Sensitivity Analysis of Various AHP Process: A Case Study on Consumption Fish Farming

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***Abstract*— The utilization of a decision support system has successfully helped many businesses in increasing their product sales. By conducting product evaluations, the sales potential of each product will be seen more accurately, thereby helping strategic decision-makers. As one of the algorithms in product selection, AHP has been proven to solve complex problems involving multi-criteria, as many studies have successfully used it to rank products. However, in AHP implementation there are two different ways of calculating weights and consistency ratios. Due to the various AHP processes available, this paper performs testing with the most frequently used variations to determine product potential and compare the methods for multi-criteria decision-making. The criteria are harvest duration, selling price, feed production, weather conditions, and target market. The research results show that the weights of the two methods are different, but the resulting ranks are the same. The best choice type of fish to be farmed by fish farmers is catfish with the highest weight and the most difficult type of fish to farm is giant gourami. The result also show that the best way of the normalization process is squares of comparison matrices because its sensitivity does not easily change the ranking order.**

Keywords*— AHP method, type of fish, decision support, multi-criteria, product selection

I. INTRODUCTION

In a business, it is necessary to carry out an analysis before selling the product to become a consideration for the sale. By evaluating the products to be sold beforehand, entrepreneurs will be able to assess which products are most popular and have potential, so they can prioritize and focus on these products [1]. The specified priorities will help entrepreneurs determine business policies and strategies for making decisions.

In livestock businesses that sell products, evaluation is also required to determine sales potential. Sales are made in the form of edible fish, namely nile tilapia, goldfish, catfish, and giant gourami. In determining the right business strategy that suits your needs, support is needed that can assist in decision-making. Doing this to avoid judgments based solely on perception without paying attention to actual facts. When conducting an assessment analysis of products, it is necessary to pay attention to the factors that influence business sales by involving the criteria and alternatives that will be evaluated.

There are several methods in the Decision Support System for evaluating and ranking products to support business decisions to select the best alternative priorities that are multi-criteria, including the SAW, Promethee, SMART (Specific, Measurable, Achievable, Relevant, and Time-Bound), AHP (Analytical Hierarchy Process), Topsis, and so on [3]. In this research, the method used is AHP because it can measure products based on their priority and assessment order efficiently and effectively. AHP is a method of decision support (decision making) that can assist in implementation for product ranking or evaluation. Using the AHP method can analyze and evaluate products by taking into consideration several influential factors based on the weight of each criterion to determine product ranking and priority [4]. AHP is useful for capturing people's preferences related to a problem [2]. Product evaluation is carried out using subjective (experience) and objective (physical data) data. AHP is suitable for use for multi-criteria problems by structuring the problem into a hierarchical form which is broken down into more specific sub-criteria and considering best alternatives [5]. AHP involves pairwise comparison data obtained from the involvement of experts so that data consistency will be more accurate.

This has been found in previous research, there are discussions regarding the implementation of the AHP method for decision support in evaluating products in the case of product selection. A journal written by Musli Yanto in 2021, explains the implementation of the AHP method in a decision support system for selecting products of interest in a mini-market to help managers procure goods so that the stock of goods is maintained. The process of selecting alternative products is based on the criteria of price, taste, design, aroma, and benefits [1].

Then several other studies use various calculation methods to find weights and consistency values. The research includes the journal written by Bintang Rama Putra and Anita Diana to select the best employees in a restaurant by conducting an objective assessment [6], the journal written by I Wayan Sutrisna Yasa, Komang Tri Werthi, and I Putu Satwika, to determine the best lecturers and calculate the consistency ratio value with random index values from several researchers [7], a journal by Retno Waluyo, Ito Setiawan, and Vina Wulandari which explains the use of the AHP method in a decision support system to determine and rank students who receive school operational exemption scholarships [8], journal by Yulaikha

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Maratullatifah, Catur Edi Widodo, and Kusworo Adi which discusses supplier selection and compares the SAW and AHP methods and also compares with Euclidean Distance to determine the best method [11], and journal by Wahyu Handayani and Wulan Dari which implements the AHP method process to determine or select the best product and develop it into an application using PHP [20].

