

## Comparative Analysis of Broiler Chicken Productivity in Relation to the El Niño and La Niña

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### ABSTRACT

This study aims to analyze the impact of El Niño and La Niña on the productivity of broiler chickens in Mamuju Regency, West Sulawesi. The research was conducted in June 2024 using data from broiler farms that implement a close-house system. The research method involved collecting broiler productivity data, including feed consumption, weight gain (WG), Feed Conversion Ratio (FCR), mortality, and Performance Index (PI), as well as climate data such as temperature, rainfall, and humidity. The results showed significant differences in broiler productivity between the El Niño and La Niña periods. During La Niña, feed consumption (0.098 kg/bird/day) and WG (0.063 kg/bird/day) were higher compared to the El Niño period (0.088 kg/bird/day and 0.057 kg/bird/day). FCR remained stable (1.5) in both conditions, indicating consistent feed conversion efficiency. Mortality was slightly higher during La Niña (5.11%) than El Niño (4.80%). The Performance Index (PI) was higher during La Niña (393) than El Niño (360), indicating better overall productivity. Multiple linear regression analysis showed that climate variables (La Niña intensity, temperature, rainfall, and humidity) did not significantly affect the PI. A SWOT analysis identified an offensive strategy as the optimal approach, leveraging the strengths of the closed house system and the growing market opportunities. The conclusion of this study indicates that although there are productivity differences between El Niño and La Niña periods, the use of closed-house technology helps maintain production stability. This research highlights the importance of technological adaptation in addressing climate variability to sustain broiler farm productivity.

Keywords: El Nino, La Nina, broiler productivity, close house, climate variability

### INTRODUCTION

Global climate change has become a natural phenomenon impacting various sectors, particularly agriculture and livestock. The El Niño and La Niña phenomena are climatic events that influence temperature, rainfall, and water availability changes, all affecting the sustainability of agricultural and livestock endeavors. According to El-Deep et al. [1], livestock productivity is

influenced by climate change, which brings about variations in temperature, weather, and environmental conditions.

A suitable environment that meets livestock needs is a primary factor in increasing productivity. Extreme climate changes can stress livestock, necessitating environmental adjustments [2]. Living organisms strive to adapt to every change; however, certain livestock conditions struggle to adjust to climate changes, leading to higher mortality rates and reduced productivity. One aspect of climate change affecting livestock productivity is increased temperatures, which raise the temperature within poultry houses, causing heat stress in chickens and impacting air quality in the enclosures [3].

Broiler chickens are one type of livestock with low adaptability to temperature changes, whether low or high. The productivity of broilers is influenced by genetics, the environment, and management practices [4]. Generally, broilers aged 0–21 days require warmer temperatures and heating equipment, as they have not yet fully developed the ability to regulate their body temperature [5].

As broilers age, their temperature needs to decrease until they can be maintained at room temperature. High mortality is often observed in broilers in the finisher phase due to excessive heat, commonly called overheating. Conversely, high rainfall levels can increase chickens' risk of disease outbreaks [6]. High humidity, around 78-80%, accelerates bacterial growth, which hastens the breakdown of feces into ammonia within the enclosure [7]. High ammonia concentration negatively affects poultry health [8].

Climate changes like El Niño and La Niña are significant focus topics in this research. This is because broilers are highly sensitive to climate changes that impact their performance, including growth, health, and even mortality rates [9]. Specific information regarding the impacts of El Niño and La Niña phenomena is not yet available in the country, making it necessary to research the effects caused by these two phenomena. Thus, research is needed to assess the extent of El Niño and La Niña's effects on broiler productivity in Mamuju Regency. This study aims to serve as a basis for observation and actions to maintain broiler productivity despite climate change, providing valuable information for poultry farmers to address global climate challenges, particularly in Mamuju Regency.

The urgency of this study lies in offering a deeper understanding of the impacts of El Niño and La Niña on broiler productivity, particularly in Mamuju Regency. The research aims to compare broiler productivity during these phenomena and identify key factors that can be used to mitigate their adverse effects. The findings are expected to guide farmers in developing effective adaptation and mitigation measures, ensuring broiler productivity and welfare despite global climate change.

