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Web-Based Decision Support System for Superior Corn Seed Selection Using FMADM and AHP Algorithms

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ABSTRACT

Indonesia as an agricultural country still faces challenges in meeting national corn demand due to dependency on imports. One critical issue is the inaccurate selection of superior seeds that suit local conditions. This study aims to develop a web-based decision support system (DSS) for superior corn seed selection using the Fuzzy Multi-Attribute Decision Making (FMADM) algorithm combined with the Analytical Hierarchy Process (AHP) method.The research was conducted in Sei Tembo Village, Langkat Regency, with data obtained through observation, interviews with farmers, and literature review. The AHP method was applied to determine the weights of five criteria: water content, pest resistance, productivity, fruit size, and harvest time. Consistency testing produced a CR value of 0.028, indicating reliable weighting. The FMADM method was then used to rank 142 seed alternatives based on these weights.The results showed that the proposed system successfully ranked Srikandi Putih 1 (A32) as the best alternative with a score of 0.950, while Bima5 Bantimurung (A130) had the lowest score of 0.632. Productivity was identified as the dominant factor (weight = 0.484) in determining superior seeds.These findings demonstrate that the web-based DSS can improve accuracy and objectivity in seed selection, helping farmers reduce trial-and-error decisions. Practically, this system supports agricultural productivity improvement and contributes to strengthening national food security by reducing reliance on corn imports.

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1. INTRODUCTION

Indonesia is an agrarian country with the agricultural sector playing a strategic role in the nationals economy. Corn is a key food commodity, serving a dual purpose: as both human food and animal feed. However, domestic corn productivity still faces various challenges, one of which is the inaccuracy in selecting superior seeds suitable for land conditions and the growing season.[1]

Based on information provided by the Central Statistics Agency (BPS), Indonesia's corn imports continue to fluctuate. In 2023, total corn imports reached USD 252,551, then decreased to USD 130,033 in 2024, and then increased again to USD 132,356 in just the first two months of 2025. This dependence on imports indicates that domestic corn production is unable to sustainably meet national demand. One of the main causes is the practice of selecting seeds, which is still done manually and relies on individual experience, which risks producing suboptimal decisions.

At the local level, similar challenges are encountered in Sei Tembo Village, where farmers struggle to identify superior seeds suited to their local conditions. Declining soil quality, increased pest infestations, and low agricultural technology literacy exacerbate these issues. Therefore, a technology-based approach is needed that can provide accurate and systematic recommendations for selecting superior corn seeds.[2][3][4]

Recent studies have emphasized the important role of AHP and DSS methods in supporting multi-criteria decision making. Shahzad et al.[5]. used Spherical Fuzzy AHP to analyze solar energy constraints, while Bottani et al.[6] developed a LARG-AHP framework in the supply chain. Soori et al [7] studied the development of intelligent technology-based DSS to support adaptive and transparent decision making, demonstrating the important role of algorithms in improving decision quality, while Popovic et al.[8] designed an AI-based agricultural DSS with sustainability criteria. Closer to this study, Junaedi et al.[9] applied AHP to crop variety selection, but it has not been integrated into a web-based system. This research gap indicates that the application of FMADM–AHP in a web-based decision support system for selecting superior corn seeds is still rare, especially in the Indonesian context..

One relevant solution is the implementation of a Decision Support System (DSS) with the Fuzzy Multi-Attribute Decision Making (FMADM) algorithm and the Analytical Hierarchy Process (AHP) method. FMADM enables decision-making that takes into account uncertainty and data variation, while AHP serves to determin the priority weights for each criterion, such as water content, pest resistance, productivity, fruit size, and harvest time. The combination of these two methods is believed to produce a more objective approach in determining the best corn seed alternatives. [10][11][12]

Previous studies have demonstrated the successful application of AHP and FMADM in various decision-making contexts, such as business location selection, zakat recipient determination, and product selection.[13] At the international level, several other multi-criteria decision-making (MCDM) techniques such as TOPSIS and MOORA have also been widely applied to support complex decision processes, particularly in agriculture and resource management.[14][15].However, the combined application of FMADM and AHP specifically for web-based selection of superior corn seeds is still rarely explored, creating a significant research gap.

This study explicitly addresses that gap by developing a novel web-based DSS that integrates FMADM and AHP for superior corn seed selection. Compared to other MCDM approaches, FMADM–AHP offers flexibility in handling uncertainty and provides a structured framework for weighting criteria, making it well-suited for local agricultural conditions. The main contribution of this research is the development of a system that delivers recommendations quickly, accurately, and appropriately for farmers, while also demonstrating potential for broader adaptation in global agricultural decision-making. In addition, this approach not only helps increase agricultural productivity but also contributes to strengthening national food security by reducing dependence on corn imports. [16][17][18]

2. RESEARCH METHOD

This study used a quantitative approach involving 142 superior corn varieties officially released by the Ministry of Agriculture of the Republic of Indonesia. Thus, the number of alternatives analyzed represents the entire population of official varieties without sampling. Data regarding criteria and weights were obtained through expert interviews and literature reviews. To ensure data consistency and reliability, a Cronbach's Alpha test was conducted with a result of $\alpha > 0.7$, indicating a good level of reliability. Next, the Analytical Hierarchy Process (AHP) method was used to determine the criteria weights, with a Consistency Ratio (CR) test result of $0.028 \leq 0.1$, thus meeting the consistency limit according to the Saaty criteria. After the weights were obtained, the Fuzzy Multi-Attribute Decision Making (FMADM) method was applied to rank the alternatives through a matrix normalization process, so that each criterion was on the same scale and the assessment results could be analyzed objectively.[19]

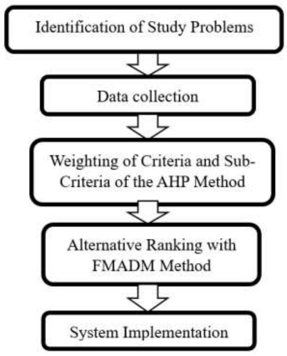


Figure 1. *Research framework*

Based on Figure 1, the application development process is in accordance with the stages in the following sub-chapters.[20]

2.1 Identification of Literature Study Problems

The main problem in corn seed selection is inaccurate decisions due to the lack of a system capable of providing objective recommendations. Farmers still rely on personal experience and limited information, leading to the risk of selecting suboptimal seeds. Therefore, a Decision Support System (DSS)-based approach using the Analytical Hierarchy Process (AHP) and Fuzzy Multi-Attribute Decision Making (FMADM) methods is needed.[21]

