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Decision Support System For Selection Of The Best Corn Seeds Using The Simple Additive Weigthing Method

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Abstract— Corn is a type of plant that has many benefits, corn plants can be found in various parts of the world, including Indonesia. This plant also spreads throughout Indonesia and in several areas becomes a staple. The Keerom district area of Papua province is very easy to find corn plants. With the high demand for corn, many farmers plant corn. However, it is not uncommon for farmers to experience crop failure because they are influenced by many factors, such as the type of seeds planted that are not good seeds. This study aims to design a decision support system using the SAW method. This research resulted in an application that is able to provide recommendations for types of seeds to farmers in rankings. The SAW method was chosen because it has characteristics that are in line with the recommendation technique which makes it easier for farmers to determine the choice of seeds. The test results using the blackbox method obtained a suitability value of 100% of all forms tested.

Keywords *: Corn, SAW, DSS*

I. INTRODUCTION

The government has a goal of improving the welfare of society and this is a recommendation from the 1945 Constitution. To achieve this goal, the government has issued various programs and strategies to increase agricultural production. One of the most successful programs is the Farming Partnership Program (PKUT). This program aims to increase agricultural production by increasing access and purchasing power of farmers to the latest agricultural technologies, one of which is increasing corn production [1], [2]. Corn is a type of plant that is continuously the mainstay of the government to achieve self-sufficiency in food, this can be seen from the demand for corn from year to year which continues to increase, exceeding 14.37 million tons in one year. With this high demand, the supply of produce from farmers must also always be high, but it is hampered by frequent crop failures. The cause of crop failure is because the corn seeds chosen for planting are not resistant to pests and diseases, bad weather, and the corn seeds planted by farmers are not the best type.

Given these problems, it is necessary to select the types of seeds that are suitable for planting under certain conditions, especially because each region in Indonesia has unique characteristics. This research aims to assist farmers in selecting the types of seeds to be planted, with computerized assistance through applications decision support system. In designing support systems, various methods can be used, such as AHP, TOPSIS, and WP. In this study using the Simple Additive Weighting (SAW) method, this method was chosen because the characteristics of SAW are very suitable in the case of selecting seeds by providing recommendations based on sequence or ranking[3], [4].

Several studies on the simple additive weighting method have been carried out, but in different cases and objects, including research entitled Analysis of the Application of the Simple Additive Weighting (SAW) Method for Selecting Ornamental Plants, this study concludes that in providing convenience for customers to buy and place orders ornamental plants do not require a long time. Besides that, it can make it easier for the customer to choose which types of ornamental plants match the criteria or wishes. The decision support system in selecting ornamental plants has been successfully implemented so that ranking results are obtained to obtain store recommendations from alternative ornamental plants that are sought according to the wishes of the customer [5]. The difference in this study is that the object under study is corn.

Furthermore, research on the Decision Support System for Determining Quality Chili Plants Using the Simple Additive Weighting (SAW)

Method, this study concludes that the System can provide alternative decisions by using the Simple Additive Weighting (SAW) method so that it can help farmers produce quality chili plants 2. System able to provide information about superior chili plants. 3. The results of the decision support system for determining quality chili plants, the largest value in ranking is the third alternative (A1), namely large chili plants with the final value[6]. The difference in this study is that this study uses 5 criteria and consists of benefit criteria and cost criteria.

Another study, namely the application of a decision support system in the selection of longan plant species that applied the SAW method in this study concluded that making the application as a tool in selecting the best longan plant seeds based on several selected criteria. Perform alternative rankings from the results of weight calculations using the SAW (Simple Additive Weighting) method and made with PHP and MySQL programming. The calculation results obtained the best alternative, namely longan seeds of the New Crystal type with a value of 82.5 [4]. The difference in this study is that the object of this study is corn plants. Using DFD while in previous studies using use cases. The weighting criteria use the range 1 to 4, while in this study the range 1-5 is used. (1= very bad- 5= very good).

Research that discusses the selection of corn has also been carried out but uses different analytical methods such as the Decision Support System for Choosing the Right Agricultural Land for Corn Plants Using the Waspas Method. first, the appropriate or related weighted average success criterion of the WSM method. Using the Weight Aggregated Sum Product Assessment method can simplify and shorten the time in providing fast and accurate information. The study stated that A5, with the highest Qi value of 0.978, has the highest priority to be used or used as agricultural land for maize [7] . The difference in this study is that in this study the SAW method is used, and the results of manual calculations will be implemented in the SPK application, so that it is possible to calculate the accuracy of applying the method.

