Journal of Computer Science and Information Technology
https://jcsitech-upiyptk.org/ojs
2023 Volume 9 Issue 3 Pg 160-164 e-ISSN: 2502-1486

Application of the Topsis Method in Selecting the Best Laying Chicken Feed

Lanni Putri Nami*, Muhammad Ikhlas, Radius Prawiro
Universitas Putra Indonesia YPTK Padang, Jl. Raya Lubuk Begalung Padang, Sumatera Barat – 25221, Indonesia
*lanniputrinami@gmail.com

Abstract

A person's limited ability in a particular field makes them think hard about getting a job that can fulfill their daily needs. Now many people are starting to try to switch to the world of animal husbandry. One of them is raising chickens to take their eggs. Choosing good laying hen feed is a very important main factor, especially for consumption by laying hens. Therefore, a decision support system was designed in selecting the best laying hen feed using the Techinique for Order Preference by Similarity to Ideal Solution (TOPSIS) method. The TOPSIS method is an approach that determines solutions based on the closest distance from the positive ideal solution and the furthest distance from the negative ideal solution in order to obtain the optimal alternative. The result achieved is that the system is able to show which laying hen feed has the best quality which will become laying hen feed for laying hen breeders based on predetermined criteria so that Sinar Animal Husbandry can easily determine the best laying hen feed . The results of calculations using the Topsis method showed that alternative A3, namely HI-PRO-VITE 124, had the highest value with an alternative value of 0.6568

Keywords: Decision Support Systems, Laying Chicken Feed, Topsis Method, Alternatives, Positive Ideal

1. Introduction

A person's limited ability in a particular field makes them think hard about getting a job that can fulfill their daily needs. Now many people are starting to try to switch to the world of animal husbandry. One of them is raising chickens to take their eggs. This job does not require special skills, just provide land, cages and several other equipment. With not too much capital, raising chickens is suitable for development.

As a beginner breeder, there are several things you must pay attention to, such as choosing feed for laying hens. Choosing good feed for laying hens is a very important main factor, especially for the purpose of consumption by laying hens, because if the feed for laying hens is not of good quality then the breeding process will not be perfect. So, when selecting feed for laying hens, you must ensure good quality.

Sinar Animal Husbandry is a business that operates in the field of laying hen farming. In choosing feed for laying hens managed by Sinar Animal Husbandry, various problems were found, namely difficulties in managing and selecting data in selecting the right feed for laying hen farms, as well as data collection which was still processed manually and required quite a long time, causing difficulties in making report on the results of the selection of laying hen feed. So that maximum livestock results are as expected , the author tries to create a Decision Support System using the TOPSIS Method to help facilitate the running of the business.

A decision support system is a specific information system intended to assist management in making decisions related to semi-structured issues. This system has the facility to generate various alternatives that are interactively used by users [1][2][3].

Decision Support Systems (DSS) are flexible, interactive and adaptable computer-based information systems, which were developed to support solutions to specific, unstructured management problems [4]. Decision Support Systems use data, provide an easy user interface and can incorporate decision making thinking [5].

Techinique for Order Preference by Similarity to Ideal Solution (TOPSIS) is based on the concept where the selected or best alternative not only has the shortest distance from the positive ideal solution, but also has the farthest distance from the negative ideal solution from a geometric point of view using Euclidean distance to determine the relative closeness of an alternative to the optimal solution [6][7][8]. This method is an approach that determines the solution based on the closest distance from the positive ideal solution and the furthest distance from the negative ideal solution in order to obtain the optimal alternative. The TOPSIS method is known for its practicality, because of its simplicity in concept, efficiency in the computational process and the best solution is obtained from the closest and farthest distance from the positive and negative ideal solutions obtained [9].

Accepted: 06-11-2023 | Revised: 07-11-2023 | Published: 07-31-2023 | doi: 10.35134/jcsitech.v9i3.81

Previous research on employee recruitment decision support systems using the topsis method obtained the results, it is hoped that decision makers will be helped in determining employees who have the right to be accepted into a company, where in the research 20 data were used, 17 alternatives of which decisions can be made to be acceptable and meet the requirements, while 3 alternatives others are not worthy of acceptance and do not meet the requirements [10]. As for previous research, the topsis method in the decision support system for determining scholarship acceptance at Stmik Pringsewu obtained the highest number of results for each predetermined criterion, stating that alternative A was with a total value of 0.54 [11] .