2.2 Data Collection

Data was obtained through field observations of the seed selection process, interviews with farmers and agricultural experts to determine determining factors, and literature review of journals and previous research. This data was used to develop criteria and pairwise comparison matrices in the AHP and as numerical input in the FMADM.[2]

2.3 Criteria and Subcriteria Weighting

The AHP method is used to calculate the importance weights for each criterion and subcriteria in corn seed selection. This process includes pairwise comparisons, weight calculations, and consistency tests to ensure the resulting weights are valid and can be used in the ranking stage.[22]

2.4 Alternative Ranking

FMADM is used to calculate the final score for each seedling alternative based on the weighted criteria from the AHP. The seedling with the highest score becomes the primary recommendation as superior seedling.[23] [24]

2.5 System Implementation

The decision support system was developed as a web-based application. This phase included the implementation of the FMADM–AHP method and system testing to ensure that the resulting recommendations meet the needs of farmers in the field.[25][26][27][28]

Table 1. AHP Method Criteria and Code

NO	CRITERIA/ATTRIBUTE NAME	INFORMATION
1	Water content	C1
2	Pest Resistance	C2
3	Productivity	C3
4	Fruit Size	C4
5	Harvest Time	C5

Table 1. explains that this study uses five predetermined criteria to assess and select superior corn seeds based on various factors that influence productivity and crop quality. The corn seeds analyzed in this study will be evaluated using The AHP method is applied to calculate the weight of importance for each criterion, which subsequently serves as input in the alternative ranking process with the FMADM method.[29]

3. RESULTS AND DISCUSSION

3.1. Data analysis

This study analyzed 142 superior corn varieties officially released by the Indonesian Ministry of Agriculture. These varieties encompass local, hybrid, and composite varieties, such as Metro (A1), Baster Kuning (A2), Kania Putih (A3), as well as modern varieties such as Pioneer (A46–A68), Semar (A72–A81), and Bisi (A82–A98). Additionally, there are NK varieties (A107–A115), the Bima series (A126–A140), and even the newest varieties such as Provit A1 (A141) and Provit A2 (A142). With this broad coverage, the alternatives used represent the complete population of superior varieties in Indonesia, ensuring a comprehensive and representative analysis.

The results indicate that Srikandi Putih 1 (A32) ranked highest with a score of 0.950, while Bima5 Bantimurung (A130) received the lowest score of 0.632. The productivity criterion was the dominant factor, with a weight of 0.484, confirming that increasing crop yields is a top priority in variety selection. This finding is consistent with research by Junaedi et al.[9], which also identified productivity as a key determining criterion in crop variety selection.

However, a comparison with other studies reveals differences in focus. While Popovic et al. [8]'s research focused on agricultural sustainability through an artificial intelligence-based DSS, this study emphasizes the integration of web-based FMADM–AHP, which is simple and practical for farmers to use. Consistent with the findings of Shahzad et al. [5] , the effectiveness of DSS is also significantly influenced by environmental factors. In the context of corn, agroecological conditions such as climate, soil type, and water availability have the potential to influence variety performance in the field. Therefore, although this system generates objective recommendations based on quantitative criteria, its use still needs to be adapted to the local knowledge of farmers and extension workers.

Thus, the results of this study not only produce objective variety rankings but also emphasize the importance of considering external environmental variability so that web-based decision support systems can be more adaptive and support increased corn productivity nationally.

3.2. AHP Method Calculation

The weighting of the criteria was carried out using information obtained from research results in Sei Tembo Village, Kuala District, Langkat Regency, North Sumatra Province.

Table 2 Criteria Weighting (adopted from field data of Sei Tembo Village and weighted using AHP method by Saaty (1980))

INFORMATION	CRITERIA/ATTRIBUTE NAME	Weight
C1	Water content	3
C2	Pest Resistance	7
C3	Productivity	9
C4	Fruit Size	5

C5	Harvest Time	6

The weighting of criteria is shown in Table 2, which presents five attributes influencing superior corn seed selection based on information obtained from field research in Sei Tembo Village. The assignment of weights follows the Analytical Hierarchy Process (AHP) scale, where values range from 1 (least important) to 9 (most important) (Saaty, 1980). Productivity (C3) has the highest weight (9), indicating it is the most dominant factor, while water content (C1) has the lowest weight (3), meaning it contributes the least in the decision-making process.

Table 3 Comparison Between Criteria

Criteria	C1	C2	C3	C4	C5
C1	1	0.2	0.14	0.33	0.25
C2	5	1	0.33	3	2
C3	7	3	1	5	4
C4	3	0.33	0.2	1	0.5
C5	4	0.5	0.25	2	1
Total	20	5.03	1.92	11.33	7.75

Table 3 presents the pairwise comparison between criteria based on the initial weighting. The table shows how each criterion is compared against others to determine its relative importance. For example, productivity (C3) has higher values compared to most criteria, indicating its stronger influence in the decision-making process.

Table 4. Normalization and Priority Weighting

Criteria	C1	C2	C3	C4	C5	Priority Weight
C1	0.050	0.039	0.072	0.029	0.032	0.044
C2	0.250	0.198	0.171	0.264	0.258	0.228
C3	0.350	0.596	0.520	0.441	0.516	0.484
C4	0.150	0.065	0.104	0.088	0.064	0.094
C5	0.200	0.099	0.130	0.176	0.129	0.146

Table 4. normalize the criteria matrix with calculations to obtain the value (C1, C1) by taking the value from the comparison table between criteria

Table 5. Consistency Measure(calculated using AHP consistency testing method as described by Saaty (1980))

Criteria	Consistency Measure
C1	5.110
C2	5.182
C3	5.227
C4	5.011
C5	5.102

Table 5. shows the Consistency Measure (CM) values obtained by multiplying the pairwise comparison matrix with the priority weight vector. This step follows the standard procedure in AHP consistency testing (Saaty, 1980; Wind & Saaty, 1980). The resulting values indicate the degree of consistency in the pairwise comparisons.

Table 6. Consistency Index

Average value	Consistency Index
5.126	0.031

Table 6 shows the results of searching for CI (Consistency Index)

Table 7. *Consistency Ratio*

Consistency Ratio
0.028

Table 7 shows the consistency ratio (CR) obtained from the pairwise comparison matrix. The CR value is 0.028, which is less than 0.1, indicating that the comparison results are consistent and valid for use in the AHP calculation.

