Decision Support System to Determine Eligibility to get Social Assistance Using the Simple Additive Weighting Method

Tonni Limbong[a)], Elpiana Putri Br. Ginting, Andy Paul Harianja, Sorang Pakpahan

Faculty of Computer Science, Universitas Katolik Santo Thomas, Medan, Indonesia

[a)]Corresponding author: tonni.budidarma@gmail.com

Abstract. The social welfare of the community is the main goal of the government to build a better country, therefore the government makes social assistance programs in the form of money and basic necessities to the community. In carrying out the program, the government hopes that the program carried out is right on target without any elements of fraud committed by government officials in carrying out their duties. In determining the eligibility for social assistance, an assessment in the form of supporting files is required in accordance with government regulations and criteria set by the Selakkar Village government, Munte District, Karo Regency. Determining the eligibility of recipients of social assistance is one of the problems that is a serious concern of the village government. Therefore we need a decision support system for receiving social assistance in Selakkar Village that is able to assist village officials in determining who deserves social assistance. Support systems aim to enable decision makers to do a lot of computing quickly at low cost. The decision support system method used in determining the eligibility for social assistance is the Simple Additive Weighting (SAW) method. Where the results of this decision support system are in the form of a weighted summation or ranking of potential recipients of social assistance in accordance with the final value of the results obtained. With the establishment of a decision support system for recipients of social assistance, it is hoped that the Selakkar village government will be able to make it easier to determine who is eligible to receive social assistance.

Keywords: Decision Support System, Simple Additive Weighting, Social Assistance

INTRODUCTION

Poverty is a very complex problem, both in terms of causes and impacts. In terms of causes, poverty can be caused by internal factors and external factors. Internal factors include the condition of the individual concerned, family or community in terms of low education and income.

The poor are people who have absolutely no source of livelihood and/or have a source of livelihood but do not have the ability to meet basic needs that are adequate for the life of himself and/or his family. Handling the poor is a directed, integrated, and sustainable effort carried out by the Government, regional government, and/or the community in the form of policies, programs and activities for empowerment, mentoring, and facilitation to meet the basic needs of every citizen [1].

Social assistance is a form of assistance provided by the local government to community groups, the form of assistance can be in the form of money or goods, selectively with the aim of protecting from all possibilities that can cause social risks.[2]. To overcome economic disparities, the Indonesian government has made a policy of providing social assistance (bansos) for the Indonesian population. The social assistance program for the Indonesian people consists of Program Indonesia Pintar (PIP), Jaminan Kesehatan Nasional (JKN-KIS), Program Keluarga Harapan (PKH), and Rastra Social Assistance/Non-Cash Food Assistance. The social assistance program is the government's commitment to accelerate poverty reduction.

A decision support system is an interactive information system that provides information, modeling and manipulating data [3], [4]. The system is used to assist decision-making in semi-structured situations and unstructured situations, where no one knows for sure how decisions should be made that can be used in determining eligibility for Social Assistance.

To make a design and implement it as a decision support system for determining beneficiaries. The results of this study are expected to be useful for decision makers to determine beneficiaries [5], [6]. Several central government programs in poverty alleviation have been carried out, including through the hopeful family program, but the prospective recipients of assistance have not been as expected and mistargeted, the cause is that the determination of appropriateness is not optimal [7], [8]. The results of the assessment that will be carried out by the given decision support system is the feasibility status, namely feasible and not feasible.

With the Social Assistance program, it is a way to help underprivileged people to continue to meet their needs and improve the welfare of the underprivileged. The effectiveness of the provision of Social Assistance needs to be reviewed that so far many people have not been eligible to receive assistance but have received it. Selakkar Village, Munte District, Karo Regency has a population of 354 out of 104 families. Social assistance recipients are households in the lowest 10-20% (poor) group who are entitled to receive government programs.

In determining the feasibility of obtaining social assistance, an assessment in the form of supporting files is required in accordance with government regulations. The criteria for the community who are entitled to receive social assistance eligibility are the prospective recipients must be registered in the RT/RW of Selakkar Village, income below Rp. 3,500,000, not classified as official or civil servants, have a simple house, do not have tiled floors and have child dependents [9].

The system is a collection of interrelated elements that are responsible for processing input (input) so as to produce output (output). There are two decision-making models, namely the closed system model and the open system model. The closed system model is based on the assumption that decisions can be made without interference from the (outside) system environment, because the decision-making system is not influenced by the environment [10], [11]. In this case the decision-making system is considered:

1. Knowing all alternative actions to respond to problems with all their consequences.
2. Have a method to arrange alternatives according to their priorities.
3. Can choose/set the most profitable alternative, for example in terms of profit, benefits, and others.

An open system is based on the assumption that decision-making systems and the environment have a relationship of mutual influence. Decisions taken will have an impact on the environment and vice versa the environment also affects the decision-making system. In this case, the decision-making system is considered:

1. Only know some of the alternatives to deal with the problem with all its consequences.
2. Can only present a number of good alternatives to deal with problems, but cannot choose / establish the most profitable alternatives.
3. Just allow the selection of the best alternative to be done by parties outside the system in accordance with their aspirations.

The objectives of the decision support system include: [4], [12]:

1. Assist managers in decision making over semi-structured issues.
2. Provide support at the manager's discretion and not to replace the manager's function.
3. Improve the effectiveness of decisions managers take more than improve their efficiency.
4. Computing speed. Computers allow decision makers to do a lot of computing quickly at a low cost.
5. Increased productivity. Computerized supporters can reduce the size of the group and allow its members to be in different locations (saving on travel expenses).