Based on several previous studies that above-mentioned, the AHP method as a decision support method is the right solution to overcome selection and ranking problems to get the best alternative using objective assessments to produce accurate results [9]. However, when applying the AHP method, there are several variations in how to implement it using the basic theory of Thomas L. Saaty. In the application of AHP that has been done by previous authors, it was found that there are 4 different ways with 2 of them being most commonly applied. This research aims to overcome the problem of making rankings to help determine the selection of fish species for farming and sale based on influencing factors or criteria, namely harvest duration, selling price, feed production, weather conditions, and target market using variations in the calculation method of the AHP method [10]. Previous research has solely focused on utilizing a single method, whereas this study will explore different calculation variations within the AHP method to compare and discern differences in ranking and weighting outcomes. This examination serves as a basis for selecting a more effective AHP process. Additionally, the implementation also uses sensitivity analysis to see the impact of data changes on ranking results. Meanwhile, the ranking results will be used by decision-makers to determine the best choice based on the ranking results of the alternatives that have been prepared.

II. RESEARCH METHODOLOGY

A. Research Stages

The following is the research flow or process carried out using the AHP method based on literature reviews from several journal sources concluded as follows [11][12][13]:

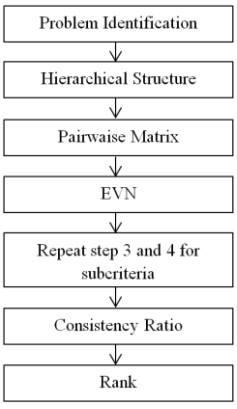

Fig. 1. AHP Method Flowchart

1) Problem identification: Defining problems and determining goals/solutions that developed into several sections of criteria, sub-criteria, and alternatives.

2) Hierarchical structure: Organize problems into a hierarchical structure, starting with the main objective followed by criteria, sub-criteria (if any), and alternatives (Saaty, 2012).

3) Pairwise matrix: Create a pairwise comparison matrix using expert judgment based on an assessment of the importance of an element to describe the impact of each element on the objectives or criteria above it. The following is a table of pairwise comparison scales and their meanings introduced by Saaty (Yasa, Werthi, & Satwika, 2021) [7]:

TABLE I. PAIRWISE COMPARISON MATRIX SCALE

Intensity of importance	Explanation
1	Both elements are equally important
3	One element is slightly more important than the others
5	One element is more important than the others
7	One element is clearly more important than the other
9	One element is absolutely more important than the others
2,4,6,8	The values between two adjacent balances
Reciprocals	If activity i can be one number compared to activity j, then j's value is the opposite compared to i.

Unification of several judgment assessments using the geometric mean equation of the formula as follows [14]:

$$GM = \sqrt[n]{(R_1)(R_2)\dots(R_n)} \quad (1)$$

Description:
GM = Geometric mean
R = Respondent
n = Number of respondents

4) Eigenvector normalization (EVN) [15]: Calculate the eigenvalue (normalized eigenvector/weight) and test its consistency. The following are the formulas used in this research :

a. Data normalization formula:

$$\begin{pmatrix} \frac{X11}{\sum \text{column K1}} & \frac{X_{12}}{\sum \text{column K2}} & \frac{X_{13}}{\sum \text{column K3}} \\ \frac{X_{21}}{\sum \text{column K1}} & \frac{X22}{\sum \text{column K2}} & \frac{X_{23}}{\sum \text{column K3}} \\ \frac{X_{31}}{\sum \text{column K1}} & \frac{X_{32}}{\sum \text{column K2}} & \frac{X33}{\sum \text{column K3}} \end{pmatrix} \quad (2)$$

b. Weight search formula (EVN):

$$\text{Weight Kn} = \frac{\sum \text{row}_{Kn}}{\text{Total}} \quad (3)$$

c. Formula for the number of eigenvalues per row:

$$NR = \begin{pmatrix} 1 & X_{12} & X_{13} \\ X_{21} & 1 & X_{23} \\ X_{31} & X_{32} & 1 \end{pmatrix} x \begin{pmatrix} \text{Weight K1} \\ \text{Weight K2} \\ \text{Weight K3} \end{pmatrix} \quad (4)$$

d. Results formula:

$$\text{Result} = \sum \left(\frac{NR_{Kn}}{\text{Weight}_{Kn}} \right) \quad (5)$$

e. Emaks formula (λmaks):

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$$\text{Emax} = \frac{\text{Result}}{\text{n}} \quad (6)$$

Description:
K = criteria
∑rowKn = Number per row of data normalization
N = number of elements
NR = Number per row for eigenvalues
Result = Eigenvalues before dividing by n
Emaks = Maximum eigenvalue

5) Repeat steps 3 and 4 for sub-criteria and alternatives.

