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Analysis of Swiftlet Nest Quality In Relation to Price using the Sugeno Method

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Abstract

Many swiftlet nest entrepreneurs in Pangkalan Lunang Village lack a comprehensive understanding of how to assess the quality of swiftlet nests. In fact, nest quality is influenced by various factors, including cultivation techniques, environmental conditions, and post-harvest handling. This lack of knowledge often leads to challenges in maintaining product quality, ultimately affecting selling prices and market competitiveness. Given this situation, it is essential to conduct an in-depth analysis of how nest quality influences its market value. This study employs the Fuzzy Sugeno method to help swiftlet business owners gain a clearer understanding of the relationship between quality parameters—such as color, humidity, shape, and cleanliness—and the selling price. The findings indicate that these quality attributes significantly impact the selling price; the higher the quality, the greater the market value. This emphasizes the importance of adopting best practices in cultivation and post-harvest management to enhance nest quality, meet consumer expectations, and ultimately increase profitability and competitiveness in the market.

Keyword: *Fuzzy Sugeno, Wallet Quality, selling price.*

1. Introduction

Indonesia is one of the world's largest producers of edible bird's nests (Collocalia fuciphaga Thunberg). These nests, made from the saliva of swiftlets, are known as edible bird's nests (EBN) and hold high economic value due to their rich nutritional content and health benefits, particularly in traditional medicine. The high market value of EBN makes the bird's nest industry a promising and competitive sector that continues to grow.

However, despite this potential, many bird's nest entrepreneurs—particularly in rural areas such as Pangkalan Lunang Village—still lack a comprehensive understanding of the factors that determine nest quality. The quality of bird's nests is significantly influenced by factors such as farming techniques, environmental conditions, and post-harvest management. A lack of knowledge in these areas often leads to inconsistent product quality, which in turn affects market price and competitiveness.

To address this challenge, an analytical approach is needed to help entrepreneurs understand the relationship between key quality parameters—such as color, moisture content, shape, and cleanliness—and selling price. One such approach is the Fuzzy Sugeno method, which is capable of handling uncertainty in decision-making processes and has proven effective in various quality-based pricing models.

Previous studies that support the application of this method include research by Arieni et al. (2021) on gold price determination, as well as by Astuti and Mashuri (2020) on determining motorcycle selling prices. These studies demonstrated that the Fuzzy Sugeno method can produce accurate price predictions based on multiple quality parameters. Based on this background, this study aims to analyze the influence of bird's nest quality on its selling price using the Fuzzy Sugeno method.

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2. Research Methodology

The research method used in this study is a qualitative approach, relying on primary data collected through direct interviews with bird's nest entrepreneurs. The data obtained was then analyzed and processed using fuzzy logic, specifically the Fuzzy Sugeno method. This approach was applied to describe and explain the relationship between the quality of swiftlet nests and their selling prices in Pangkalan Lunang Village, Kualuh Leidong Sub-district, North Labuhan Batu Regency. By applying the Fuzzy Sugeno method, it is expected that bird's nest entrepreneurs can obtain systematic and accurate information regarding price determination based on quality parameters, thereby supporting more informed and strategic decision-making.

2.1. Data Analysis

In the data analysis phase, the researcher conducted several steps. First, information on the quality of bird's nests was collected based on their types through direct interviews with swiftlet nest business owners in Pangkalan Lunang Village. This data was then classified to help entrepreneurs convey information about nest pricing more clearly and systematically to consumers based on quality. As a result, the information provided becomes more structured and easier to understand.

2.2. System Analysis

System analysis was carried out to provide a clear overview of the flow and stages of the system being developed. In this process, the researcher used several modeling tools such as the Context Diagram, Data Flow Diagram (DFD), and Entity Relationship Diagram (ERD) to visualize the relationships between components within the system. These diagrams are intended to assist users in better understanding and operating the system. Additionally, to illustrate the design of input and output interfaces, the researcher used Microsoft Visio. This aims to produce a user interface that looks more professional and is easier to comprehend.