Consisting of CI and RI, we calculate *Consistency Ratio* :

$CR = CI / RI$

$= 0.031 / 1.12$

$= 0.0277$

$= 0.028 < 0.100$

A CR value < 0.100 is considered consistent and more than that is inconsistent. So the comparison given for the criteria is consistent.[30]

3.3. FMADM Method Calculation

Determine the type of criteria weighting with FMADM

Table 8. Criteria/Attribute Weighting Type
Source: (Sei Tembo Village Agriculture)

Code	Criteria/Attributes	Type
C1	Water content	Cost
C2	Pest Resistance	Benefits
C3	Productivity	Benefits
C4	Fruit Size	Benefits
C5	Harvest Time	Benefits

Table 8 shows the classification of each criterion into benefit or cost type according to FMADM provisions. Water content (C1) is categorized as a cost criterion, meaning lower values are preferred, while the other four criteria (C2–C5) are benefit types, where higher values indicate better performance.

Table 9. Corn Seed Assessment Based on Each Criteria/Attribute

Code	Name	C1	C2	C3	C4	C5
A1	Metro	A	C	B	B	C
A2	BasterKuning	C	C	A	A	A
A3	Kania Putih	C	C	A	A	A
A4	Malin	A	A	B	C	B
A5	Harapan	B	C	B	B	B
A6	Bima	C	A	B	C	B
A7	Pandu	C	B	B	A	C
A8	Permadi	C	A	A	C	C
A9	Bogor Composite2	A	C	B	B	A
A10	Harapan Baru	C	B	A	C	A
A11	Arjuna	A	B	B	B	C
A12	Bromo	A	A	A	C	C
A13	Parikesit	A	B	A	C	B
A14	Abimayu	C	A	B	B	C
A15	Nakula	A	B	B	B	C
A16	Sadewa	B	A	A	B	A
A17	Wiyasa	C	C	B	C	A
A18	Kalingga	C	A	B	C	B
A19	Rama	C	A	B	C	C
A20	Bayu	C	C	B	A	A
A21	Antasena	C	A	B	C	C
A22	Wisanggeni	A	A	B	B	C
A23	Bisma	A	B	A	B	B
A24	Surya	C	A	A	B	C
A25	Lagaligo	A	B	A	C	B
A26	Gumarang	C	C	B	B	A
A27	Lamuru	A	B	A	B	A
A28	Kresna	A	B	B	A	A
A29	Srikandi	A	C	B	A	A
A30	Palakka	A	B	A	B	B
A31	Sukmaraga	B	C	B	A	B
A32	Srikandi Putih 1	C	A	A	A	A
A33	Srikandi Kuning 1	B	A	A	B	A
A34	Anoman 1	A	B	A	C	A
A35	C1	B	A	A	C	B
A36	C2	C	C	A	B	A
A37	C3	C	A	A	C	B
A38	C4	A	C	B	A	C

A39	C5	B	A	B	B	A
A40	C6	B	B	A	C	B
A41	C7	B	A	B	C	B
A42	C8	C	A	B	A	B
A43	C9	C	A	B	B	C
A44	C10	B	C	A	B	A
A45	A (Andalas) 4	C	C	B	A	B
A46	Pioneer 1	C	B	B	B	A
A47	Pioneer 2	B	C	A	B	B
A48	Pioneer 3	C	A	B	A	A
A49	Pioneer 4	B	A	B	A	C
A50	Pioneer 5	B	C	B	C	B
A51	Pioneer 6	A	A	B	B	B
A52	Pioneer 7	B	B	B	A	C
A53	Pioneer 8	C	B	B	C	A
A54	Pioneer 9	A	C	B	B	B
A55	Pioneer 10	B	C	A	C	C
A56	Pioneer 11	A	B	B	A	B
A57	Pioneer 12	C	B	B	B	B
A58	Pioneer 13	B	C	B	C	B
A59	Pioneer 14	C	C	B	A	A
A60	Pioneer 15	A	C	A	A	C
A61	Pioneer 16	B	A	A	A	C
A62	Pioneer 17	A	C	A	A	C
A63	Pioneer 18	A	C	B	A	C
A64	Pioneer 19	B	A	A	A	B
A65	Pioneer 20	A	B	B	A	A
A66	Pioneer 21	C	C	A	C	C
A67	Pioneer 22	A	A	A	B	A
A68	Pioneer 23	C	C	B	B	C
A69	IPB 4	C	C	A	C	C
A70	CPI1	A	A	A	A	B
A71	CPI2	C	B	A	B	B
A72	Semar 1	B	A	B	A	B
A73	Semar 2	C	C	B	B	A
A74	Semar 3	C	B	A	A	B
A75	Semar 4	C	A	B	C	B
A76	Semar 5	B	A	B	A	C
A77	Semar 6	B	B	B	B	C
A78	Semar 7	B	C	A	A	B
A79	Semar 8	A	A	B	B	B
A80	Semar 9	B	A	A	A	A
A81	Semar 10	C	A	B	B	A
A82	Bisi-1	B	C	B	B	C
A83	Bisi-2	B	A	A	B	A
A84	Bisi-3	C	B	A	A	B
A85	Bisi-4	A	B	B	B	B
A86	Bisi-5	B	A	A	A	C
A87	Bisi-6	A	A	A	C	B
A88	Bisi-7	A	B	B	C	B
A89	Bisi-8	A	B	A	B	B
A90	Bisi-9	C	A	B	A	B
A91	Bisi-10	A	B	B	B	A
A92	Bisi-11	A	C	A	A	A
A93	Bisi-12	C	C	B	A	A
A94	Bisi-13	A	C	B	C	A
A95	Bisi-14	A	C	B	A	A
A96	Bisi-15	C	B	A	A	C
A97	Bisi-16	C	C	A	B	B
A98	Bisi-18	B	A	B	B	C

