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Decision Support System Best Cage Selection for Chicken Raising

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Abstract

Chicken farming is considered not to require the application of an information system, however, the application of a decision-making system can increase the chances of getting bigger profits. In one time raising chickens requires large capital and the right time when planning sales. Therefore, the selection of decisions is an important factor in an ongoing business. Companies often experience losses which, although not too large, but also occur sustainably will affect the company's finances. It is hoped that the chicken rearing decision support system can also assist in managing the data that comes into the company. Decision support systems will be used in business to help meet company targets and reduce risk. Electre stands for Elimination and Choice Translating Reality which is a method of determining the ranking order through pairwise comparisons between alternatives and the appropriate criteria. Standardization and the use of complete data in decision making can increase the percentage of profit and satisfaction which increases partner integrity

I. INTRODUCTION

Information systems today are very important because almost every part of the organization requires the right information and a good system to control it. An information system is a combination of software, hardware and telecommunications created by humans to make collecting and transmitting data useful, especially for companies[1].

The rapid development of information will help humans continue to compete to create systems that can simplify and help human work. A good information system will make human work more effective and efficient in all respects, one of which is in chicken farming. Information systems can be applied in the company's data processing system as well as in data analysis to make decisions that will help planning and accuracy of harvest estimates.

H.Heru's chicken farm is located in the middle of a densely populated neighborhood. The chickens that are kept are broilers, with a harvest age of about 30-40 days. H.heru's poultry house is located at Curug Sarengseng Village, Rt 001 Rw 05, Kelapa Dua sub-district, Tangerang Regency. This slaughterhouse serves a minimum slaughter of 12000 heads per day. H.heru slaughter has 14 cages for maintenance scattered around Tangerang. In one 30-day maintenance period, H.heru farm can raise as many as 200,000 chickens.

Keeping chickens requires a good and clean place, therefore the selection of a cage that has cleanliness and good cage conditions is very important. The method used to solve this problem must have the ability to provide accurate assessments and ratings so that if the main cage is not ready there will be a ready cage.

Based on previous journals in selecting the right home industry small business for students [2], The electre method was chosen because this problem is in accordance with the concept of outranking in electre, Electre is superior to other methods because it can be better used when there are many alternatives in the election. H.heru slaughter will continue to grow and involve many partner breeders. Easy addition and subtraction of alternatives without changing the results can be a strong reason for choosing this method.

The capital for raising chickens is very large, therefore the decision support system that is being made will help the core company to be able to choose the best coop partner for chicken rearing.

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II. Related Works & Literature Review

Chicken Farming and Technology

Technology and information systems are very commonly used in life to support human activities and efforts. Information systems now have many forms because there are also many changes that are needed over time or often referred to as a means to improve human capabilities and an instrument of change. The human ability to be creative, modify with various techniques to use it optimally in the environment can be referred to as a form of support for existing information systems.

The information system that will be focused on in this discussion is the decision support system. According to Saragih in the book Decision Support Systems: Methods & Implementation of decision support systems is not to automate decision making but to provide interactive tools that help to perform various analyzes using available models.[3].

A decision support system will help analyze with the help of information technology to filter data using criteria and attributes that match the wishes of the decision maker. The decision-making system itself in chicken farming is used as an aid to analyze cages that have great potential to produce better production than others.

Chicken is the cheapest form of protein and is very much in demand. According to the Indonesian Central Statistics Agency, in the last 10 years there has been a significant increase, in just 5 years there was an increase from 73,488.06 tons in 2015 to 223,250.35 in 2019. The type of chicken that is kept is Broiler, Broiler chicken has good endurance and growth. A healthy chicken can measure 1.2 – 1.5 kilograms in 35 days[4].

The capital required in raising chickens is quite large. According to Ferry Tamaludin's book, one-time chicken rearing with a range of 1000 birds requires a capital of 26 million only for seeds and maintenance, so it does not include cages and maintenance staff costs. With a large capital, the right data and analysis are needed to make a decision on the place to be used as chicken maintenance [5]

Electre

Electre stands for Elimination and Choice Translating Reality which is a method of determining the ranking order through pairwise comparisons between alternatives and the appropriate criteria.[3]. The Electre method is rarely known, but its use in MADM is widely applied. The ELECTRE method was introduced by Bernard Roy in 1965. Electre was originally used in selecting the best action in a given sample, but Electre continues to be developed in terms of 3 main problems: Selection, ranking and sorting ELECTRE is one effective method for MADM (Multiple Attribute Decision Making) with qualitative and quantitative features, so as to improve the ability to make decisions.

