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Web-Based Application for Determining Clove Oil Selling Prices using the Topsis Method

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Keywords

clove, essential oil, topsis method, distillation, bl ack box

Abstract

Clove oil is oil produced from distilling parts of the clove plant, especially the leaves, handles, and flowers of cloves, and is commonly called clove essential oil. In recent years, the selling price of clove oil has fluctuated, and there is no price certainty. The refiners determine the price based on the market price, so it is considered less supportive and needs to produce a fair selling price. Refiners should set prices based on the quality of the oil. This research was conducted in Bulukumba Regency, South Sulawesi, to create a system that can help refiners determine the selling price of clove oil based on oil quality and provide price certainty for refinery business owners. The method used in this decision-making is the Topsis Method. Based on the results of calculations with the Topsis method in this study, the selected alternative value is leaf oil at a price of Rp.120,000.00 per liter with a value of 0.68, which has clear sub-criteria, specific gravity 1.0450, pH level 21, total eugenol 82, refractive index 1.5330, optical rotation -1˚, solubility in ethanol by 69%. This web application has been tested using black box testing to determine the functionality of each feature. As for knowing the assessment of the aspects of interface, performance, database, and termination, a questionnaire was distributed to five distillers. Then, the assessment results obtained were 88.65% and included excellent assessment criteria

Introduction

One of the strategic commodities that plays an important role in the Indonesian economy, especially in terms of providing employment opportunities, a source of income for farmers, a source of foreign exchange, encouraging domestic agribusiness and agro-industry and regional development is cloves (Bahari & Wibowo, 2019).

Cloves have high economic value, starting from flowers as a primary product to being processed into oil (Lekatompessy & Timisela, 2019). Clove oil commonly referred to as essential oil is oil from distilling parts of the clove plant, both leaves, stems, and flowers (Ramadhan, 2019). The essential oil content in clove plants is quite large, namely 10-20% in the flowers, 5-10% in the stalks and 1-4% in the leaves. Of these three parts, the most abundant and easy to obtain are the leaves, so what is mostly sold on the market is clove leaf oil (Ramadhan, 2019).

Clove plants are a type of plant that is easy to plant and can grow evenly in tropical land (Ramadhan, 2019, Wijaya et al., 2022). Bulukumba is a region that has the highest potential for clove farming in South Sulawesi. Based on data from the Forestry and Plantation Service of Bantaeng Regency in 2010, several areas in Bulukumba Regency had more clove production, namely 1025.2 tons in Kindang District, 963.4 tons in Gantarang District, and 948.2 tons in Bulukumpa District, this is beating clove production in Bantaeng Regency which reached 190.5 tons in Gantarang Keke District and 108.6 tons in Tompo Bulu District. Seeing this potential, fallen dry clove leaves gave rise to the idea of a business opportunity for farmers to build a clove oil processing industry where fallen clove leaves are very abundant in the dry season. This business is very profitable for farmers as the need for essential oils increases on the world market. From 2019 to 2020, Indonesia was one of the essential oil exporting countries with an export value of US$400 million, dominated by clove oil and its derivatives such as patchouli, nutmeg, and lemongrass (Israwati et al., 2021, Ginoga et al., 2021). Clove oil is usually used in the pharmaceutical, medicinal, cosmetic, and perfume fields because of its distinctive aroma.

From a marketing perspective, the clove oil sales process in Bulukumba Regency only looks at market prices as a benchmark, so it is considered not very supportive and results in inappropriate selling prices. Based on the results of interviews with refiners, currently, the standard selling price of leaf oil has decreased slightly, from the usual IDR 130,000 to IDR 160,000 per kg to IDR. 120,000 per kg and for handle oil Rp. 160,000 to Rp. 200,000 per kg. The thing that causes high and low prices is the balance of supply and demand. When oil demand increases, the selling price of oil will increase, and if oil demand decreases, the price will also fall. Therefore, refiners are expected to know and set prices based on the quality of the oil. Another thing that is very important for farmers or distillery entrepreneurs is market certainty, in this case the selling price (Ramadhan, 2019, Widayat et al., 2012).

Previous research on clove oil was conducted by (Marhawati et al., 2023); (Patmawati et al., 2023); (Amin, 2017); (Gaylor et al., 2014); (Sulaeman, 2013); (Bustaman et al., 2011), this research is limited, because it only discusses business development strategies carried out by clove farmers. Research discussing determining the price of clove oil based on quality has never been carried out. Therefore, the aim of this research is to help solve this problem by building a system for determining the selling price of clove oil and providing price information for refining entrepreneurs.

