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Decision Support System For Seed Aid Recipients Using The Combined Compromise Solution Method (Case Study: Among Tani Farmer Group)

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ABSTRACT

The distribution of seed assistance in the Among Tani Farmer Group, Magetan, has traditionally relied on manual assessment and subjective judgment, increasing the risk of inconsistent recipient selection. This study develops a web-based Decision Support System (DSS) that applies the Combined Compromise Solution (CoCoSo) method to prioritize 148 farmer candidates based on five evaluation criteria: economic condition, cultivated land area, land readiness, previous aid history, and land tenure status. Primary data were collected through interviews and field observations, then converted into standardized 1–5 ratings using predefined assessment rules established with the farmer group administrators before being processed through the CoCoSo algorithm. The system was implemented using Laravel 12 and MySQL to provide transparent and traceable ranking results. The proposed system generated a complete ranking of all candidates, supporting the prioritization of 100 farmers according to the available assistance quota, while the remaining 48 farmers were categorized as requiring further consideration. Computational verification against an independent Microsoft Excel implementation produced identical Ki values for all 148 alternatives, confirming the correctness of the CoCoSo implementation. Functional testing across 72 black-box test scenarios indicated that all system features operated as intended. In addition, a comparative analysis with the Simple Additive Weighting (SAW) method revealed notable differences in ranking outcomes, particularly among highly ranked alternatives, demonstrating the distinct aggregation characteristics of the CoCoSo method.

1. INTRODUCTION

The agricultural sector plays a crucial role in the Indonesian economy, contributing to the national Gross Domestic Product (GDP) and providing livelihoods for the majority of the population [1]. Agriculture is also a key sector in maintaining food security, as a significant portion of food needs depends on agricultural production [2]. To strengthen food availability, the Indonesian government routinely distributes seed assistance to farmer groups as part of its strategy to improve agricultural productivity and support national food security [3]. The use of superior seeds has been shown to significantly increase crop yields and constitutes an important component in achieving sustainable agricultural production [4]. However, the availability of seed assistance remains limited in many regions, requiring an objective mechanism to prioritize eligible recipients.

The Among Tani Farmer Group is a member of the Tawang Maju Farmer Group Association (Gapoktan) located in Tawanganom Village, Magetan District, Magetan Regency. The selection of seed assistance recipients within this farmer group is currently conducted manually based on discussions among administrators. Although this approach reflects local knowledge, the absence of standardized assessment procedures may lead to inconsistent decisions and reduce the transparency of the selection process. Since seed assistance is distributed only once each year with a quota of 100 recipients from 148 registered members, a systematic and criteria-based prioritization mechanism is required to support fair and accountable decision-making.

Decision Support Systems (DSS) have been widely applied to improve decision-making processes by providing systematic, transparent, and data-driven evaluation mechanisms [5]. Within DSS, Multi-Criteria Decision Making (MCDM) methods enable multiple assessment criteria to be evaluated simultaneously, thereby reducing reliance on subjective judgment while improving consistency in ranking alternatives [6]. Furthermore, DSS facilitates transparent documentation of every evaluation stage, allowing decision-makers to review and justify the resulting recommendations [7].

One MCDM method that can be adopted is the Combined Compromise Solution (CoCoSo), which integrates multiple compromise strategies to generate balanced rankings across multiple evaluation criteria [8]. Previous studies have demonstrated that CoCoSo provides stable and consistent ranking performance in various decision-making applications by combining additive and compromise-based aggregation mechanisms within a unified evaluation framework [9]. The method has also been successfully implemented in several practical decision support applications because of its efficient computational process and its capability to evaluate alternatives using multiple criteria simultaneously [10], [11]. Nevertheless, like other compensatory MCDM methods, CoCoSo allows strong performance on certain criteria to compensate for weaker performance on others, making the selection of evaluation criteria and their corresponding weights an important aspect of the decision-making process.

Based on these considerations, this study develops a web-based Decision Support System that applies the CoCoSo method to prioritize seed assistance recipients in the Among Tani Farmer Group. The system evaluates 148 farmer candidates using five predefined assessment criteria and provides transparent ranking results through traceable calculation stages. In addition to implementing the CoCoSo method, this study verifies the correctness of the computational implementation through comparison with independent Microsoft Excel calculations, evaluates the functional performance of the developed application using black-box testing, and compares the resulting rankings with those produced by the Simple Additive Weighting (SAW) method to illustrate the different ranking characteristics of the two approaches. Rather than claiming the universal superiority of one MCDM method over another, this study aims to demonstrate the applicability, transparency, and practical usefulness of CoCoSo in supporting agricultural seed assistance allocation.

2. LITERATURE REVIEW

2.1. Decision Support System

A Decision Support System (DSS) is an information system designed to assist decision-makers in solving semi-structured and unstructured problems by integrating data, analytical models, and decision-making techniques. DSS provides systematic support to improve the effectiveness, consistency, and transparency of the decision-making process, particularly when multiple evaluation criteria must be considered simultaneously [12]. In agricultural assistance programs, a DSS enables objective assessment of farmer eligibility based on predefined criteria, thereby reducing subjectivity and improving the accuracy of recipient selection. Consequently, DSS has been widely adopted in various domains requiring objective evaluation and prioritization of alternatives [13].

