial weight has a strong association with final weight. However, other factors also influence final weight.

Regression analysis

Table 4.5: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.667[a]	.444	.405	.4499

a. Predictors: (Constant), Weight_before

Table 4.6: ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2.266	1	2.266	11.191	.005[b]
	Residual	2.834	14	.202		
	Total	5.100	15			

a. Dependent Variable: Weight_after
b. Predictors: (Constant), Weight_before

Table 4.7: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	1.478	.541		2.731	.016	.317	2.640
	Weight_before	.964	.288	.667	3.345	.005	.346	1.582

a. Dependent Variable: Weight_after

Interpretation:

- The R^2 value of 0.444 means that 44.4% of the variation in final weight is explained by initial weight. The remaining 55.6% is due to other factors (e.g., feed quality, environment, genetics).
- Since p-value (0.005) < 0.05, the regression model is statistically significant.
- The positive coefficient (0.964) means that as the initial weight increases by 1 kg, the final weight increases by approximately 0.964 kg.

CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSION AND RECOMMENDATION

5.0 SUMMARY OF FINDINGS

From the findings of the Paired Sample Test, the p-value (.000) < 0.05, we reject the null hypothesis and conclude that there is significant relationship between feeding patterns and broiler weight gain. Feeding has a significant impact on broiler weight gain.

From Pearson correlation coefficient, there is a moderate positive correlation (r = 0.667) between weight before and weight after feeding. Since the p-value is significant (0.005 < 0.05), we conclude that initial weight has a strong association with final weight. However, other factors also influence final weight.

From the Regression analysis, Since p-value (0.005) < 0.05, the regression model is statistically significant. The positive coefficient (0.964) means that as the initial weight increases by 1 kg, the final weight increases by approximately 0.964 kg.Initial weight significantly influences final weight, but other factors (e.g., feed quality, environment, and genetics) also contribute to weight gain.

Fitting the model

Y (weight after) = $\alpha(1.478) + \beta(0.964)x - \varepsilon$

5.1 CONCLUSION

This study examined the effect of feeding on broiler weight gain at Anuokiki Poultry Farm using statistical techniques such as Paired Sample t-Test, Correlation Analysis, and Regression Analysis.

The results provided strong evidence that feeding significantly contributes to weight gain in broilers. Key conclusions drawn from the analysis include:

i. **Significant Increase in Weight:**
    - The mean weight before feeding was 1.84 kg, while the mean weight after feeding was 3.25 kg.
    - The Paired Sample t-Test showed a statistically significant difference in weight before and after feeding ($p = 0.000$), confirming that feeding has a positive impact on broiler weight gain.

ii. **Moderate Positive Correlation Between Initial and Final Weight:**
    a. The correlation coefficient ($r = 0.667$, $p = 0.005$) indicated that broilers with a higher initial weight tended to gain more weight after feeding.

iii. **Regression Analysis Shows That Initial Weight Influences Final Weight:**
    a. The regression model suggested that 44.4% of the variation in final weight can be explained by initial weight.
    b. However, other factors such as feed quality, genetics, and environmental conditions also contribute to weight gain.

The findings from this study highlight the importance of proper feeding strategies in broiler production. Farmers can use these insights to improve feed management, optimize growth rates, and enhance poultry farm profitability**.** However, since weight gain is also influenced by other factors such as genetics, health, and environmental conditions, future studies should explore these aspects for a more comprehensive understanding of broiler weight variation.

5.2 RECOMMENDATION

Based on the findings of this study, the following recommendations are made to optimize broiler weight gain at Anuokiki Poultry Farm:

1. Improve Feeding Strategies

- **Ensure a Balanced Diet:** Use high-quality feed with an optimal balance of protein, carbohydrates, vitamins, and minerals to support rapid growth.
- **Adopt Phase Feeding:** Adjust the feed composition based on the age and growth stage of the broilers to maximize feed efficiency.
- **Monitor Feed Intake:** Regularly check the quantity and quality of feed to prevent underfeeding or overfeeding.

2. Optimize Farm Management Practices

- **Maintain Proper Stocking Density:** Avoid overcrowding to reduce competition for feed and ensure even weight gain among the flock.
- **Ensure Proper Ventilation and Temperature Control:** Maintain an optimal environment by regulating temperature, humidity, and air circulation in the poultry house.
- **Implement a Strict Biosecurity Program:** Prevent disease outbreaks by maintaining hygiene, disinfecting equipment, and following vaccination schedules.

3. Monitor Growth Progress and Weight Gain

- **Conduct Regular Weighing:** Track weight changes weekly to detect growth variations and adjust feeding plans accordingly.

- **Use Data-Driven Decisions:** Apply statistical analysis periodically to assess performance trends and identify areas for improvement.

4. Enhance Genetic Selection

- **Use High-Performance Broiler Breeds:** Select breeds with high feed conversion efficiency and fast growth rates.
- **Improve Selective Breeding Practices:** Consider breeding strategies that enhance desirable traits, such as disease resistance and rapid weight gain.

5. Further Research and Continuous Improvement

- **Investigate Additional Factors:** Future studies should analyze the impact of genetics, water quality, disease management, and feed additives on weight gain.
- **Adopt Precision Farming Technologies:** Explore the use of smart farming tools such as automated feeders, weight monitoring systems, and AI-based growth prediction models.

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