6) Consistency ratio: Check the consistency of all comparison matrices in the hierarchical structure. If they are inconsistent, repeat the data collection. A good consistency ratio is less than or equal to 10% (0,1) [15].

a. Formula for calculating the consistency index (CI):

$$\text{CI} = \frac{\lambda_{\text{maks}} - \text{n}}{\text{n}-1} \quad (7)$$

b. Formula for calculating the consistency ratio (CR):

$$\text{CR} = \frac{\text{CI}}{\text{RI}} \quad (8)$$

Thomas L. Saaty determined the IR value as follows [2]:

TABLE II. RANDOM CONSISTENCY INDEX VALUE

Matrix Size	1, 2	3	4	5	6	7	8	9	10
RI	0	0,58	0,9	1,12	1,24	1,32	1,41	1,45	1,49

Description :
CI = Consistency index
RI = Ratio index
CR = Consistency ratio

7) Ranking: The ranking formula for alternatives to get the final decision or recommendation:

Alternative = ∑(Weight Kn x Weight SKn)

B. Data Collection Methods

In this research, data collection was carried out in the following way [16]:

1) Questionnaire

Search for assessment data by giving questionnaires to experts. These results will be used for a pairwise comparison matrix. This questionnaire changes qualitative data and produces quantitative data but contains objective assessments and experiences of experts [20]. The form of this questionnaire is an assessment of 2 factors, namely the comparison of each criterion against other criteria, for example, the comparison of the importance between the harvest duration and the selling price, harvest duration, feed production, and so on. In the questionnaire form, factors in the same criterion category will be aligned with the intensity value of their respective importance on the right and left of the criterion by assessing one side [17].

2) Interview

Due to the small number of respondents, interviews can be conducted for data collection through questions and answers between researchers and sources (experts) directly (face to face) and independently. This interview stage produces a problem faced by the fish farmer in evaluating various types of fish for consumption to obtain factors (criteria and sub-criteria) that affect selection.

3) Document (historical data)

Collecting data sourced from companies [13]. The data collected involves quantitative (numerical) and qualitative (descriptive) data. In this research, the documents used are a collection of company data, namely data on harvest duration, selling price, feed production, weather conditions, and target market that will used as ranking input.

4) Literature study

Search and understand theories from books and several journal references from previous researchers related to this research. The results of this literature study obtained the theory and implementation process of the AHP method and gained knowledge that there are several ways of calculating the acquisition of weights and consistency ratios.

C. Literature Review

Based on previous studies, there are several ways to calculate the AHP method. There are two different ways found. The following are the differences in each way found with the same stages:

TABLE III. DIFFERENCES IN TWO AHP PROCESS

Step	Way 1	Way 2
1	Problem identification and solution	
2	Hierarchical Structure	
3	Pairwise Comparison Matrix	
4 (different normalization process)	EVN	
	Square of comparison matrix.	Multiplication of the values in the matrix column by the sum of the columns. (The resulting output is the same)
5	Repeat steps 3 and 4 for sub-criteria or alternatives	
6 (different in Emax)	Consistency ratio (All hierarchical levels)	
	The sum of the priority weights is multiplied by the total column of the comparison matrix. (Output is different because the output of step 4 is different even though the formula is the same)	Find the sum per row and divide by the average, then add up and divide by the number of elements.
7	Ranking	
	The sum of the priority weights for each criterion (step 4) times the priority weights for each sub-criterion or alternative (step 5).	

