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DEVELOPMENT OF A WEBSITE-BASED DECISION SUPPORT SYSTEM FOR SELECTING DUMBO CATFISH FEED USING THE SIMPLE ADDITIVE WEIGHTING (SAW) METHOD

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ABSTRACT

Catfish cultivation, especially the Dumbo catfish (Clarias Gariephinus), is one of the fisheries sectors that has high economic potential in Indonesia. Dumbo catfish is the choice of many farmers because it has good resilience and stable market demand. This research aims to develop a website-based Decision Support System that uses the Simple Additive Weighting (SAW) method to determine optimal feed for Dumbo catfish in Puger District. With this system, it is hoped that it can help farmers in choosing feed that suits the specific needs of catfish, considering the challenges faced by farmers in mixing their own feed. The SAW method was chosen because of its ability to provide decisions based on systematic calculations of weights and attribute values. This system is designed to be easily accessible via the web, allowing farmers to evaluate feed alternatives efficiently. The research results show that the application of SAW in this decision support system can increase the accuracy of feed selection and time efficiency for farmers. By using this system, farmers can optimize the quality of the feed used, which in turn supports the success of cultivating Dumbo catfish more effectively.

Keywords : Dumbo Catfish; Decision Support Systems; Simple Additive Weighting; Website

1. INTRODUCTION

Catfish is one of the cultivated fishery commodities that has great potential to meet people's nutritional needs. In Indonesia, there are ten main provinces that are catfish producers, with East Java ranking second, producing 79,927 tons of catfish in 2013. To date, catfish contributes more than 10 percent to the total national aquaculture production, with a growth rate of reached 17 to 18 percent. The Department of Maritime Affairs and Fisheries (DKP) has designated catfish as one of the leading commodities for cultivating freshwater fish in Indonesia. Over the last five years, catfish production has experienced a significant increase, with annual growth of 21.82 percent. This condition really supports the development of intensive fisheries cultivation businesses (Suwito & Rivai, 2018).

Catfish cultivation, especially the Dumbo catfish (Clarias Gariephinus), is one of the fisheries sectors that has high economic potential in Indonesia. Dumbo catfish cultivation in Puger District, Jember Regency, is one of the agricultural sectors that is quite developed. Dumbo catfish is the choice of many farmers because it has good resilience and stable market demand. However, one of the main challenges faced by farmers is choosing the right feed to support optimal growth of catfish. Quality and appropriate feed greatly influences productivity and efficiency in catfish farming (Rochman et al., 2014).

In practice, many farmers in Puger District experience difficulties in preparing catfish feed that suits the nutritional needs and growth stages of the fish. The feed compounding process requires in-depth knowledge of nutritional composition, proper dosage, and available ingredients. As a result, most farmers prefer to buy ready-made feed that is already available on the market. Even though this method is more practical, it does not always provide optimal results in terms of fish growth and cost efficiency (Haikal et al., 2024). To overcome this problem, a system is needed that can help farmers choose the right feed according to the specific conditions of their cultivation. Decision Support Systems (DSS) are one potential solution. By using the Simple Additive Weighting (SAW) method (Rahayu & Sindar, 2022), This system can process various important criteria in selecting feed such as nutritional content which includes protein, fat, fiber, water content and ash content to provide recommendations for the most suitable feed. (Wulandari, 2021).

The application of the SAW Method in this SPK aims to help Dumbo catfish farmers in Puger District make better decisions regarding feed selection. In this way, it is hoped that farmers can increase the productivity of their cultivation and optimize the use of existing resources, without having to sacrifice significant time and energy (Arnita, 2018). This research will examine how the SAW method can be implemented in SPK to support decisions on selecting Dumbo catfish feed more effectively and efficiently. Apart from that, this research will also assess the impact of implementing this system on increasing production results and the welfare of farmers in the area. The

development of website-based SPK allows farmers in Puger District to easily access feed recommendations that suit the needs of their catfish, anytime and anywhere (Rizqian Noor et al., 2021). With this system, it is hoped that it can help increase the efficiency and effectiveness of Dumbo catfish cultivation, as well as provide practical solutions for farmers in overcoming the difficulties they face..

2. RESEARCH METHOD

2.1 Decision Support System

Decision Support System (DSS) as a computer-based system consisting of three components that interact with each other, a language system (mechanism for providing communication between users and other Decision Support System components), a knowledge system (repository of problem domain knowledge contained in the Decision Support System or as data or as procedures), and the problem processing system (the relationship between the other two components, consisting of one or more general problem manipulation capabilities required for decision making)(Ermin et al., 2020).

Decision Support Systems are interactive information systems that provide information, modeling and data manipulation that are used to assist decision makers in semi-structured situations where no one knows exactly how the decision should be made. Decision Support System is a computer-based information system that produces various decision alternatives to assist management in dealing with various structured problems using data and models. (Sumarno & Harahap, 2020).

