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Comparison of WASPAS and VIKOR methods to determine non-cash food assistance recipients

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Article Info	ABSTRACT
	Non-cash food assistance or *bantuan pangan non-tunai* (BPNT) is a government program of the Republic of Indonesia by distributes food assistance in non-cash to beneficiary families. The process of distributing BPNT still needs to be done with the data and criteria set, because the existing BPNT distribution is considered not right on target. We need a method that can help provide an objective decision. One method that can be used in making decisions is the weighted aggregated sum product assessment (WASPAS) and Vlsekriterijumsko Koompromisno Rangiranje (VIKOR) methods. The results of the calculations from the two methods will then be chosen which is the best, by conducting sensitivity tests and accuracy tests. This study uses 100 sample data and 16 criteria. The sensitivity test results are 9.780678997% for the WASPAS method and -0.0759182% for the VIKOR method, while the results of the accuracy test show that both methods have the same level of accuracy, which is 80%. Based on the comparison of the sensitivity test and accuracy test of the two methods, the WASPAS method is considered more accurate determining the recipients of the BPNT program because the WASPAS method has a higher sensitivity test value than the VIKOR method.

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1. INTRODUCTION

The Central Bureau of Statistics of the Republic of Indonesia defines poverty as the inability of individuals or groups to fulfill basic food and non-food needs to survive more properly, either from the poverty line or the poverty line. The problem of poverty is still one of the problems faced by Indonesia which is multidimensional and complex, even now there is a slowdown in the reduction of poverty and the government is still trying to suppress the poverty rate [1]. In line with the slowing down of the poverty rate, the results of the release of the poverty rate by the Indonesian Central Bureau of Statistics showed that there was an increase of 0.37 percent point in the period March 2019 to September 2020, then increased again to 0.56 percent in March 2021 with a total poverty rate of 9.78 percent, and if calculated with the population in Indonesia, the poor in Indonesia has increased to 2.91 million people with a total of 26.42 million people in the period March 2020 to March 2021. Along with the increasing number of poor people, according to the people's welfare statistics records released by the Central Bureau of Statistics Republic of Indonesia in 2018, shows that the distribution of social assistance for the poor/rice prosperous (raskin/rastra) with a figure of 34.74% which already includes urban communities and rural areas. The raskin/rastra social assistance was then transferred to

the non-cash food assistance or *bantuan pangan non-tunai* (BPNT) program which was implemented under the auspices of the Indonesian Ministry of Social Affairs in 2020 with the number of beneficiaries reaching 10.80% and an increase in 2021 to 15.25%.

This condition prompted the Government of Indonesia to create a program to address the food consumption rate of the people in Indonesia with the aim of reducing the expenditure of poor families as well as developing policies in the field of social protection, and this effort was carried out by carrying out the implementation of BPNT in 2017. BPNT is a stretcher program from the Indonesian Ministry of Social Affairs that provides monthly non-cash food social assistance to poor families in Indonesia who were previously designated as BPNT beneficiary families with distribution via electronic accounts used to buy daily food. In its implementation, BPNT prioritizes poor families who experience difficult conditions in meeting their daily food needs by taking into account the circumstances of each household. BPNT provides assistance to poor families by paying attention to the personal condition and living environment of each household that is concerning. In particular, the purpose of having BPNT is an effort to reduce the burden of spending on each poor family and provide balanced nutrition to poor families who are BPNT participants [2]–[4].

Based on its implementation, the BPNT program which has survived until now, it cannot be denied that there are still fundamental problems with BPNT that need to be addressed in terms of data collection and criteria set by the Ministry of Social Affairs of the Republic of Indonesia, that there are still many distributions of the BPNT program which are considered not right on target and determine eligibility. Every family that should receive assistance, actually does not get the assistance so that an application is needed that can help with these problems in order to produce better performance. This has an impact on the transparency of data management in determining BPNT recipients, especially if there are several poor or underprivileged prospective participants who have a level of eligibility that is not much different from other participants. Therefore, the researcher based on his observations at the Social Service of Samarinda City which aims to help facilitate the relevant agencies in determining the recipients of BPNT for poor or underprivileged families. The purpose of this research is to apply the the weighted aggregated sum product assessment (WASPAS) and Vlsekriterijumsko Koompromisno Rangiranje (VIKOR) methods to be able to determine the recipients of the BPNT program, and to find out the appropriate method between the two methods based on sensitivity tests and accuracy tests.