Another study, namely the Decision Making System for Selection of Corn Seeds Using the Analytical Hierarchy Process (AHP) Method at the Abadi Jaya Store, East Lampung, this study concluded that by using the SPK for Selection of Corn Seeds, it is hoped that it can assist in processing data effectively and efficiently [8], The difference in this study is that the researchers used the SAW method and the system was built based on a website.

II. RESEARCH METHODS

2.1 Research Flow

The steps in this study generally consist of seven stages, as shown in Figure 1.

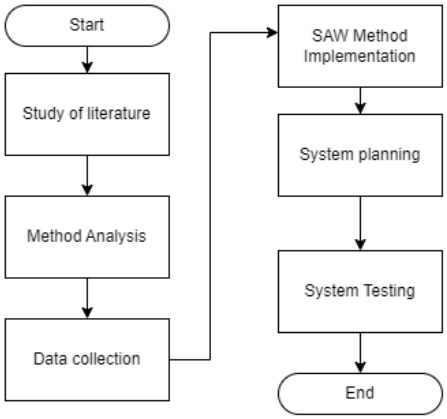

Figure 1. Research Flow

Based on Figure 1, the research steps start from problem determination starting from literature study, method analysis, data collection, SAW method implementation, system design, system testing.

2.2 Data Source

The research data used is categorized into two parts, namely the first is primary data that flows from direct observations in the field and the second is secondary data, namely data sourced from books and previous research journals..

2.3 Data Collection Techniques

In this study, there were three types of data collection, namely observation, interviews and literature studies. The observations were made in arso ten farmer groups in Keerom district.

III. RESULT AND ANALYSIS

3.1 Application of the Simple Additive Weighting (SAW) Method

Data analysis in the Decision Support System Application uses the SAW method, decision making in this method is based on several criteria that are adapted to conditions in the Arso Ten area of Keerom Regency, besides that in this application it consists of several types of corn seeds which are interpreted as alternatives.

3.1 Criteria

There are several criteria used, as shown in table 1.

Table 1. List of Criteria

No	Criteria	Type Criteria	Code Criteria
1	Seed Prices	Cost	C5
2	Harvest time	Cost	C2
3	Yield Potential/Ha	Benefit	C1
4	Resistant to disease at least 3	Benefit	C3
5	Number of humps	Benefit	C4

Table 1 shows a list of criteria used, namely (1) Seed Prices (2) Harvest time, (3) Yield Potential/Ha (4) Resistant to disease at least 3, (4) Number of humps.

3.2 Alternative

In this study, several alternative types of corn seeds were used which were most often planted in the Keerom district. The alternative values can be seen in table 2.

Table 2. Alternative Data

No	Alternative	Code Alternative
1	Talango type seeds	A1
2	Bima Type 7 Seeds	A2
3	Bima Type Seeds 18	A3
4	BMI Type Seeds	A4
5	Seed Type JH36	A5
6	Seeds Type Provit A1	A6

3.3 Decision Matrix

The purpose of making a decision matrix in the Simple Additive Weighting method is to determine the preference value of each alternative based on predetermined criteria. This decision matrix will assist in determining the alternative that best suits your needs. The value of the decision matrix can be seen in table 3.

Table 3. Decision Matrix

Alternative	C1	C2	C3	C4	C5
A1	13000	3	5	1	2
A2	14000	3	4	2	3
A3	12000	2	5	1	3
A4	13500	4	5	1	3
A5	14000	3	7	2	3
A6	13500	3	6	3	2

3.4 Normalization

This normalization aims to overcome the problem of bias and variance in evaluating alternatives. Normalization is used to ensure that all criteria have the same scale and have the same role in determining the final result.

