

# 利用迴歸模式為肉雞福祉管理 建立基於環境指標之預測方法

## Regression Models Derive Environmental Indicators-Based Predictions for Managing Welfare of Broilers.

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### 摘 要

永續的肉類生產是肉雞生產者關心的問題。雞的健康福祉受到溫度和濕度等環境因素的影響。此外，氣候變遷持續地為生產肉雞帶來挑戰。因此，本研究之目的為建立一個基於環境指標且可預測肉雞福祉的模式。本研究蒐集禽舍 2021 年 8 月至 2022 年 12 月期間的溫、濕度以及死亡率之監測數據，以 2021 年 8 月至 2022 年 8 月為校準期，建構死亡率與前一至前七日平均溫度、濕度和週齡之迴歸模式，後以 2022 年 9 月至 2022 年 12 月期間之數據進行模式驗證。結果顯示以當日溫度、前七日平均濕度及週齡建構之模式，其赤池資訊準則值和均方根誤差分別為 1245.5 和 3.17。然而當溫度替換為前二日平均溫度時，模式的赤池資訊準則值（1244.5）和均方根誤差（3.11）相對更低且所有變數之係數均具有統計意義，顯示此模式具有良好且較好的表現。總體而言，我們的方法可以識別關鍵環境指標以更準確地預測死亡率，且此模式未來可整合至感測器的系統中，幫助動物福祉之評估並為禽舍管理提供資訊。

關鍵詞：肉雞，迴歸模式，環境指標，動物福祉

## **Abstract**

A sustainable meat production is of concern to broiler producers. The welfare of chickens is affected by environmental factors such as temperature and humidity. Moreover, climate change continues to pose challenges to broiler productions. Therefore, the aim of this study is to propose an environmental indicators-based model for predicting the welfare of broilers. Temperature and humidity monitoring data together with mortality data, were collected between August 2021 and December 2022. Then, generalized linear models were fitted for a calibration period of August 2021 to August 2022 to construct the relationships among mortality and the 1 – 7-day average temperature, humidity, and weekly age. The model with a lower Akaike Information Criterion (AIC) was then validated over the period of September 2022 to December 2022. Results showed that the AIC and root mean squared error (RMSE) for the model consisting of the average temperature on the same day, 7-day average humidity, and weekly age were 1245.5 and 3.17, respectively. While the temperature predictor was replaced with the 2-day average temperature, the model had lower AIC (1244.5) and RMSE (3.11); moreover, all coefficients have predictive power with statistical significance, indicating that the model had good and better performance. Overall, our methodology can identify key environmental indicators to properly predict the mortalities. The developed model can be integrated into sensor-based systems to support animal welfare assessment and to provide information for farm management.

**Keywords:** Broiler chicken, Regression model, Environmental indicator, Animal welfare.