2. METHOD

In this study, we found that the distribution of BPNT programs still are not on target, aid recipients are not evenly distributed to poor people, data on poor people is not yet valid because it has not been updated for a long time. This decision suppot system by using the WASPAS and VIKOR methods as alternatives to solve it. The next stage is identifying the criteria and determining the formulation of potential recipients of the BPNT program. The data and information collection stage was carried out by collaborating to collect data and information from the Samarinda City Social Service, by observing and validating the integrated social welfare data or *data terpadu kesejahteraan sosial* (DTKS) used for research. The analysis phase of the WASPAS and VIKOR methods, carried out a calculation analysis of the data that has been collected against the WASPAS and VIKOR methods [5]–[10]. The system design stage, making a software engineering of the decision support system for acceptance of the BPNT program. It is done by creating a system by applying the WASPAS and VIKOR methods to determine the recipients of the BPNT program [11]–[13]. The conclusion drawing stage is carried out after getting the results from the WASPAS and VIKOR methods to be able to see the results of the sensitivity test and the accuracy test. The stages in this study were previously conducted interviews with DTKS management officers who also manage the implementation of BPNT in Samarinda City, to identify and evaluate problems that occur. The following is the data on the criteria for the recipients of the BPNT program [3], [4], [14].

2.1. Number of family members (C1)

The criteria for the number of family members are determined by whether or not there are many family members. The more family members are the greater the opportunity to get help. Further information regarding the C1 criteria can be seen in Table 1.

Table 1. C1 criteria

Criteria	Weight	Type	Sub criteria	Weight
C1	10%	Benefit	More than 7 people	4
			5-6 people	3
			3-4 people	2
			1-2 people	1

2.2. Residential building status (C2)

The criteria for the status of residential buildings are determined from the ownership of the family's residence. There are three sub criteria for resident building status. Further information regarding the C2 criteria can be seen in Table 2.

2.3. Age of the head of the family (C3)

The criteria for the age of the head of the family are determined by the circumstances of the head of the family. The older the head of the family is the greater the opportunity to get help. Further information regarding the C3 criteria can be seen in Table 3.

2.4. Head of family education (C4)

The education criteria for the head of the family are determined by the quality of the education of the head of the family. There are five sub criterian for the head family education. Further information regarding the C4 criteria can be seen in Table 4.

2.5. Type of house floor (C5)

The criteria for the type of floor of the house are determined from the quality of the floor of the residence. There are five sub criteria for type of house. Further information regarding the C5 criteria can be seen in Table 5.

2.6. Type of house wall (C6)

The criteria for the type of house walls are determined by the quality of the walls of the residence. There are four sub criteria for type of house wall. Further information regarding the C6 criteria can be seen in Table 6.

2.7. Roof type (C7)

The criteria for the type of roof of the house are determined from the quality of the roof of the residence. There are six sub criteria for roof type. Further information regarding the C7 criteria can be seen in Table 7.

Table 2. C2 Criteria

Criteria	Weight	Type	Sub criteria	Weight
C2	10%	Benefit	Rent/contract	10
			Ride	7
			One's own	4

Table 3. C3 criteria

Criteria	Weight	Type	Sub criteria	Weight
C3	10%	Benefit	More than 70 years old	10
			Age 60-69 years old	7
			Under 70 years old	4

Table 4. C4 criteria

Criteria	Weight	Type	Sub criteria	Weight
C4	5%	Benefit	No school	10
			Primary School	8
			Junior High School	6
			Senior High School	4
			College	2

Table 5. C5 criteria

Criteria	Weight	Type	Sub criteria	Weight
C5	5%	Benefit	Stone/land	10
			Wood	8
			Ironwood	6
			Tile	4
			Ceramic	2

Table 6. C6 criteria

Criteria	Weight	Type	Sub criteria	Weight
C6	5%	Benefit	Wooven bamboo/wood	4
			Versaboard	3
			Wood	2
			Wall	1

Table 7. C7 criteria

Criteria	Weight	Type	Sub criteria	Weight
C7	5%	Benefit	Leaves	10
			Clay	8
			Zinc/metal	6
			Shingle	5
			Asbestos	4
			Concrete	3

2.8. Drinking water source (C8)

The criteria for drinking water sources are determined from the source of water consumption of the family. There are five sub criteria for drinking water source. Further information regarding the C8 criteria can be seen in Table 8.