Criterion 1 is a cost criterion, so you need to find the smallest value for each alternative and get a value of 12,000 for each criterion:

$$A1=\frac{\min\,[13000,14000,12000,13500,14000,13500]}{13000}=\frac{12000}{13000}=0.92307$$
$$A2=\frac{\min[13000,14000,12000,13500,14000,13500]}{14000}=\frac{12000}{14000}=0.85714$$
$$A3=\frac{\min[13000,14000,12000,13500,14000,13500]}{12000}=\frac{12000}{12000}=1$$
$$A4=\frac{\min[13000,14000,12000,13500,14000,13500]}{13500}=\frac{12000}{13500}=0.88888$$
$$A5=\frac{\min[13000,14000,12000,13500,14000,13500]}{14000}=\frac{12000}{14000}=0.85714$$
$$A6=\frac{\min[13000,14000,12000,13500,14000,13500]}{13500}=\frac{12000}{13500}=0.88888$$

Likewise, the second criterion is cost in nature, so you need to find the smallest value for each alternative and get a value of 2 for each criterion:

$$A1=\frac{\min\,[3,3,2,4,3,3]}{3}=\frac{2}{3}=0.66666 \qquad A4=\frac{\min\,[3,3,2,4,3,3]}{3}=\frac{2}{4}=0.5$$
$$A2=\frac{\min\,[3,3,2,4,3,3]}{3}=\frac{2}{3}=0.66666 \qquad A5=\frac{\min\,[3,3,2,4,3,3]}{3}=\frac{2}{3}=0.66666$$
$$A3=\frac{\min\,[3,3,2,4,3,3]}{3}=\frac{2}{2}=1 \qquad A6=\frac{\min\,[3,3,2,4,3,3]}{3}=\frac{2}{3}=0.66666$$

The third criterion is a criterion that is of a benefit so it is necessary to find the maximum value and obtain a value of 7.

$$A1=\frac{5}{\max[5,4,5,5,7,6]}=\frac{5}{7}=0.71428 \qquad A4=\frac{5}{\max[5,4,5,5,7,6]}=\frac{5}{7}=0.71428$$
$$A2=\frac{5}{\max[5,4,5,5,7,6]}=\frac{4}{7}=0.57142 \qquad A5=\frac{5}{\max[5,4,5,5,7,6]}=\frac{7}{7}=1$$
$$A3=\frac{5}{\max[5,4,5,5,7,6]}=\frac{5}{7}=0.71428 \qquad A6=\frac{5}{\max[5,4,5,5,7,6]}=\frac{6}{7}=0.85714$$

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The fourth criterion is a criterion that is of a benefit so it is necessary to find the maximum value and obtain a value of 5.

$$A1=\frac{1}{max[1,2,1,5,2,3]}=\frac{1}{5}=0.2 \qquad A4=\frac{5}{max[1,2,1,5,2,3]}=\frac{5}{5}=1$$
$$A2=\frac{2}{max[1,2,1,5,2,3]}=\frac{2}{5}=0.4 \qquad A5=\frac{3}{max[1,2,1,5,2,3]}=\frac{2}{5}=0.4$$
$$A3=\frac{1}{max[1,2,1,5,2,3]}=\frac{1}{5}=0.2 \qquad A6=\frac{3}{max[1,2,1,5,2,3]}=\frac{3}{5}=0.6$$

The fifth criterion is a criterion that is of a benefit so it is necessary to find the maximum value and obtain a value of 3.

$$A1=\frac{2}{max[2,3,3,2,3,2]}=\frac{2}{3}=0.66666 \qquad A1=\frac{2}{max[2,3,3,2,3,2]}=\frac{2}{3}=0.66666$$
$$A1=\frac{3}{max[2,3,3,2,3,2]}=\frac{3}{3}=1 \qquad A1=\frac{3}{max[2,3,3,2,3,2]}=\frac{3}{3}=1$$
$$A1=\frac{2}{max[2,3,3,2,3,2]}=\frac{3}{3}=1 \qquad A1=\frac{2}{max[2,3,3,2,3,2]}=\frac{2}{3}=0.66666$$

3.5 Normalization Matrix

The normalization matrix helps in objectively determining the weight of the criteria and avoids the situation where one criterion has more influence simply because it has a larger scale. Creating a normalization matrix ensures that all criteria are on the same scale and makes determining the final result more fair and objective.

$$R=\begin{bmatrix}0.92 & 0.66 & 0.71 & 0.2 & 0.66\\ 0.85 & 0.66 & 0.57 & 0.4 & 1\\ 1 & 1 & 0.71 & 0.2 & 1\\ 0.8 & 0.5 & 0.71 & 1 & 0.66\\ 0.85 & 0.66 & 1 & 0.4 & 1\\ 0.88 & 0.66 & 0.85 & 0.6 & 0.66\end{bmatrix}$$

Weight value W = criterion 1 = 10, criterion 2 = 10, criterion 3 = 30, criterion 4 = 30 and criterion 5 = 20.