## **MATERIALS AND METHODS**

### **Time and Place**

This research was conducted in Mamuju Regency, West Sulawesi Province, beginning June 1, 2024. Mamuju Regency was chosen as the research location due to the significant impact of global climate phenomena, including El Niño and La Niña, which could affect broiler chicken productivity. The research will involve monitoring environmental conditions and broiler productivity across various regional farms, particularly during extreme climatic events.

## **Research Population and Sample**

The population in this study includes all broiler chicken farming companies in Mamuju Regency that utilize close-house technology. Two companies meet this population criterion. The research sample is drawn from one company selected to represent the entire population. The chosen company shares similarities in technology (close-house enclosures) and other management practices, such as feed, Day-Old Chicks (DOC) source, and health management. Five farmers were selected as respondents from the chosen company. By selecting a consistent company, the resulting data will be more relevant and generalizable for understanding broiler productivity in Mamuju Regency while minimizing unwanted variations between different companies.

## **Research Method**

The method involves collecting data on broiler chicken productivity during El Niño and La Niña periods, including average body weight, feed consumption, FCR (Feed Conversion Ratio), and mortality. The data is then statistically analyzed to determine if there are significant differences in broiler chicken productivity between these two climate phenomena.

The data required for this research consists of both primary and secondary data. Primary data is obtained through direct observation at the research site and interviews with broiler chicken farmers, as well as with one representative each from the Department of Animal Husbandry, the Department of Agriculture, BMKG (Meteorological, Climatological, and Geophysical Agency), and BPS (Central Statistics Agency) of Mamuju Regency. Secondary data includes processed information gathered indirectly through literature reviews and other sources relevant to the research topic.

This research is classified as descriptive research, aligning with its objectives. Historical records on rainfall, air temperature, humidity, and other climate variables during the El Niño and La Niña periods were gathered to collect descriptive data. Additionally, measurements were taken of parameters such as chicken weight, feed consumption, feed conversion, and broiler mortality rates during the El Niño and La Niña periods.

## **Research Procedure**

Broadly, this research consists of four main stages: This stage includes proposal preparation, location survey, literature review, and gathering the necessary research tools and materials.

## **Data Collection Activities**

Conducting direct identification at the BMKG office in Mamuju Regency to obtain information related to the timing of El Niño and La Niña phenomena. Data is collected through direct field observations and interviews with partner farmers and core companies in the broiler chicken partnership system to gather information on broiler chicken productivity data aligned with the timing of El Niño and La Niña phenomena.

## Data Analysis Activities

The data analysis technique used is multiple linear regression, which analyzes the factors influencing broiler chicken production during El Niño and La Niña phenomena. The analysis involves F-tests (simultaneous effect testing), t-tests (partial effect testing), and dominant variable analysis to determine the factors most affecting broiler production, as seen through Standardized Coefficients Beta. The Ordinary Least Squares (OLS) approach uses the SPSS 25 software. Classical Assumption Test is conducted before testing and analyzing data, including Normality, Multicollinearity, and Heteroscedasticity tests, to determine research feasibility [10]. The analysis results compare broiler productivity during the El Niño and La Niña phenomena. A SWOT analysis, which includes Strengths, Weaknesses, Opportunities, and Threats, is applied to devise management strategies for broiler chicken productivity during El Niño and La Niña phenomena. This qualitative approach involves systematically evaluating various related factor, based on the principle of optimizing strengths and opportunities while reducing weaknesses and threats.

## RESULTS AND DISCUSSIONS

### General Overview of the Research Location

Mamuju Regency is located in the western part of Sulawesi Island, specifically in West Sulawesi Province, the province's capital. Geographically, the region is positioned at coordinates 2°8'13" - 2°56'41" South Latitude and 117°8'10" - 119°51'33" East Longitude, with an area of approximately 4,954.57 km<sup>2</sup>. Administratively, Mamuju borders Central Mamuju Regency to the north, North Luwu Regency to the east, Majene Regency, Mamasa Regency, and South Sulawesi Province to the south, and East Kalimantan Province to the west [11].