2.9. Source of light (C9)

The criteria for lighting sources are determined by the type of electricity used by the family. There are three sub criteria for source of light. Further information regarding the C9 criteria can be seen in Table 9.

2.10. Cooking fuel (C10)

The criteria for cooking fuel are determined from the source of the fuel used for cooking from the family. There are four sub criteria for cooking fuel. Further information regarding the C10 criteria can be seen in Table 10.

2.11. Family head job (C11)

The criteria for the work of the head of the family are determined by the type of work the head of the family does. There are eight sub creiteria for family head job. Further information regarding the C11 criteria can be seen in Table 11.

Table 8. C8 criteria

Criteria	Weight	Type	Sub criteria	Weight
C8	5%	Benefit	Rain water	10
			River water	8
			Well water	6
			Tap water	4
			Refill water	2

Table 9. C9 criteria

Criteria	Weight	Type	Sub Criteria	Weight
C9	5%	Benefit	Not electricity	10
			Not PLN's electricity	7
			PLN's electricity	4

Table 10. C10 criteria

Criteria	Weight	Type	Sub Criteria	Weight
C10	5%	Benefit	Fire Wood	4
			Kerosene	3
			Gas 3 Kg	2
			Gas > 3 Kg	1

Table 11. C11 criteria

Criteria	Weight	Type	Sub Criteria	Weight
C11	10%	Benefit	Unemployment	10
			Scavengers	8
			Construction Laborers	7
			Farmer/Gardening	6
			Trader	5
			Education Services	3
			Online/Non Motorcycle Taxi	2
			Private Selector Employee	1

2.12. Amount of assets (C12)

The criteria for the amount of assets are determined from the number of assets owned by the family. There are four sub criteria for amount of assets. Further information regarding the C12 criteria can be seen in Table 12.

2.13. Number of rooms (C13)

The criteria for the number of rooms are determined from the number of rooms owned by the family. There are five sub criteria for number of rooms. Further information regarding the C13 criteria can be seen in Table 13.

Table 12. C12 criteria

Criteria	Weight	Type	Sub Criteria	Weight
C12	5%	Benefit	Have No. Assets	4
			1-2 Assets	3
			3-5 Assets	2
			More Than 6 Assets	1

Table 13. C13 criteria

Criteria	Weight	Type	Sub Criteria	Weight
C13	5%	Benefit	Have no rooms	10
			1-2 rooms	8
			3-4 rooms	6
			5-6 rooms	4
			More than 7 rooms	2

2.14. Defecation facility (C14)

The criteria for defecation facilities are determined from the use of the family facilities. There are four sub criteria for defacation facility. Further information regarding the C14 criteria can be seen in Table 14.

2.15. Toilet type (C15)

The criteria for the type of toilet are determined by the quality of the toilet used by the family. There are four sub criteria for toilet type. Further information regarding the C15 criteria can be seen in Table 15.

2.16. Final disposal site (C16)

The criteria for the final disposal of feces are determined from the destination of the feces issued by the family being disposed of. There are five sub creiteria for final disposal site. Further information regarding the C16 criteria can be seen in Table 16.

Table 14. C14 criteria

Criteria	Weight	Type	Sub criteria	Weight
C14	5%	Benefit	Not Any	4
			General	3
			Together	2
			Alone	1

Table 15. C15 criteria

Criteria	Weight	Type	Sub criteria	Weight
C15	5%	Benefit	Not use	4
			Plump	3
			Pleasure	2
			Goose neck	1

Table 16. C16 Criteria

Criteria	Weight	Type	Sub criteria	Weight
C16	5%	Benefit	Not any	10
			Beach/field	8
			Pool/ricefiled/river	6
			Earth hole	4
			Tank	2

2.17. Accuracy test

The accuracy test is carried out by analyzing the data resulting from decisions made by the system using the WASPAS and VIKOR methods as well as real data owned by the Samarinda City Social Service. The data generated by the system will then be compared with the decision result data issued by the Social Service of Samarinda City which is then calculated for the suitability and discrepancy of the data between the WASPAS and VIKOR methods. One method will be considered as the appropriate method in determining the recipient of the BPNT program if it has a higher accuracy test value than the other methods [15], [16].