A1 = (0.92*10)+(0.66* 10)+(0.71*30)+(0.2*30)+(0.66*20) = 56.65
A2= (0.85*10)+(0.66* 10)+(0.57*30)+(0.4*30)+(1*20) = 64.38
A3= (1*10)+(1* 10)+(0.71*30)+(0.2*30)+(1*20) = 67.42
A4= (0.8*10)+(0.5* 10)+(0.71*30)+(1*30)+(0.66*20) = 78.65
A5= (0.85*10)+(0.66* 10)+(0.85*30)+(0.6*30)+(1*20) = 77.23
A6= (0.88*10)+(0.66* 10)+(0.85*30)+(0.6*30)+(0.66*20) = 72.60

3.6 Design

The design displays the app's user page and the design of the use case diagram.

a. Context Diagram

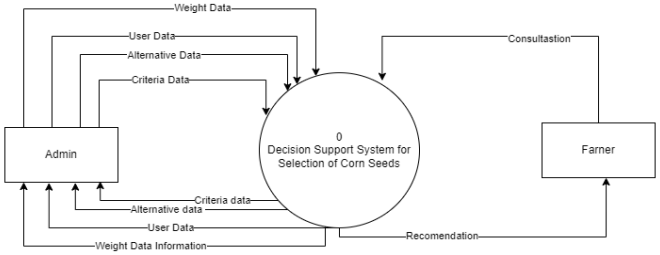

Figure 2. Context Diagram

The context diagram shows that there are 2 external entities related to the system, namely the admin and the farmer. The admin is in charge of inputting alternative data, criteria, and users while farmers can carry out consultations through a decision support system application and obtain recommendations for the most suitable seeds for planting.

b. User Inter Face

Figure 3 shows the main page display of the decision support system application

Figure 3. Main Menu Page

Figure 4 shows the appearance of the corn seed data page in a decision support system application

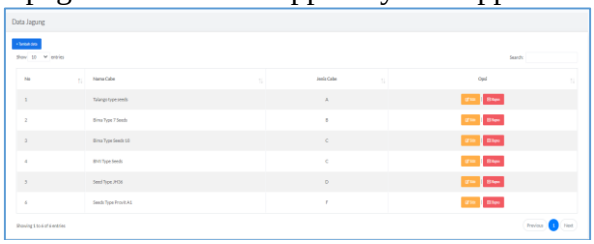

Figure 4. Corn Seed data page

Figure 5 shows the appearance of the Corn Criteria page in a decision support system application.

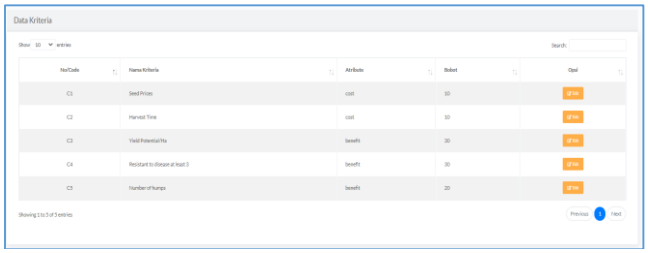

Figure 5. Criteria Data Page

Figure 6 shows the display of alternative data pages in the decision support system application.

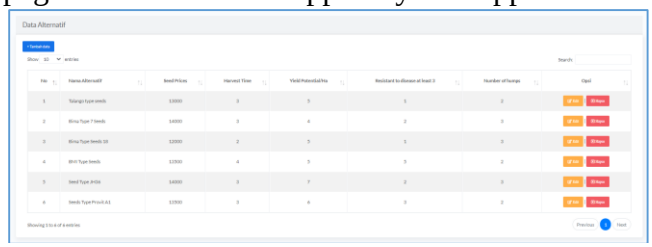

Figure 6. Alternative data page

Figure 7 shows the display of the Recommendations page in a decision support system application

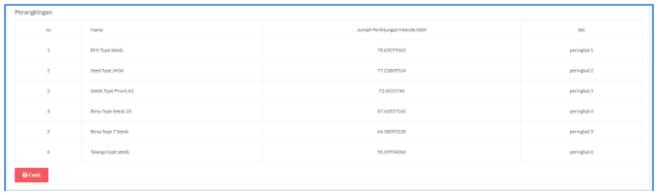

Figure 7. Recommendations page

3.7 Testing

The purpose of Black Box testing is to test the functionality and performance of a system without knowing its internal details or source code. This test is carried out by providing input and observing the resulting output, and comparing it with the expected results or predetermined specifications. The goal is to find flaws or bugs in the system so they can be fixed before they are fully implemented. The test results can be seen in table 4.