A99	SHS 1	B	A	A	A	B
A100	SHS 2	B	C	B	C	B
A101	SHS 11	A	A	A	B	B
A102	SHS 12	A	C	A	B	C
A103	Jaya 1	A	C	A	C	B
A104	Jaya 2	C	C	B	B	B
A105	NKRI (Negara Kesatuan RI)	A	A	B	A	A
A106	N 35	B	A	A	A	A
A107	NK 11	C	C	A	A	B
A108	NK 22	C	C	B	B	A
A109	NK 33	C	C	B	B	C
A110	NK 55	B	C	A	B	B
A111	NK 66	B	B	B	B	C
A112	NK 81	B	C	A	A	A
A113	NK 82	C	A	B	C	A
A114	NK 88	C	C	A	A	C
A115	NK 99	A	B	A	B	B
A116	DK2	A	A	B	A	A
A117	DK3	B	B	B	C	A
A118	R 01	C	C	B	A	A
A119	P 28	A	A	B	C	C
A120	P29	B	C	B	B	C
A121	P31	B	A	A	A	A
A122	JK7	A	A	B	A	B
A123	JK8	B	A	A	A	C
A124	PAC224	C	B	B	A	B
A125	PAC759	B	C	B	B	C
A126	Bima1	C	B	A	C	C
A127	Bima2 Bantimurung	C	B	A	C	B
A128	Bima3 Bantimurung	A	C	B	A	B
A129	Bima4 Bantimurung	A	C	A	B	B
A130	Bima5 Bantimurung	A	C	B	C	C
A131	Bima6 Bantimurung	B	A	B	C	B
A132	Bima7	A	B	B	C	B
A133	Bima8	A	B	A	C	B
A134	Bima9	B	B	A	C	B
A135	Bima10	A	B	B	C	B
A136	Bima11	B	B	B	B	B
A137	Bima12Q	B	A	B	A	B
A138	Bima13Q	C	C	B	C	C
A139	Bima14 Batara	C	A	A	B	B
A140	Bima15 Sayang	A	A	B	B	C
A141	Provit A1	B	A	B	A	A
A142	Provit A2	C	C	A	A	A

Table 9 shows the assessment of each corn seed alternative on five criteria using A, B, and C scales. Higher ratings (A) indicate better performance, such as Srikandi (A29), while lower ratings (C) reflect weaker attributes.

Table 10. Normalization Matrix

Code	C1	C2	C3	C4	C5
A1	0.500	0.500	0.750	0.750	0.500
A2	1.000	0.500	1.000	1.000	1.000
A3	1.000	0.500	1.000	1.000	1.000
A4	0.500	1.000	0.750	0.500	0.750
A5	0.667	0.500	0.750	0.750	0.750
A6	1.000	1.000	0.750	0.500	0.750
A7	1.000	0.750	0.750	1.000	0.500
A8	1.000	1.000	1.000	0.500	0.500
A9	0.500	0.500	0.750	0.750	1.000
A10	1.000	0.750	1.000	0.500	1.000
A11	0.500	0.750	0.750	0.750	0.500

A12	0.500	1.000	1.000	0.500	0.500
A13	0.500	0.750	1.000	0.500	0.750
A14	1.000	1.000	0.750	0.750	0.500
A15	0.500	0.750	0.750	0.750	0.500
A16	0.667	1.000	1.000	0.750	1.000
A17	1.000	0.500	0.750	0.500	1.000
A18	1.000	1.000	0.750	0.500	0.750
A19	1.000	1.000	0.750	0.500	0.500
A20	1.000	0.500	0.750	1.000	1.000

Table 10 presents the normalization results of 20 corn seed alternatives as an example calculation. Normalization is performed to equalize the scale between criteria so that the values of each alternative can be compared objectively. The selection of 20 alternatives in the table aims to provide a representative picture of the normalization calculation results for all 142 corn seed alternatives. The normalization process is calculated using the following formula.

Normalization Formula:
For Benefit criteria (C2, C3, C4, C5):
rij = xij / max(xij)
For Cost criteria (C1):
rij = min(xij) / xij
Where:
rij = normalized score of the i-th alternative on the j-th criterion
xij = the score of the i-th alternative under the j-th criterion
max(xij) = maxim score of the j-th criterion
min(xij) = minim score of the j-th criterion

Table 11. Corn Seed Ranking

Ranking	Code	Name	Final Score
1	A32	Srikandi Putih 1	0.950
2	A80	Semar 9	0.940
3	A2	BasterKuning	0.926
3	A3	Kania Putih	0.926
5	A106	N 35	0.918
6	A121	P31	0.918
7	A105	NKRI	0.908
8	A16	Sadewa	0.898
9	A33	Srikandi Kuning 1	0.890
10	A67	Pioneer 22	0.886
11	A70	CPI1	0.886
12	A64	Pioneer 19	0.882
13	A83	Bisi-2	0.882
14	A99	SHS 1	0.882
15	A123	JK8	0.882
16	A141	Provit A1	0.874
17	A48	Pioneer 3	0.872
18	A86	Bisi-5	0.872
19	A81	Semar 10	0.864
20	A84	Bisi-3	0.858
21	A74	Semar 3	0.858
22	A96	Bisi-15	0.854
23	A139	Bima14 Batara	0.854
24	A142	Provit A2	0.850
25	A92	Bisi-11	0.848
26	A61	Pioneer 16	0.842
27	A112	NK 81	0.842
28	A87	Bisi-6	0.840
29	A101	SHS 11	0.838
30	A116	DK2	0.834
31	A122	JK7	0.834
32	A72	Semar 1	0.830
33	A78	Semar 7	0.830
34	A107	NK 11	0.826

35	A114	NK 88	0.826
36	A59	Pioneer 14	0.822
37	A93	Bisi-12	0.822
38	A118	R 01	0.822
39	A90	Bisi-9	0.820
40	A60	Pioneer 15	0.818
41	A62	Pioneer 17	0.818
42	A65	Pioneer 20	0.814
43	A27	Lamuru	0.814
44	A28	Kresna	0.814
45	A20	Bayu	0.812
46	A26	Gumarang	0.812
47	A29	Srikandi	0.812
48	A36	C2	0.812
49	A108	NK 22	0.812
50	A91	Bisi-10	0.808
51	A94	Bisi-13	0.808
52	A95	Bisi-14	0.808
53	A12	Bromo	0.806
54	A24	Surya	0.806
55	A37	C3	0.806
56	A8	Permadi	0.804
57	A18	Kalingga	0.804
58	A75	Semar 4	0.804
59	A13	Parikesit	0.802
60	A25	Lagaligo	0.802
61	A34	Anoman 1	0.802
62	A71	CPI2	0.802
63	A115	NK 99	0.802
64	A127	Bima2 Bantimurung	0.802
65	A133	Bima8	0.802
66	A134	Bima9	0.802
67	A97	Bisi-16	0.800
68	A126	Bima1	0.798
69	A35	C1	0.796
70	A39	C5	0.796
71	A40	C6	0.796
72	A41	C7	0.796
73	A76	Semar 5	0.796
74	A137	Bima12Q	0.796
75	A6	Bima	0.794
76	A14	Abimayu	0.794
77	A42	C8	0.794
78	A113	NK 82	0.794
79	A44	C10	0.792
80	A47	Pioneer 2	0.792
81	A110	NK 55	0.792
82	A4	Malin	0.790
83	A22	Wisanggeni	0.790
84	A51	Pioneer 6	0.790
85	A79	Semar 8	0.790
86	A140	Bima15 Sayang	0.790
87	A23	Bisma	0.788
88	A30	Palakka	0.788
89	A89	Bisi-8	0.788
90	A17	Wiyasa	0.786
91	A53	Pioneer 8	0.786
92	A73	Semar 2	0.786
93	A129	Bima4 Bantimurung	0.786
94	A46	Pioneer 1	0.784