The difference lies in the formula, the following is the difference in the formula from the calculation way in steps 4 and 6:

Step 4

1) *Way 1:* In way 1 [6] [19] data normalization is calculated by multiplying the comparison matrix by itself

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$$\begin{pmatrix} X_{11} & X_{12} & X_{13} \\ X_{21} & X_{22} & X_{23} \\ X_{31} & X_{32} & X_{33} \end{pmatrix} \times \begin{pmatrix} X_{11} & X_{12} & X_{13} \\ X_{21} & X_{22} & X_{23} \\ X_{31} & X_{32} & X_{33} \end{pmatrix} \quad (10)$$

2) Way 2: In way 3 the calculation for data normalization is the formula [1]:

$$\begin{pmatrix} \frac{X11}{\sum \text{column K1}} & \frac{X_{12}}{\sum \text{column K2}} & \frac{X_{13}}{\sum \text{column K3}} \\ \frac{X_{21}}{\sum \text{column K1}} & \frac{X22}{\sum \text{column K2}} & \frac{X_{23}}{\sum \text{column K3}} \\ \frac{X_{31}}{\sum \text{column K1}} & \frac{X_{32}}{\sum \text{column K2}} & \frac{X33}{\sum \text{column K3}} \end{pmatrix} \quad (2)$$

Step 6 (Emax)

1) Way 1: The Emax value is obtained from the sum of the weight values times the total of each column of the comparison matrix using the formula:

Emax = ∑(Element weight x number of columns of element comparison matrix)

2) Way 2: The Emax value is obtained by dividing the number of rows by the weight of the elements in each criterion and then adding the results. The total per row can be found by multiplying the comparison matrix by the element weights. Here is the formula:

$$NR = \begin{pmatrix} X_{11} & X_{12} & X_{13} \\ X_{21} & X_{22} & X_{23} \\ X_{31} & X_{32} & X_{33} \end{pmatrix} X \begin{pmatrix} EVN\ K1 \\ EVN\ K2 \\ EVN\ K3 \end{pmatrix} \quad (11)$$

$$\text{Result} = \sum \left(\frac{NR_{Kn}}{EVN_{Kn}} \right) \quad (12)$$

III. RESULT

A. Defining The Problem And Determining The Goal/Solution [16]

1) Problem: A farmer from Bandung wants to choose types of freshwater fish for consumption to be farmed and sold, but the farmer has difficulty determining the types of fish for consumption that have more potential to be bred and sold on the market than suit the conditions of the farmer's location.

2) Objective: The best types of fish for consumption to farm

3) Criteria and sub-criteria:

TABLE I. CRITERIA AND SUB-CRITERIA

No	Criteria	Sub criteria
1	Harvest Duration	<3 months
		3-5 months
		>5 months
2	Selling price	<25.000
		25.000 – 35.000
		>35.000
3	Feed Production	Cheap
		Medium
		Expensive
4	Weather Conditions	Drought
		Transition season
		Rain
5	Target Market	Traditional market
		Food Stall
		Restaurant

Alternative (products): Nile tilapia, goldfish, catfish, and giant gourami.

B. Organize Problems Into A Hierarchical Structure, Starting With The Main Objective

The hierarchical structure of the problem definition is based on Saaty's hierarchical formulation principle [16][18].

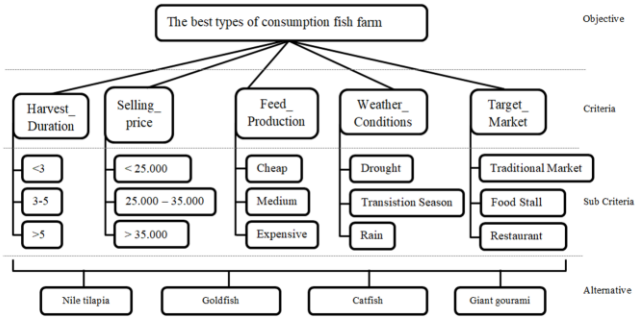

Fig. 2. AHP Hierarchy Structure on Type of Consumption Fish

C. Creating A Pairwise Comparison Matrix

Description of criteria:

HD = Harvest Duration
SP = Selling price
FP = Feed Production
WC = Weather Conditions
TM = Target Market

1) 3 expert assessment of criteria: In compiling a pairwise comparison matrix, expert judgment is needed. If there is more than one expert, it is necessary to combine the assessments using Geomean.

2) Pairwise comparison matrix table of criteria.

D. Calculating Eigenvalues (Normalized Eigenvectors / Weights)

1) Sum the values in each column of the criteria matrix (Way 2,3,4).