### Feed Consumption

Based on research data, the average feed consumption per bird per day during La Niña was 0.098 kg, while during El Niño, it was 0.088 kg per bird per day. In La Niña conditions, the temperature tends to be lower and more humid. In this environment, chickens require more energy to maintain a stable body temperature, increasing their feed intake. In colder environments, broiler chickens eat more to generate additional body heat.

Conversely, during El Niño, the environmental temperature is higher and tends to be drier. In hot conditions, chickens reduce their feed intake because their bodies do not require additional energy for warming, and they are also prone to heat stress, which reduces their appetite. Therefore, feed consumption is lower in El Niño conditions. According to Liu et al. [12], high ambient temperatures can increase chickens' water intake, making them feel full quickly, thus reducing their feed consumption. Lohman [13] said that at 32°C, chickens experience stress, characterized by decreased feed intake. Maggini et al. [14] added that poultry body temperature rises when the environmental temperature exceeds the thermoneutral zone. As a result, poultry must use some of their energy to expel heat from the body, which causes stress. This condition impacts feed intake and feed conversion efficiency. Chickens tend to be more active in seeking food and water when they feel comfortable [15].

## Comparison of Broiler Chicken Productivity during El Niño and La Niña Periods

	Month	Feed consumption kg/head/day	Body weight Gain kg/head/day	FCR	Mortality	IP	Temperature	Rainfall/mm	Humidity	Intensity
Period La Niña	January	0.097	0.062	1.60	4.26	377	27.20	237	79	-1.00
	February	0.102	0.071	1.40	1.30	489	27.20	192	80	0.90
	March	0.085	0.060	1.40	1.80	425	27.90	138	80	-1.00
	April	0.085	0.059	1.40	3.74	400	28.00	219	82	-1.10
	May	0.095	0.057	1.70	1.40	304	27.80	552	85	-1.00
	June	0.114	0.070	1.60	4.90	410	27.20	547	85	-0.90
	July	0.101	0.061	1.60	5.70	353	27.40	356	80	-0.80
	August	0.105	0.064	1.60	4.27	360	27.30	151	71	-0.90
	September	0.099	0.064	1.53	5.56	398	27.50	257	73	-1.00
	October	0.104	0.069	1.50	4.14	443	27.20	541	73	-1.00
	November	0.090	0.060	1.50	3.49	385	27.30	263	87	-0.90
	December	0.098	0.062	1.60	4.90	374	27.10	78	86	-0.80
	Average	0.098	0.063	1.50	5.11	393	27.40	294	80	-0.90
Period El Niño	May	0.088	0.059	1.50	3.10	386	28.50	159	80	0.50
	June	0.084	0.052	1.60	3.45	311	27.80	156	81	0.80
	July	0.102	0.065	1.60	5.85	385	27.40	132	78	1.10
	August	0.095	0.061	1.60	4.45	371	27.90	55	74	1.30
	September	0.086	0.056	1.50	3.95	349	28.50	120	71	1.60
	October	0.095	0.064	1.50	4.16	412	29.30	106	78	1.80
	November	0.065	0.044	1.50	10.16	269	29.10	270	81	1.90
	December	0.085	0.057	1.50	3.41	371	28.90	324	81	2.00
	February	0.081	0.055	1.50	5.91	351	28.90	106	78	1.50
	March	0.092	0.063	1.50	3.71	411	28.70	299	80	1.00
	April	0.090	0.057	1.60	4.70	345	28.70	222	81	0.70
	Average	0.088	0.057	1.50	4.80	360	28.50	177	78	1.30

(Source: Primary Data, 2024)