Research on the decision support system for selecting the Ma Al Mubarok Batu Raja exemplary teacher using the topsis method. This method was chosen because it was able to choose the best alternative from a number of existing alternatives. Of the number of existing alternatives, the best alternative is Budi Santoso S.Ag with a value of 0.7338 . Budi Santoso became an exemplary teacher with the highest score at MA Al Mubarok[12]. The research is a combination of 2 methods in the decision support system for selecting quality rice seeds using the ahp and topsis methods where the results obtained are quality rice from five predetermined alternatives, namely: Sunggal, Inpari32, Ciherang, IR64, Situbagendit. The system produces the highest preference value, namely 0.858 for Sunggal rice in first place and 0.767 for Inpari32 rice in second place. So from the results of this research, researchers recommend quality rice seeds that are suitable for planting in the Sambongbangi village, namely Sunggal and Inpari32[13].

Based on the previous explanation , this research aims to select the best chicken feed which will be used as the best food in chicken farming. It is hoped that this research can obtain results to assist in decision making, so that the decisions obtained become a reference in making decisions effectively and efficiently.

2. Research methodology

The research framework is a sequence of activities that will be carried out in a study. The research will be carried out using the Techinique for Order Preference by Similarity to Ideal Solution (TOPSIS) method, which is a good alternative that not only has the shortest distance from the positive ideal solution but also has the longest distance from the negative ideal solution. The concept is simple and easy to understand, computationally efficient, and has the ability to measure the relative performance of decision alternatives in simple mathematical form [14].

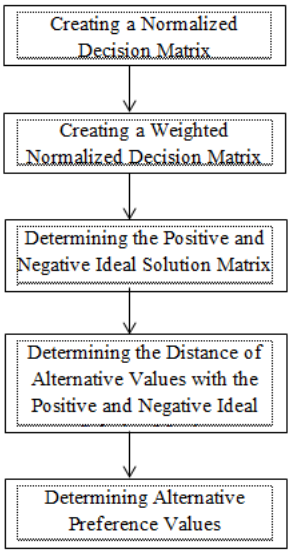

Figure 1. Research Framework

The stages carried out in the Topsis method framework are based on the concept where the best selected alternative not only has the shortest distance from the positive ideal solution, but also has the longest distance from the negative ideal solution from a geometric point of view by using Euclidean distance to determine the relative closeness of an alternative to optimal solution.

2.1 Topsis Method Calculation

1. Create a normalized decision matrix

TOPSIS requires a work rating of each alternative Ai on each normalized criterion Cj

$$rj = \frac{xij}{\sqrt{\sum_{i=j}^{m} \text{xij}^2}} \qquad (1)$$

With i =1,2,...,m; and j=1,2,...,n,
Where :
rij = normalized matrix (i)(j)

2. Create a weighted normalized decision matrix

xij = decision matrix (i)(j) The positive ideal solution A+ and negative ideal solution A- can be determined based on the normalized weight rating (yij) as follows:

$$y_{ij} = w_i * r_{ij} \qquad (2)$$

with i =1,2,...,m; and j=1,2,...,n;

where :
yij = weighted normalized matrix (i)(j);

wi = weight vector(i) of the AHP process

yj + = max yij ,

3. Determine the positive ideal solution matrix and the negative ideal solution matrix

$$A+ = (y1+, y1 + \cdots yn +);$$

$$A- = (y1-, y1 - \cdots yn -);$$

With:

$$yi^{+} = \begin{Bmatrix} max_1 y_{ij} \\ min_1 y_{ij} \end{Bmatrix}$$

If j is a profit attribute, if j is a cost attribute

$$yi^{-} = \begin{Bmatrix} max_1 y_{ij} \\ min_1 y_{ij} \end{Bmatrix}$$

If j is a profit attribute, if j is a cost attribute

4. Determine the distance between the value of each alternative with the positive ideal solution matrix and the negative ideal solution matrix

$$Di^{+} = \sqrt{\sum_{i=1}^{n} \left(y_i^{+} - y_{ij}\right)^{2}} \qquad (3)$$

i=1 ,2 ,...,m,

Where :