III. Methods

The research framework is made to make it easier to get information in a concise and concise manner so that you can find out the outline of the system to be made. The research framework was created to help researchers not get out of focus on the main problem. The approach used to obtain the right data using quantitative methods. According to Djaali [6] in his book explains that the quantitative approach method is an approach that seeks to draw conclusions based on statistics or exact numbers, definite measurements of an object or situation.

Electre

Electre has 9 main steps to get the following ranking steps and examples of calculations in the application in H.heru poultry shop:

a. Stage 1: Determining the Decision Matrix

In the available column, a decision matrix is made containing the decision criteria (n) and rows on the alternative form (m) so that the data can be processed further.

$$Xij = \begin{Bmatrix} x11 & x12 & \dots & x1n \\ x21 & x22 & \dots & x2n \\ \dots & \dots & \dots & \dots \\ xm1 & xm2 & \dots & xmn \end{Bmatrix}$$

Example of input data from H.Heru poultry shop :

Table 1 Initial data

Alternative	Ip	chicks	State of last Chicken	Chicken coop	Farmer rating
Cage 1	3	5	4	4	5
Cage 2	4	4	3	3	4
Cage 3	4	2	4	5	4
Cage 4	3	4	3	3	3
Cage 5	3	3	4	4	4

change the matrix form as the following :

Table 2 Initial matrix

3	5	4	4	5
4	4	3	3	4
4	2	4	5	4
3	4	3	3	3
3	3	4	4	4

b. Stage 2: Normalization of Decision Matrix

The decision matrix will be normalized using the formula and produce a normalized model.

$$Rij = \frac{xij}{\sqrt{\Sigma_{i=1}^{m} xij2}} \qquad i=1,2,.....,m \quad J=1,2,.....,m$$

And produce the following matrix :

Table 3 Normalization Matrix

0,3906	0,4619	0,5976	0,4924	0,5522
0,5208	0,3464	0,4781	0,3693	0,4417
0,5208	0,5774	0,2390	0,4924	0,4417
0,3906	0,3464	0,4781	0,3693	0,3313
0,3906	0,4619	0,3586	0,4924	0,4417

c. Stage 3: Giving Weigh

The next stage is giving the desired weight or interest from the existing criteria, the interest factor (weight) shows the value of interest (w) this is determined by the decision owner which in this case is the core company.

$$W_n = (W1,W2,W3,...,Wn); \text{ and } \Sigma_{j=1}^{N} Wj = 1$$

The weights used are based on the company's provisions as follows:

Table 4 Weight

Alternative	Ip	chicks	State of last Chicken	Chicken coop	Farmer rating
w (Weight Preference)	5	2	4	4	2

d. Stage 4 : Calculating a weighted Normalized matrix

Each column in the R matrix is multiplied by the weight (W) that has been made by the decision maker using the following equation:

$$V_{ij} = W_i R_{ij}$$

Where V is :

$$V_{ij} = \begin{bmatrix} V11 & V12 & ... & V1n \\ V21 & V22 & ... & V2n \\ ... & ... & ... & ... \\ Vmn & Vm2 & ... & Vmn \end{bmatrix}$$

And the result is the matrix in table 5 which is the multiplication of table 3 and table 4 as the following :

Table 5 Normalized Table

1,9528	1,3856	2,3905	1,4771	1,1043
2,6038	1,0392	1,9124	1,1078	0,8835
2,6038	1,7321	0,9562	1,4771	0,8835
1,9528	1,0392	1,9124	1,1078	0,6626
1,9528	1,3856	1,4343	1,4771	0,8835

e. Stage 5 : Determining Corcondance and Discordance Sets

Corcondance set $\{Ckl\}$ is a set that is used to express the calculation of the weight criteria A can and is better than other possibilities

$$C_{kl} = \{ j / V_{kl} \geq V_{lj} , \; j = 1,2, \ldots n$$

The Discordance set $\{Dkl\}$ is written is as the following :