95	A56	Pioneer 11	0.784
96	A124	PAC224	0.784
97	A131	Bima6 Bantimurung	0.782
98	A117	DK3	0.780
99	A7	Pandu	0.778
100	A45	A (Andalas) 4	0.778
101	A57	Pioneer 12	0.778
102	A104	Jaya 2	0.778
103	A11	Arjuna	0.776
104	A15	Nakula	0.776
105	A85	Bisi-4	0.776
106	A132	Bima7	0.776
107	A135	Bima10	0.776
108	A5	Harapan	0.774
109	A31	Sukmaraga	0.774
110	A49	Pioneer 4	0.774
111	A52	Pioneer 7	0.774
112	A98	Bisi-18	0.774
113	A136	Bima11	0.774
114	A43	C9	0.772
115	A68	Pioneer 23	0.772
116	A88	Bisi-7	0.772
117	A111	NK 66	0.772
118	A128	Bima3 Bantimurung	0.772
119	A9	Bogor Composite2	0.770
120	A54	Pioneer 9	0.770
121	A10	Harapan Baru	0.768
122	A19	Rama	0.768
123	A21	Antasena	0.768
124	A66	Pioneer 21	0.768
125	A69	IPB 4	0.768
126	A119	P 28	0.768
127	A100	SHS 2	0.766
128	A120	P29	0.766
129	A125	PAC759	0.766
130	A82	Bisi-1	0.764
131	A102	SHS 12	0.764
132	A103	Jaya 1	0.764
133	A109	NK 33	0.764
134	A138	Bima13Q	0.764
135	A38	C4	0.762
136	A58	Pioneer 13	0.762
137	A63	Pioneer 18	0.762
138	A50	Pioneer 5	0.760
139	A77	Semar 6	0.760
140	A55	Pioneer 10	0.758
141	A1	Metro	0.643
142	A130	Bima5 Bantimurung	0.632

Table 11 shows the final ranking of corn seed alternatives based on FMADM–AHP calculations.
The final score is calculated using the formula:
$Si = \Sigma(wj \times rij)$
Where:
Si = final score of the i-th alternative
wj = weight of the jth criterion (from AHP results)
rij = normalized value

With weights from AHP:
w1 = 0.044 (Water content)
w2 = 0.228 (Pest Resistance)
w3 = 0.484 (Productivity)

w4 = 0.094 (Fruit Size)
w5 = 0.146 (Harvest Time)[31].

Final Score Calculation Example for A1 (Metro):
S1 = (0.044 × 0.500) + (0.228 × 0.500) + (0.484 × 0.750) + (0.094 × 0.750) + (0.146 × 0.500)
S1 = 0.022 + 0.114 + 0.363 + 0.071 + 0.073
S1 = 0.643
Based on the calculation results, the alternative with the highest score is A32 (Srikandi Putih 1) with a value of 0.950, which indicates that the variety has the best performance based on the five criteria used. Conversely, the alternative with the lowest score is A130 (Bima5 Bantimurung) with a value of 0.632. A score close to 1 indicates that the variety has values close to the maximum on the benefit criterion and the minimum on the cost criterion, so this ranking system can be used as a basis for recommendations in determining superior corn seeds. The discovery of several alternatives with identical final scores is normal in the FMADM method, which is caused by the same or very similar normalization values due to the similarity of initial values, constant criteria weights (such as productivity with a dominant weight of 0.484), and the use of fixed value categories such as a scale of 1–4 or A–D which limits the variation of value combinations between alternatives.

3.4. Results of system implementation

This testing stage is a stage that is intended to find out whether each function in the system is functioning according to the design that was made. In the testing stage, it is carried out by using a web application with a web browser media, namely Google Chrome. The following are the results of the tests carried out:

The results of the study showed that productivity (0.484) was the most dominant factor in selecting superior corn seeds. This finding aligns with research by Nazilah et al. (2023).[27] found that the Bisi variety was superior at different research locations, indicating that the growing environment significantly influences variety performance. Thus, this FMADM-AHP-based decision support system helps tailor seed recommendations to local conditions.

Overall, this study confirms the superiority of the FMADM–AHP approach over traditional subjective experience-based methods. The results are consistent with previous studies. [10][25][27] This study demonstrates the feasibility of adopting this method to support food security through the selection of superior seeds. However, the variation in results between studies also highlights the importance of this system being flexible and regularly updated with local data to maintain its relevance to local agroecological conditions.

1. Decision Support System Login View,

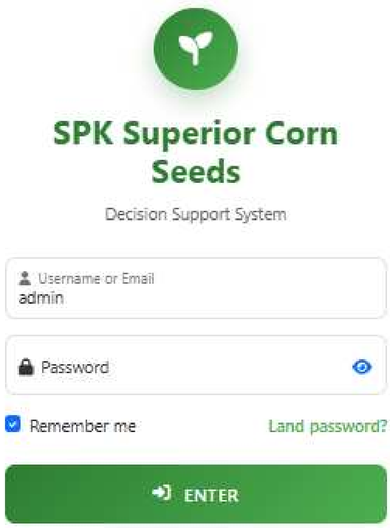
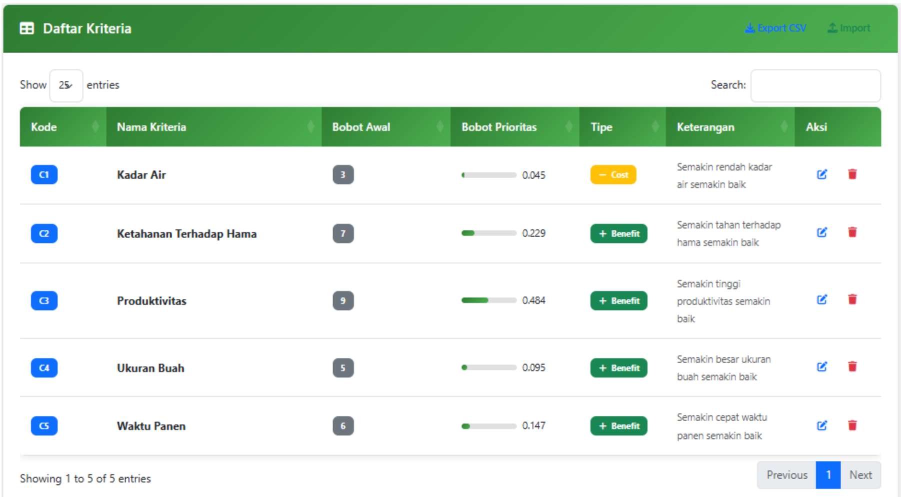


Figure 2. Login Page

Figure 2 displays the login page of the decision support system for superior corn seed selection. This page is used by users or administrators to enter the system by filling in their email and password. The purpose of this interface is to ensure secure access before managing or retrieving recommendation data.