The Simple Additive Weighting method is a method often known as the weighted addition method. The purpose of weighted summation is to look for the weighted sum of the ratings in each alternative to all attributes or criteria. The total result obtained for an alternative is to sum all the multiplication results between the ratings compared across attributes and the weight of each attribute. The rating on each previous attribute must have gone through the normalization process. The SAW method requires the process of normalizing the x decision matrix to a scale that can be compared to existing alternative ratings. The SAW method is formulated with the following formula[3], [4], [10], [13]:

$$R_{ij} = \begin{cases} \frac{xij}{\max_i xij} & \text{If j is a lucky attribute (benefit)} \\ \frac{minxij}{xij} & \text{If j is the cost attribute (}cost\text{)} \end{cases} \quad \text{..... (1)}$$

Where:
r_{ij} = Normalized performance rating
Max_{ij} = Maximum value of each row and column
Min_{ij} = Minimum value of each row and column
Xij = Matrix rows and columns
With r_{ij} is the normalized performance rating of the Ai alternative on the cj: i. attribute. m and j = 1.2,...,n.

The preference value for each alternative (Vi) is given as [14], [15]:

$$V_i = \sum_{j=1}^{n} wjrij \quad \text{..... (2)}$$

Information:
Vi = Ranking for each alternative
Wj = Weight values of each criterion
Rij = normalized performance rating value
A greater Vi value indicates that Ai alternatives are more selected.

METHODS

Research is a step that is done in a planned and systematic way to get problem solving or get answers to certain questions. [16]–[19]. The framework in research is a collection of concepts that are systematically arranged so that the purpose of research carried out becomes good. In doing this research the steps of research can be seen in figure 1 below:

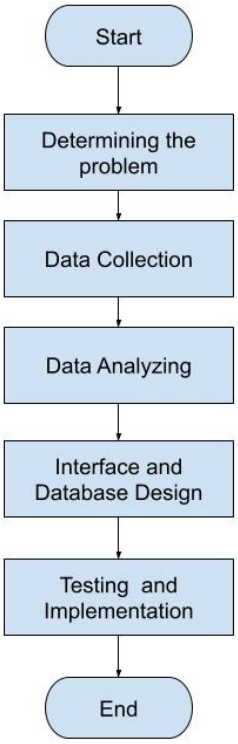

FIGURE 1. Research Framework

Researchers determine the object and location of the study then identify the problem, create formulations and limitations of the problem so that the problem studied is clear and does not deviate from the problem and determines the purpose of the study so that the study runs well. The author collects the data needed to manage the data and analyze and draft research and conduct testing and implementation

RESULTS AND DISCUSSION

Problem Analysis

Analysis is an attempt to observe in detail a thing or object by deciphering the components for further study. Research that has been done in Selakkar village, Munte Subdistrict, Karo Regency. Data obtained directly interviews and surveys conducted directly in case studies and literature studies that the author conducted to get data, then processed to get conclusions that are in accordance with the research conducted.

Based on research conducted in Selakkar village, Munte subdistrict, Karo district, found that the system that is running is less efficient, because it is not yet precisely the target of determining who really deserves social assistance. Recipients of social assistance get social assistance 3 times in one year, each year will be re-recorded and the village apparatus chooses social assistance recipients who are considered worthy of receiving assistance. The recipient of social assistance who dies will be transferred to his wife or child. Flow of Document diagram (FOD) of the current system is as follows:

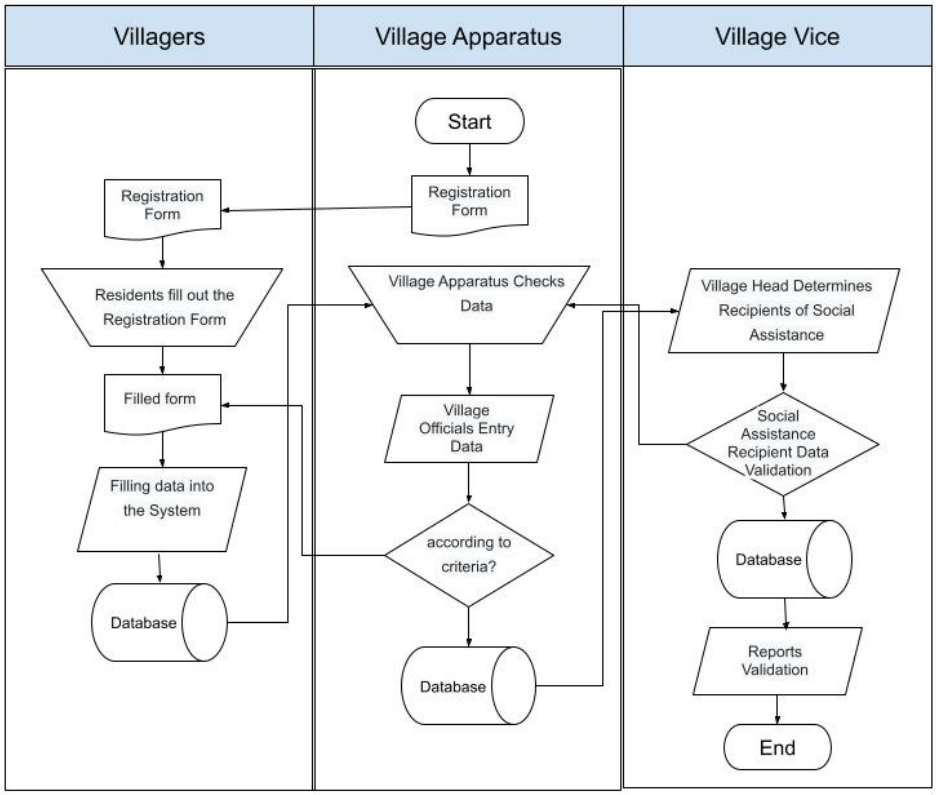

FIGURE 2. Flow of Document

The selection steps of social assistance recipients are as follows:

1. The village apparatus submits the registration form.
2. Residents fill out the registration form.
3. Village officials check the data of prospective recipients of social assistance.
4. The village apparatus provides data on prospective recipients of social assistance.
5. The village head checks the data of prospective recipients of social assistance.
6. The village head determines the recipient of social assistance.