2.2. Combined Compromise Solution (CoCoSo)

The Combined Compromise Solution (CoCoSo) is a Multi-Criteria Decision Making (MCDM) method that integrates the concepts of the Simple Additive Weighting (SAW) and Exponential Weighted Product approaches to produce compromise-based ranking results [14]. Initially proposed by Yazdani et al., CoCoSo evaluates alternatives through weighted normalization followed by the aggregation of multiple appraisal strategies, allowing more balanced decision outcomes than conventional single-aggregation methods [15]. By combining additive and multiplicative evaluation mechanisms, the method minimizes bias caused by extreme criterion values while maintaining consistency in the ranking process.

Compared with several conventional MCDM methods, CoCoSo offers better flexibility in handling benefit and cost criteria simultaneously while generating stable ranking results through three compromise strategies before producing the final preference value [9]. These characteristics make CoCoSo suitable for decision support systems that require objective prioritization, including scholarship selection, supplier evaluation, medical diagnosis, and agricultural assistance allocation [14], [9].

Despite these advantages, CoCoSo remains a compensatory MCDM method, meaning that excellent performance on one criterion may compensate for weaker performance on another. Consequently, the quality of decision outcomes still depends on the appropriateness of the selected evaluation criteria and their assigned weights. Therefore, transparent determination of criteria and weighting remains essential when implementing CoCoSo in practical decision support systems.

2.3. Previous Studies

Several studies have demonstrated the effectiveness of the CoCoSo method in various decision-making applications. Yazdani et al. introduced the CoCoSo method to solve multi-criteria decision-making problems by combining multiple compromise strategies, resulting in more stable and reliable rankings than conventional approaches [15]. Subsequently, Marito et al. applied CoCoSo in franchise selection and reported that the method successfully ranked business alternatives based on multiple evaluation criteria while improving decision consistency [11]. Likewise, Sallaby et al. implemented CoCoSo in determining educational assistance recipients and concluded that the method enhanced the objectivity and transparency of the selection process [17].

In the agricultural sector, decision support systems have mostly employed alternative MCDM methods. Darnita et al. developed a web-based decision support system using the Multi-Attribute Utility Theory (MAUT) method for selecting rice seed aid recipients and demonstrated that the system effectively supported recipient classification based on predefined criteria [18]. Similarly, Hiswara et al. utilized the Simple Additive Weighting (SAW) method to determine agricultural aid recipients and reported that the developed system simplified the selection process through weighted scoring of evaluation criteria [19]. Although these studies successfully improved decision-making efficiency, the adopted methods relied on a single aggregation mechanism that may be sensitive to criterion weighting and extreme alternative values.

Based on previous studies, CoCoSo has been successfully implemented in several decision support applications; however, its application to agricultural seed aid recipient selection remains limited. Furthermore, previous agricultural studies have predominantly employed conventional MCDM methods such as MAUT and SAW, while the implementation of CoCoSo integrated into a web-based decision support system for farmer groups has received little attention. Therefore, this study develops a web-based decision support system for selecting seed aid recipients using the CoCoSo method to provide a more objective, transparent, and systematic evaluation process while improving the accuracy of ranking results.

3. RESEARCH METHODS

This research was conducted through systematic stages, including problem identification, literature review, data collection, system design, system implementation, and the application of the CoCoSo method, and system testing.

3.1. Data Collection

Primary data were collected through semi-structured interviews with the Group Leader of the Among Tani Farmer Group, Mr. Slamet Suhartono, and direct field observations to identify the characteristics of prospective seed assistance recipients. The interviews were conducted to determine the assessment criteria, understand the existing recipient selection procedure, and establish the evaluation rules applied in the decision-making process. Secondary data were obtained from administrative records maintained by the farmer group, including the list of registered members, previous seed assistance records, land ownership information, and other supporting documents. All collected data were verified by the group administrators before being used in the evaluation process. A total of 148 registered farmer members were included as decision alternatives in this study.

3.2. Assessment Criteria and Weighting

The assessment criteria were determined based on interviews with farmer group administrators. There were five criteria, each with different types of costs and benefits, along with their importance weightings, as shown in Table I.

Table 1. Assessment criteria, types, and weighting

Code	Criteria Name	Type	Weight
C1	Farmers' Economic Conditions	Cost	0,25
C2	Amount of Cultivated Land	Benefit	0,20
C3	Land Readiness for Planting	Benefit	0,20
C4	History of Assistance Receipt	Cost	0,20
C5	Land Ownership Status	Cost	0,15
	Total		1,00

The evaluation criteria and their corresponding weights were determined through structured discussions with the Group Leader and farmer group administrators based on the existing practices used in seed assistance allocation. The weighting process employed direct expert judgment, where each criterion was assigned a relative importance according to its perceived influence on recipient eligibility. The final weights represent a consensus among the administrators and were adopted as the decision policy implemented by the proposed system. Although formal weighting techniques such as the Analytic Hierarchy Process (AHP) were not employed, the objective of this study was to preserve the practical assessment policy currently applied within the farmer group while providing a more transparent and systematic evaluation process.