TABLE II. THE SUM OF MATRIX VALUES FOR EACH CRITERIA COLUMN

Criteria	HD	SP	FP	WC	TM
HD	1	2	3	7	5
SP	0,5	1	3	4	2
FP	0,33	0,33	1	2	0,25
WC	0,143	0,25	0,5	1	0,143
TM	0,2	0,5	4	7	1
Total	2,176	4,083	11,5	21	8,393

2) Normalization of criteria matrix data.

- Way 1 (Square of comparison matrix)

TABLE III. NORMALIZATION OF CRITERIA DATA WAY 1

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Iteration 1					
Criteria	**HD**	**SP**	**FP**	**WC**	**TM**
HD	5	9,25	35,5	63	15,750
SP	3	5	17,5	31,5	7,821
FP	1,17	2	5	9,417	3,119
WC	0,6	1,02	2,750	5	1,625
TM	2,98	4,483	13,6	25,4	5
Total	12,73	21,715	74,35	134,317	33,315
Iteration 2					
Criteria	**HD**	**SP**	**FP**	**WC**	**TM**
HD	179,149	297,133	904,325	1655,717	442,949
SP	93	154,073	473,482	865,656	230,785
FP	32,52	54	169,086	308,728	80,222
WC	17,2	28,51	89,028	162,5958	42,379
TM	74,45	125,067	390,217	711,242	190,748
Total	395,874	658,809	2026,139	3703,938	987,083

- Way 2 (by dividing each value of the column by the total of the corresponding column)

TABLE IV. NORMALIZATION OF CRITERIA DATA WAY 2

Criteria	HD	SP	FP	WC	TM
HD	0,460	0,490	0,26	0,33	0,596
SP	0,230	0,245	0,261	0,190	0,238
FP	0,153	0,08	0,087	0,095	0,030
WC	0,066	0,061	0,043	0,048	0,017
TM	0,09	0,122	0,35	0,33	0,119
Total	1	1	1	1	1

3) EVN / weight per criterion by summing the values of each row and dividing by the number of criteria.

- Way 1

TABLE V. WEIGHT OF EACH CRITERIA WAY 1

Iteration 1		
Criteria	**Total**	**Weight**
HD	128,500	0,465
SP	64,793	0,234
FP	20,663	0,075
WC	11,005	0,040
TM	51,467	0,186
Total	276,427	1
Iteration 2		
Criteria	**Total I2**	**Weight**
HD	3479,274	0,448
SP	1816,590	0,234
FP	644,579	0,083
WC	339,681	0,044
TM	1491,719	0,192
Total	7771,843	1

- Way 2

TABLE VI. WEIGHT OF EACH CRITERIA WAY 2,3,4

Criteria	Total	Weight
HD	2,139	0,428
SP	1,16	0,233
FP	0,45	0,089
WC	0,23	0,047
TM	1,015	0,203
Total	5	1

E. Repeat Steps 3 and 4 for Sub-Criteria

Also calculate for each sub-criterion, namely the harvest duration, selling price, feed production, weather condition, and target market by creating a pairwise comparison matrix and calculating normalized EVN values (weights).

F. Checking Hierarchy Consistency

Searching for consistency values for each criterion and sub-criteria to ensure that the assessment data from the judgment is consistent, namely with a value below 10% or 0.1 with the following calculations and results:

- Way 1

Emax = (0,448 x 2,176) + (0,234 x 4,083) + (0,083 x 11,5) + (0,044 x 21) + (0,192 x 8,393) = 5,411

TABLE VII. CONSISTENCY RATIO (CR) CRITERIA WAY 1

Emax	CI	CR	
5,411	0,103	0,092	nilai CR<=0,1 maka consistent

- Way 2

TABLE VIII. NUMBER PER ROW AND RESULTS ON CRITERIA WAY 2

Criteria	Number Per Row	Weight	Result
HD	2,51	0,428	5,856
SP	1,309	0,233	5,620
FP	0,454	0,089	5,1
WC	0,240	0,047	5,107
TM	1,091	0,20	5,378
Total			27,045

$$\text{Emax} = \frac{27{,}045}{5} = 5{,}409$$

TABLE IX. CONSISTENCY RATIO (CR) CRITERIA WAY 2

Emax	CI	CR	
5,409	0,102	0,091	nilai CR<=0,1 consistent

G. Ranking

After ensuring that all assessment data is consistent, the next stage is calculating the weight of each alternative tool using the weight of the criteria and sub-criteria that have been obtained previously, then calculating it based on the company's conditions and data to create a ranking with the following calculations:

TABLE X. ALTERNATIVE INPUT DATA

Alternative	HD	SP	FP	WC	TM
Nile tilapia	4	25000	Medium	Drought	Food stall

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Goldfish	5	27000	Medium	Drought	Traditional market
Catfish	2	23000	Cheap	Drought	Food stall
Giant gourami	8	40000	Expensive	Drought	Restaurant

TABLE XI. WEIGHTING AND RANKING OF ALTERNATIVES WAY 1

Alternative	HD	SP	FP	WC	TM	Wg	R
Nile tilapia	0,149	0,038	0,026	0,026	0,048	0,287	3
Goldfish	0,149	0,069	0,026	0,026	0,114	0,385	2
Catfish	0,236	0,038	0,046	0,026	0,048	0,394	1
Giant gourami	0,063	0,126	0,010	0,026	0,030	0,255	4

TABLE XII. WEIGHTING AND RANKING OF ALTERNATIVES WAY 2

Alternative	HD	SP	FP	WC	TM	Wg	R
Nile tilapia	0,143	0,069	0,028	0,028	0,051	0,320	3
Goldfish	0,143	0,069	0,028	0,028	0,120	0,388	2
Catfish	0,225	0,038	0,050	0,028	0,051	0,391	1
Giant gourami	0,061	0,126	0,011	0,028	0,032	0,257	4

IV. DISCUSSION

In this research, testing AHP calculations for product sales was conducted using Google Colab (Python) in two different ways, drawing from insights from several previous studies. This test was carried out to compare each way to the results. The following is a recap of AHP calculation data that shows the differences in the two ways of using Google Colab (Python):

1) Consistency ratio

Based on the previous discussion, the following are the data results obtained from finding the consistency ratio with differences in each way:

TABLE XIII. CONSISTENCY RATIO OF THE TWO AHP WAYS

Consistency Ratio (CR) Criteria		
	Way 1	Way 2
CR	0,091	0,090
Consistency Ratio Sub-Criteria Harvest Duration		
	Way 1	Way 2
CR	0,046	0,046
Consistency Ratio Sub-Criteria Selling price		
	Way 1	Way 2
CR	0,008	0,008
Consistency Ratio Sub-Criteria Feed Production		
	Way 1	Way 2
CR	0,016	0,016
Consistency Ratio Sub-Criteria Weather Conditions		
	Way 1	Way 2
CR	0,012	0,012
Consistency Ratio Sub-Criteria Target Market		
	Way 1	Way 2
CR	0,046	0,046

The consistency values in ways 1 and 2 show that the comparison matrix data is consistent because it has a value below 10%. Although the comparison matrix data from each way is consistent, some CR values from each method sometimes have differences. Way 1 tends to have a larger CR value than way 2. However, based on the results found, way 1 and way 2 have almost similar and even the same consistency values.

2) Value weighting and ranking

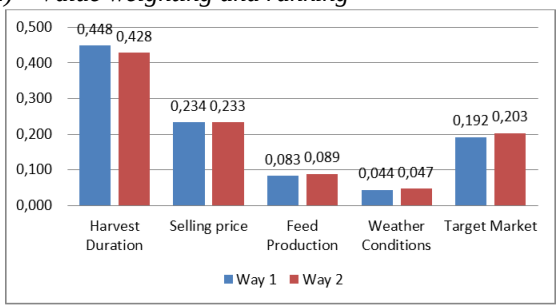

Fig. 3. Comparison Chart of Criteria Weights in Way 1 and Way 2

In way 1, the resulting criteria weight value is different from way 2, but not significantly. Based on the research, the criteria for the harvest duration has the largest weight and the weather has the smallest weight.