The method used to solve the problem is the Topsis method. The Topsis method is a multi-criteria decision-making method that has the shortest distance from a positive ideal solution and the farthest distance from a negative ideal solution (Sasongko et al., 2022, Maria & Junirianto, 2021, Mukhlis et al., 2022, As'ad et al. ., 2022). A positive ideal solution is defined as a solution that maximizes profit attributes and minimizes cost attributes, while a negative ideal solution is defined as a solution that minimizes profit attributes and maximizes costs.

Method

The method used in this research is to visit the distillery and get the problems at the distillery location. Furthermore, conduct a literature study on the TOPSIS method and interviews using the following flowchart.

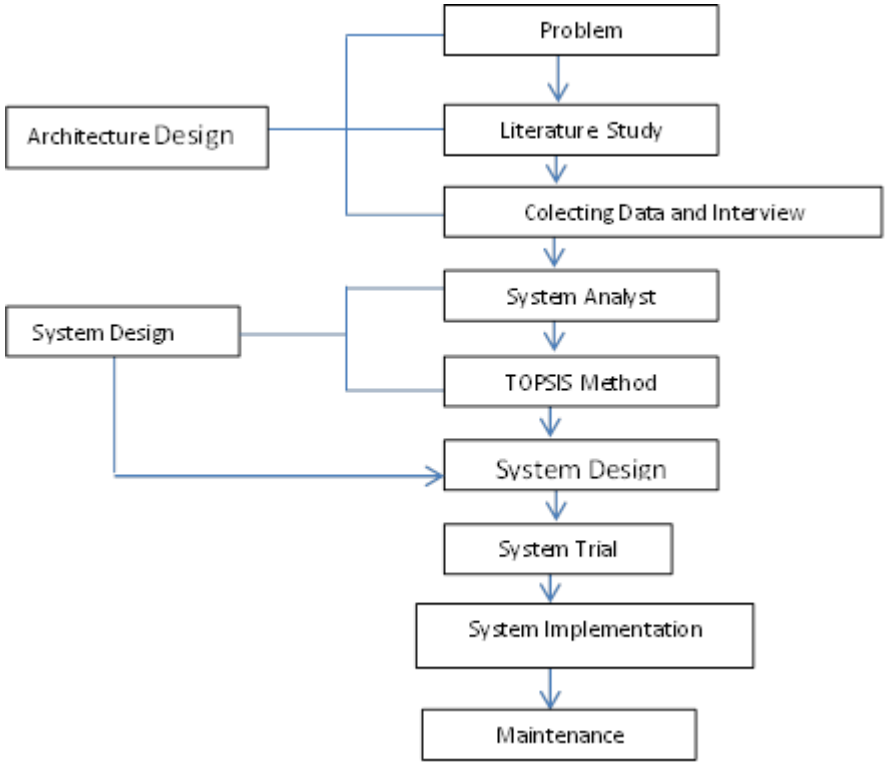


Figure 1. Research Flowchart

The Topsis method has a simple and easy-to-understand concept, efficient computation, and the ability to measure the performance of alternative decisions (Listiyani et al., 2019; Titin Kristiana, 2018). Topsis aims to determine the positive ideal solution and negative ideal solution. Positive perfect solutions maximize benefit criteria and minimize cost criteria, while negative ideal solutions maximize and minimize benefit criteria.

Data collection and interviews when visiting the distillation location to obtain criteria and sub-criteria for leaf oil are as follows.

Table 1. Criteria and Sub-criteria of Clove Oil

Criteria Code	Criteria	Sub-criteria	Description	Weight
C1	Color	Very Good	Clear	5
		Good	Turbid	4
		Fair	Yellow brown	3
C2	Specific Gravity	Very Good	1,0451 - 1,0455 gram	5
		Good	1,0355 - 1,0450 gram	4
		Fair	<1,0355 gram	3
C3	PH	Very Good	22	5
		Good	21	4
		Fair	20	3
C4	Eugenol total	Very Good	>82	5
		Good	82	4
		Fair	<82	3
C5	Indeks Bias	Very Good	1,5260-1,5330	5
		Good	<1,5260-1,5330	4

C6	Optical Rotation	Very Good Good	(-2°)-0° <(-2°)-0°	5 4
C7	Solubility in Ethanol	Very Good Good	70% <70%	5 4

(Resource: *International Standard* 3141:1997(E) dan *Food Chemical Codex* Edisi IV dan Penyuling Minyak Cengkeh)

After collecting data, it is then analyzed using the Topsis Method to determine the correct oil selling price, in this case, ranking based on the quality of the oil, which collectors will later use as users.

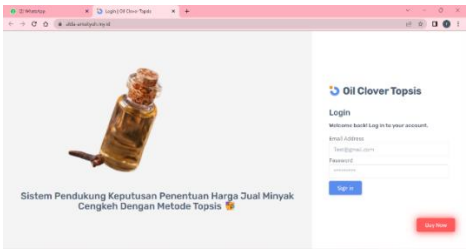
The data testing is carried out with black box testing involving the user to determine the user interface's configuration in terms of security, strength, data, and integrity (Mochamad Haris Reza et al., 2021).