### Body Weight Gain (PBB)

The analysis results indicate that the daily weight gain (DWG) per bird during La Niña was 0.063 kg, while during El Niño, it was only 0.057 kg. Although this study utilized a close-house system designed to provide a comfortable environment for chickens, such systems also have drawbacks, including uneven temperature distribution and suboptimal air circulation [16]. Therefore, environmental influences, such as climate changes like El Niño and La Niña, can still affect the chickens, as reflected in the study findings. The higher weight gain observed during La Niña is attributed to the cooler and more stable temperatures. Broiler chickens generally grow better in cooler conditions with good ventilation, as they can convert feed into body mass more effectively. In these cooler conditions, chickens tend to eat more, have a more efficient metabolism, and experience reduced environmental stress, resulting in better growth. Nurhidayah et al. [17] noted that insufficient ventilation and cooling systems can lead to reduced feed intake, slower growth rates, and increased disease risk. Although this study was conducted in a closed-house system, external environmental factors around the farm still influence conditions. Nurhidayah et al. [18] pointed out that the surrounding temperature and humidity can impact air quality within the house due to ammonia from chicken waste.

During El Niño, however, hotter temperatures can cause heat stress in chickens, which reduces appetite and inhibits weight gain. In hot conditions, chickens are more likely to use energy to maintain their normal body temperature rather than for growth. This explains why DWG during El Niño is lower than during La Niña. Omomowo et al. [19] offered a similar perspective, indicating that reduced broiler body weight is due to heat stress. Heat stress affects broiler feed intake, as chickens reduce feed consumption to adapt to higher temperatures [20]. This reduced feed intake leads to a deficiency in essential nutrients needed to maintain optimal

immune function [21]. Siregar and Sabrani [22] added that heat stress triggers the secretion of the corticosterone hormone, which is associated with increased body protein breakdown. This results in decreased digestive system performance and reduced utilization and digestibility of nutrients from feed.

### **Feed Conversion Ratio (FCR)**

Feed Conversion Ratio (FCR) is the ratio of the feed consumed to the resulting body weight. According to Soliman and Safwan [23], the feed conversion rate is influenced by several factors, including disease, management practices, ambient temperature, and stocking density. Suasta et al. [24] added that feed conversion is affected by various factors, such as genetics, feed form, temperature, environment, feed intake, body weight, and gender. The identical FCR in both conditions (1.5) indicates that the efficiency of converting feed into body weight remains relatively stable during both La Niña and El Niño conditions. Although there are differences in feed consumption and weight gain, the amount of feed converted to meat remains efficiently proportioned.

Another reason FCR remains unchanged is that, even though chickens consume more feed during La Niña and achieve more significant weight gain, the proportion of energy used for growth remains stable in both conditions. This also suggests that, even under extreme conditions, the chicken's metabolic system can consistently convert feed into meat with the same efficiency. However, according to Sugito and Delima [25] research, high temperatures within chicken coops have several negative impacts, including increased feed conversion ratios, reduced body mass, and heightened mortality risk among chicken populations. Trisanto et al. [26] revealed that suboptimal environmental conditions, especially temperature and humidity, can affect feed efficiency. Specifically, the study found that when temperature and humidity fall outside the ideal range, this tends to increase the feed conversion ratio in livestock.

Although extreme climate conditions, such as El Niño, typically associated with high temperatures, usually affect FCR efficiency, the stable FCR (1.5) in both conditions indicates that the close-house environmental management system successfully mitigates the effects of high temperatures. Thus, the internal temperature of the housing is controlled to minimize any impact on feed conversion efficiency, which aligns with Hendrizal's theory that temperature significantly influences FCR. The close-house system employs effective ventilation control, ensuring the coop temperature remains lower than the outside temperature. Humidity, wind speed, and light entering the coop are optimally adjusted to create a comfortable environment for the chickens. This helps prevent excessive stress in chickens [27].

### **Mortality**

The mortality rate during La Niña was 5.11%, while during El Niño, it was 4.80%. The higher mortality rate in La Niña is likely due to increased humidity during this season. High humidity can create a more conducive environment for pathogen development, such as bacteria and viruses, and increase the risk of respiratory diseases and infections in chickens. According to Umam et al. [28], physiologically, cold temperatures can cause blood vessels in chickens to constrict, leading to impaired lung function. In humid conditions, diseases such as CRD (Chronic

Respiratory Disease) and fungal infections are more likely to occur, contributing to a higher mortality rate. According to Widianingrum et al. [29], extreme changes in environmental temperatures significantly trigger these diseases.