$$D_{kl} = \{ j / V_{kl} < V_{lj} , \; j = 1,2, \ldots n$$

Table 6 Set of Concordance and Discordance

No.	Alternative 1	Alternative 2	Index Concordance	Index Discordance
1	K001-Cage 1	K002-Cage 2	2, 3, 4, 5	1
2	K001-Cage 1	K003-Cage 3	3, 4, 5	1, 2
3	K001-Cage 1	K004-Cage 4	1, 2, 3, 4, 5	
4	K001-Cage 1	k005-Cage 5	1, 2, 3, 4, 5	
5	K002-Cage 2	K001-Cage 1	1	2, 3, 4, 5
6	K002-Cage 2	K003-Cage 3	1, 3, 5	2, 4
7	K002-Cage 2	K004-Cage 4	1, 2, 3, 4, 5	
8	K002-Cage 2	k005-Cage 5	1, 3, 5	2, 4
9	K003-Cage 3	K001-Cage 1	1, 2, 4	3, 5
10	K003-Cage 3	K002-Cage 2	1, 2, 4, 5	3
11	K003-Cage 3	K004-Cage 4	1, 2, 4, 5	3
12	K003-Cage 3	k005-Cage 5	1, 2, 4, 5	3
13	K004-Cage 4	K001-Cage 1	1	2, 3, 4, 5
14	K004-Cage 4	K002-Cage 2	2, 3, 4	1, 5
15	K004-Cage 4	K003-Cage 3	3	1, 2, 4, 5
16	K004-Cage 4	k005-Cage 5	1, 3	2, 4, 5
17	k005-Cage 5	K001-Cage 1	1, 2, 4	3, 5
18	k005-Cage 5	K002-Cage 2	2, 4, 5	1, 3
19	k005-Cage 5	K003-Cage 3	3, 4, 5	1, 2
20	k005-Cage 5	K004-Cage 4	1, 2, 4, 5	3

f. Stage 6 : Calculating Concordance and Discordance Matrix

To calculate and determine the corcondance matrix is to add weights in the corcondance matrix.

$$C_{kl} = \sum_{j \in Ckl} Wj$$

To determine the discordance matrix is to divide the maximum difference in the criteria in the concordance with the highest difference between the values in the criteria.

$$D_{kl} = \frac{\text{Max} \{|V_{kj} - V_{lj}|\}}{\text{Max} \{|V_{kj} - V_{lj}|\}} \quad \begin{matrix} J \in D_{kl} \\ V_j \end{matrix}$$

g. Stage 7 : Determine the dominant Concordance matrix and the dominant Discordance matrix

The array obtained can form the upper value (threshold) of C. The formula that can produce the value of C is as the following :

$$\underline{C} = \frac{\sum_{k=1}^{m}\sum_{l=1}^{m} C_{kl}}{m(m-1)}$$

The alternative A_k can have a dominant chance if the concordance index C_{kl} exceeds the threshold value $\underline{C}$ with $C_{kl} \geq \underline{C}$ and the dominant concordance matrix element f is defined as:

$$F_{kl} = \begin{Bmatrix} 1, & \text{if } C_{kl \geq c} \\ 0, & \text{if } C_{kl \geq c} \end{Bmatrix}$$

The same thing is also done in the discordance matrix using the following formula:

$$\underline{d} = \frac{\sum_{k=1}^{m}\sum_{l=1}^{m} D_{kl}}{m(m-1)}$$

The discordance matrix elements G are defined as:

$$G_{kl} = \begin{Bmatrix} 1, & \text{if } d_{kl \geq c} \\ 0, & \text{if } d_{kl \geq c} \end{Bmatrix}$$

Examples of implementation in the initial data are as the following :

Table 7 Concordance Matrix

C	K001	K002	K003	K004	k005
K001	-	12,00	9,00	17,00	17,00
K002	5,00	-	11,00	17,00	11,00
K003	11,00	13,00	-	13,00	13,00
K004	5,00	10,00	4,00	-	9,00
k005	11,00	8,00	9,00	13,00	-

The threshold value of the concordance matrix is 10.9000, then values greater than the threshold value will be calculated as 0 and 1 for numbers greater than the threshold.

Table 8 Concordance Dominant Matrix

F	K001	K002	K003	K004	k005
K001	-	1	0	1	1
K002	0	-	1	1	1
K003	1	1	-	1	1
K004	0	0	0	-	0
k005	1	0	0	1	-

Table 9 Discordance Matrix Table

D	K001	K002	K003	K004	k005
K001	-	1,0000	0,4538	0,0000	0,0000
K002	0,7345	-	0,7246	0,0000	0,5673
K003	1,0000	1,0000	-	1,0000	0,7345
K004	1,0000	1,0000	0,7246	-	0,7724
k005	1,0000	1,0000	1,0000	1,0000	-

The discordance matrix threshold value is 0.7356, then values greater than the threshold value will be calculated as 0 and 1 for numbers greater than the threshold.