Results and Discussion

This research creates a web-based system that can be used by refiners in determining the selling price of oil based on its quality. The determination of the selling price of clove oil is based on 7 criteria and 18 sub criteria. Based on the results of calculations with the Topsis method in this study, the selected alternative value is clove leaf oil at a price of Rp.120,000.00/liter with a value of 0.68 which has clear sub-criteria, specific gravity 1.0450, pH level 21, total eugenol 82, refractive index 1.5330, optical rotation -1˚, solubility in ethanol of 69%. This web application has been tested using black box testing to determine the functionality of each feature. As for knowing the assessment of the aspects of interface, performance, database and termination, a questionnaire was distributed. Then the assessment results obtained were 88.65% and included very good assessment criteria.

Web view of determining the selling price of agricultural products that have been made:

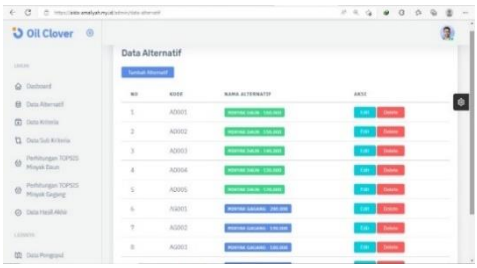
1. Login Page View



Picture 2. Login Page View

On the login page, admins and users are asked to enter the registered email and password.

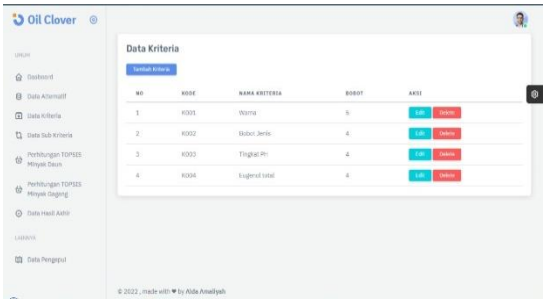
2. Alternative Data Page View



Picture 3. Alternative Data Page

On this page, there are alternative options that will be selected through Topsis calculation. On this page, there are features to add alternatives, edit and delete.

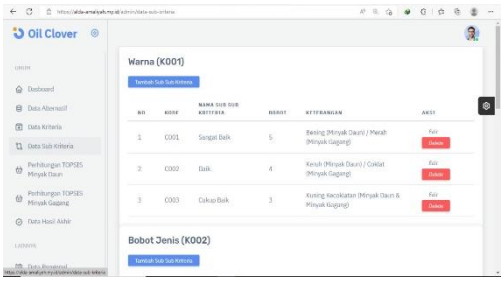
3. Criteria Data View



Picture 4. Criteria Data Page

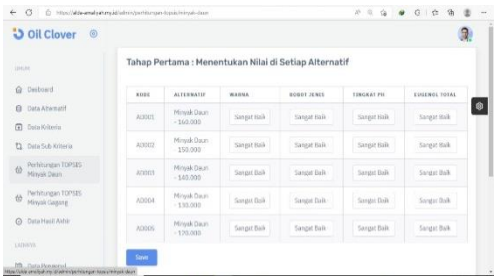
On this page there is an add criteria button to add criteria, edit and delete data that becomes an assessment of determining the selling price of clove oil.

4. Sub Criteria Data View



Picture 5. Sub Criteria Data Page

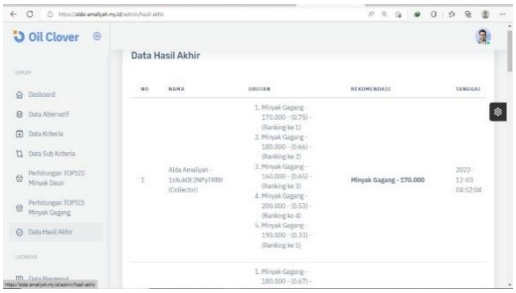
On this page there is an add sub criteria button to add sub criteria and their weights, edit and delete.



Picture 6. Topsis Calculation Page

On the topsis calculation page, users first input the weight of the criteria that will be calculated by the system. After that the user presses the save button, the system will display the calculation results and rankings.

5. Result Data Display



Picture 7. Result Data Page

This page will display the results of the recommendations and detailed calculations that have been carried out.