TABLE XIV. WEIGHTING AND RANKING OF THE TWO AHP WAYS

Alternative	Weight		Ranking
	Way 1	Way 2	
Catfish	0,394	0,391	1
Goldfish	0,385	0,388	2
Nile tilapia	0,319	0,320	3
Giant gourami	0,255	0,257	4

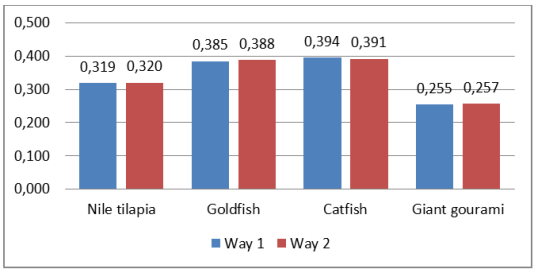

Fig. 4. Comparison Chart for Alternative Way 1 and Ways 2

The amount of weight produced in way 1 is different from way 2 but not too significant. Although the amount of weight is different, the ranking results remain the same with the catfish in the first place to the giant gourami in the last place. Comparison between the normalization way by squaring (Way 1) and dividing the comparison matrix data by the number of matrix columns (Ways 2) produces weights as shown in the graph above (Figure 4).

Based on these results, farmers are better off choosing to farm catfish than other fish because they have the greatest potential for success. The farmer's priority in choosing this type of consumption fish becomes the farmer's main choice and focus because it is related to their interest in selling the product.

However, this study also considered the sensitivity of the data in each method to see its effect on the results. If changes are made to the pairwise comparison matrix data for the criteria section, with the same sub-criteria comparison matrix data and input data, the results will change and differ in weights and rankings as follows.

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TABLE XV. PAIRWISE COMPARISONS FOR CRITERIA

Criteria	HD	SP	FP	WC	TM
HD	1	2	3	6	5
SP	0,5	1	4	5	2
FP	0,33	0,25	1	2	0,25
WC	0,167	0,2	0,5	1	0,143
TM	0,2	0,5	4	7	1
Total	2,2	3,95	12,5	21	8,393

TABLE XVI. CONSISTENCY RATIO OF THE AHP WAYS (CHANGE DATA)

Consistency Ratio (CR) Criteria	
Way 1	Way 2
0,095	0,093

TABLE XVII. WEIGHTING AND RANKING OF THE TWO AHP WAYS (CHANGE DATA)

Weight		Ranking
Alternative	**Way 1**	
Catfish	0,388	1
Goldfish	0,383	2
Nile tilapia	0,318	3
Giant gourami	0,263	4
Weight		**Ranking**
Alternative	**Way 2**	
Goldfish	0,386	1
Catfish	0,384	2
Nile tilapia	0,319	3
Giant gourami	0,266	4

Based on the results above, it can be concluded that changes in the HD – WC criteria increased by 1 value, and SP – WC decreased by 1 value resulting in a change in ranking in way2. This is because, in step 4, way 1 uses the square of the comparison matrix, while way 2 uses the multiplication of the values in the matrix column by the sum of the columns. However, the difference in Step 6 between both methods does not produce significantly different results. Therefore, method 2 has a higher level of sensitivity to change than method 1.

V. CONCLUSION

Based on the result of research on the implementation of the AHP method to select and determine the type of consumption fish, it is concluded that the AHP method can support decision-making by prioritizing the sales of products. This approach makes it easier to identify types of fish for consumption that have the potential to be farmed, thereby aiding decision-makers in determining the main priority of products from best to worst. Factors that influence the type of consumption fish to be farmed are harvest duration, selling price, feed production, weather conditions, and target market. Based on the results of the comparison of the two ways, the weighting results for each method have different results and have the same ranking results. The consistency ratio value is different for each way, but the results still show that the data is consistent in each way. Way 1 and 2 have almost the same consistency value. Even though the ranking results in one dataset are the same, it cannot be denied that the ranking results can be different in other cases using these two ways, especially if the alternative weights have close values. If modifications are made to the assessment of one of the criteria that will change the pairwise comparison matrix data, it is proven that changes in ranking will occur. The conclusion obtained from this research is that way 2 has higher sensitivity so the results change easily. Then decision makers can use the result to determine fish farmer business, ranking results of fish type are catfish in the first place, goldfish, nila tilapia, dan the last giant gourami. So it can be concluded that catfish is the best choice for fish farmers in Bandung and the best use of the AHP process is way 1 because they have close consistent results and have a smaller level of sensitivity to changes. So in deciding on the selection of the AHP process, it is necessary to pay attention to how sensitive the process is to the ranking results. Even if there are small changes in the expert assessment data, the ranking will not change easily, which indicates that the process is worth implementing.

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