Conversely, in El Niño conditions, characterized by hot and dry weather, the risk of respiratory infections and diseases caused by humidity is reduced. Although heat stress can occur during El Niño, good housing management can help reduce mortality due to heat. Therefore, mortality during El Niño is lower than during La Niña.

### **Index Performance (IP)**

According to Wijayanti [30], the performance index (IP) value is calculated based on four main factors: ready-to-harvest body weight, feed conversion, age at harvest, and the percentage of chickens that survive during rearing. Considering this theory, we can analyze the differences in IP under La Niña and El Niño conditions as follows:

The IP under La Niña conditions is 393, higher than the 360 observed under El Niño conditions. This performance index (IP) reflects the overall performance of broiler chickens based on growth, feed efficiency, and survival rate. However, the percentage of surviving chickens is lower during La Niña, and significant increases in ready-to-harvest body weight and feed conversion efficiency lead to an overall rise in the IP. Chickens grow faster and reach higher body weights during La Niña, which boosts total meat production per bird, positively contributing to the IP.

In contrast, during El Niño, although the percentage of surviving chickens is higher, slower growth (resulting in lower ready-to-harvest body weight) and potentially less efficient feed conversion lead to a decline in overall productivity. The suboptimal growth and feed efficiency performance affect the IP score, resulting in a lower IP value than during La Niña. This indicates that the factors of ready-to-harvest body weight and feed conversion exert a more dominant influence on IP than the percentage of surviving chickens in both climatic conditions.

### **Multiple Linear Regression of La Nina**

Based on the Model Summary results, an R value of 0.271 indicates a low correlation between the independent variables (La Niña Intensity, Temperature, Rainfall Accumulation, and Humidity) and the dependent variable (Broiler Chicken Productivity/IP). The R Square ( $R^2$ ) value of 0.074 suggests that only 7.4% of the variation in broiler chicken productivity can be explained by the independent variables in this model. In contrast, the remaining variation is influenced by other factors not included in the model. The negative Adjusted R Square value (-0.112) indicates that the model does not provide a reasonable explanation after accounting for the number of independent variables, implying that the model is unsuitable for describing the relationship between these variables. Additionally, the standard error value of 63.929 indicates a relatively high level of prediction error.

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.271 <sup>a</sup>	.074	-.112	63.929

<sup>a</sup>Predictors: (Constant), Humidity, La Nina Intensity, Rainfall Accumulation, Temperature

The ANOVA results indicate that the F value is 0.397 with a significance level of 0.808, suggesting that the regression model as a whole is not statistically significant. This means no firm evidence exists that the independent variables collectively impact broiler chicken productivity. In other words, this regression model fails to explain a sufficient amount of variation in the dependent variable, reinforcing the findings from the Model Summary regarding the model's shortcomings in explaining the relationship between weather variables and broiler chicken productivity.

ANOVA <sup>a</sup>						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	6491.333	4	1622.833	.397	.808 <sup>b</sup>
	Residual	81739.227	20	4086.961		
	Total	88230.560	24			

<sup>a</sup>Dependent Variable: IP

<sup>b</sup>Predictors: (Constant), Humidity, La Nina Intensity, Rainfall Accumulation, Temperature

The regression coefficients indicate that none of the independent variables significantly influences the dependent variable. The La Niña intensity has a coefficient of -92.602 with a significance value of 0.649, suggesting that its effect on broiler chicken productivity is insignificant. Similarly, temperature has a coefficient of -38.778 (significance value of 0.518), rainfall accumulation has a coefficient of -0.085 (significance value of 0.375), and humidity has a coefficient of -0.049 (significance value of 0.985), all of which demonstrate no significant effect on productivity. These results affirm that the variables tested in this regression model do not contribute significantly to broiler chicken productivity during the La Niña phenomenon.