This research creates a web that will be implemented on distillers in determining the selling price of clove oil using the TOPSIS method. The determination of the selling price is as follows:

1. TOPSIS Method Calculation
   a. Determining Criteria and Alternatives

      The criteria used in the process of determining the selling price of clove oil using the TOPSIS method include:
      C1 : Colour
      C2 : Specific Type
      C3 : pH Level
      C4 : Total Eugenol
      C5 : Bias Index
      C6 : Optical Rotation
      C7 : Solubility in Ethanol
      Alternatif yang terpilih adalah
      A1 : Rp.160.000
      A2 : Rp.150.000
      A3 : Rp.140.000
      A4 : Rp.130.000
      A5 : Rp.120.000

Table 2. Oil data to determine the selling price

No	Criteria	Sub Criteris	Score
1	Colour	Bening	5
2	Specific Type	1,0450	4
3	pH Level	21	4
4	Total Eugenol	82	4
5	Bias Index	1,5330	5
6	Optical Rotation	-1°	5
7	Solubility in Ethanol	69%	4

b. Create a decision matrix based on the preference value of each criterion on all alternatives.

Table 3. Decision Matrix

Alternatif	C1	C2	C3	C4	C5	C6	C7
Rp.160.000	5	5	4	4	4	4	4
Rp.150.000	4	4	3	3	5	5	4
Rp.140.000	3	4	5	3	5	4	5
Rp.130.000	5	3	3	4	5	4	4
Rp.120.000	4	4	5	4	5	5	5

then normalize the decision matrix value as follows:

$X1 = \sqrt{5^2 + 4^2 + 3^2 + 5^2 + 4^2} = 9{,}5393$

r11 = 5/9,5393= 0,5241
r21 = 4/9,5393= 0,4193
r31 = 3/9,5393= 0,3144
r41 = 5/9,5393= 0,5241
r51 = 4/9,5393= 0,4193

$X2 = \sqrt{5^2 + 4^2 + 4^2 + 3^2 + 4^2} = 9{,}0553$

r12 = 5/9,0553= 0,5521
r22 = 4/9,0553= 0,4417
r32 = 4/9,0553= 0,4417
r42 = 3/9,0553= 0,3312
r52 = 4/9,0553= 0,4417

$X3 = \sqrt{4^2 + 3^2 + 5^2 + 3^2 + 5^2} = 9{,}1651$

r13 = 4/9,1651= 0,4364
r23 = 3/9,1651= 0,3273
r33 = 5/9,1651= 0,5455
r43 = 3/9,1651 = 0,3273
r53 = 5/9,1651= 0,5455

$X4 = \sqrt{4^2 + 3^2 + 3^2 + 4^2 + 4^2} = 8{,}1240$

r14 = 4/8,1240= 0,4923
r24 = 3/8,1240= 0,3692
r34 = 3/8,1240= 0,3692
r44 = 4/8,1240= 0,4923
r54 = 4/8,1240= 0,4923

$X5 = \sqrt{4^2 + 5^2 + 5^2 + 5^2 + 5^2} = 10{,}77$

r15 = 4/10,77= 0,3714
r25 = 5/10,77= 0,4642
r35 = 5/10,77= 0,4642
r45 = 5/10,77= 0,4642
r55 = 5/10,77= 0,4642

$X6 = \sqrt{4^2 + 5^2 + 4^2 + 4^2 + 5^2} = 9{,}8994$

r16 = 4/9,8994= 0,4040
r26 = 5/9,8994= 0,5050
r36 = 4/9,8994= 0,4040
r46 = 4/9,8994= 0,4040
r56 = 5/9,8994= 0,5050

$X7 = \sqrt{4^2 + 4^2 + 5^2 + 4^2 + 5^2} = 9{,}8994$

r17 = 4/9,8994= 0,4040
r27 = 4/9,8994= 0,4040
r37 = 5/9,8994= 0,5050
r47 = 4/9,8994= 0,4040
r57 = 5/9,8994= 0,5050

c. The normalization matrix value is multiplied by the value of the oil data for which the selling price will be calculated.

y11 = w1 x r11 = 5 x 0,5241 = 2,6205
y21 = w1 x r21 = 5 x 0,4193 = 2,0965
y31 = w1 x r31 = 5 x 0,3144 = 1,572
y41 = w1 x r41 = 5 x 0,5241 = 2,6205
y51 = w1 x r51 = 5 x 0,4193 = 2,0965

y12 = w2 x r12 = 4 x 0,5521 = 2,2084
y22 = w2 x r22 = 4 x 0,4417 = 1,7668
y32 = w2 x r32 = 4 x 0,4417 = 1,7668
y42 = w2 x r42 = 4 x 0,3312 = 1,3248
y52 = w2 x r52 = 4 x 0,4417 = 1,7668
y13 = w3 x r13 = 4 x 0,4364 = 1,7456
y23 = w3 x r23 = 4 x 0,3273 = 1,3092
y33 = w3 x r33 = 4 x 0,5455 = 2,182
y43 = w3 x r43 = 4 x 0,3273 = 1,3092
y55 = w3 x r53 = 4 x 0,5455 = 2,182