3.3. Combined Compromise Solution Method

The Combined Compromise Solution (CoCoSo) method was implemented through a sequence of computational stages consisting of decision matrix normalization, calculation of weighted aggregation values, generation of three compromise appraisal scores, and computation of the final preference value (Ki). Each stage was implemented exactly according to the mathematical formulation proposed in the original CoCoSo method [9], ensuring that all intermediate results could be traced and verified.

$$r_{ij} = (x_{ij} - \min x_{ij}) / (\max x_{ij} - \min x_{ij}) \quad (1)$$

$$r_{ij} = (\max x_{ij} - x_{ij}) / (\max x_{ij} - \min x_{ij}) \quad (2)$$

The second stage is to calculate the weighted sum Si and the power-weighted sum Pi for each alternative using equations (3) and (4).

$$S_i = \Sigma\, w_j \cdot r_{ij} \quad (3)$$

$$P_i = \Sigma\, (r_{ij})\text{^}w_j \quad (4)$$

The third stage is to calculate three aggregation strategies, namely Kia which is the relative contribution of the alternative to the total alternative, Kib which is the ratio to the minimum value of Si and Pi, and Kic which is a balanced compromise between the additive and multiplicative approaches with a balancing parameter λ = 0.5. All three are calculated using equations (5), (6), and (7).

$$K_{ia} = (P_i + S_i) / \Sigma\, (P_i + S_i) \quad (5)$$

$$K_{i\beta} = S_i/\min S_i + P_i/\min P_i \quad (6)$$

$$K_i^c = [\lambda S_i + (1-\lambda)P_i] / [\lambda \max(S) + (1-\lambda) \max(P)] \quad (7)$$

In this study, the balancing parameter λ was set to 0.5, following the recommendation of the original CoCoSo formulation [8]. This value provides equal importance to the additive and multiplicative aggregation components, producing a balanced compromise score for each alternative. The final step is to calculate the final aggregate value of Ki by combining the arithmetic mean and geometric mean of the three components using equation (8). The alternative with the highest Ki value is ranked first.

$$K_i = \tfrac{1}{3}(K_{ia} + K_{i\beta} + K_i^c) + \sqrt[3]{(K_{ia} \cdot K_{i\beta} \cdot K_i^c)} \quad (8)$$

The resulting Ki value represents the final preference score for each alternative. Alternatives were ranked in descending order according to their Ki values, where a higher score indicates higher priority for receiving seed assistance. Since the ranking is entirely determined by the predefined criteria, criterion weights, and the CoCoSo aggregation mechanism, identical criterion values will produce identical preference scores.

3.4. System Design and Implementation

The system was developed using the PHP programming language with the Laravel 12 framework and a MySQL database, following the Model-View-Controller (MVC) architectural pattern. The system has two user roles: Admin and Group Leader. The Admin is responsible for managing criteria and weight data, assessment periods, farmer data, alternative values, running CoCoSo calculations, and managing users. The Group Leader has access to view ranking results and download reports for decision-making. The system's business process flow is shown in Figure 1.