3. Results and Discussion

3.1. Data Analysis

On the collected data, the analysis of swiftlet nest quality in Pangkalan Lunang Village using the Fuzzy Sugeno method focuses on four main indicators: type of swiftlet, color, moisture content, and nest shape. These indicators were selected due to their significant influence on market value.

The Fuzzy Sugeno method was chosen for its ability to integrate multiple quality variables and produce predictive and measurable outputs. This makes it a suitable approach for assessing the relationship between quality parameters and the selling price of swiftlet nests in a structured and systematic way.

3.2. System Analysis

The purpose of system analysis is to gain a comprehensive understanding of the requirements, functions, and components needed to develop a system for analyzing the quality of edible bird's nests using the Fuzzy Sugeno method. This system is designed to assist bird's nest business owners in evaluating the quality of their products and determining competitive selling prices based on quality indicators. System analysis involves identifying inputs and outputs, system processes, as well as the hardware and software specifications required to support implementation.

a. Input Requirements Analysis

The input requirements involve collecting raw data based on the main quality indicators of edible bird's nests, which include bird species, color, humidity, and shape. This data is then processed using the Fuzzy Sugeno method, which integrates input

variables within a fuzzy logic framework. The process includes fuzzification, application of rules based on membership functions, and defuzzification to produce a final quality assessment of the bird's nest.

b. Output Requirements Analysis

The output requirements analysis involves processing data using fuzzy logic rules developed based on the relationships between the quality variables. The result is a final quality assessment report of the bird's nest, presented in the form of a score or a quality category: low, medium, or high.

3.3. System Design

The purpose of system design is to illustrate the structure, flow, and main components of the edible bird's nest quality analysis system based on the Fuzzy Sugeno method. This stage includes the design of processes, user interfaces, and data structures to ensure the system operates optimally in assisting users with evaluating bird's nest quality.

a. Use Case Diagram

This diagram illustrates the relationships between users (actors) and the system, providing an overview of the available functionalities from the user's perspective. It helps in understanding how users interact with the system and the features they can access. Below is the use case diagram for the Bird's Nest Quality Analysis System Influencing Price in Pangkalan Lunang Village Using the Fuzzy Sugeno Method:

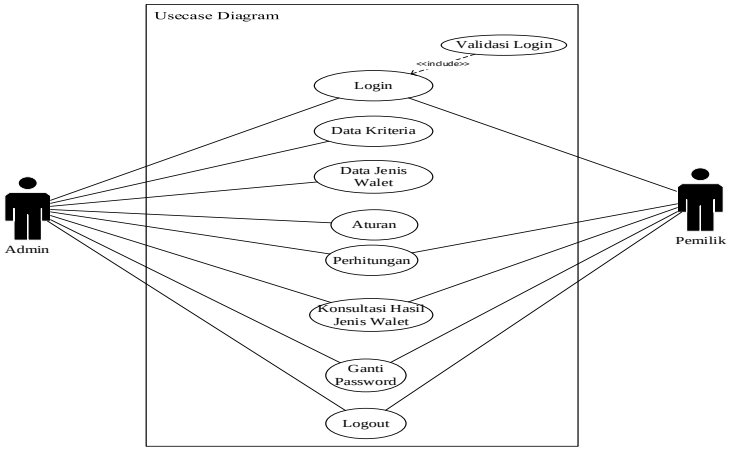

Figure 1. Use Case Diagram

The table below provides an introduction to the Admin and Owner actors in the Bird's Nest Quality Analysis System Influencing Price in Pangkalan Lunang Village Using the Sugeno Method.

Table 1. The Admin and Owner actors in the Bird's Nest Quality Analysis System Influencing Price in Pangkalan Lunang Village Using the Sugeno Method

No	Actor Name	Activity
1	Developer	1. Log in to the system. 2. Manage criteria data. 3. Manage bird species data. 4. Manage rules. 5. Access calculations. 6. Access consultation of nest quality results. 7. Manage passwords. 8. Log out.

No	Actor Name	Activity
2	User	1. Log in to the system. 2. Access calculations. 3. Manage passwords. 4. Log out

The table below describes the identification of use cases related to the role of the Admin in the Bird's Nest Quality Analysis System Influencing Price in Pangkalan Lunang Village Using the Sugeno Method.