y14 = w4 x r14 = 4 x 0,4923 = 1,9692
y24 = w4 x r24 = 4 x 0,3692 = 1,4768
y33 = w4 x r34 = 4 x 0,3692 = 1,4768
y44 = w4 x r44 = 4 x 0,4923 = 1,9692
y54 = w4 x r54 = 4 x 0,4923 = 1,9692

y15 = w5 x r14 = 5 x 0,3714 = 1,857
y25 = w5 x r24 = 5 x 0,4642 = 2,321
y35 = w5 x r34 = 5 x 0,4642= 2,321
y45 = w5 x r44 = 5 x 0,4642= 2,321
y55 = w5 x r54 = 5 x 0,4642= 2,321

y16 = w6 x r14 = 5 x 0,4040 = 2,02
y26 = w6 x r24 = 5 x 0,5050 = 2,525
y36 = w6 x r34 = 5 x 0,4040 = 2,02
y46 = w6 x r44 = 5 x 0,4040 = 2,02
y56 = w6 x r54 = 5 x 0,5050 = 2,525

y17 = w7 x r14 = 4 x 0,4040 = 1,616
y27 = w7 x r24 = 4 x 0,4040 = 1,616
y37 = w7 x r34 = 4 x 0,5050 = 2,02
y47 = w7 x r44 = 4 x 0,4040 = 1,616
y57 = w7 x r54 = 4 x 0,5050 = 2,02

1. Determine the positive ideal matrix A+

   Take the maximum value of the weighted normalization of the benefit criteria attribute and the minimum value of the cost criteria.

   y_1^+ = max (2.6205, 2.0965, 1.572, 2.6205, 2.0965) = 2,6205
   y_2^+ = max (2.2084, 1.7668, 1.7668, 1.3248, 1.7668) = 2,2084
   y_3^+ = max (1.7456, 1.3092, 2.182, 1.3092, 2.182) = 2,182
   y_4^+ = max (1.9692, 1.4768, 1.4768, 1.9692, 1.9692) = 1.9692
   y_5^+ = max (1.857, 2.321, 2.321, 2.321, 2.321) = 2.321
   y_6^+ = max (2.02, 2.525, 2.02, 2.02, 2.525) = 2.525
   y_7^+ = max (1.616, 1.616, 2.02, 1.616, 2.02) = 2.02

2. Determine the positive ideal matrix A-

   Take the minimum value of the weighted normalization of the benefit criteria attribute and the maximum value of the cost criteria.

   y_1^- = min (2.6205, 2.0965, 1.572, 2.6205, 2.0965) = 1.572
   y_2^- = min (2.2084, 1.7668, 1.7668, 1.3248, 1.7668) = 1.3248
   y_3^- = min (1.7456, 1.3092, 2.182, 1.3092, 2.182) = 1.3092
   y_4^- = min (1.9692, 1.4768, 1.4768, 1.9692, 1.9692) = 1.4768
   y_5^- = min (1.857, 2.321, 2.321, 2.321, 2.321) = 1.857
   y_6^- = min (2.02, 2.525, 2.02, 2.02, 2.525) = 2.02
   y_7^- = min (1.616, 1.616, 2.02, 1.616, 2.02) = 1.616

d. Determining the distance between the weighted values of each alternative to the positive ideal solution

$$D_1^+ = \sqrt{(2{,}6205-2{,}6205)^2+(2{,}2084-2{,}2084)^2+(2{,}182-1.7456)^2+(1{,}9692-1{,}9692)^2+(2{,}321-1{,}857)^2+(2{,}525-2{,}02)^2+(2{,}02-1{,}616)^2}$$

$$= 0{,}9076$$

$$D_2^+ = \sqrt{(2{,}6205-2.0965)^2+(2{,}2084-1{,}7668)^2+(2{,}182-1{,}3092)^2+(1{,}9692-1{,}4768)^2+(2{,}321-2{,}321)^2+(2{,}525-2{,}525)^2+(2{,}02-1{,}616)^2}$$

$$= 1{,}2793$$

$$D_3^+ = \sqrt{(2{,}6205-1{,}572)^2+(2{,}2084-1{,}7668)^2+(2{,}182-2{,}182)^2+(1{,}9692-1{,}4768)^2+(2{,}321-2{,}321)^2+(2{,}525-2{,}02)^2+(2{,}02-2{,}02)^2}$$

$$= 1{,}3385$$

$$D_4^+ = \sqrt{(2{,}6205-2{,}6205)^2+(2{,}2084-1.3248)^2+(2{,}182-1{,}3092)^2+(1{,}9692-1{,}9692)^2+(2{,}3945-2{,}3945)^2+(2{,}525-2{,}02)^2+(2{,}02-1{,}616)^2}$$

$$= 1{,}4$$

$D_5^+ = \sqrt{\begin{matrix}(2{,}6205 - 2{,}0965)^2 + (2{,}2084 - 1{,}7668)^2 + (2{,}182 - 2{,}182)^2 \\ +(1{,}9692 - 1{,}9692)^2 + (2{,}321 - 2{,}321)^2 + (2{,}525 - 2{,}525)^2 + \\ (2{,}02 - 2{,}02)^2\end{matrix}}$

= 0,6852

e. Determining range of the weighted values of each alternative to the negative ideal solution.