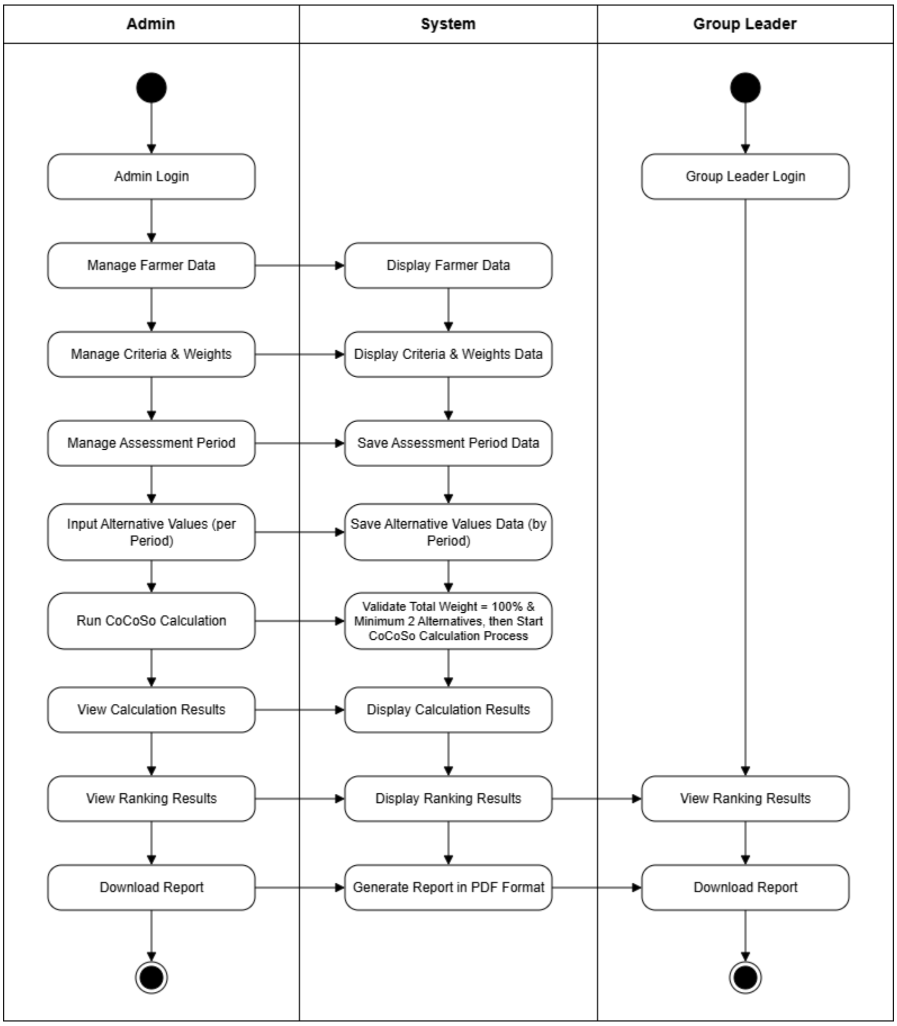

Figure 1. System Business Process

The CoCoSo calculation is implemented in a separate service class, separating the calculation logic from the controller layer. The results of each calculation stage, from the normalization value to the final Ki score, are stored in a database for retrieval.

3.5. System Testing

Testing was conducted using two approaches. First, functional testing (black box testing) was conducted by providing various inputs into the system and observing the resulting output without paying attention to the internal structure of the source code [16]. The testing involved the Admin and Group Leader as the main users. Second, computational verification was performed by comparing the Ki values generated by the system with those obtained from an independent Microsoft Excel implementation using the same dataset, criteria, weights, and mathematical equations. This verification was intended to confirm the correctness of the software implementation of the CoCoSo algorithm rather than to evaluate the validity of the decision outcomes themselves. The level of computational consistency was calculated using Equation (9).

$$Accuracy = (\Sigma\ correct\ data / \Sigma\ test\ data) \times 100\% \tag{9}$$

4. RESULT AND DISCUSSION

4.1. System Implementation

The decision support system was successfully implemented as a web-based application. The interface was built using the Blade template engine, with a workflow that follows the assessment stages: establishing criteria and weights, creating an assessment period, entering farmer data and alternative values, running calculations, and displaying the ranking results and reports.

The CoCoSo calculation page displays all stages sequentially, starting with the decision matrix, normalization matrix, Si and Pi values, Kia, Kib, Kic, and the final Ki score, allowing administrators to trace the origin of each farmer's score. The page layout is shown in Figure 2.

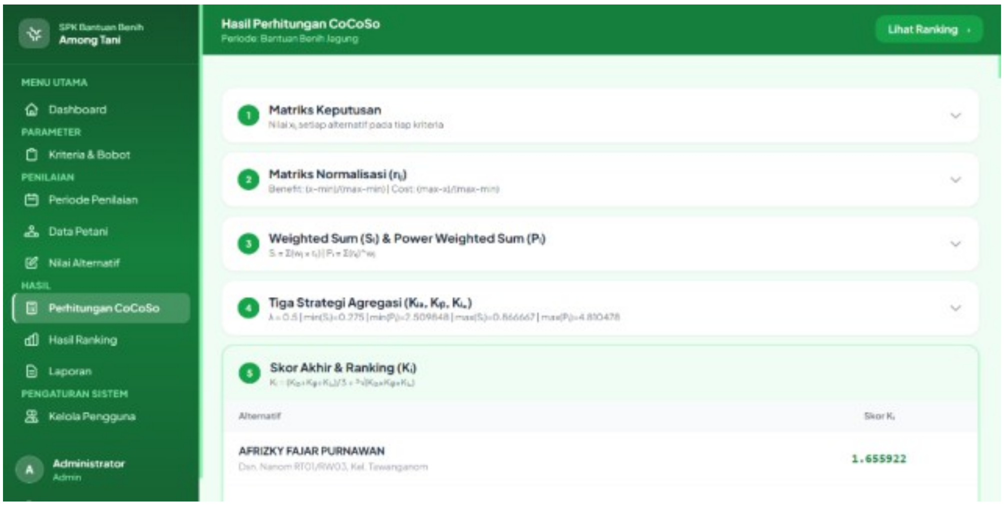

Figure 2. CoCoSo Calculation Page View

The ranking results page displays a list of farmers sorted by Ki value from highest to lowest, along with their acceptance status. The ranking results page is shown in Figure 3.