7. Next the village chief makes a report.

The measures used in the study determining eligibility for social assistance are:

1. Determining the criteria that will be used as a reference in decision making is Ci.
2. Determine the match rating of each alternative on each criterion.
3. Build a decision matrix based on criteria (Ci), then normalize the matrix based on equations that are adjusted to the type of attribute so that the matrix is projected to normalize Ri.
4. The final result is obtained from the process of fighting, namely the sum of the multiplication of normalized matrix ri with weights so that the largest value is obtained as the best alternative as the determinant who is entitled to receive social assistance

DISCUSSION

The basic concept of the SAW method is to look for the weighted summation of the performance rating on each alternative on all attributes. The SAW method requires the process of normalizing the decision matrix (x) to a scale that can be compared to all existing alternative ratings. The conditions for getting social assistance are:

1. Registered at RT/RW Selakkar Village.
2. Income below Rp 3,500,000.
3. Not belonging to the service or Civil Service.
4. Have a simple house.
5. Does not have ceramic floors.
6. Have child dependents.

Decision making in this case the village head gives weight to each criterion in the certificate as follows:

TABLE 1. Criteria Assessment

Criteria Code	Criteria	Percent	Value
C1	Amount of Income	30%	0.3
C2	Type of work	15%	0.15
C3	Home ownership	15%	0.15
C4	the condition of the walls of the house	15%	0.15
C5	The condition of the floor of the house	15%	0.15
C6	Lots of dependents	10%	0.1

From table 1 stated the number of percent taken from the amount of income 30%, Type of work 15%, Home ownership 15%, Condition of the walls of the house 15%, Condition of the floor of the house 15%, Many dependents 10%. From the above statement set by the head of Selakkar village in the certificate No: 086/ SLK/V/ 2021. The steps to determine the final result using the Simple Additive Weighting (SAW) method must be done, among others:

1. Determining criteria
   Data used in the form of data from a number of villagers that will later be used as a determination of the eligibility of Social Assistance recipients.

TABLE 2. Criteria

Criteria	Criteria Value
Very Qualified	4
Eligible	3
Quite Worthy	2
Less Eligible	1
Very Unfit	0

From table 2 stated the Very Decent criteria are worth 4, the Decent criteria are worth 3, the Decent Enough criteria is worth 2, the less Worthy criterion is worth 1 and the Very Less Worthy criterion is worth 0. Based on the selection of criteria for the amount of income of prospective recipients of social assistance, namely as follows:

TABLE 3. Amount of Income

Amount of Income (C1)	Weight
<1.000000	4
>= 1.000000 s/d <=2.000000	3
>=2.000000 s/d<=3.000000	2
<=3.000000 s/d = 3.5000000	1
>3.500000	0

From table 3 obtained the amount of income <1.000000 worth 4, the amount of income > = 1.000000 to < = 2,000000 is worth 3, the amount of income > = 2.000000 to < = 3.000000 is worth 2, the amount of income < = 3,000000 s / d = 3.5 million worth 1 and the amount of income>35000000. Based on the collection of job values of prospective recipients of social assistance, namely as follows:

TABLE 4. Work

Work (C2)	Weight
Not Working	4
Laborer	3
Farmer	2
Self employed	1
Civil Servants	0

From table 4 obtained for the value of criteria that do not work worth 4, labor is worth 3, farmers are worth 2, self-employed are worth 1 and civil servants 0. Based on the taking of the value of home ownership of prospective recipients of social assistance, namely as follows:

TABLE 5. Home Ownership

Ownership (C3)	Weight
None	4
Hitchhike	3
Contracting	2
Inheritance	1
Own	0

From table 5. Known criterion value that no house is worth 4, hitchhiking is worth 3, contracting is worth 2, inheritance is worth 1, own property is worth 0. Based on the taking of the value of the condition of the prospective recipient's house wall, it is as follows:

TABLE 6. The condition of the walls of the house

The Condition of the House Wall (C4)	Weight
Rumbia	4
Plywood	3
Board	2
Half Concrete	1
Whole Concrete	0

From table 6 obtained the criteria value of the condition of the walls of the house made of rumbia worth 4, Plywood 3, wood worth 2, half concrete worth 1 and concrete entirely 0. Based on the taking of the value of the floor condition of the prospective recipient's house, it is as follows:

TABLE 7. Condition of the floor of the house

Condition of the floor (C5)	Weight
Soil	4
Bamboo	3
Board	2
Cement	1
Ceramics	0

From table 7 obtained the value of the criteria for the condition of the floor of the house that the ground is worth 4, bamboo is worth 3, the board is worth 2, cement is worth 1 and ceramics 0. Based on the collection of dependent values of prospective recipients' children are as follows:

TABLE 8. Many Child Dependents

Child Dependents (C6)	Weight
>4	4
3	3
2	2
1	1
0	0

From table 8 the value of the criteria for many dependents is 4 children or more worth 4, 3 children is worth 3, 2 children is worth 2, 1 child is worth 1 and has no dependents is worth 0. Villagers as an example for the application of the SAW method in assessing the feasibility of getting assistance social. Data from each population is entered into the following table:

TABLE 9. Example of village population data.

Alternative	Name	Criteria					
		C1	C2	C3	C4	C5	C6
A1	Rosita Sembiring	3	2	3	2	1	4
A2	Indunia	2	2	1	4	1	2
A3	Kasirta Kaban	1	1	0	0	1	2
A4	Cipta Sepakat Depari	1	1	0	0	0	3
A5	Febri Sitepu	2	2	1	4	1	2

From table 9, data obtained from a villager named Rosita Sembiring C1 is worth 3, C2 is worth 2, C3 is worth 3, C4 is worth 2, C5 is worth 1, C6 is worth 4. Indunia C1 is worth 2, C2 is worth 2, C3 is worth 1, C4 is worth 4, C5 is worth 1, C6 is worth 2. Kasirta Kaban C1 is worth 1, C2 is worth 1, C3 is worth 0, C4 is worth 0, C5 is worth 1, C6 is worth 2. Cipta Agrees Depari C1 is worth 1, C2 is worth 1, C3 is worth 0, C4 is worth 0, C5 is worth 0, C6 is worth 3. Febri Sitepu C1 is worth 2, C2 is worth 2, C3 is worth 1, C4 is worth 4, C5 is worth 1, C6 is worth 2.

