



## Analysis of Promethee II Method Determines The Best Cooking Oil Ayam Penyet Cindelaras Rantauprapat

Khairunnisya Ritonga<sup>1</sup>, Marnis Nasution<sup>2</sup>, Sahat Parulian Sitorus<sup>3</sup>

<sup>1,2</sup> Information Management, Faculty of Science and Technology, Labuhanbatu University, 21418, Indonesia

<sup>3</sup> Information Systems, Faculty of Science and Technology, Labuhanbatu University, 21418, Indonesia

E-mail: [dhera2017888@gmail.com](mailto:dhera2017888@gmail.com)<sup>1</sup>, [marnisnst@gmail.com](mailto:marnisnst@gmail.com)<sup>2</sup>, [sahatparuliansitorus4@gmail.com](mailto:sahatparuliansitorus4@gmail.com)<sup>3</sup>

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### ABSTRACT

Cooking oil is a liquid oil made from processed plant and animal fats widely used in frying. People frequently use cooking oil to process food in order to make fried food more savoury and delicious. Every cooking oil company claims to have the best and healthiest product on the market. Cholesterol-free and contains omega 3 and 9 and vitamins A, D, and E. Decision support systems are computer programs that can solve problems based on a set of criteria. Promethee is a method used to assess the order in multi-criteria studies (priority). Simplicity, openness, and continuity are essential aspects. Promethee's parameters expected and governed by the use of partnership benefit over competitors. To users with the best substitute cooking oil breakdown, the decision support system uses the Promethee II approach. The Promethee II Template and the MCDM Model also have guidelines. Sanco oil was found in the Outranking results, specifically Outranking Flow 0.96, which was rated first as the best cooking oil.

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## 1. Introduction

Cooking oil is a liquid temperature oil derived from a placed vegetable that animal fats and commonly used for frying. Food usually processed in cooking oil to make fried foods taste more savoury and delicious. Every cooking oil manufacturer asserts that their product is the best and healthiest on the market. It contains omega 3 and 9 and vitamins A, D, and E. Thanks to a two-stage filtering process, it is cholesterol-free.[1]. The research location in Ayam Penyet Cindelaras Rantauprapat used an enrichment evaluation model (Promethee). With this decision-making method, the hope is to get the best cooking oil. The Ayam Penyet Cindelaras Rantauprapat Menu will make customers want to come back to buy the menu. The PROMETHEE II approach is used in this research as an assessment method (PROMETHEE) to determine the order (priority) in a multi-criteria review. The most critical considerations are simplicity and stability. In terms of other processes, promethee's parameter dominance statement is worth. In comparison to other multi-criteria research approaches, it is a basic definition rating methodology and implementation.[2].

## 2. Method

PROMETHEE II is a study instrument that evaluates sequences based on several parameters (priorities). The most critical considerations are simplicity and stability. The importance of the parameters used in promethee in comparison to others.[3].

Enrichment Evaluation Using a Multi-Criteria Decision Making Model (MCDM) with a Preference Ranking Organization Method (Promethee). The safest choice is to use the parameters and weights for carrying out the calculation procedure. The aim of this study is to find the best substitute cooking oil.[4].

## 3. Results and Discussion

### 3.1 Problem Analysis

The study is the first step towards resolving a persistent problem. This stage of research is critical since the right analysis approach can result in a usable program.

### 3.2 Analysis of the MCDM Model Using the Promethee II Method

To pick the best cooking oil, it employs the Multi-Criteria Decision Making (MCDM) model and the



Choice Rating Organization Methodology for Enrichment Assessment (Promethee) process. It goes through a measurement phase to find the best solution in terms of consideration, parameters, and weights. This specific option is the most effective cooking oil.

### 3.3 Criteria and Weights

For the best cooking oil ranking technique, the Promethee II approach includes parameters as measuring materials. Table 1 indicates the factors that taken into consideration. Criteria for selection:

**Table 1.**

Criteria

Criteria	Description
C <sub>1</sub>	Price
C <sub>2</sub>	Saturated Fat Content
C <sub>3</sub>	Color
C <sub>4</sub>	Filtering Process

Table 1. Criteria table where price criteria are represented by C1, saturated fat content with C2, C3 staining, and filtering process with C4.

**Table 2.**

Cooking Oil to Be Selected

No	Oil Name	C1	C2	C3	C4
1.	Sania	Rp 13.900	Height	Clear Yellow	2 x
2.	Bimoli	Rp 13.500	Height	Clear Yellow	3 x
3.	Filma	Rp 15.100	Low	Golden yellow	2 x
4.	Sanco	Rp 13.800	Low	Clear Yellow	5 x
5.	Tropical	Rp 15.900	Height	Golden yellow	2 x

The weights would be calculated based on both of these parameters. As seen in table 3. Weight, the weight is made up of five Fuzzy numbers: very poor (SB), bad (B), appropriate (C), good (B), and very nice (SB).