The characteristics of a decision support system are as follows (Siregar et al., 2022):

1. Support decision making to discuss structured, semi-structured and unstructured problems.
2. Output is intended for organizational personnel at all levels.
3. Support in all phases of the decision-making process: intelligence, design, choice.
4. The existence of a human or machine interface, where the human (user) still controls the decision-making process.
5. Use mathematical and statistical models that are appropriate to the discussion.
6. Have dialogue skills to obtain information according to needs.
7. Have subsystems that are integrated in such a way that they can function as a unified system.
8. Requires a comprehensive data structure that can serve the information needs of all levels of management.
9. Easy to use approach. The characteristics of an effective decision support system are that it is easy to use and allows users the freedom to choose or develop new approaches in discussing the problems faced.
10. The system's ability to adapt quickly, where decision makers can face new problems and at the same time can handle them by adapting the system to the changing conditions that occur.

The stages of decision making are:

1. Identify the problem;
2. Method selection;
3. Collection of data needed to implement the decision model;
4. Implement the model;
5. Evaluate the positive side of each existing alternative;
6. Implement the selected solution.

2.2 Simple Additive Weighting (SAW)

One method for solving Multiple Attribute Decision Making (MADM) problems is Simple Additive Weighting (SAW). This method is also known as the weighted sum method, where the performance rating of each alternative is added up for all existing attributes. The SAW method requires a process of normalizing the decision matrix (X) into a scale that allows comparison between all available alternative ratings (Wibowo et al., 2020).

The Simple Additive Weighting (SAW) method has the advantage of determining the weight for each attribute, then continuing with ranking to select the best alternative from several available options. Evaluation in this method tends to be more accurate because it is based on predetermined standard weight values, and matrix normalization calculations are carried out based on existing attribute values. However, the SAW method also has disadvantages, namely that it is more suitable for local weighting and requires the use of clear numbers and fuzzy numbers in calculations. (Sopian & Ermatita, 2021).

Decision support system testing uses the Simple Additive Weighting (SAW) weighting method, starting from analyzing the problem to weighting criteria (Sopian & Ermatita, 2021):

1. Determine the criteria that will be used as a reference in decision making, namely Cj.
2. Determine the suitability rating of each alternative for each alternative for each criterion.
3. Create a decision matrix based on criteria (Cj), then normalize the matrix based on equations adjusted to the type of attribute (profit attribute or cost attribute) to obtain a normalized matrix R.

4. The final result obtained from the ranking process is the sum of the multiplication of the normalized matrix R with the weight vector (W) to obtain the largest value which is selected as the best alternative (Ai) as a solution to equation (1) below:

$$r_{ij} = \begin{cases} \dfrac{x_{ij}}{\max x_{ij}} & jika\ j\ adalah\ atribut\ keuntungan\ (benefit) \\ \dfrac{\min x_{ij}}{x_{ij}} & jika\ j\ adalah\ atribut\ biaya\ (cost) \end{cases} \quad (1)$$

With :
rij : Normalized performance rating of alternative Ai on attribute Cj;
i=1,2,...,m and j=1,2,....,n. (m and n are the number of criteria and alternatives).
xij is the suitability rating on Ai and Cj.
The preference values are presented in equation (2) below:

$$V_i = \sum_j^n = 1 w_j r_{ij} \quad (2)$$

With :
rij is the normalized performance rating of alternative Ai on attribute Cj;
Wj is the weight of each criterion.
A larger Vi value indicates that alternative Ai is more selected.

2.3 Website-Based Information Systems

A website-based information system is a system designed to collect, process, store and present information through applications that can be accessed using a web browser. This system utilizes internet technology and web protocols to provide online information services to users, which can be accessed from various devices such as computers, tablets or smartphones with an internet connection. (Nugroho et al., 2020).

The advantages of website-based information systems include ease of access, affordability, and the ability to operate in real-time, allowing users to obtain and manage information from anywhere and at any time. This system is often used in various fields such as business, education, health and government to increase operational efficiency and effectiveness and make it easier for users to access information and services. (Laugi, 2018).

A website-based Decision Support Information System is an application or digital platform designed to assist decision making by integrating various data, information and analysis methods that can be accessed via the web. This system allows users to access and process information from anywhere and at any time, as long as they are connected to the internet.