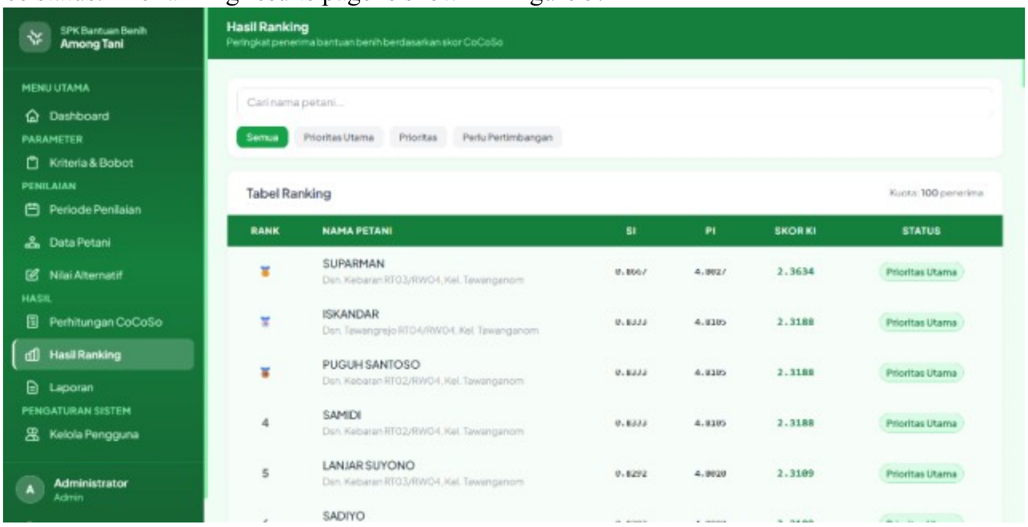

Figure 3. Ranking Results Page View

4.2. Implementation of the CoCoSo Method

The CoCoSo calculation was applied to all 148 farmer alternatives with five criteria. The first stage was to create a decision matrix containing each farmer's score on each criterion after converting it to a 1–5 rating scale. From all the data, the minimum and maximum scores for each criterion were obtained as follows: C1 (1–5), C2 (2–5), C3 (2–5), C4 (2–5), and C5 (1–5). The decision matrix values for the ten top-ranked alternatives are shown in Table 2.

Table 2. Top Ten Alternative Decision Matrix

Alternative Name	C1	C2	C3	C4	C5
Suparman	1	5	3	2	1
Iskandar	2	5	4	2	2
Puguh Santoso	2	5	4	2	2
Samidi	2	5	4	2	2
Lanjar Suyono	1	4	4	2	2
Sadiyo	1	5	4	3	2
Sukardi	1	4	4	2	2
Supar	1	5	4	3	2
Samsuji	1	5	3	2	2
Sudarsono	1	5	3	2	2

The second stage is normalization using equations (1) and (2). Criteria C1, C4, and C5 are normalized inversely because they are of the cost type, while C2 and C3 are normalized in the same direction because they are of the benefit type. The normalization results are presented in Table 3.

Tabel 3. Normalization Matrix Of Top Ten Alternatives

Alternative Name	C1	C2	C3	C4	C5
Suparman	1,0000	1,0000	0,3333	1,0000	1,0000
Iskandar	0,7500	1,0000	0,6667	1,0000	0,7500
Puguh Santoso	0,7500	1,0000	0,6667	1,0000	0,7500
Samidi	0,7500	1,0000	0,6667	1,0000	0,7500
Lanjar Suyono	1,0000	0,6667	0,6667	1,0000	0,7500
Sadiyo	1,0000	1,0000	0,6667	0,6667	0,7500
Sukardi	1,0000	0,6667	0,6667	1,0000	0,7500
Supar	1,0000	1,0000	0,6667	0,6667	0,7500
Samsuji	1,0000	1,0000	0,3333	1,0000	0,7500
Sudarsono	1,0000	1,0000	0,3333	1,0000	0,7500

The third step is to calculate the weighted sum of Si and the weighted sum of Pi using equations (3) and (4). The calculation results, along with the combined value (Si + Pi), are presented in Table 4. Of the 148 alternatives, the obtained values are min(Si) = 0.275000, min(Pi) = 2.509848, max(Si) = 0.866667, max(Pi) = 4.810478, and the total Σ(Si + Pi) is 732.588261.

Tabel 4. Si And Pi Values Top Ten Alternatives

Alternative Name	S_i	P_i	$S_i + P_i$
Suparman	0,866667	4,802742	5,669408
Iskandar	0,833333	4,810478	5,643812
Puguh Santoso	0,833333	4,810478	5,643812
Samidi	0,833333	4,810478	5,643812
Lanjar Suyono	0,829167	4,801981	5,631148
Sadiyo	0,829167	4,801981	5,631148
Sukardi	0,829167	4,801981	5,631148
Supar	0,829167	4,801981	5,631148
Samsuji	0,829167	4,760507	5,589674
Sudarsono	0,829167	4,760507	5,589674

The fourth stage is to calculate the three aggregation strategies Kia, Kib, and Kic through equations (5), (6), and (7) with the balancing parameter λ = 0.5. The results of the calculations for the three components are presented in Table 5.

Tabel 5. Kia, Kib, And Kic Values Top Ten Alternatives

Alternative Name	K_{ia}	K_{iB}	K_i^c
Suparman	0,007739	5,065074	0,998637
Iskandar	0,007704	4,946944	0,994129
Puguh Santoso	0,007704	4,946944	0,994129
Samidi	0,007704	4,946944	0,994129
Lanjar Suyono	0,007687	4,928407	0,991898
Sadiyo	0,007687	4,928407	0,991898
Sukardi	0,007687	4,928407	0,991898
Supar	0,007687	4,928407	0,991898
Samsuji	0,007630	4,911882	0,984592
Sudarsono	0,007630	4,911882	0,984592

The final stage is to calculate the final aggregate score Ki using equation (8), which then becomes the basis for the ranking. The final results of the calculation for the top ten rankings along with their acceptance status are presented in Table 6.