**Table 3.**

Weight

Fuzzy numbers	Value
Very poor (SB)	20
bad (B)	40
appropriate (C)	60
good (B)	80
very nice (SB)	100

The value of each criterion dictated the weighting of each criterion. The requirements for Cooking Oil's final yield and colour consistency are the most important. The price and texture of Cooking Oil are second and equally essential requirements. The initial weight for each criterion (C1 - C4) of each alternative seen in table 4 based on the weighted sum against each criterion's significance. The following is a list of criteria for determining the price of cooking oil:

**Table 4.**

Criteria for Cooking Oil Prices

Price
Rp 13.900
Rp 13.500
Rp 15.100
Rp 13.800
Rp 15.900

**Table 5.**

Determining the Criteria of Saturated Fat Content of Cooking Oil

Saturated Fat Content	Fuzzy numbers	Value
Height	appropriate	50
Low	good	80

**Table 6.**  
Determining the Color Criteria of Cooking Oil

Cooking Oil Color	Fuzzy numbers	Value
Brownish Yellow	bad	30
Golden yellow	good	60
Clear	very nice	90

**Table 7.**  
Determining the Criteria of Cooking Oil Filtration Process

Filtering Process
2 x
3 x
4 x

**3.4 Application By Promethee II Method**

Weight value (W) = Price (0.20), Saturated Fat Content (0.35), Color (0.15), Filtration Process (0.30), Alternative (N) = 5. Completion Steps

**Step 1:** Normalize the decision matrix by using the following equations:

$$R_{ij} = \frac{[X_{ij} - \min(X_{ij})]}{[\max(X_{ij}) - \min(X_{ij})]} = \frac{[X_{ij} - \min(X_{ij})]}{[\max(X_{ij}) - \min(X_{ij})]} \dots \dots \dots [5]$$

$$R_{11} = \frac{[13900 - 13500]}{[15900 - 13500]} = \frac{[400]}{[2400]} = 0,17$$

$$R_{12} = \frac{[13500 - 13500]}{[15900 - 13500]} = \frac{[0]}{[2400]} = 0$$

$$R_{13} = \frac{[15900 - 13500]}{[15100 - 13500]} = \frac{[2400]}{[1600]} = 0,67$$

$$R_{14} = \frac{[15900 - 13500]}{[13800 - 13500]} = \frac{[2400]}{[300]} = 0,12$$

$$R_{15} = \frac{[15900 - 13500]}{[15900 - 13500]} = \frac{[2400]}{[2400]} = 1$$

**Table 8.**  
Normalization of Decision Matrix

Alternative	Criteria			
	C1	C2	C3	C4
A1	0,17	0	1	0
A2	0	0	1	0,33
A3	0,67	1	0	0
A4	0,12	1,67	1	1
A5	1	0	0	0

**Step 2:** Calculate my alternative evaluative differences against other alternatives.

**Step 3:** Calculate the preferences function

$$P_j(i,i') = 0 \text{ jika } R_{ij} \leq R_{i'j}$$

$$P_j(i,i') = (R_{ij} - R_{i'j}) \text{ jika } R_{ij} > R_{i'j} \dots \dots \dots [5]$$

To A1, A2:  $0,17 \leq 0 \rightarrow (0,17 - 0) = 0,17$   
 $0 \leq 0 = 0$   
 $0 \leq 1 = 0$   
 $0 \leq 0,33 = 0$

To A1, A3:  $0,17 \leq 0,67 = 0$   
 $0 \leq 1 = 0$   
 $1 \leq 0 = 1$   
 $0 \leq 0 = 0$

To A1, A4:  $0,17 \leq 0,12 \rightarrow (0,17 - 0,12) = 0,05$   
 $0 \leq 1,67 = 0$   
 $0 \leq 1 = 0$



$0 \leq 1 = 0$   
 To A1, A5:  $0.17 \leq 1 = 0$   
 $0 \leq 0 = 0$   
 $0 \leq 0 = 0$   
 $0 \leq 0 = 0$

**Table 9.**  
 Preference Functions for All Alternative Pairs

Alternatif	C1	C2	C3	C4
A1, A2	0.17	0	0	0
A1, A3	0	0	1	0
A1, A4	0.05	0	0	0
A1, A5	0	0	0	0
A2, A1	0	0	1	0.33
A2, A3	0	0	0	0.33
A2, A4	0	0	0	0
A2, A5	0	0	0	0.33
A3, A1	0.5	0	1	0
A3, A2	0.67	1	0	0
A3, A4	0.55	0	0	0
A3, A5	0	1	1	0
A4, A1	0	1.67	1	1
A4, A2	0.12	1.67	0	0.67
A4, A3	0	0.67	1	1
A4, A5	0	1.67	1	1
A5, A1	0.88	0	0	0.33
A5, A2	0	0	0	0
A5, A3	0	0	0	0.33
A5, A4	0	0	0	0