2.Displays the criteria, weight, type and priority weight that have been inputted according to the research results.


Daftar Kriteria

Export CSV Import

Show 25 entries Search:

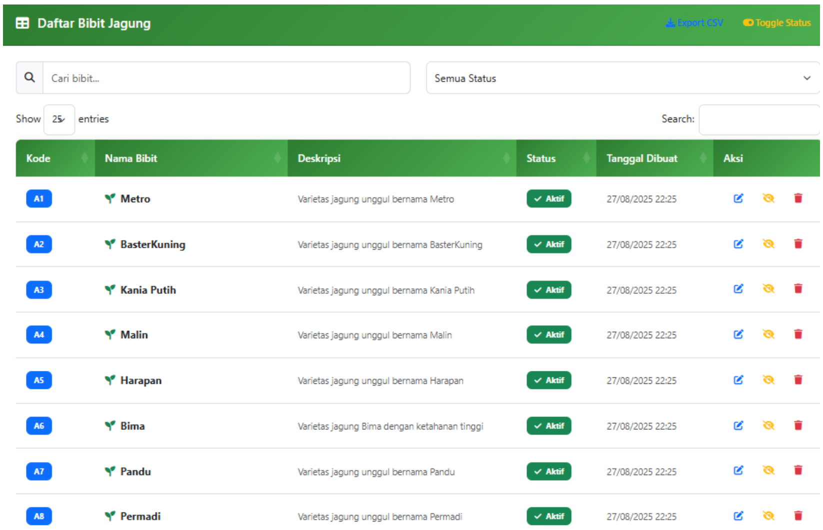
Kode	Nama Kriteria	Bobot Awal	Bobot Prioritas	Tipe	Keterangan	Aksi
C1	Kadar Air	3	0.045	Cost	Semakin rendah kadar air semakin baik	
C2	Ketahanan Terhadap Hama	7	0.229	Benefit	Semakin tahan terhadap hama semakin baik	
C3	Produktivitas	9	0.484	Benefit	Semakin tinggi produktivitas semakin baik	
C4	Ukuran Buah	5	0.095	Benefit	Semakin besar ukuran buah semakin baik	
C5	Waktu Panen	6	0.147	Benefit	Semakin cepat waktu panen semakin baik	

Showing 1 to 5 of 5 entries Previous 1 Next

Figure 3. Criteria Data

Figure 3 displays the criteria, their weights, and types based on the research results. Priority weights indicate the level of importance, with higher values indicating a more dominant criterion. The lower the Cost, the better, while the higher the Benefit, the better.

3. Display alternatives that have been inputted according to research results.


Daftar Bibit Jagung

Export CSV Toggle Status

Cari bibit... Semua Status

Show 25 entries Search:

Kode	Nama Bibit	Deskripsi	Status	Tanggal Dibuat	Aksi
A1	Metro	Varietas jagung unggul bernama Metro	Aktif	27/08/2025 22:25	
A2	BasterKuning	Varietas jagung unggul bernama BasterKuning	Aktif	27/08/2025 22:25	
A3	Kania Putih	Varietas jagung unggul bernama Kania Putih	Aktif	27/08/2025 22:25	
A4	Malin	Varietas jagung unggul bernama Malin	Aktif	27/08/2025 22:25	
A5	Harapan	Varietas jagung unggul bernama Harapan	Aktif	27/08/2025 22:25	
A6	Bima	Varietas jagung Bima dengan ketahanan tinggi	Aktif	27/08/2025 22:25	
A7	Pandu	Varietas jagung unggul bernama Pandu	Aktif	27/08/2025 22:25	
A8	Permadi	Varietas jagung unggul bernama Permadi	Aktif	27/08/2025 22:25	

Figure 2. Alternative Data

Figure 4 displays alternative data in the form of corn seed varieties used in the study. The purpose is to demonstrate the seed options that will be evaluated based on predetermined criteria. The data is read by looking at the seed code, name, and description. All alternatives are displayed in an active state for further calculation

4.Presents the AHP computation results to identify the priority weights of each criterion through the pairwise comparison method

Matriks Perbandingan Berpasangan

Pastikan semua nilai perbandingan telah diisi. Klik di sini untuk inisialisasi data AHP

Kriteria	C1	C2	C3	C4	C5	Prioritas
C1	1	1/5	1/7	1/3	1/4	0.0451
C2	5.000	1	1/3	3.000	2.000	0.2289
C3	7.000	3.000	1	5.000	4.000	0.4845
C4	3.000	0.333	1/5	1	1/2	0.0946
C5	4.000	1/2	1/4	2.000	1	0.1469
Jumlah Kolom	20.000	5.033	1.926	11.333	7.750	1.0000

Figure 3. AHP Calculation

Figure 5 shows AHP calculation to determine priorities weights of criteria through paired comparisons. The matrix values indicate the comparison between criteria, while the normalization results provide the final weights for each criterion.

5. Displays the results of the FMADM calculation

Detail Perhitungan

Ranking	Kode Bibit	Nama Bibit	C1		C2		C3		C4		C5		Skor Akhir
			Nilai	Skor	Nilai	Skor	Nilai	Skor	Nilai	Skor	Nilai	Skor	
1	A32	Srikandi Putih 1	2	0.023	4	0.229	4	0.484	4	0.095	4	0.147	**0.977**
2	A106	N 35	3	0.015	4	0.229	4	0.484	4	0.095	4	0.147	**0.970**
3	A121	P31	3	0.015	4	0.229	4	0.484	4	0.095	4	0.147	**0.970**
4	A80	Semar 9	3	0.015	4	0.229	4	0.484	4	0.095	4	0.147	**0.970**
5	A16	Sadewa	3	0.015	4	0.229	4	0.484	3	0.071	4	0.147	**0.946**
6	A83	Bisi-2	3	0.015	4	0.229	4	0.484	3	0.071	4	0.147	**0.946**
7	A33	Srikandi Kuning 1	3	0.015	4	0.229	4	0.484	3	0.071	4	0.147	**0.946**
8	A67	Pioneer 22	4	0.011	4	0.229	4	0.484	3	0.071	4	0.147	**0.943**
9	A99	SHS 1	3	0.015	4	0.229	4	0.484	4	0.095	3	0.110	**0.933**
10	A64	Pioneer 19	3	0.015	4	0.229	4	0.484	4	0.095	3	0.110	**0.933**
11	A70	CPI1	4	0.011	4	0.229	4	0.484	4	0.095	3	0.110	**0.929**
12	A139	Bima14 Batara	2	0.023	4	0.229	4	0.484	3	0.071	3	0.110	**0.917**
13	A101	SHS 11	4	0.011	4	0.229	4	0.484	3	0.071	3	0.110	**0.906**

Figure 4. FMADM Calculation

Figure 6 displays the results of the FMADM calculation used to rank alternatives based on weighted criteria. This is read by looking at the total score for each alternative, with the highest score indicating the best alternative.