Table 2. The identification of use cases related to the role of the Admin in the Bird's Nest Quality Analysis System Influencing Price in Pangkalan Lunang Village Using the Sugeno Method

Devoloper		
No	**Use Case Names**	**Actor Description**
1	Validation	1. Validate login. 2. Validate logout.
2	Manage Criteria Data	1. Add criteria data. 2. Search criteria data. 3. Edit criteria data. 4. Delete criteria data.
3	Manage Bird Species Data	1. Add bird species data. 2. Search bird species data. 3. Edit bird species data. 4. Delete bird species data.
4	Manage Rules	1. Add rules. 2. Search rules. 3. Edit rules. 4. Delete rules.
5	Access Calculation	1. Display calculation data.
6	Manage Password	1. Change password.
7	Logout	1. Exit from the main system page.uencing Price in Pangkalan Lunang Village Using the Sugeno Method.

The table below explains the identification of use cases for the Owner in the Bird's Nest Quality Analysis System Influencing Price in Pangkalan Lunang Village Using the Sugeno Method

Table 3. The identification of use cases for the Owner in the Bird's Nest Quality Analysis System Influencing Price in Pangkalan Lunang Village Using the Sugeno Method

User		
No	**Use Case Names**	**Actor Description**
1	Validation	1. Validate login. 2. Validate logout.
2	Access Calculation	1. Display calculation data.
3	Manage Password	1. Change password.4

User		
No	**Use Case Names**	**Actor Description**
4	Logout	1. Exit from the main system page.

b. Activity Diagram

An activity diagram is a visualization used to describe the workflow or process. This diagram displays a sequence of activities, decisions, and control flows that illustrate the course of a process from start to finish.

1. Admin Login Activity Diagram

The activity diagram for the login process visualizes the steps that occur between the user and the system during the authentication process. These steps include the user entering a username and password, followed by system verification. The result of this process could be successful access if authentication is successful, or an error message if the entered data is invalid.

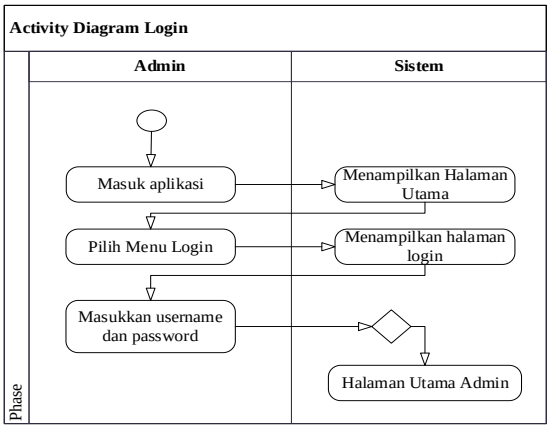

Figure 2. Login activity diagram

2. Devolooper Criteria Data Activity Diagram

The activity diagram for the criteria data menu illustrates the workflow carried out by the admin in managing criteria data within the system. This diagram visualizes the steps involved, including adding, editing, and deleting criteria data, as well as saving any changes made.

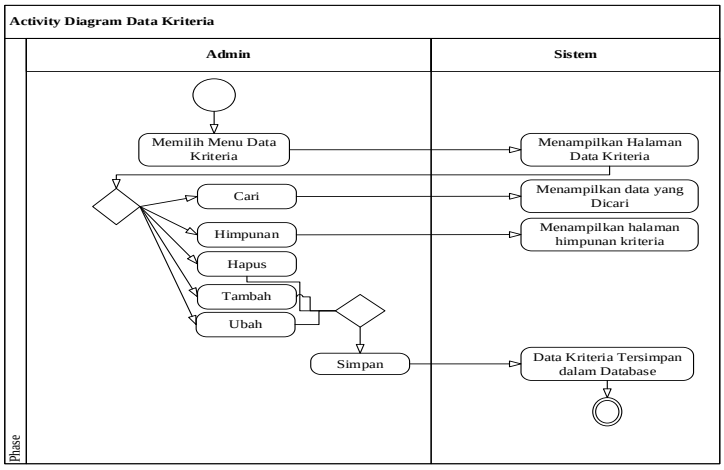

Figure 3. Criteria Data Activity Diagram

3. Devolooper Bird Species Data Activity Diagram

The activity diagram for the bird species data menu illustrates the workflow followed by the admin in managing bird species data within the system. This diagram shows the steps taken by the admin, starting from adding, editing, or deleting data to saving the changes made.