Table 10 Discordance Dominant Matrix

G	K001	K002	K003	K004	k005
K001	-	1	0	0	0
K002	0	-	0	0	0
K003	1	1	-	1	0
K004	1	1	0	-	1
k005	1	1	1	1	-

h. Stage 8 : Determine the overall dominant matrix

To get the dominant matrix, the following formula is used:

$$E_{kl} = F_{kl} * G_{kl}$$

Table 11 Table of Dominant Matrix

E	K001	K002	K003	K004	k005
K001	-	1	0	0	0
K002	0	-	0	0	0
K003	1	1	-	1	0
K004	0	0	0	-	0
K005	1	0	0	1	-

i. Stage 9 : Alternative Elimination

The last stage is to compare the eliminations that get better points with those who don't get points.

Table 12 Table Point

E	K001	K002	K003	K004	k005	Total Point
K001	-	1	0	0	0	1
K002	0	-	0	0	0	0
K003	1	1	-	1	0	3
K004	0	0	0	-	0	0
k005	1	0	0	1	-	2

Based on the table 12, the highest rank was achieved by Cage 3 with 3 points

Table 13 Ranking Table

Cage	Rank
Cage 3	1
Cage 5	2
Cage 1	3
Cage 2	4
Cage 4	5

IV. RESULTS

From the design of the application display, an application that has the function and appearance resembles the design that has been made by adding the colors and images needed to support the maximum use of the application. The minor difference from the design to the final look is a direct adjustment as it feels it will work better and is easier to use. Here's what the application looks like:

Login, displays a login display that separates user levels based on ownership of the login identity that will be carried out

The admin homepage, displays the menu in the sidebar and also the company profile.Data kriteria, menampilkan data bobot dan apakah data akan ditampilkan di level user tertentu.

Value data, showing a list of assessments and results of the last period of maintenance. And used as a parameter to make a decision

The calculation of the electre method is made complete by entering 9 stages of calculation so that the difference in comparison can be seen. The initial view of the electre method is to enter all the comparison values into the matrix, then normalize the weights and also calculate the discordance and discordance subsets. Enter the concordance and discordance matrices. The Electre process has reached its end by determining the dominant matrix, where the value that dominates the other values will be the main choice.

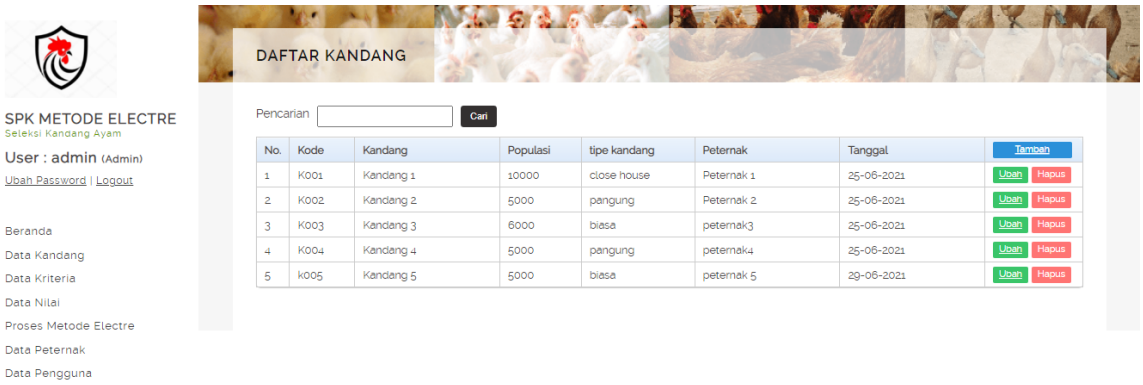

Figure 1 Cage Data Display

The data display of the cage that has been successfully created is shown in the image above, the cage and the breeder who maintains it are shown in this table along with the menu for changes

V. CONCLUSIONS

After doing research and discussion about the decision support system in the selection of cages that will be used as maintenance locations. So it can be concluded that the system has been completed and is ready to be tested at the research site.

The use of the system will reduce the time needed to search for data from maintenance results in the old way. Selection of good and accurate decisions in accordance with the wishes of the company based on Requirement Elicitation also results in appropriate calculations so that maintenance can be carried out in the best cages. The workflow has also become more regular with transparent data between farmers and keepers so that there are no misunderstandings.

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