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Analysis of Decision Support Systems on Recommended Sales of the Best Ornamental Plants by Type

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Abstract. The research objective is to recommend the sale of the best ornamental plant species to lovers of ornamental plants by using decision support system techniques. Ornamental plants are a type of ornamental plants that can survive in various conditions. In this case ornamental plants are also very vulnerable to disease such as root rot, shoot rot and others. Many types of ornamental plant sellers do not know how to handle ornamental plants that have diseases or symptoms when they occur. The study was conducted in Simalungun District with a sample of thirteen traders selling ornamental plants using observation and questionnaire distribution techniques. Selection of ornamental plants based on the types in this study include: Orchid Plants (A1), Tulips (A2), Bougenvil (A3) and Jasmine (A4). The assessment criteria used include: Plant height (C1), Plant quality (C2), Plant type (C3) and Plant age (C4). The method used in this research is Simple Additive Weighting. The results showed that Orchid Plant (A1) was the best alternative for selling ornamental plant species (V1: 0.91) and Jasmine (A4) as a second alternative (V2: 0.8).

1. Introduction

Ornamental plants are one of the horticultural products that are currently starting to be in great demand by the public. This can be seen from the function of ornamental plants which are now not only used as home decoration but have developed as an export crop. Ornamental plants that are widely exported are flower ornamental plants. The exported ornamental plants are in the form of cut flowers and potted ornamental plants, depending on consumer demand. The study was conducted in Simalungun District using observations to farmers and ornamental plant traders in Simalungun District. Types of ornamental plants used as research objects include: Orchid, Jasmine, Tulip, and Bougainvillea. Ornamental plants have high economic value, but not many local governments have looked at as a potential to improve the people's economy. Besides the lack of knowledge of farmers about the types of ornamental plants make farmers and ornamental plant traders lose money because it is too late to handle the problems of these ornamental plant types. For traders of ornamental plants, this gives a loss. Because of this ornamental plant traders need knowledge of ornamental plant types that can provide maximum benefits that can be seen from the physical characteristics of ornamental plants, including: Plant height, Plant quality, Plant type and Plant age.



In computer science there are many settlement techniques that can be done to solve complex problems. Among artificial intelligence. Artificial intelligence has many branches of science including: Decision support systems [1]–[8], Datamining [9]–[14], Expert Systems [15], [16], Artificial Neural Networks [17]–[31] and others [32], [33]. Each method has a different solution according to the example case. In this case, researchers used a decision support system technique in solving the problem of selling the best ornamental plants based on the type seen from several assessment criteria such as: plant height, plant quality, plant type and plant age. So that the final result of the study is ranking the best ornamental plant recommendations. There are several previous studies conducted by researchers using decision support systems in solving problems. One of them is done by [34]. with the research title "Comparative Analysis of Simple Additive Weighting Method and Weighted Product Method to New Employee Recruitment Decision Support System (DSS) at PT. Warta Media Nusantara ". In the study explained that the Simple Additive Weighting method can be applied to the recruitment of new employees at PT. Warta Media Nusantara. It is expected that the results of the Simple Additive Weighting (SAW) Method can help in making decisions for the sale of ornamental plants. Therefore this application is expected to be an evaluation material.

2. Methodology

Research on the recommendation of the best ornamental plant sales by type using the SAW method was conducted at the Simalungun district location. The study was conducted by collecting data through observation and interviews with farmers and ornamental plant traders. Research is also carried out by the study of literature by searching and studying books from reliable references (scientific articles). This research was conducted according to the stages of SPK development with 4 phases in making decisions including: intelligence, design, choice, and implementation.

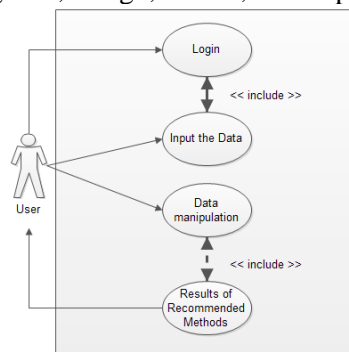


Figure 1. Use case diagram

Based on Figure 1, it can be explained that the process of inputting data on the sale of ornamental plants using the SAW method is done using 4 assessment criteria, including: plant height (C1), plant quality (C2), type of plant (C3) and plant age (C4) and 4 alternatives used as ornamental plants by type include: Orchid Plants (A1), Tulips (A2), Bougenvil (A3) and Jasmine (A4). The data manipulation process is done using the SAW method. The results of the method analysis will produce the best alternative from some existing ornamental plant recommendations.