**Step 4:** Aggregate preference function

$$\pi(i, i') = \left[ \sum_{j=1}^m W_j \cdot P_j(i, i') \right] / \sum_{j=1}^m W_j \dots \dots \dots [6]$$

The calculations:

A1,A2:  $(0.17 * 0.20) / 1 = 0.034$   
 $(0 * 0.35) / 1 = 0$   
 $(0 * 0.15) / 1 = 0$   
 $(0 * 0.30) / 1 = 0$   
 A1,A3:  $(0 * 0.20) / 1 = 0$   
 $(0 * 0.35) / 1 = 0$   
 $(1 * 0.15) / 1 = 0.15$   
 $(0 * 0.30) / 1 = 0$   
 A1,A4:  $(0.05 * 0.20) / 1 = 0.01$   
 $(0 * 0.35) / 1 = 0$   
 $(0 * 0.15) / 1 = 0$   
 $(0 * 0.30) / 1 = 0$   
 A1,A5:  $(0 * 0.20) / 1 = 0$   
 $(0 * 0.35) / 1 = 0$   
 $(0 * 0.15) / 1 = 0$   
 $(0 * 0.30) / 1 = 0$

**Table 10**  
 Combined Preferences

Alternatif	C1	C2	C3	C4	Total
A1,A2	0.034	0	0	0	0.034
A1,A3	0	0	0.15	0	0.15
A1,A4	0.01	0	0	0	0.01
A1,A5	0	0	0	0	0
A2,A1	0	0	0.15	0.099	0.249



Alternatif	C1	C2	C3	C4	Total
A2,A3	0	0	0	0.099	0.099
A2,A4	0	0	0	0	0
A2,A5	0	0	0	0.099	0.099
A3,A1	0.1	0.35	0.15	0	0.6
A3,A2	0.134	0.35	0.15	0	0.634
A3,A4	0.11	0	0	0	0.11
A3,A5	0	0.35	0	0.15	0.5
A4,A1	0	0.584	0.5	0.30	1.384
A4,A2	0.024	0.584	0.15	0.201	0.959
A4,A3	0.20	0.234	0.15	0.30	0.884
A4,A5	0	0.584	0.15	0	0.734
A5,A1	0.176	0	0	0.099	0.275
A5,A2	0	0	0	0	0
A5,A3	0	0	0.15	0.099	0.249
A5,A4	0	0	0	0	0

**Table 11**  
Combined Preference Functions

Alternative	A1	A2	A3	A4	A5	Total
A1	-	0.034	0.15	0.01	0	0.194
A2	0.249	-	0.099	0	0.099	0.447
A3	0.6	0.634	-	0.11	0.5	1.844
A4	1.384	0.959	0.884	-	0.734	3.961
A5	0.275	0	0.249	0	-	0.524
Total	2.508	1.627	1.382	0.12	1.333	

**Step 5:** determine the outflow and current outranking

To Entering flow:

$$\varphi(i) = \frac{1}{n-1} \sum_{i'=1}^n \pi(i', i) \dots \dots \dots [6]$$

Where are the calculations:

Leaving flow:

$$A1 = \frac{1}{5-1} * 0.194 = 0.048$$

Entering flow:

$$A1 = \frac{1}{5-1} * 2.508 = 0.627$$

**Table 12.**  
Results of Outflows and Outflows Outranking

Alternative	Leaving Flow	Entering Flow
A1	0.048	0.627
A2	0.112	0.407
A3	0.461	0.345
A4	0.990	0.03
A5	0.131	0.333

**Step 6:** Calculating outranking or net flow clean every alternative

$$\varphi(i) = \varphi^+(i) - \varphi^-(i) = \text{Leaving flow} - \text{Entering flow} \dots \dots \dots [6]$$

Where are the calculations:

$$A1 = 0.045 - 0.627 = -0.579$$

$$A2 = 0.112 - 0.407 = -0.295$$

$$A3 = 0.461 - 0.345 = 0.116$$

$$A4 = 0.990 - 0.03 = 0.96$$

$$A5 = 0.131 - 0.333 = -0.202$$



**Table 13**  
Results of the Net Outranking of Each Alternative

Alternative	Outranking Flow	Rangking
A1	-0.579	5
A2	-0.295	4
A3	0.116	2
A4	0.96	1
A5	-0.202	3

Table 13 Net Outranking Results for Each Alternative data collected by alternative A4, namely cooking oil, which was chosen as the highest outranking alternative, namely cooking oil sanco, which had the best outranking flow of 0.96.

#### 4. Conclusion

Users may select the right cooking oil by using procedures that provide requirements for cooking oil costs, filter cooking oil, color, and saturated fat content in cooking oil. A decision support system uses the Promethee II process to provide users with details about the right cooking oil replacement. The data results include a judgment for the MCDM Model and the Promethee II Method. The effects of the Net Outranking of Each Alternative, namely Outranking Flow 0.96, which is rated first as the best cooking oil, can be used to make recommendations for the use of sanco oil.

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