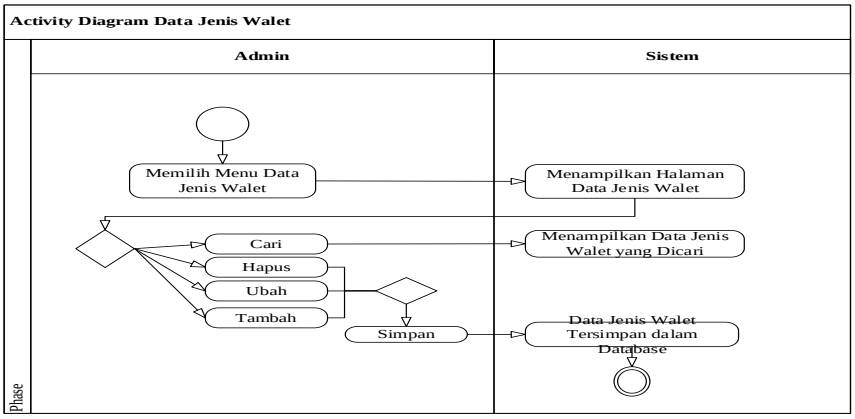

Figure 4. Bird Species Data Activity Diagram

c. User Interface Design

The User Interface (UI) is the visual component of an application or system that serves as an intermediary for interaction between users and the device or software. UI design focuses on layout arrangement, color selection, icons, and other visual elements to create an engaging user experience.

1. Main Page Design

The main page of the system is designed with two primary menus: the bird's nest quality consultation menu and the login menu. The consultation menu allows users to assess the quality of bird's nests using the Fuzzy Sugeno method, while the login menu is reserved for registered users to access additional features. Both are designed to be simple and easily accessible to enhance user convenience.

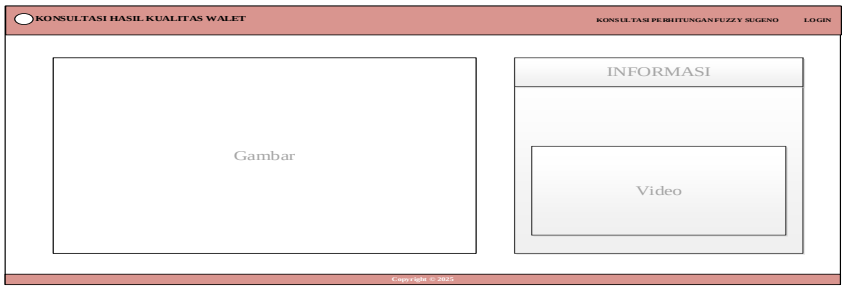

Figure 5. Main Page Design

2. Login Page Design

The login page design provides users with access to the system's main interface. Users must enter their username and password to utilize various available features, depending on their access level.

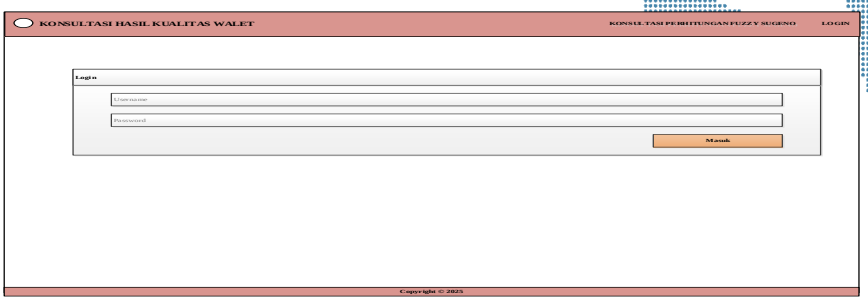

Figure 6. Login Page Design

3. Devolooper Criteria Data Page Design

The design of the criteria data page, as proposed in the system, is intended to allow the admin to easily manage and monitor criteria data.