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1386.675	1455.126		.953	.352
	Intensitas La Nina	-92.602	200.693	-.133	-.461	.649
	Suhu	-38.778	58.893	-.194	-.658	.518
	Akumulasi Curah Hujan	-.085	.094	-.205	-.908	.375
	Kelembaban	-.049	2.653	-.004	-.019	.985

<sup>a</sup>Dependent Variable: IP

The multiple linear regression analysis concludes that weather variables such as La Niña intensity, temperature, rainfall accumulation, and humidity do not significantly influence broiler chicken productivity (IP). Significance values greater than 0.05 for each variable, and the insignificant ANOVA test results indicate that these factors do not contribute meaningfully to the variation in broiler chicken productivity in this model.

Although these results show no significant effects, it is essential to consider the possibility of other, more relevant factors or different analytical approaches to re-examine the impact of weather on broiler chicken productivity. Other untested factors, along with the quality and quantity of limited data, could also influence the final analysis results.

### Multiple Linear Regression Analysis of El Niño

Based on the multiple linear regression test results, the following discussion outlines the relationship between the independent variables (El Niño Intensity, Temperature, Rainfall Accumulation, and Humidity) and the dependent variable (Broiler Chicken Productivity/IP).

#### Model Summary

The R-value of 0.208 indicates a low correlation between the independent and dependent variables. The R Square ( $R^2$ ) value of 0.043 suggests that only 4.3% of the variation in broiler chicken productivity can be explained by the four independent variables in this model. The Adjusted R Square value of -0.148 indicates that after accounting for the number of independent variables, this model experiences a decrease in its ability to explain data variability. It does not predict the relationship between weather variables and broiler chicken productivity. The Standard Error of the Estimate of 51.741 indicates a relatively high level of prediction error.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.208 <sup>a</sup>	.043	-.148	51.741

<sup>a</sup>Predictors: (Constant), Humidity, El Nino Intensity, Temperature, Rainfall Accumulation

From the regression coefficient table, the El Niño Intensity variable has a coefficient of -21.661 with a significance value of 0.446, indicating that its influence on broiler chicken productivity is insignificant. Temperature has a coefficient of 18.982 with the same significance value (0.446), which is also negligible. Rainfall Accumulation has a coefficient of 0.074 with a significance value of 0.664, demonstrating that this variable has no significant influence. Similarly, Humidity has a coefficient of -3.057 with a significance value of 0.562, indicating that its effect on broiler chicken productivity is insignificant.

ANOVA <sup>a</sup>						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	2427.048	4	606.762	.227	.920 <sup>b</sup>
	Residual	53542.952	20	2677.148		
	Total	55970.000	24			

<sup>a</sup>Dependent Variable: IP

<sup>b</sup>Predictors: (Constant), (Constant), Humidity, El Niño Intensity, Temperature, Rainfall Accumulation

The ANOVA results indicate an F value of 0.227 with a significance value of 0.920, significantly greater than 0.05. This suggests that the model is not statistically significant, meaning there is no substantial evidence that the independent variables collectively impact broiler chicken productivity.

Coefficients <sup>a</sup>						
Model		Unstandardized Coefficients		Standardized Coefficients Beta	t	Sig.
		B	Std. Error			
1	(Constant)	82.382	706.523		.117	.908
	El Nino Intensity	-21.661	27.849	-.226	-.778	.446
	Temperature	18.982	24.403	.212	.778	.446
	Rainfall Accumulation	.074	.169	.143	.441	.664
	Humidity	-3.057	5.178	-.191	-.590	.562

a. Dependent Variable: IP

The multiple linear regression analysis results indicate that no independent variable significantly influences broiler chicken productivity. The low R<sup>2</sup> value and the negative Adjusted R<sup>2</sup> value suggest that this model fails to demonstrate a strong relationship between weather factors during El Niño and broiler chicken productivity. Consequently, this model may need to be reevaluated, or additional variables should be considered to enhance the predictive model.