Di+ = distance between alternative Ai and positive ideal solution,

yi + = positive ideal solution(i),

yij = weighted normalization matrix(i)(j),

$$Di^{-} = \sqrt{\sum_{j=1}^{n} \left(y_{ij} - y_i^{-}\right)^{2}} \qquad (4)$$

i=1 ,2 ,...,m, where:

Di- = distance between alternative Ai and negative ideal solution,

yi- = positive ideal solution(i),

yij = weighted normalization matrix(i)(j),

5. Determine the preference value for each alternative.

$$Vi = \frac{D_i^{-}}{D_i^{-} + D_i^{+}} \qquad (5)$$

Where:

Vi = closeness of each alternative to the ideal solution,

Di+ = distance between alternative Ai and positive ideal solution,

Di- = distance between alternative Ai and negative ideal solution.

larger Vi value indicates that the alternative Ai is preferred.

2.2 System Requirements Analysis

Through the TOPSIS calculation stages contained above, to create a system the elements needed are as follows:

a. Criteria (Cj): criteria are attributes of an object or solution that will be assessed after being clarified according to needs. The object criteria in this case are the criteria regarding the assessment ranking of the selected animal feed products. These criteria will later be assessed as good or not for the feed products that will be used at the Sinar Perkertanian Office. The following are the criteria and weights that will be used which can be seen in Table 1 below:

Table 1. Criteria and Weights

Code	Criterion Name	Attributes	Weight
C1	Protein	Benefits	20%
C2	Fat	Benefits	10%
C3	Fiber	Benefits	10%
C4	Calcium	Benefits	20%
C5	Phosphor	Benefits	10%
C6	Price	Cost	30%

the best animal feed for laying hens, you need to provide an alternative value for each predetermined criterion. From each of these criteria a value will be determined. The following are the criteria used:

Table 2. Criteria Values

Criteria	Preliminary data	Score
Proteins	(Max 40%) > 20%	5
	19 – 20%	4
	18 – 19%	3
	17 – 18%	2
Fat	7%	5
	6%	4
	5%	3
	4%	2
Fiber	8%	5
	7%	4
	6%	3
	5%	2
Calcium	3.8 – 4.0%	5
	3.6 – 3.7%	4
	3.4 – 3.5%	3
	3.0 – 3.3%	2
Phosphor	0.9 – 1.0%	5
	0.7 – 0.8%	4
	0.5 – 0.6%	3
	0.3 – 0.4%	2
Price	375,000 – 400,000	5
	350,000 – 374,000	4
	325,000 – 349,000	3
	300,000 – 324,000	2

The following is a table of alternative suitability for each criterion

Table 3. Sub Criteria

Criteria	Fuzi Number	Weight
Proteins	Very good	5
	Pretty good	4
	Not good	3
	Not good	2
Fat	Very good	5
	Pretty good	4
	Not good	3
	Not good	2
Fiber	Very good	5
	Pretty good	4
	Not good	3
	Not good	2
Calcium	Very good	5
	Pretty good	4
	Not good	3
	Not good	2
Phosphor	Very good	5
	Pretty good	4
	Not good	3
	Not good	2
Price	Very good	5
	Pretty good	4
	Not good	3
	Not good	2

b. Alternative (Ai):

Alternatives in this case are objects or solutions whose value will be calculated by the system. The object referred to in this case is the criteria that will be assessed based on the specified animal feed product, which will be input through the program. The alternatives used can be seen in table 4.

Table 4. Alternative Data

Code	Alternative name
A1	K36
A2	7605
A3	HI-PRO-VITE 124
A4	324 pokhpand
A5	HK335

Table 5. Suitability Rating of Alternatives and Criteria

Alternative name	Criterion Name					
	C1	C2	C3	C4	C5	C6
K36	34% - 36%	5 %	5 %	10% - 12%	1% - 1.5%	400, 000
7605	17% - 19%	7 %	6 %	3.3% - 4.2%	0.6% - 0.9%	327, 000
HI-PRO-VITE 124	30% - 32%	3 %	8 %	10.9 %	1.1%	325, 000
324 pokhpand	17.5% - 18.5%	4.5 %	5 %	3.65 %	0.60 %	370, 000
HK366	35% - 37%	3 %	8 %	10%	1%	340, 000