6. Displaying Corn Seed Ranking

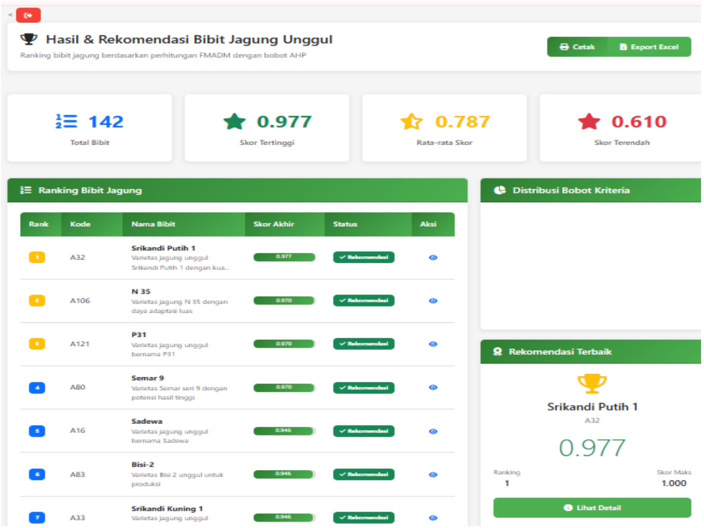


Figure 5. Ranking of Superior Corn Seeds

Figure 7 displays the ranking results of superior corn seeds based on the final calculated scores. The goal is to determine the best alternative, with the highest score indicating the most recommended seed. The ranking is determined by looking at the ranking order and score for each seed.

4. CONCLUSION

This study demonstrates that the integration of the FMADM method with the AHP approach can objectively support the selection of superior corn seeds. The results indicate that productivity is the most dominant criterion, followed by pest resistance, harvest time, fruit size, and moisture content. Among the 142 varieties analyzed, Srikandi Putih 1 (A32) achieved the highest score (0.950), while Bima5 Bantimurung (A130) obtained the lowest (0.632). These findings confirm that the system is capable of providing structured recommendations that align with farmers' needs. However, this research has limitations, particularly in not explicitly considering environmental variability such as soil conditions and regional climate, which may affect field performance. For future development, the system could be enhanced with machine learning techniques to process larger and more diverse datasets, while integration into national agricultural policies would increase its scalability and contribute directly to strengthening Indonesia's food security.

REFERENCES

[1] Z. Azhar and J. Hutahaean, "Penerapan metode Analytical Hierarchy Process dalam pemilihan tempat cafe di Kisaran," *Building of Informatics, Technology and Science*, vol. 2, no. 2, pp. 159–164, 2020, doi: 10.47065/bits.v2i2.560.

[2] P. dan C. T. M. Ahmadar, "Perancangan sistem informasi penjualan berbasis web pada Rahayu Photo Copy dengan database MySQL," *Dharmakarya: Jurnal Aplikasi Ipteks untuk Masyarakat*, vol. 10, no. 4, pp. 284–289, 2021, doi: 10.24198/dharmakarya.v10i4.35873.

[3] M. Harahap, "Perancangan perangkat lunak teks editor bahasa C menggunakan metode lexical analyzer," *Bulletin of Artificial Intelligence*, vol. 1, no. 1, pp. 13–16, 2022.

[4] D. Oktarina, A. Alfiarini, and Y. Primadasa, "Analisis dan implementasi metode AHP, MOORA dalam penentuan jurusan pada Madrasah Aliyah Negeri 2 Kota Lubuklinggau," *Digital Zone: Jurnal Teknologi Informasi dan Komunikasi*, vol. 12, no. 1, pp. 91–102, 2021.

[5] K. Shahzad *et al.*, "Analysis of obstacles to adoption of solar energy in emerging economies using spherical fuzzy AHP decision support system: A case of Pakistan," *Energy Reports*, vol. 10, pp. 381–395, 2023, doi: 10.1016/j.egyr.2023.06.015.

[6] E. Bottani, L. Monferdini, N. Villani, M. Caterino, and M. Rinaldi, "Integrating the lean, agile, resilient, green perspectives in decision support systems: The LARG-AHP framework," *IFAC PapersOnLine*, vol. 59, no. 10, pp. 1576–1581, 2025, doi: 10.1016/j.ifacol.2025.09.265.

[7] R. M. Soori, F. K. G. Jough, and B. A. Dastres, "AI-based decision support systems in Industry 4.0: A review," *Pharmacological Research*, p. 107723, 2025, doi: 10.1016/j.phrs.2025.107723.

[8] A. Ghazvinian, B. Feng, J. Feng, H. Talebzadeh, and M. Dzikuć, "Lean, agile, resilient, green, and sustainable (LARGS) supplier selection using multi-criteria structural equation modeling under fuzzy environments," *Sustainability*, vol. 16, no. 4, 2024, doi: 10.3390/su16041594.

[9] Q. Zuo, J. Guo, J. Ma, G. Cui, R. Yang, and L. Yu, "Assessment of regional-scale water resources carrying capacity based on fuzzy multiple attribute decision-making and scenario simulation," *Ecological Indicators*, vol. 130, p. 108034, 2021, doi: 10.1016/j.ecolind.2021.108034.

[10] Z. Azhar, “Penerapan metode Analytical Hierarchy Process dalam pemilihan bibit jagung unggul,” *JURTEKSI: Jurnal Teknologi dan Sistem Informasi*, vol. 6, no. 2, pp. 145–154, 2020, doi: 10.33330/jurteksi.v6i2.528.