Tabel 6. Top Ten Ranking Results Of CoCoSo Calculation

Rank	Alternative Name	K_i	Status
1	Suparman	2,363356	top priority
2	Iskandar	2,318790	top priority
3	Puguh Santoso	2,318790	top priority
4	Samidi	2,318790	top priority
5	Lanjar Suyono	2,310940	top priority
6	Sadiyo	2,310940	top priority
7	Sukardi	2,310940	top priority
8	Supar	2,310940	top priority
9	Samsuji	2,300958	top priority
10	Sudarsono	2,300958	top priority

Suparman's alternative ranked first with the highest Ki score of 2.363356. This farmer achieved the maximum normalized scores for four of the five criteria: the weakest economic condition (C1 = 1), the largest cultivated land area (C2 = 5), having not received assistance in the last three periods (C4 = 2), and the least stable land tenure status (C5 = 1), although his land readiness was only moderate (C3 = 3). This combination resulted in the highest Si score among all alternatives, at 0.866667.

Several alternatives achieved identical Ki scores, for example, Iskandar, Puguh Santoso, and Samidi, which all scored 2.318790. This occurred because all three had exactly the same pattern of criterion values, resulting in identical normalized Si, Pi, and all aggregate components. This condition is normal for data with a discrete assessment scale and indicates that CoCoSo is deterministic regarding the same pattern of criterion values.

The occurrence of identical Ki values also indicates that the CoCoSo method consistently produces the same preference score for alternatives with identical criterion patterns. In practical implementation, if identical scores occur around the administrative selection threshold, the final decision should follow a predefined tie-breaking policy established by the farmer group administrators to ensure fairness and consistency. The proposed system therefore serves as a transparent decision support tool, while the final administrative decision remains under the authority of the farmer group management.

Based on an aid quota of 100 recipients, the system classifies the top 100 farmers as Top Priority, while the remaining 48 farmers are classified as Needing Consideration. This classification serves as the basis for recommendations to farmer group administrators and provides a traceable priority order should quota adjustments occur in the next period. Because the classification into the Top Priority and Requires Consideration categories follows the administrative quota of 100 recipients rather than a mathematical threshold, the Ki values around the cutoff point should be interpreted carefully. Farmers located near the boundary may have very similar preference scores, indicating comparable eligibility. Therefore, the ranking should be regarded as a decision support recommendation that assists administrators in allocating limited resources rather than as an absolute classification.

4.3. Computational Verification

Computational verification was conducted by comparing the Ki values generated by the developed system with those obtained from an independent Microsoft Excel implementation using the same dataset, criteria, weights, and mathematical equations. The objective of this verification was to confirm that the implemented software correctly reproduced the CoCoSo computational procedure.

No	Nama Petani	Ki
1	Afrizky Fajar Purnawan	1.655922
2	Agus Supriyanto	2.189299
3	Agus Trianto	1.958672
4	Agus Widodo	1.348129
5	Aldi Alamsah	2.026174

Figure 4. CoCoSo Calculation Results with Microsoft Excel

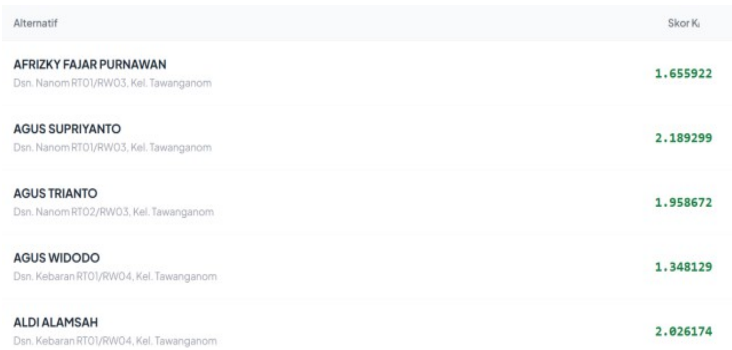

Figure 5. CoCoSo Calculation Results on the System

The comparison demonstrated that all Ki values produced by the system were identical to those obtained from the independent Microsoft Excel implementation, resulting in complete computational consistency (148/148). These results confirm the correctness of the software implementation of the CoCoSo algorithm. However, this verification evaluates the accuracy of the computational implementation rather than the validity of the ranking outcomes themselves.

4.4. Black Box Testing

Functional testing was conducted on 14 features across two user roles, with a total of 72 test scenarios. A summary of the test results is presented in Table 7.