2.4 Criteria

Criteria in a Decision Support System (DSS) are factors or parameters used to assess and compare various decision alternatives. This criterion functions as a basis for evaluation to determine the best alternative for decision making. The following are several main criteria used in the Decision Support System for Determining Dumbo Catfish Feed:

1. Protein: Protein is the main component in the formation of muscles, tissues and organs of Dumbo catfish. These nutrients are important to support optimal growth, especially during the rapid growth phase. Protein also helps in the repair of damaged tissue and in the formation of enzymes and hormones that are essential for body function.
2. Fat: Fat is the main source of energy for Dumbo catfish. The energy produced from fat is used for daily activities, growth and body metabolism.
3. Fiber: Fiber helps regulate the absorption of other nutrients, such as fats and carbohydrates, thereby preventing excessive absorption and helping maintain nutritional balance.
4. Moisture Content: Proper moisture content in feed helps maintain freshness and prevents the growth of microorganisms such as fungi and bacteria. Feed with too high a water content is susceptible to spoilage, which can reduce quality and risk harming fish health.
5. Ash content: The ash content in feed is an indicator of the amount of minerals contained in the feed, such as calcium, phosphorus, magnesium and potassium. These minerals are important for bone growth, body health and physiological function of Dumbo catfish.

3. RESULT AND DISSCUSION

Some results from the features that have been provided. The feed search process in the decision support system for determining African catfish feed is adjusted to predetermined criteria and the weight input by the website user.

3.1 Home Page

The following is a display of the home page. On the home page there are various features that the website has.

Figure 3.1 Page Home

The dashboard page or main menu is the first page that appears after the admin successfully logs in. On this page, three types of data are displayed, namely criteria data, alternative data, and calculation result data. There is also a logout button if the user wants to leave the system.

3.2 Alternative Pages

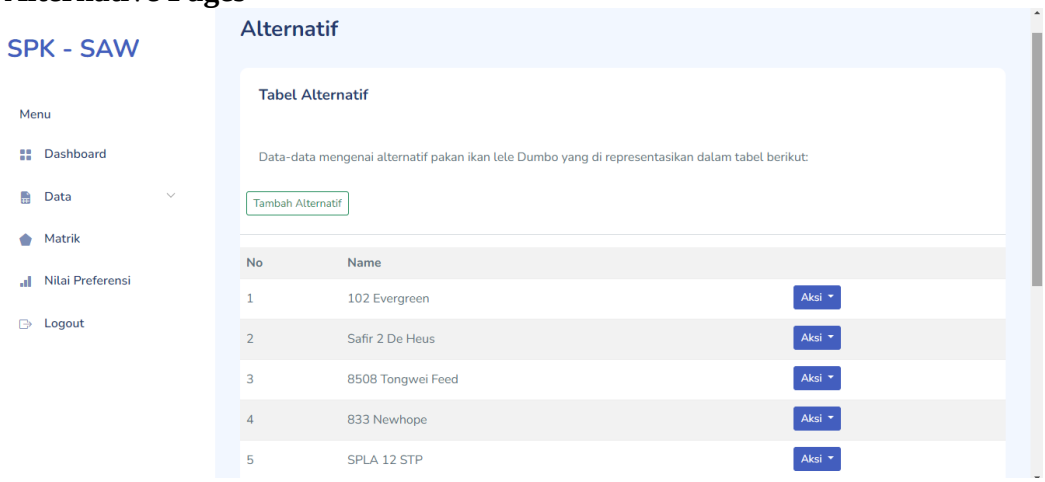

Figure 3.2 Alternative Pages

The alternative data menu page displays all Dumbo catfish use data that has been added by the admin. In each data there is an action option which contains several functions, including: edit and delete. In the top left corner there is an Add Alternative Data button to add new data on Dumbo catfish feed.

3.3 Criteria Page

Figure 3.3 Criteria Page

The criteria data menu page displays all the criteria weighting data that has been added along with the desired weights. Each data displays an action button containing edit and delete functions.

3.4 Assessment Matrix Page

Figure 3.4 Assessment Matrix Page

The criteria weight preference value menu page displays all the criteria weighting preference value data that has been added along with the desired weight. Each data displays a delete button.

3.5 Decision Preference Value

Figure 3.5 Decision Preference Value

The ranking page displays the results of the previous process on the value input process page. Displays all previously processed Dumbo catfish feed data in each initial, normalized and ranking matrix data column. The ranking column displays the final results of the process of determining Dumbo catfish feed based on the criteria that have been entered.

4. CONCLUTION

The application of the Simple Additive Weighting (SAW) method in a website-based decision support system to determine Dumbo catfish feed in Puger District shows positive and effective results. The SAW method, with its ability to assess alternatives based on predetermined criteria, allows users to derive optimal feed recommendations by considering factors such as nutrient content, price, and availability. This system not only simplifies the decision-making process, but also increases accuracy and efficiency in selecting appropriate feed for Dumbo catfish.

With a website-based system, breeders in Puger District can access information and feed recommendations easily and practically, anytime and anywhere. This helps overcome the challenges farmers face in mixing feed manually and provides a more integrated and user-friendly solution. Overall, the implementation of this system has the potential to increase the productivity of Dumbo catfish cultivation and support the development of fisheries businesses in the region.

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