Table 6. Conversion of Topsis Numbers

Alternative name	Criterion Name					
	C1	C2	C3	C4	C5	C6
A1	5	3	2	5	5	5
A2	3	5	3	5	5	3
A3	5	2	5	5	5	3
A4	3	3	2	4	3	4
A5	5	2	5	5	5	3

3. Results and Discussion

3.1 Calculating the normalized decision matrix

Calculations were carried out to find the decision matrix using formula 1 and the following results were obtained:

Table 7. Normalized Decision Matrix

Alternative name	Criterion Name					
	C1	C2	C3	C4	C5	C6
A1	0.51	0.42	0.24	0.46	0.47	0.60
A2	0.31	0.70	0.36	0.46	0.47	0.36
A3	0.51	0.28	0.61	0.46	0.47	0.36
A4	0.31	0.42	0.24	0.37	0.28	0.48
A5	0.51	0.28	0.61	0.46	0.47	0.36

3.2 Calculates the normalized weight decision matrix

Next, carry out calculations to find the normalized weight decision matrix using formula 2. After carrying out the calculations, the results are obtained:

Table 8. Normalized Weights

Alternative name	Criterion Name					
	C1	C2	C3	C4	C5	C6
A1	2.55	1.26	0.48	2,3	2.35	3
A2	0.93	3.5	1.08	2,3	2.35	1.08
A3	2.55	0.56	3.05	2,3	2.35	1.8
A4	0.93	1.26	0.48	1.48	0.84	1.92
A5	2.55	0.56	3.05	2,3	2.35	1.8

3.3 Determine positive ideal matrix and negative ideal matrix

Table 9. Ideal Solution

$\mathbf{y_i}$	Ideal Solution	Max	Min
y_1	2.55 ; 0.93 ; 2.55 ; 0.93 ; 2.55	2.55	0.93
y_2	1.26 ; 3.5; 0.56 ; 1.26 ; 0.56	3.5	0.56
y_3	0.48 ; 1.08 ; 3.05 ; 0.48 ; 3.05	3.05	0.48
y_4	2.3 ; 2.3 ; 2.3 ; 1.48 ; 2,3	2,3	1.48
y_5	2.35 ; 2.35 ; 2.35 ; 0.84 ; 2.35	2.35	0.84

3.4 Determine the distance between the positive ideal solution and the negative ideal solution

Table 10. Distance to Positive Ideal Solution

$\boldsymbol{Di^+}$	
D_1^+	3,4091
D_2^+	2,5505
D_3^+	2,94
D_4^+	4,1472
D_5^+	2,94

Table 11. Negative Ideal Solution Distance

Di^-	
D_1^-	2,4631
D_2^-	3,4577
D_3^-	3,4902
D_4^-	0,7
D_5^-	3,4902

3.5 Determine the preference value for each alternative

$$Vi = \frac{Di^-}{Di^- + Di^+}$$

$$V_1 = \frac{2,4631}{2,4631 + 3,4091} = \frac{2,4631}{5,8722} = 0,4194$$

$$V_2 = \frac{3,4577}{3,4577 + 2,5505} = \frac{3,4577}{7,2366} = 0,4778$$

$$V_3 = \frac{3,4902}{3,4902 + 2,94} = \frac{3,4902}{6.4302} = 0,5427$$

$$V_4 = \frac{0,7}{0,7 + 4,1472} = \frac{0,7}{4,8472} = 0,1444$$

$$V_5 = \frac{3,4902}{3,4902 + 2,94} = \frac{3,4902}{6,4302} = 0,5427$$

Table 12. Preference Value for Each Alternative

V_i	
v_1	0,4194
v_2	0,4778
v_3	0,5427
v_4	0,1444
v_5	0,5427

Table 13. Calculation Results

No	Code	Name	Mark	Ranking
1	A3	HI-PRO-VITE 124	0,6568	1
2	A5	HK366	0,6531	2
3	A2	7605	0,6480	3
4	A1	K36	0,5502	4
5	A4	324 pokhpand	0,4825	5

From the calculation results above, alternative A3 is HI-PRO-VITE 124 which has the highest value with an alternative value of 0.6568 and has quality criteria for laying chicken animal feed at the Sinar Animal Husbandry office.