Tabel 7. Summary Of Black Box Testing Results

No	Fitur	Role	Scenario	Succeed
1	Login	Admin	5	5
2	Manage Criteria and Weights	Admin	8	8
3	Manage Assessment Period	Admin	7	7
4	Manage Farmer Data	Admin	8	8
5	Alternative Values	Admin	7	7
6	CoCoSo Calculation	Admin	4	4
7	Ranking Results	Admin	5	5
8	Reports	Admin	3	3
9	Manage Users	Admin	8	8
10	Profile	Admin	6	6
11	Login	Ketua	4	4
12	Ranking Results	Ketua	3	3
13	Report	Ketua	2	2
14	Profile	Ketua	2	2
	Total		72	72

All 72 test scenarios were found valid, covering input validation, error handling, inter-role access restrictions, and system output conformity. The tests also included intentionally invalid input, and in all cases, the system rejected the process and displayed an appropriate error message. The successful execution of all functional scenarios indicates that the developed application satisfies the specified functional requirements and is capable of supporting the complete evaluation workflow, from data management to recommendation generation.

4.5. Comparison with Conventional Process

A comparison between the conventional selection process and the CoCoSo SPK system is presented in Table 8.

Tabel 8. Comparison Of Conventional And System Processes

Aspects	Conventional Process	CoCoSo DSS System
Basis for Decision	Subjective assessment by management	Combination of 5 mathematically weighted criteria
Consistency	Not guaranteed	Consistent for the same data and weights
Transparency	Not documented	Each calculation stage is traceable
Efficiency	Long time for 148 farmers	Automated by the system
Possibility of Bias	High	Low

To examine the practical relevance of the generated recommendations, the ranking results were discussed with the Group Leader of the Among Tani Farmer Group. According to the Group Leader, the farmers identified in the Top Priority category generally corresponded to those considered eligible for seed assistance based on field experience. This evaluation provides preliminary face validity by indicating that the generated rankings are consistent with practical observations. Nevertheless, because the assessment was conducted by the same stakeholder involved in the existing selection process, broader validation involving independent evaluators or historical allocation outcomes would further strengthen the evidence regarding the practical validity of the proposed approach.

4.6. Comparison with the SAW Method

To test the consistency of the decision results, a ranking comparison was conducted between the CoCoSo and Simple Additive Weighting (SAW) methods on 148 alternatives with identical data, criteria, and weights. SAW was chosen as a comparison because it is the most commonly used MCDM method in research on determining aid recipients, so that differences in results with SAW can illustrate the unique characteristics of CoCoSo. The analysis was carried out by measuring overlap, namely the similarity of members, in the Top-10, Top-20, and Bottom-10 groups of both methods, so that it can be seen in which parts of the ranking the two methods agree and in which parts they differ significantly. The comparison results are presented in Table 9.

Tabel 9. Comparison Results Of CoCoSo and SAW

Metrics	Score
Number of alternatives compared	148
Overlap Top-10	5 out of 10 (50%)
Overlap Top-20	9 out of 20 (45%)
Overlap Bottom-10	8 out of 10 (80%)
Largest rank shift	Rank 137 (CoCoSo) → rank 31 (SAW), a difference of 106 positions

The high similarity level in the Bottom-10 group (80%) indicates that both methods agree in identifying the lowest-performing alternative. Conversely, the similarity in the Top-10, which is only 50%, and the discovery of extreme ranking shifts of up to 106 positions, indicate that the choice of method can produce significantly different final results at the top of the ranking.

This difference can be explained by the calculation mechanisms of the two methods. SAW calculates the final score purely through a weighted linear sum, so the result is highly proportional to the criterion weight, which in this study was dominated by C1 with a weight of 0.25. Meanwhile, CoCoSo combines three aggregation strategies with a balancing parameter λ, so the final score is non-linear and takes into account the alternative's relative position relative to all other alternatives. As a result, an alternative that excels on a single, heavily weighted criterion can jump sharply in SAW, but not as drastically in CoCoSo because this method considers trade-offs between alternatives more complexly.

5. CONCLUSION

This study successfully developed a web-based Decision Support System (DSS) for prioritizing agricultural seed assistance recipients in the Among Tani Farmer Group using the Combined Compromise Solution (CoCoSo) method. The proposed system evaluates 148 farmer candidates based on five predefined assessment criteria and provides transparent ranking results through traceable computational stages, thereby supporting a more systematic and accountable decision-making process compared with the previous manual approach.

Computational verification demonstrated complete consistency between the system-generated Ki values and those obtained from an independent Microsoft Excel implementation for all 148 alternatives, confirming the correctness of the implemented CoCoSo algorithm. In addition, functional evaluation through 72 black-box testing scenarios showed that all system features operated according to the specified requirements. The comparison with the SAW method further demonstrated that different MCDM methods may produce substantially different ranking outcomes despite using identical datasets, criteria, and weights, highlighting the importance of selecting an appropriate decision-making approach for the intended application.

Nevertheless, this study has several limitations. The weighting scheme was established based on expert judgment from the farmer group administrators, and the practical validation of the ranking results was limited to contextual evaluation by the Group Leader. Therefore, the findings should be interpreted as decision support recommendations rather than absolute decision outcomes.

Future studies are encouraged to perform sensitivity analysis on criterion weights, investigate alternative tie-breaking strategies for alternatives with identical preference scores, incorporate additional socio-economic criteria relevant to agricultural assistance programs, and validate the generated rankings using independent experts or historical aid allocation outcomes to further strengthen the robustness and practical applicability of the proposed system.