3. Results and Discussion

The weights used for the evaluation criteria on the sale of ornamental plants are linkers and integers. The weights of the assessment criteria include: very good (5), good (4), good enough (3), not good (2) and very bad (1). Furthermore, the elaboration of each criterion that has been converted by linkert and integers can be seen in the following table:

Table 1. Plant Height Criteria

Plant height	Fuzzy Numbers	Score
1 – 3	Very Bad	1

4 – 6	Good Enough	3
7 – 9	Good	4
10 – 12	Very Good	5

Table 2. Crop Quality Criteria

Crop Quality	Fuzzy Numbers	Score
Not fresh	Really not good	1
Fresh	Quite good	3
Fresh & Short	Nice	4
Fresh & tall	Very good	5

Table 3. Crop Type Criteria

Crop Type	Fuzzy Numbers	Score
Not Imported	Not Good	1

Imported	Good Enough	3
Export & Not Import	Nice	4
Export & Import	Very Good	5

Table 4. Crop Age Criteria

Crop Age	Fuzzy Numbers	Score
0 – 7	Not good	2
8 – 30	Good Enough	3
31 – 45	Nice	4
46 – 60	Very good	5

The following is the calculation data used for 4 ornamental plant samples by type as shown in the table:

Table 5. Ornamental Plant Research Data

Types of Ornamental Plants	A1	A2	A3	A4
Orchid Plants (A1)	30	8	In Export & Import	7
Tulips (A2),	30	4	Imported	5
Bougenvil (A3)	30	7	Export & Not Import	10
Jasmine (A4).	30	10	Not Imported	8

Based on table 5, the data are converted based on the assessment criteria for each criterion shown in table 1 - table 4. The results of the table conversion can be seen as follows:

Table 6. Alternative Match Ratings

Types of Ornamental Plants	A1	A2	A3	A4
Orchid Plants (A1)	4	5	4	4
Tulips (A2),	4	2	5	3
Bougenvil (A3)	4	5	2	5
Jasmine (A4).	4	4	5	2

After the alternative match rating data (the result of data conversion) is formed, the settlement by the SAW method can be done by giving weight (W) to each of the evaluation criteria for the sale of ornamental plants by type. For weights (W) each criterion includes: W = [0.30 (C1); 0.25 (C2); 0.20 (C3); 0.25 (C4)]. After weights (W) are determined, then make the matrix X from the alternative match rating table as follows:

$$X = \begin{pmatrix} 4 & 5 & 4 & 4 \\ 4 & 2 & 5 & 3 \\ 4 & 2 & 2 & 5 \\ 4 & 4 & 5 & 2 \end{pmatrix}$$

The weighting matrix calculation results obtained normalization matrix X results. Normalized matrix R results are as follows:

$$R = \begin{pmatrix} 1 & 1 & 0,8 & 0,8 \\ 1 & 0,4 & 1 & 0,6 \\ 1 & 0,4 & 0,4 & 1 \\ 1 & 0,8 & 1 & 0,4 \end{pmatrix}$$

The results of the R matrix calculation, will be continued on the multiplication matrix $W * R$ to obtain the best alternative by looking at the largest value. Here are the results of the calculation of the preference value for each alternative (V) of each alternative:

$$V1 = (0,30)(1)+(0,25)(1)+(0,20)(0,8)+(0,25)(0,8) \\ = 0,3+0,25+0,16+0,2= 0,91$$

$$V2 = (0,30)(1)+(0,25)(0,4)+(0,20)(1)+(0,25)(0,6) \\ = 0,3+0,1+0,2+0,15= 0,75$$

$$V3 = (0,30)(1)+(0,25)(0,4)+(0,20)(0,4)+(0,25)(1) \\ = 0,3+0,1+0,08+0,25= 0,73$$

$$V4 = (0,30)(1)+(0,25)(0,8)+(0,20)(1)+(0,25)(0,4) \\ = 0,3+0,2+0,2+0,1= 0,8$$

Table 7. the calculation of the preference value

No	Types of Ornamental Plants	Vi
1	Orchid Plants (A1)	0,91
2	Tulips (A2),	0,75
3	Bougenvil (A3)	0,73
4	Jasmine (A4).	0,8

Based on Table 7, it can be seen that the ranking results from 4 alternatives show the type of plant with the highest V value is Orchid Plant (A1) with a value of 0.91. This ornamental plant is recommended as an ornamental plant based on the type that can maximize sales.

4. Conclusion

Based on the results of the study it can be concluded that the application of a decision support system with the SAW method can be applied to the sale of the best ornamental plants based on the type. The process produced by the SAW method is the highest result in the ranking of 4 alternatives (Orchid Plants (A1), Tulips (A2), Bougenvil (A3) and Jasmine (A4)) and 4 criteria (Plant height (C1), Plant quality (C2), Plant type (C3) and Plant age (C4)) used in the assessment process.

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