1. Determining the Match Matrix
   From the suitability rating of each alternative on each criterion, each assessment is converted into a decision matrix X with the following data:

$$X=\begin{vmatrix} 3 & 2 & 3 & 2 & 1 & 4 \\ 2 & 2 & 1 & 4 & 1 & 2 \\ 1 & 1 & 0 & 0 & 1 & 2 \\ 1 & 1 & 0 & 0 & 0 & 3 \\ 2 & 2 & 1 & 4 & 1 & 2 \end{vmatrix}$$

2. Calculate the normalization value of each alternative
   Benefit, each element of the matrix divided by the max of the rows of the matrix. Cost, min of the column of the matrix divided by each element of the matrix.

TABLE 10. Nature of Analysis

Alternative	Criteria	Sifat
C1	Total Income	Cost
C2	Type of work	Benefit
C3	Home ownership	Benefit
C4	house wall condition	Benefit
C5	Condition of the floor of the house	Benefit
C6	Many dependents	Benefit

Then the matrix R is as follows:

$$R=\begin{vmatrix} 0{,}333 & 1 & 1 & 0{,}5 & 1 & 1 \\ 0{,}5 & 1 & 0{,}3 & 1 & 1 & 0{,}5 \\ 1 & 0{,}5 & 0 & 0 & 1 & 0{,}5 \\ 1 & 0{,}5 & 0 & 0 & 0 & 0{,}75 \\ 0{,}5 & 1 & 0{,}3 & 1 & 1 & 0{,}5 \end{vmatrix}$$

3. Giving Weight Value (W)
To determine the weight of the value of the village population is formed in the table below:

TABLE 11. Criteria Weight Value

C1, C2, C3, C4, C5			
C1	Total Income	30%	0.3
C2	Type of work	15%	0.15
C3	Home ownership	15%	0.15
C4	house wall condition	15%	0.15
C5	Condition of the floor of the house	15%	0.15
C6	Many dependents	10%	0.1

From table 11 obtained the value of weight (W) with data: W = [0.3, 0.15, 0.15, 0.15, 0.15, 0.1].

4. Search Ranking or best score
Enter any given criteria using the formula:
$V_i = \sum_{j=1}^{n} wjrij$

So the ranking is as follows:
V1= (0.3)(0.333) + (0.15)(1) + (0.15)(1) + (0.15)(0.5) + (0.15)(1) + (0.1)(1) = 0.72
V2= (0.3)(0.5) + (0.15)(1) + (0.15)(0.3) + (0.15)(1) + (0.15)(1) + (0.1)(0.5) = 0.70
V3= (0.3)(0.1) + (0.15)(0.5) + (0.15)(0) + (0.15)(0) + (0.15)(1) + (0.1)(0.5) = 0.58
V4= (0.3)(0.1) + (0.15)(0.5) + (0.15)(0) + (0.15)(0) + (0.15)(0) + (0.1)(0.75) = 0.45
V5= (0.3)(0.5) + (0.15)(0.1) + (0.15)(0.3) + (0.15)(1) + (0.15)(1) + (0.1)(0.5) = 0.70

5. Ranking results by highest
The highest rankings are as follows:

TABLE 12. Ranking results

Name	**Criteria**						
	C1	**C2**	**C3**	**C4**	**C5**	**C6**	**Sum**
Rosita Sembiring	3	2	3	2	1	4	0.72
Indunia	2	2	1	4	1	2	0.70
Febri Sitepu	1	1	0	0	1	2	0.70
Kasirta Kaban	2	2	1	4	1	2	0.58
Sepakat Depari	1	1	0	0	0	3	0.45

From table 12, data obtained from a villager named Rosita Sembiring C1 is worth 3, C2 is worth 2, C3 is worth 3, C4 is worth 2, C5 is worth 1, C6 is worth 4 and the total is 0.72. In the world C1 is worth 2, C2 is worth 2, C3 is worth 1, C4 is worth 4, C5 is worth 1, C6 is worth 2 and the total is 0.70. Febri Sitepu C1 is worth 2, C2 is worth 2, C3 is worth 1, C4 is worth 4, C5 is worth 1, C6 is worth 2 and the total is 0.70. Kasirta Kaban C1 is worth 1, C2 is worth 1, C3 is worth 0, C4 is worth 0, C5 is worth 1, C6 is worth 2 and the total is 0.58. Cipta Agrees Depari C1 is worth 1, C2 is worth 1, C3 is worth 0, C4 is worth 0, C5 is worth 0, C6 is worth 3 and the total is 0.45.

Use Case Diagrams are often used to describe login, input data, manage data with SAW method, output. Use Case Diagram shows the relationship that occurs between actors and use cases in the system. The following is an image of the Use Case Diagram:

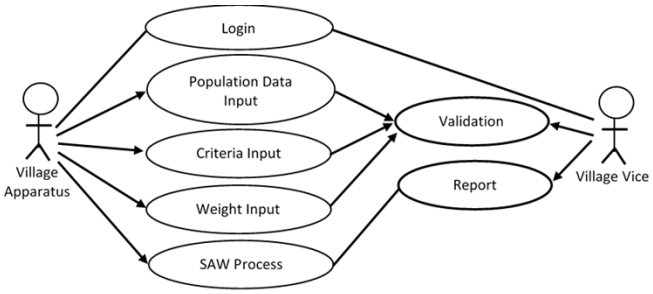

FIGURE 3. Use Case Diagram

Information:

a. Here's a brief explanation of the Use Case Diagram above:
b. The village head serves as admin control.
c. Login is an activity for admins in processing decision system applications.
d. Inputting Population Data is an administrator's activity in order to manage or input data.
e. Inputting weight data is processing data that has been determined from the government.\
f. The SAW process is an administrator's activity in order to be able to manage values and determine rankings.
g. Reports are admin controls that are included in reports into the system.