### Swot Analysis

The analysis results indicate that the score for strengths and weaknesses in the IFAS is 2.07 - 1.14 = 0.93, while the score for opportunities and threats in the EFAS is 2.06 - 0.83 = 1.23 (Figure 1). This position falls within Quadrant I (the development and growth quadrant) when represented in a quadrant format. In Quadrant I, strengths outweigh weaknesses, and growth opportunities are favorable. Therefore, improving performance to support development and pursue growth is necessary. This signifies that the Study Program is developing and growing, making an Offensive strategy (S-O) the most suitable approach.

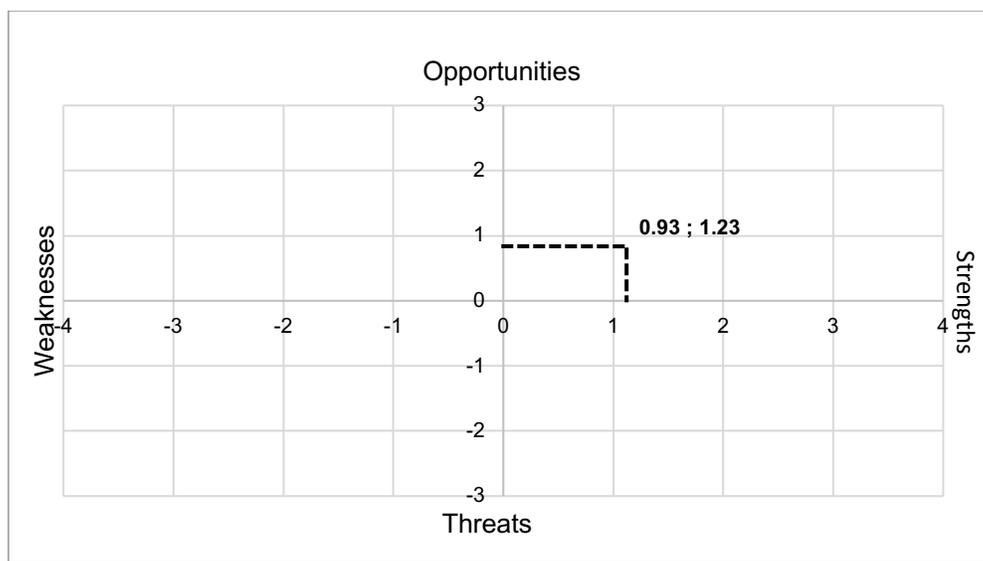


Figure 1. IFAS – EFAS Quadrant

Strategic factors are the key elements of strengths, weaknesses, opportunities, and threats that influence existing conditions and situations, offering advantages when positive actions are taken. Strategy formulation, often referred to as strategic planning, entails developing long-term plans that require in-depth analysis. After establishing strategies through the SWOT matrix, the next step is to identify priority strategy programs based on the quadrants of the IFAS-EFAS matrix. The priority strategy suitable for the internal and external conditions of broiler chicken productivity, in response to the El Niño and La Niña phenomena, is the Offensive strategy (S-O strategy), which is:

1. With support from corporate partnerships, farmers can utilize closed-house technology and efficient feed management to optimize broiler chicken productivity. The market potential surrounding the IKN can be leveraged to expand product distribution to developing areas.
2. Partnerships with large companies enable climate control technology in close-house facilities. This can be utilized to cope with extreme weather changes associated with the El Niño and La Niña phenomena.
3. With access to resources and capital from partner companies, farmers can expand their distribution network for broiler chickens to strategic emerging markets around the IKN, maximizing the potential of growing demand.
4. With the support of corporate partnerships, farmers can utilize closed-house technology to optimize broiler chicken productivity while enhancing infrastructure resilience against disasters such as floods and earthquakes. For example, they can construct houses with earthquake-resistant foundations and effective drainage systems to prevent flooding.

## CONCLUSIONS

The comparison of broiler productivity during El Niño and La Niña indicates that productivity during the La Niña period tends to be better than during El Niño, as observed from several parameters such as feed consumption, weight gain (PBB), mortality, and performance index (IP). Nevertheless, closed-house systems can maintain stable FCR efficiency and support broiler productivity. Furthermore, the impact of each phenomenon, El Niño and La Niña, on broiler productivity does not show a significant influence.

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