Table 4. Test Results

No	Skenario	Information	
		Valid	Invalid
1	Enter the correct user name and password then the system will direct you to the main page of the decision support system	v	
2	Admin can add alternative data to the application	v	
3	Admin can add criteria data to the application	v	
4	Admin can add user data to the application	v	

Based on tests carried out on the four existing formats, a success rate or validity of 100% was obtained.

VI. CONCLUSION

This study concludes that based on the 5 specified selection criteria, the application of a decision support system can provide recommendations from several alternatives in the form of a ranking. In this study, to achieve better scores and accuracy, further researchers can test these alternatives and criteria using different methods such as the AHP method and the WP method and even combine the SAW method with other methods.

REFERENCES

[1] A. Fadiliya dan A. Mayangsari, "ANALISIS FAKTOR-FAKTOR YANG MEMPENGARUHI KEPUTUSAN PETANI DALAM MELAKUKAN USAHATANI CABAI RAWIT (studi kasus di Desa Bungatan Kecamatan Bungatan Kabupaten Situbondo)," *AGRIBIOS*, vol. 19, no. 2, hlm. 89, Nov 2021, doi: 10.36841/agribios.v19i2.1297.

[2] A. P. R. Pinem, N. Hidayati, dan K. Kholidin, "KLASIFIKASI PRIORITAS DISTRIK TERHADAP KETAHANAN PANGAN MENGGUNAKAN METODE JARINGAN SYARAF TIRUAN," *Telematika*, vol. 11, no. 2, hlm. 1, Agu 2018, doi: 10.35671/telematika.v11i2.712.

[3] E. Pawan, P. Hasan, dan R. M. Thamrin, "Utilization SAW Method to Choose Goods Suppliers at PT.King Computer," *CCIT Journal*, vol. 13, no. 1, hlm. 111–

124, Feb 2020, doi: 10.33050/ccit.v13i1.928.

[4] Y. I. Anas *dkk.*, "Decision Support System Pemilihan Bibit Unggul Tanaman Kelengkeng Menggunakan Metode Saw (Simple Additive Weighting)," dalam *Seminar Nasional Inovasi Teknologi*, 2020, hlm. 17–22.

[5] E. Erlangga, Y. Yolandari, T. Thamrin, dan A. K. Puspa, "Analisis Penerapan Metode Simple Additive Weighting (SAW) Pemilihan Tanaman Hias," *Explore:Jurnal Sistem informasi dan telematika*, vol. 12, no. 1, hlm. 56, 2021, doi: 10.36448/jsit.v12i1.2010.

[6] M. A. Afrizal, "Sistem Pendukung Kepututsan Penentuan Tanaman Cabai Berkualitas Menggunakan Metode Simple Additive Weighting (SAW)," *Jurnal Sistem Informasi dan Teknologi Jaringan (SISFOTEKJAR)*, vol. 1, no. 1, hlm. 1–4, 2020.

[7] N. Rida, Yani Maulita, "SISTEM PENDUKUNG KEPUTUSAN PEMILIHAN LAHAN PERTANIAN YANG TEPAT UNTUK TANAMAN JAGUNG MENGGUNAKAN METODE WASPAS," *Jurnal Sistem Informasi Kaputama (JSIK)*, vol. 6, no. 3, 2022, [Daring]. Tersedia pada: http://www.jurnal.kaputama.ac.id/index.php/JSIK/article/view/1157

[8] F. Ardhy, "SISTEM PENGAMBLAN KEPUTUSAN PEMILIHAN BIBIT JAGUNG DENGAN METODE ANALYTICAL HIERARCHY PROCESS (AHP) PADA TOKO ABADI JAYA LAMPUNG TIMUR," *Jurnal Informasi dan Komputer*, vol. 6, no. 2, hlm. 73–80, Okt 2018, doi: 10.35959/jik.v6i2.115.