$D_1^- = \sqrt{\begin{matrix}(1{,}572 - 2{,}2605)^2 + (1{,}3248 - 2{,}2084)^2 + (1{,}3092 - 1.7456)^2 \\ +(1.4768 - 1{,}9692)^2 + (1{,}857 - 1{,}857)^2 + (2{,}02 - 2{,}02)^2 + \\ (1{,}616 - 1{,}616)^2\end{matrix}}$

= 1,5211

$D_2^- = \sqrt{\begin{matrix}(1{,}572 - 2{,}0965)^2 + (1{,}3248 - 1{,}7668)^2 + (1{,}3092 - 1{,}3092)^2 \\ +(1{,}4768 - 1{,}4768)^2 + (1{,}857 - 2{,}321)^2 + (2{,}02 - 2{,}525)^2 + \\ (1{,}616 - 1{,}616)^2\end{matrix}}$

= 0,9698

$D_3^- = \sqrt{\begin{matrix}(1{,}572 - 1{,}572)^2 + (1{,}3248 - 1{,}7668)^2 + (1{,}3092 - 2{,}182)^2 \\ +(1{,}4768 - 1{,}4768)^2 + (1{,}4365 - 2{,}3945)^2 + (2{,}02 - 2{,}02)^2 + \\ (1{,}616 - 2{,}02)^2\end{matrix}}$

= 1,1555

$D_4^- = \sqrt{\begin{matrix}(1{,}572 - 2{,}6205)^2 + (1{,}3248 - 1{,}3248)^2 + (1{,}3092 - 1{,}3092)^2 \\ +(1{,}4768 - 1{,}9692)^2 + (1{,}857 - 2{,}321)^2 + (2{,}02 - 2{,}02)^2 + \\ (1{,}616 - 1{,}616)^2\end{matrix}}$

= 1,2477

$D_5^- = \sqrt{\begin{matrix}(1{,}572 - 2{,}0965)^2 + (1{,}3248 - 1{,}7668)^2 + (1{,}3092 - 2{,}182)^2 \\ +(1{,}4768 - 1{,}9692)^2 + (1{,}857 - 2{,}321)^2 + (2{,}02 - 2{,}525)^2 + \\ (1{,}616 - 2{,}02)^2\end{matrix}}$

= 1,4518

f. Determining the preference value for each alternative

A1 = $\frac{1{,}5211}{1{,}5211 + 0{,}9076}$ = 0,63

A2 = $\frac{0{,}9698}{0{,}9698 + 1{,}2793}$ = 0,43

A3 = $\frac{1{,}1555}{1{,}1555 + 1{,}3385}$ = 0,46

A4 = $\frac{1{,}2477}{1{,}2477 + 1{,}4}$ = 0,47

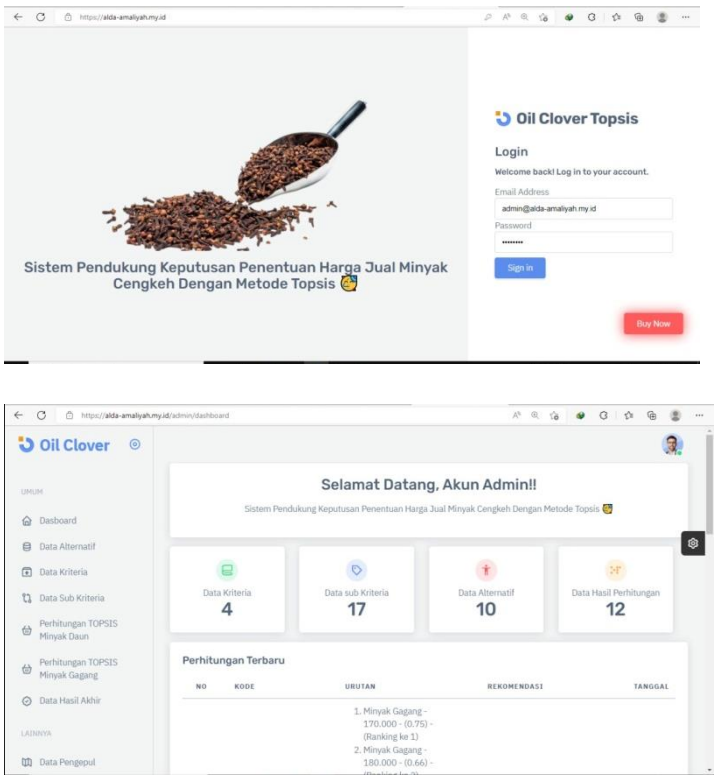
A5 = $\frac{1{,}4518}{1{,}4518 + 0{,}6852}$ = 0,68

Hence, the oil price has a value of Rp.120,000 because the price has the highest value among other alternatives.