4. Conclusion

After conducting research with several stages of a support system using the topsis method with calculations, the results showed that the system can recommend decisions on choosing the best egg laying chicken feed, so that it can help farmers in choosing chicken feed for their farms.

References

[1] Marpaung, N. (2018). Application of the Simple Additive Weighting Method in a Decision Support System to Determine Employee Salary Increases. JURTEKSI (Journal of Information Technology and Systems), 4(2), 171-178. https://doi.org/10.33330/jurteksi.v4i2.58

[2] Niswatin, R.K. (2015). Decision Support System for Forecasting Drinking Water Production Using the Trend Moment Method. Symmetric: Journal of Mechanical Engineering, Electrical and Computer Science, 6(2), 337-344. https://doi.org/10.24176/simet.v6i2.470

[3] Handayani, M., Marpaung, N., & Anggraini, S. (2019, September). Implementation of the Weighted Aggregated Sum Product Assessment (WASPAS) Method in Selecting the Best Employees Based on Decision Support Systems. In Proceedings of the National Information Science Research Seminar (SENARIS) (Vol. 1, pp. 1098-1106). http://dx.doi.org/10.30645/senaris.v1i0.122

[4] Hadinata, N. (2018). Implementation of the Multi Attribute Utility Theory (MAUT) Method in the Decision Support System in Determining Credit Recipients. SISFOKOM Journal, 7(2), 87-92, DOI: https://doi.org/10.32736/sisfokom.v7i2.562

[5] Ramadiani, R., Rahmah, A. (2019). Decision Support System for Selection of Exemplary Health Workers Using the Multi Attribute Utility Theory Method. Scientific Journal of Information Systems Technology, 5(1), 1-12, DOI: https://doi.org/10.26594/register.v5i1.1273

[6] Syafi'ie, M., Tursina, T., & Yulianti, Y. (2019). Decision Support System for Selecting Priority Areas for Handling Stunting in Toddlers Using the TOPSIS Method (Case Study: Pontianak City). JUSTIN (Journal of Information Systems and Technology), 7(1), 33-39. http://dx.doi.org/10.26418/justin.v7i1.27815

[7] Doni, R., Amir, F., & Juliawan, D. (2019, September). Promotion Decision Support System Using the Technique for Order Preference by Similarity to Ideal Solution (TOPSIS) method. In Proceedings of the National Information Science Research Seminar (SENARIS) (Vol. 1, pp. 69-75). http://dx.doi.org/10.30645/senaris.v1i0.9

[8] Lumentut, HB, & Hartati, S. (2015). Decision Support System for choosing freshwater fish cultivation using AF-TOPSIS. IJCCS (Indonesian Journal of Computing and Cybernetics Systems), 9(2), 197-206. https://doi.org/10.22146/ijccs.7548

[9] Hertyana, H. (2019). College Selection Decision Support System Using the Topsis Method. Pilar Nusa Mandiri Journal, 15(1), 97-102.

[10] Yani, Z., Gusmita, DG, & Pohan, N. (2022). The employee recruitment decision support system uses the topsis method. Journal of Science and Social Research, 5(2), 205-210. https://doi.org/10.54314/jssr.v5i2.906

[11] Renaldo, R., Anggraeni, EY, & HC, ER (2019). Topsis Method in the Decision Support System for Determining Scholarship Acceptance at Stmik Pringsewu. EXPERT: Journal of Information Systems and Technology Management, 9(1).

[12] Hidayat, S., & Irviani, R. (2017). Decision Support System for Selection of Ma Al Mubarok Batu Raja Exemplary Teachers Using the Topsis Method. TAM (Technology Acceptance Model) Journal, 6, 1-8. https://doi.org/10.56327/jurnaltam.v6i0.54

[13] Khusna, IM, & Mariana, N. (2021). Decision Support System for Selecting Quality Rice Seeds Using the AHP and Topsis Methods. Sisfokom Journal (Information and Computer Systems), 10(2), 162-169. https://doi.org/10.32736/sisfokom.v10i2.1145

[14] Mallu, S. (2015). The decision support system for determining contract employees to become permanent employees uses the topsis method. Scientific Journal of Applied Information Technology , 1(2). https://doi.org/10.33197/jitter.vol1.iss2.2015.53