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REFERENCES

[2] N. Jam'iyyah, M. Fakhriza, and M. D. Irawan, "Penerapan metode AHP dan MFEP dalam menentukan penerima bantuan benih padi," Jurnal Ilmiah Sistem Informasi, vol. 4, no. 2, pp. 128–135, 2025.

[3] S. Hermawan, Y. Nuryanto, and A. Taryana, "Efektivitas program ketahanan pangan berupa bantuan pemberian bibit tanaman padi," JANE: Jurnal Administrasi Negara, vol. 17, no. 1, pp. 72–81, 2025.

[4] A. Qadir et al., "Commercial rice seed production and distribution in Indonesia," Heliyon, vol. 10, no. 3, 2024.

[5] M. J. Barons, L. E. Walsh, E. E. Salakpi, and L. Nichols, "A decision support system for sustainable agriculture and food loss reduction under uncertain agricultural policy frameworks," Agriculture, vol. 14, no. 3, 2024.

[6] M. I. Gunawan, J. W. Sitopu, and G. Sechan, "Optimizing crop selection: a multi-criteria decision support system for sustainable agriculture," Int. J. Enterprise Modelling, vol. 18, no. 3, pp. 113–123, 2024.

[7] I. A. Rahman, "Tren pengembangan sistem pendukung keputusan metode Simple Additive Weighting: systematic literature review," Jurnal Teknologi dan Sistem Informasi Bisnis, vol. 7, no. 1, pp. 29–35, 2025.

[8] M. Yazdani, P. Zarate, E. K. Zavadskas, and Z. Turskis, "A combined compromise solution (CoCoSo) method for multi-criteria decision-making problems," Management Decision, vol. 57, no. 9, pp. 2501–2519, 2019.
[9] R. G. Rasoanaivo, M. Yazdani, P. Zaraté, and A. Fateh, "Combined compromise for ideal solution (CoCoFISo): a multi-criteria decision-making based on the CoCoSo method algorithm," Expert Systems with Applications, 2024.
[10] E. Winarno and T. D. Cahyono, "Penerapan metode CoCoSo dan TOPSIS untuk pemilihan lokasi pembangunan perumahan Kota Semarang," Bulletin of Information Technology, vol. 5, no. 4, pp. 222–232, 2024.
[11] J. Marito, W. Nainggolan, and G. Mahendra, "Penerapan metode Combined Compromise Solution (CoCoSo) dalam pemilihan franchise minuman," Jurnal Teknologi Terpadu, vol. 10, no. 1, pp. 32–39, 2024.
[12] Hutahaean, J., Nugroho, F., Kraugusteeliana, D., & Aini, Q. (2023). Full Book Sistem Pendukung Keputusan (Mesran & D. Siregar, Ed.). Yayasan Kita Menulis.
[13] Rahmansyah, N., & Lusinia, S. (2021). Buku Ajar SISTEM PENDUKUNG KEPUTUSAN (N. Rahmansyah & S. Lusinia, Ed.). Pustaka Galeri Mandiri. http://jurnal.pustakagalerimandiri.co.id
[14] Karami, S., Mousavi, S. M., & Antucheviciene, J. (2023). Enhancing Contractor Selection Process by a New Interval-Valued Fuzzy Decision-Making Model Based on SWARA and CoCoSo Methods. Axioms, 12(8). https://doi.org/10.3390/axioms12080729
[15] Gou, C. (2022). An Integrated CoCoSo-CRITIC-Based Decision- Making Framework for Quality Evaluation of Innovation and Entrepreneurship Education in Vocational Colleges with Intuitionistic Fuzzy Information. Mathematical Problems in Engineering, 2022, 1–7. https://doi.org/10.1155/2022/6071276
[16] D. Azizah et al., "Analysis and testing of the Combox web application system using black box testing with the equivalence partitioning method," Int. J. Electrical Engineering, Mathematics and Computer Science, vol. 1, no. 4, pp. 37–43, 2024.
[17] A. F. Sallaby, I. Kanedi, V. N. Sari, R. T. Alinse, and R. Supardi, "Penentuan penerima bantuan dengan program miskin berprestasi menggunakan metode Combined Compromise Solution (CoCoSo)," Journal of Computer System and Informatics, vol. 5, no. 3, pp. 615–625, 2024.
[18] Darnita, Y., Nugroho Pratama, B., Hendri Wibowo, S., Muhammadiyah Bengkulu, U., & Korespondensi, I. (2022). Sistem Pendukung Keputusan Pemilihan Penerima Bantuan Bibit Padi Menggunakan Metode Multi Attribute Utility Theory (Maut) Pada Desa Lubuk Sirih Ilir. Journal Innovation Informatics(JII), 1(2), 85–92.
[19] Hiswara A, Warta J, Hartanti D, & Hanafi A. (2022). Sistem Pendukung Keputusan Distribusi Bantuan Pertanian Menggunakan Simple Additive Weighting (Saw) Berbasis Web. Sentri: Jurnal Riset Ilmiah, 1(1), 164–178. ejournal.nusantaraglobal.ac.id/index.php/sentri

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