2. Testing *Black Box*

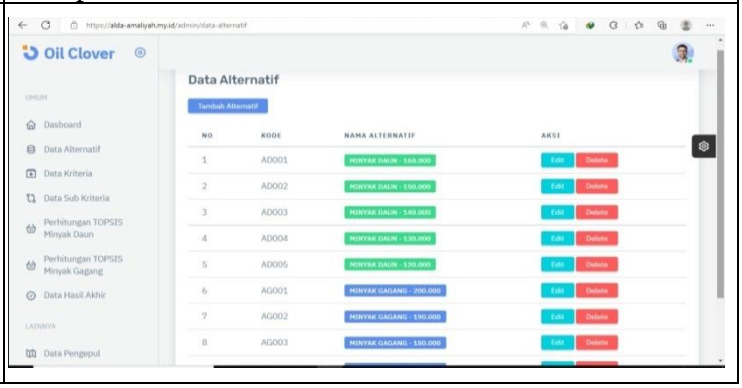
a. Login Page

Table 4. Testing Login Page

Normal Test Cases and Results	
Data Input	Press sign in button
Page Display	Dashboard Page Display
Observation Result	Results as expected
Conclusion	Accepted
Figure	

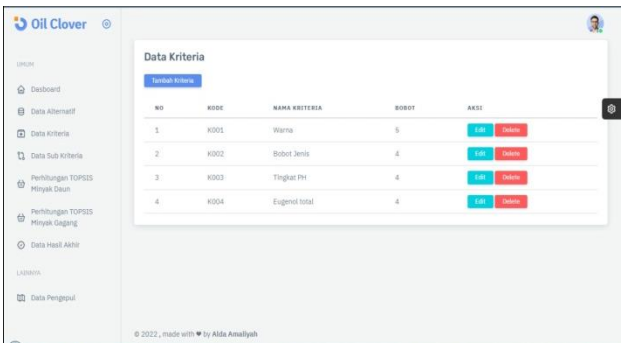
b. Alternate Data View

Tabel 5. Testing the Alternative Data Page

Normal Test Cases and Results	
Data Input	Select the alternative data menu
Page Display	Display the alternative data page
Observation Result	Results as expected
Conclusion	Accepted
Figure	

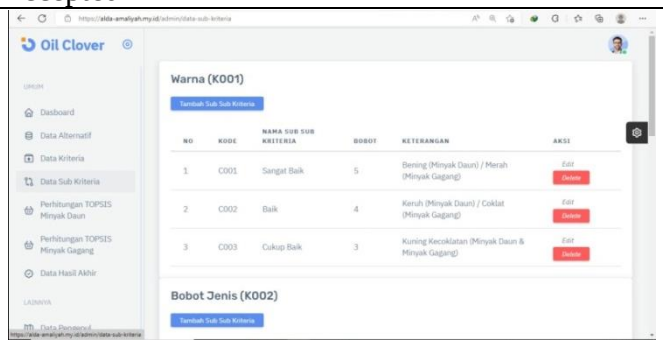
a. Data Criteria View

Table 6. Testing the Criteria Data Page

Normal Test Cases and Results	
Data Input	Select the criteria data menu
Page Display	Display the criteria data page
Observation Result	Results as expected
Conclusion	Accepted
Figure	

b. Sub Criteria Data View

Table 7. Testing the Sub Criteria Data Page

Normal Test Cases and Results	
Data Input	Select the sub criteria data menu
Page Display	Display the sub criteria data page
Observation Result	sults as expected
Conclusion	Accepted
Figure	

c. TOPSIS Calculation View

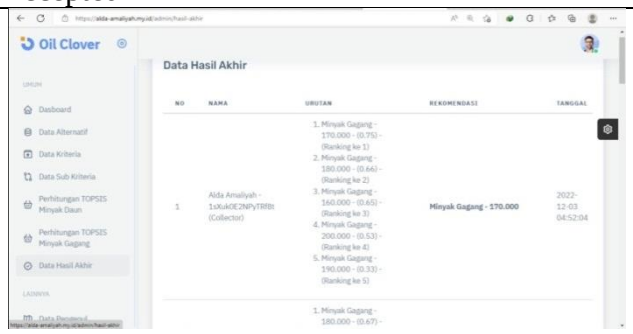
Table 8. Testing the Topsis Calculation Page