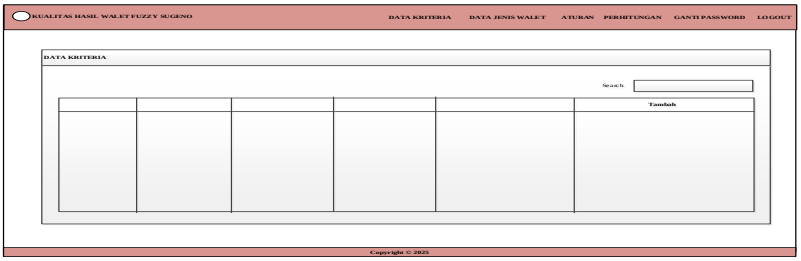

Figure 7. Devolooper Criteria Data Page Design

4. Calculation Page Design

The design of the calculation results page, as proposed in the system, is intended to enable the admin to monitor and evaluate the system's performance.

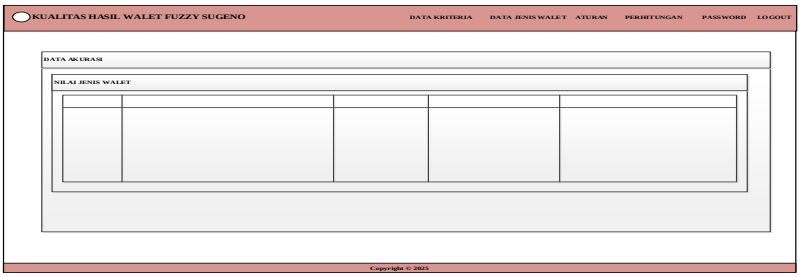

Figure 8. Calculation Page Design

5. Rules Page Design

The design of the rules page, as proposed in the system, is intended to facilitate the admin in managing and monitoring the rules used by the system.

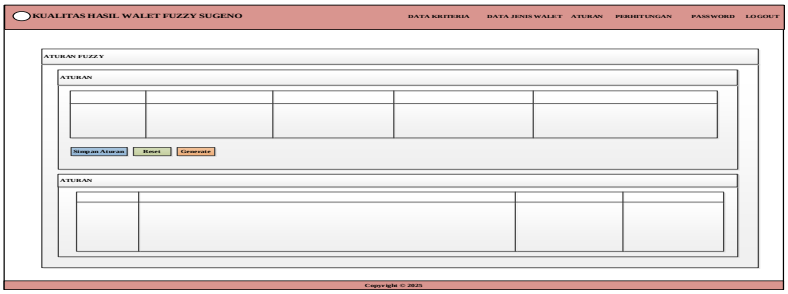

Figure 9. Rules Page Design

4. Conclusion

Based on the research results of the Bird's Nest Quality Analysis System Influencing Price in Pangkalan Lunang Village Using the Sugeno Method, the following conclusions can be drawn. Firstly, the system output is presented in the form of a final assessment report that categorizes the quality of bird's nests into three levels: low, medium, and high. This categorization is designed to help stakeholders easily understand the evaluation results and support accurate decision-making based on nest quality. Additionally, the system provides a clear overview of the nest's quality status and potential areas for improvement. Secondly, the research findings indicate that quality factors such as color, humidity, shape, and cleanliness significantly affect the selling price of bird's nests. The better the nest quality, the higher its market value. These findings highlight the importance of maintaining quality as a key strategy to enhance competitiveness and economic value in the marketplace. Lastly, based on the analysis, it is concluded that bird's nest entrepreneurs in Pangkalan Lunang Village need to improve the quality management of their production to achieve optimal selling prices. By implementing the Fuzzy Sugeno method, entrepreneurs are expected to gain a more comprehensive understanding of the relationship between quality and price. This understanding is crucial to help maintain quality consistency while promoting the sustainability and profitability of their business in the future.

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