Implementation is the stage of implementing as well as testing for the new system and is the stage where the application is ready to operate in the actual state, the effectiveness of the new system will be known for sure, as well as for all the advantages and disadvantages of the system and application programs. The following page is the first display that appears when a visitor opens a web that has been built. With the main menu page, every visitor can access other pages, as shown in Figure 4 below:

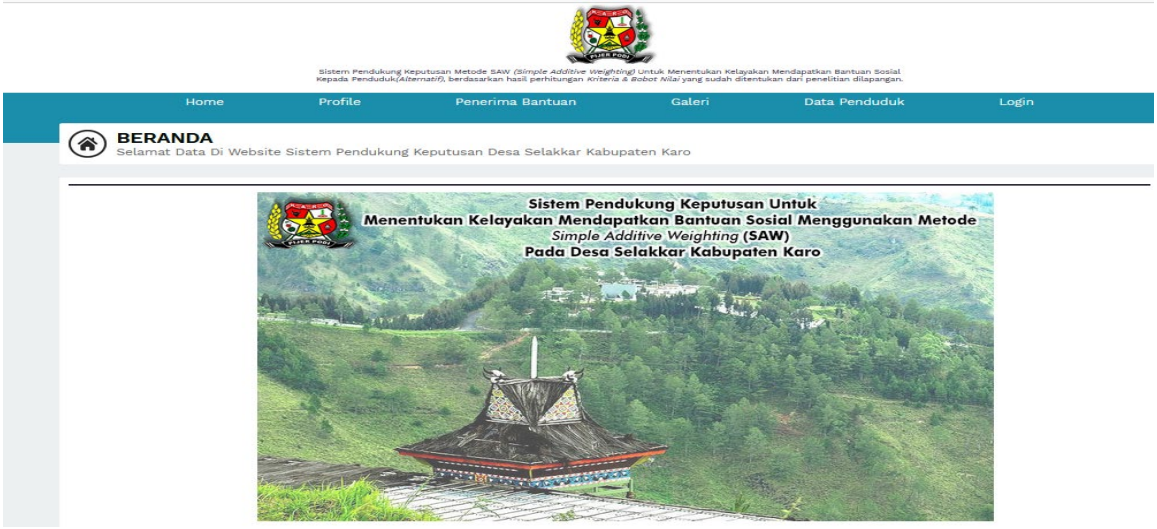

FIGURE 4. Main Menu Page

This menu serves as a place for residents to input data. The population data menu is as shown in Figure 5 below:

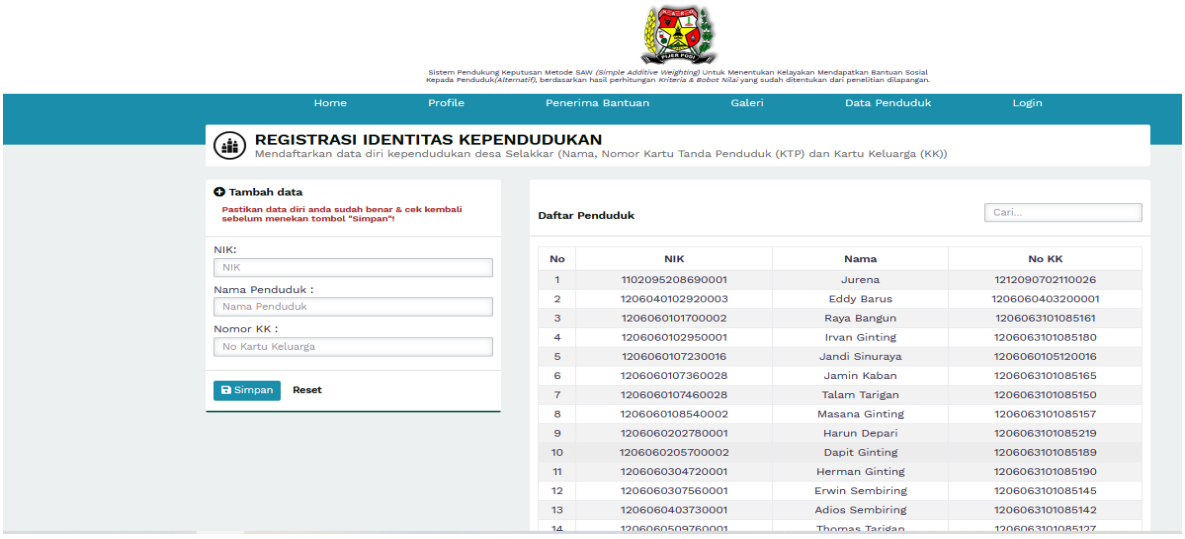

FIGURE 5. Population Data Menu

The population menu is a menu for inputting data on residents of Selakkar village, Munte sub-district, Karo district. The population menu is as shown in Figure 6 below:

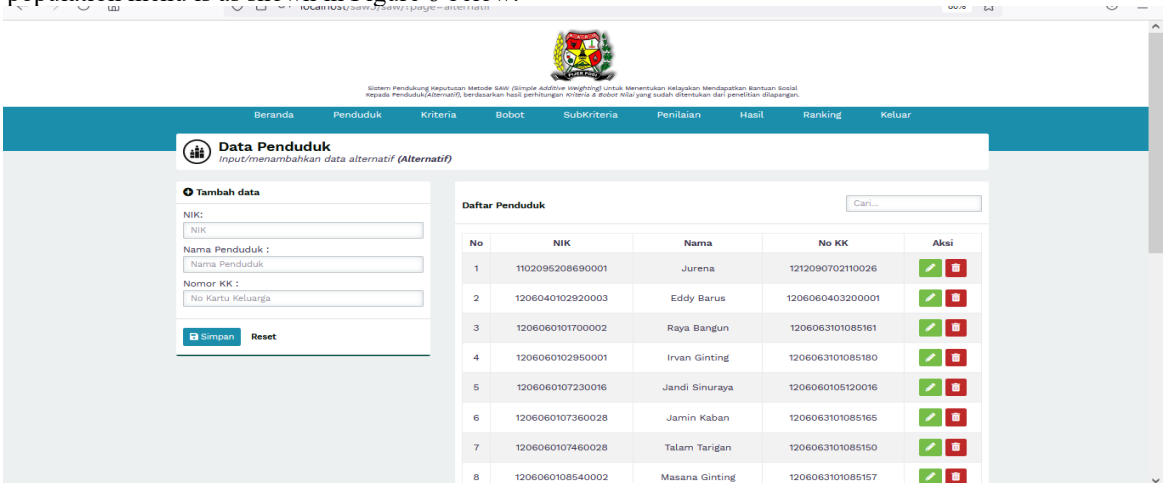

FIGURE 6. Population Input Display Menu

The criteria menu is a menu for inputting the criteria for receiving social assistance from the residents of Selakkar village, Munte sub-district, Karo district. The criteria menu is as shown in Figure 7 below:

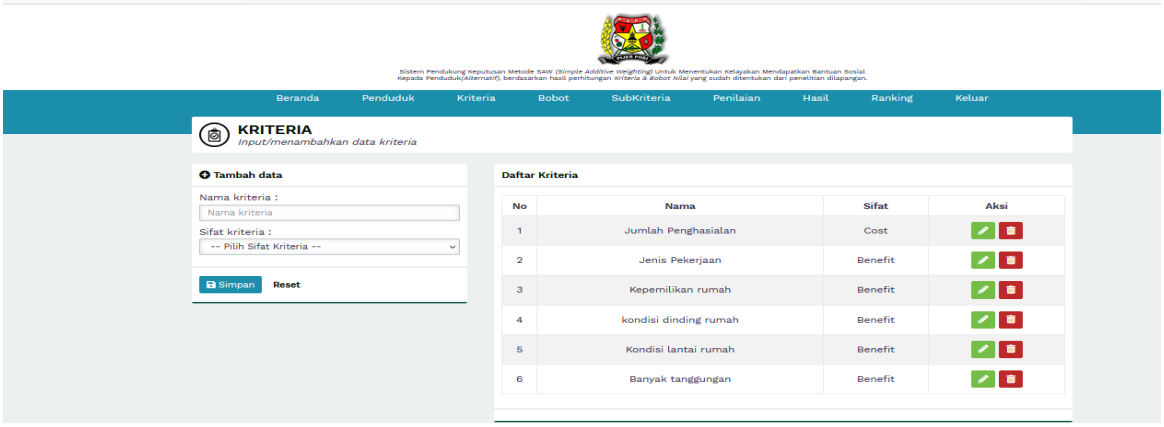

FIGURE 7. Criteria data display menu

The weight menu is a menu for inputting the weights of potential recipients of social assistance from the residents of Selakkar village, Munte sub-district, Karo district. The weight menu is as shown in Figure 8 below:

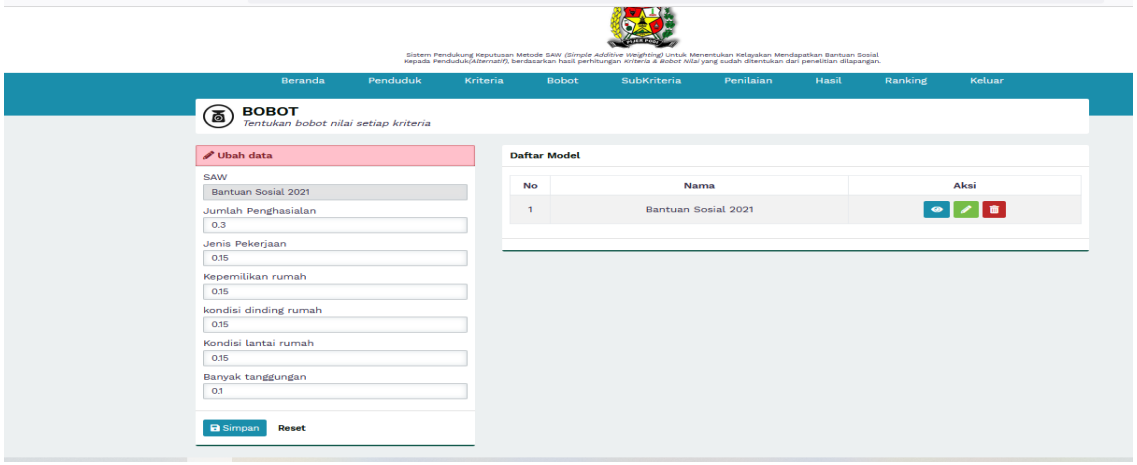

FIGURE 8. Criterion Weight Input Menu

The sub-criteria menu is a menu for inputting the sub-criteria for social assistance recipients from the Selakkar village, Munte sub-district, Karo district. The sub-criteria menu is as shown in Figure 9 below:

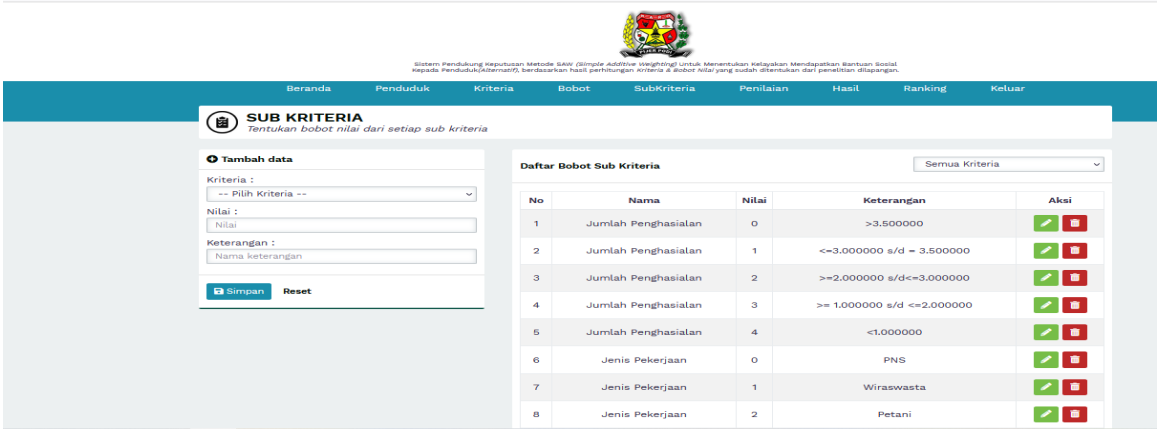

FIGURE 9. Sub Criteria Menu

The assessment menu is a menu for assessing potential recipients of social assistance from residents of Selakkar village, Munte sub-district, Karo district. The assessment menu is as shown in Figure 10 below:

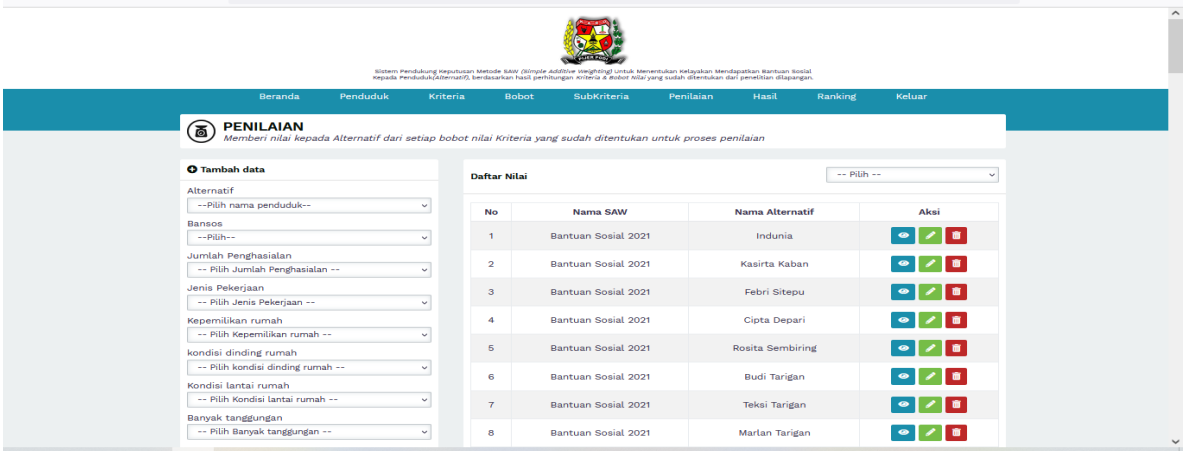

FIGURE 10. Rating View Form

The results menu is a menu to see the results of prospective recipients of social assistance from selakkar villagers, Munte subdistrict, Karo Regency, as figure 11 below:

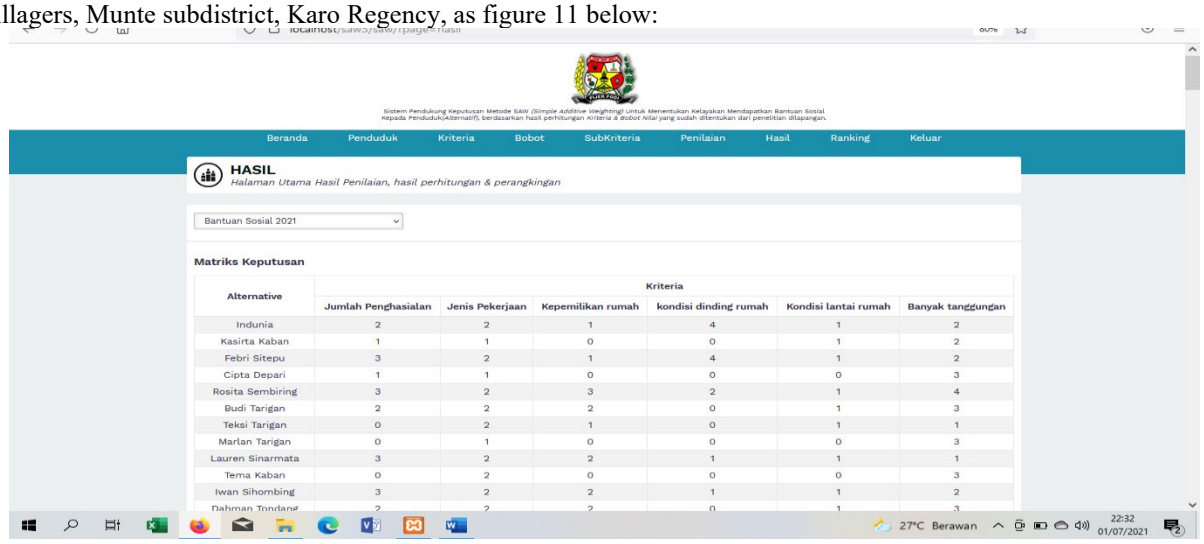

FIGURE 11. Test Results menu with SAW Meth

The ranking menu is a menu to see the ranking of prospective recipients of social assistance from Selakkar village, Munte subdistrict, Karo Regency, as figure 12 below:

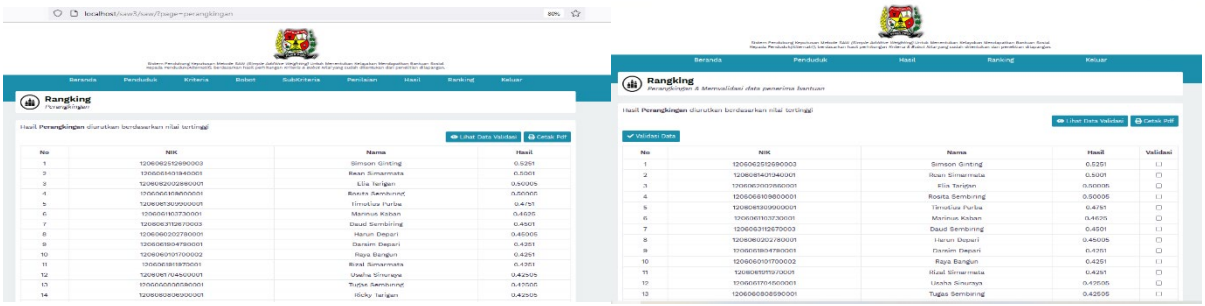

FIGURE 12. Ranking and Validation menu

CONCLUSIONS

Based on research that has been conducted in Selakkar Village, Munte Subdistrict, Karo Regency can be concluded as follows:

1. Simple Additive Weighting (SAW) method is one of the methods of decision support system in solving various multi-criterion decision making problems. The criteria needed to determine the eligibility to get social assistance are the Amount of Income, Type of work, Home ownership, condition of the floor of the house and many dependents.
2. The Simple Additive Weighthing (SAW) method is able to support the decision for the determination of social aid recipients by providing compensation for the village head.
3. With the support system of the decision to choose the recipient of social assistance, it provides a quick decision in determining the recipient of social assistance.