Normal Test Cases and Results	
Data Input	Select calculation Topsis
Page Display	Display calculation Topsis page
Observation Result	Results as expected
Conclusion	Accepted

Figure	

d. Final Result Data Display

Table 9. Testing the Final Result Data Page

Normal Test Cases and Results	
Data Input	Select the final result data menu
Page Display	Display the final result data menu
Observation Result	Results as expected
Conclusion	Accepted
Figure	

After conducting black box testing, a questionnaire was distributed to distillers about the assessment of the use of this web. The process of calculating the results of the questionnaire used a Likert scale which was distributed to 5 respondents.

Table 15. Questionnaire Results

No	Questions	SS	S	CS	TS	STS	AP	Criteria
Interface aspect								
1	Do you agree that the web interface for determining the selling price of clove oil is attractive?	3	2	-	-	-	4,6	Very Good
2	Do you agree with the easily visible menu layout?	2	3	-	-	-	4,4	Very Good
3	Is the use of font and background colors appropriate?	2	3	-	-	-	4,4	Very Good

4	Do you agree with the appearance of each clove oil sales price determination web page?	2	3	-	-	-	4,4	Very Good
5	Overall, is the web interface in accordance with user needs for the assessment of determining the selling price?	1	4	-	-	-	4,2	Very Good
						Mean	4,4	Very Good
						Index	88%	Very Good
Performance and Function Aspects								
6	Do you find it easy to use the clove oil sales price determination web?	2	2	1	-	-	4,2	Very Good
7	Does the response of each process not take a long time?	2	3	-	-	-	4,4	Very Good
8	Can the web provide information related to the final result data?	3	1	1	-	-	4,4	Very Good
9	Is this web dynamic or easy to modify according to user needs?	2	2	1	-	-	4,2	Very Good
10	Are the overall features provided in accordance with user needs in determining the selling price of clove oil?	2	2	1	-	-	4,2	Very Good
						Mean	4,28	Very Good
						Index	85,6%	Very Good
Aspect Data Basic								
11	Has the login menu run correctly and according to user needs as determining the selling price of clove oil?	2	3	-	-	-	4,4	Very Good

12	Does the add data feature on the admin account work correctly?	3	1	1	-	-	4,4	Very Good
13	Is the edit or change data feature on the admin account working correctly?	4	1	-	-	-	4,8	Good
14	Is the delete data feature working correctly?	3	2	-	-	-	4,6	Very Good
						Mean	4,55	Very Good
						Index	91%	Very Good
Initialization/Termination Testing								
15	When selecting the add data, is there a process message failure message when not input the requested data?	2	3	-	-	-	4,4	Very Good
16	When selecting the add data, is there a process message failure message when not input the requested data?	3	2	-	-	-	4,6	Very Good
						Mean	4,5	Very Good
						Index	90%	Very Good
						Total Mean	4,43	Very Good
						Overall Index	88,65%	Very Good

Note:
SS = Strongly Agree
S = Agree
CS = Moderately Agree
TS = Not Agre
STS = Strongly Disagree
AP = Interpretation value

From the recapitulation of the answers to the questionnaires that have been distributed, the assessment in terms of the interface aspect of the application produced a figure of 4.4 with an index of 88% with very good criteria. Then in terms of performance and function aspects, an assessment number of 4.2 with an index of 85.6% was obtained, then from the database aspect, an assessment number of 4.35 was obtained with an index of 87% and finally in terms of the initialization / termination aspect, an assessment number of 4.5 was obtained with an index of

90%. And the average calculation result of the assessment number is 4.38 and an index of 87.6% with very good assessment criteria.

Conclusion

This research has created a decision support system application for determining the selling price of clove oil to assist refiners in determining the selling price. Meanwhile, the selling price is determined using 7 criteria and 12 sub-criteria. Based on the results of calculations using the Topsis method in this research, the selected alternative value was obtained, namely leaf oil with a price of Rp. 120,000.00 per kg with a value of 0.68 which has clear sub-criteria, specific gravity 1.0450, pH level 21, total eugenol 82, index refractive 1.5330, optical rotation -1˚, solubility in ethanol is 69%.

This web application has been tested using black box testing to determine the functionality of each feature. To find out the assessment from the interface, performance, database and termination aspects, a questionnaire was distributed. So the assessment results were obtained at 88.65 % and included very good assessment criteria.

Recommendations

It is hoped that further research can use other methods to develop this application such as the *Simple Additive Weight* (SAW) method, *Analytic Hierarchy Process* (AHP) and other ranking methods to obtain comparisons.
It is also hoped that this application can be developed into mobile form so that it is more easily accessible.

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