[11] Y. Y. Hilda Amalia, Ari Puspita, Ida Faridah, Seni Kurniasari, “Penerapan Metode AHP untuk Sistem Pendukung Keputusan Pemilihan Siswa Teladan,” *J. Inform. dan Teknol.*, vol. 8, no. 1, pp. 172–180, 2025.

[12] M. Yanto, “Sistem penunjang keputusan dengan menggunakan metode AHP dalam seleksi produk,” *Jurnal Teknologi dan Informasi Bisnis*, vol. 3, no. 1, pp. 167–174, 2021.

[13] G. Galih, W. Wandi, and H. Herlambang, “Edusaintek: Jurnal Pendidikan, Sains dan Teknologi,” *Edusaintek: Jurnal Pendidikan, Sains dan Teknologi*, vol. 11, no. 1, pp. 367–378, 2024.

[14] Sajaratud Dur, Fibri Rakhmawati, and Jumianti Ritonga, “Sistem Pendukung Keputusan Penerrima Bantuan Zakat untuk Anak Yatim Menggunakan FMADM dengan Metode AHP,” *SATIN - Sains dan Teknol. Inf.*, vol. 8, no. 2, pp. 183–197, 2022, doi: 10.33372/stn.v8i2.882.

[15] I. R. Mukhlis *et al.*, “Penerapan Metode Weighted Product dalam Sistem Pendukung Keputusan Program Penerimaan Bantuan Beras,” *J. Ilmu Komput. dan Desain Komun. Vis.*, vol. 9, no. 2, pp. 476–490, 2024.

[16] Z. Sengaji and Y. Kurniawan, “Perancangan Sistem Pendukung Keputusan Penilaian Kinerja Karyawan Menggunakan Metode Topsis Pada PT. Media Pariwara Indonesia,” *OKTAL J. Ilmu Komput. dan Sains*, vol. 1, no. 06, pp. 677–686, 2022.

[17] M. S. Nono, C. Vladimir Juino Jago Uko, R. P. Kolihar, S. G. Rafael, Y. B. Henakin, and Y. Kaesmetan, “Sistem Pendukung Keputusan Pemilihan Siswa Berprestasi dengan Metode PROMETHEE,” *Jav. J. Vokasi Inform.*, pp. 155–159, 2024, doi: 10.24036/javit.v3i3.162.

[18] Rohman, “Penentuan Karyawan Terbaik Menggunakan Metode Moora pada Swalayan M di Kota Tegal,” vol. 6, no. 1, pp. 36–41, 2024.

[19] F. Wajdi *et al.*, *Metode Penelitian Kuantitatif*, vol. 7, no. 2. 2024.

[20] M. Kharisma, A. Miharja, M. Riyadhi, A. Fikri, and E. Tarigan, “Pengembangan Aplikasi Berbasis Dekstop Penjualan Rumah dengan Metode Waterfall,” *J. Inform. Univ. Pamulang*, vol. 7, no. 1, pp. 190–194, 2022.

[21] Dendi, “Perbandingan metode SAW , WP dan TOPSIS untuk,” vol. 1, no. 2, pp. 57–64, 2022.

[22] R. F. Ramadhan and R. Mukhaiyar, “Penggunaan Database Mysql dengan Interface PhpMyAdmin sebagai Pengontrolan Smarthome Berbasis Raspberry Pi,” *JTEIN J. Tek. Elektro Indones.*, vol. 1, no. 2, pp. 129–134, 2020.

[23] Kevin and Muhammad Rizky Tri Harsito, “Penerapan algoritma FMADM dengan metode MOORA untuk menentukan kelayakan beasiswa pada SMK Muhammadiyah 1 Palembang,” *Indones. J. Data Sci.*, vol. 2, no. 3, pp. 117–132, 2021, doi: 10.56705/ijodas.v2i3.55.

[24] Y. Maratullatifah, C. E. Widodo, K. Adi, and P. Korespondensi, “Perbandingan Metode Simple Additive Weighting Dan Analytic Hierarchy Process Untuk Pemilihan Supplier Pada Restoran Comparison of Simple Additive Weighting and Analytic Hierarchy Process Methods for Supplier Selection At Restaurant,” *J. Teknol. Inf. dan Ilmu Komput.*, vol. 9, no. 1, pp. 121–128, 2022, doi: 10.25126/jtiik.202294428.

[25] S. S. Yani and A. H. Hasugian, “Sistem Pengambilan Keputusan terhadap Kinerja Karyawan Berdasarkan Usia Menggunakan Metode AHP dan MOORA di Lonsum Perkebunan Pulo Rambung Estate Divisi IV,” *J. Teknol. Sist. Inf. dan Apl. Penerbit*, vol. 6, no. 4, pp. 765–774, 2023, doi: 10.32493/jtsi.v6i3.34361.

[26] S. Ramayana, S. D. Idris, Rusdiansyah, and K. F. Madjid, “Pertumbuhan Dan Hasil Tanaman Jagung (zea mays l.) Terhadap Pemberian Beberapa Komposisi Pupuk Majemuk Pada Lahan Pasca Tambang Batubara,”, 2021.

[27] S. Nazilah, N. Zaenab, T. Informatika, F. Teknik, and U. Suryakancana, “Sistem Pendukung Keputusan Pemilihan Bibit Jagung Terbaik Menggunakan Metode Analytic Hierarchy Process (AHP) (Studi Kasus : Balai Pelatihan Tanaman Pangan Dan,” vol. 7, no. 1, pp. 36–45, 2023.

[28] I. Aldiansyah, “implementasi metode fmadm dengan kolaborasi algoritma ahp dan saw untuk menentukan karangan bunga terlaris (studi kasus : cv. usaha sahabat),” 2022.

[29] H. Gani, M. I. Abas, I. Ibrahim, A. Lasarudin, and Y. Yunus, “Penerapan Metode Analytic Hierarchy Process (AHP) dalam Pengambilan Keputusan Perekrutan Tenaga Kesehatan,” *KLIKKajian Ilm. Inform. dan J.*, vol. 3, no. 6, pp. 1121–1128, 2023, doi: 10.30865/klik.v3i6.935.

[30] A. Jannatul Rahmah and V. Zahrotun Kamila, “Metode AHP-TOPSIS Pada Perancangan Sistem Pendukung Keputusan Penentuan Mata Kuliah Pilihan,” *49 Jurti*, vol. 8, no. 1, pp. 2579–8790, 2024.

[31] N. Puspitasari, W. Kurniati, and H. R. Hatta, “Comparison of FMADM TOPSIS and FMADM WP in determining recipients of the Family Hope Program (PKH) assistance,” *Jurnal Teknologi Informasi*, vol. 9, no. 4, pp. 1506–1512, 2025.