REFERENCES

1. UU No. 13 Tahun 2011, "UNDANG-UNDANG REPUBLIK INDONESIA NOMOR 13 TAHUN 2011 TENTANG PENANGANAN FAKIR MISKIN ," Jakarta, 2011.
2. P. Pemberian Hibah Dan Bantuan Sosial Yang Bersumber Dari Anggaran Pendapatan Dan Belanja Daerah Dengan Rahmat Tuhan Yang Maha Esa, "PERATURAN MENTERI DALAM NEGERI REPUBLIK INDONESIA NOMOR 32 TAHUN 2011 TENTANG", Accessed: Sep. 16, 2021. [Online]. Available: www.djpp.depkumham.go.id
3. T. Limbong *et al.*, *Sistem Pendukung Keputusan: Metode & Implementasi*. Yayasan Kita Menulis, 2020.
4. Kusrini, *Konsep dan Aplikasi Sistem Pendukung Keputusan*. 2007.
5. N. K. Sukerti, "SISTEM PENUNJANG KEPUTUSAN PENERIMA BANTUAN DESA DI KECAMATAN KLUNGKUNG DENGAN METODE SAW," *Jurnal Informatika*, vol. 14, no. 1, pp. 84–93, 2014.
6. T. Limbong, "IMPLEMENTASI METODE SIMPLE ADDITIVE WEIGHTING (SAW) UNTUK PEMILIHAN PEKERJAAN BIDANG INFORMATIKA," *Proceeding SNIKOM*, vol. 3, no. 5, pp. 6–7, 2013.
7. Fadhliazis and Sarjono, "ANALISIS DAN PERANCANGAN SISTEM PENDUKUNG KEPUTUSAN PENERIMA BANTUAN PROGRAM KELUARGA HARAPAN DENGAN SIMPLE ADDITIVE WEIGHTING (SAW) PADA DINAS SOSIAL, KEPENDUDUKAN DAN PENCATATAN SIPIL PROVINSI JAMBI," *Jurnal Manajemen Sistem Informasi*, vol. 4, no. 2, pp. 126–136, Jun. 2019, doi: 10.33998/JURNALMANAJEMENSISTEMINFORMASI.2019.4.2.617.
8. F. Yanti and T. Limbong, "Sistem Pendukung Keputusan Pemilihan Lembaga Bimbingan Belajar Berdasarkan Pendapatan Orang Tua dengan Metode Simple Additive Weighting," *JUKI : Jurnal Komputer dan Informatika*, vol. 2, 2020.
9. nasional.kontan.co.id, "Kemensos akan beri bantuan sosial modal usaha mikro Rp 3,5 juta, ini syaratnya," Jan. 22, 2021. https://nasional.kontan.co.id/news/kemensos-akan-beri-bantuan-sosial-modal-usaha-mikro-rp-35-juta-ini-syaratnya (accessed Sep. 16, 2021).
10. D. Nofriansyah and S. Defit, *Multi Criteria Decision Making (MCDM) pada Sistem Pendukung Keputusan*. Deepublish, 2017.
11. D. M. Rajagukguk, "Implementasi Metode Simple Additive Weighting pada Sistem Pendukung Keputusan Penerima Beasiswa," *Edu Komputika Journal*, vol. 4, no. 1, pp. 55–55, 2017.
12. Faisal and S. D. H. Permana, "Sistem Penunjang Keputusan Pemilihan Sekolah Menengah Kejuruan Teknik Komputer Dan Jaringan Yang Terfavorit Dengan Menggunakan Multi-Criteria Decision Making," *Jurnal Teknologi Informasi dan Ilmu Komputer*, vol. 2, no. 1, p. 11, 2015, doi: 10.25126/jtiik.201521123.
13. J. Simarmata, T. Limbong, M. Aritonang, and S. Sriadhi, "SISTEM PENDUKUNG KEPUTUSAN PEMILIHAN GURU BIDANG STUDI KOMPUTER MENGGUNAKAN METODE SIMPLE ADDITIVE WEIGHTING (SAW)," *Computer Engineering, Science and System Journal*, vol. 3, no. 2, pp. 186–190, 2018.
14. T. Andayani, *"Sistem Pendukung Keputusan Pemilihan Calon Kenaikan Jabatan Pada BLHKP Kabupaten Aceh Tengah Dengan Menggunakan Metode Simple Additive Weighting (SAW)" (2015)*.
15. J. Purnama, "SISTEM PENDUKUNG KEPUTUSAN SELEKSI PENERIMAAN SISWA BARU MENGGUNAKAN METODE SIMPLE ADDITIVE WEIGHTING (SAW) (Studi Kasus : SMA Negeri 01 Kalirejo)." [Online]. Available: www.stmikpringsewu.ac.id

16. "Sugiyono 2012 Metode Penelitian Kuantitatif kualitatif dan R D Bandung Alfabeta | Course Hero." https://www.coursehero.com/file/p1io3ei/Sugiyono-2012-Metode-Penelitian-Kuantitatif-kualitatif-dan-R-D-Bandung-Alfabeta/ (accessed Oct. 24, 2019).
17. Sugiyono, *Metode Penelitian Kuantitatif, Kualitatif dan R&D.* Bandung: PT Alfabet, 2016.
18. S. Suryabrata, "Metodelogi penelitian," *Jakarta: Raja Grafindo Persada*, 1998.
19. S. Arikunto, "Metodelogi penelitian," *Yogyakarta: Bina Aksara*, 2006.