2.18. Sensitivity test

Sensitivity testing is done by increasing the weight of each criterion by 0.5 to 1. Then adding up the percentage change in ranking that occurs from calculating criterion C1 onwards by comparing the conditions of the sensitivity test weights and the initial weights. One method will be considered as the appropriate method in determining the recipient of the BPNT program if it has a higher sensitivity test value than the other methods [17], [18].

3.   RESULTS AND DISCUSSION
3.1. Program description
This decision support application for non-cash food aid recipients uses the WASPAS and VIKOR methods with a web display using the hypertext preprocessor (PHP) programming language, with the aim that the BPNT implementing team at the Social Service of Samarinda City has no difficulty in determining the recipients of the BPNT program [19]–[26]. In this system there are several pages, namely the home page, criteria, results, calculations, check recipient data, and login. After logging in, the admin will enter the home page which contains a menu of criteria, results, alternatives, and calculations. To be able to find out the results of calculations using the WASPAS and VIKOR methods, the first step is to enter alternative data according to predetermined criteria. On the criteria page, there is a results page where you can see the ranking and calculation results in Figures 1 and 2.

Figure 1. Results page

Figure 2. Calculation page

3.2. Application method
To be able to determine the feasibility of the system made to match the calculations carried out manually. Data was collected from the DTKS which was processed by the Social Service of Samarinda City [27]–[32]. There are 100 sample data taken using 16 criteria based on the data verification and validation form from the Ministry of Social Affairs of the Republic of Indonesia. Then the conversion of each alternative data and criteria used is as in Table 17. Table 17 can also be regarded as a decision matrix and then calculated by the WASPAS and VIKOR methods.

Table 17. Match rating

Alt	Criteria					
	C1	C2	C3	C4	...	C16
A1	2	4	4	8	...	6
A2	1	7	4	4	...	4
A3	2	10	4	8	...	2
A4	2	4	10	8	...	2
...	...	...	...	...	...	...
A100	2	4	10	8	...	6

3.2.1. Weighted aggregated sum product assessment method process

a) Normalize matrix

$$R_{11}=\frac{X11}{Max\,1}=\frac{2}{4}=0.5 \qquad R_{19}=\frac{X19}{Max\,9}=\frac{4}{10}=0.4$$

$$R_{12}=\frac{X12}{Max\,2}=\frac{4}{10}=0.4 \qquad R_{110}=\frac{X110}{Max\,10}=\frac{2}{4}=0.5$$

$$R_{13}=\frac{X13}{Max\,3}=\frac{4}{10}=0.4 \qquad R_{111}=\frac{X111}{Max\,11}=\frac{1}{10}=0.1$$

$$R_{14}=\frac{X14}{Max\,4}=\frac{8}{10}=0.8 \qquad R_{112}=\frac{X112}{Max\,12}=\frac{3}{4}=0.75$$

$$R_{15}=\frac{X15}{Max\,5}=\frac{8}{10}=0.8 \qquad R_{113}=\frac{X113}{Max\,13}=\frac{6}{10}=0.6$$

$$R_{16}=\frac{X16}{Max\,6}=\frac{3}{4}=0.75 \qquad R_{114}=\frac{X114}{Max\,14}=\frac{3}{4}=0.75$$

$$R_{17}=\frac{X17}{Max\,7}=\frac{6}{10}=0.6 \qquad R_{115}=\frac{X115}{Max\,15}=\frac{3}{4}=0.75$$

The results of calculating the normalization of the WASPAS method are summarized in the form of a table. The following table represents the results of the normalization. We can see in Table 18.

Table 18. WASPAS Matrix Normalization

Alt	Criteria					
	C1	C2	C3	C4	...	C16
A1	0.5	0.4	0.4	0.8	...	0.6
A2	0.25	0.7	0.4	0.4	...	0.4
A3	0.5	1	0.4	0.8	...	0.2
...	...	...	...	...	...	...
A100	0.5	0.4	1	0.8	...	0.6

b) Stage 1 preference weight value

Stage 1 is carried out by adding up the matrix normalization results multiplied by the criterion weight values. The multiplication results are summarized in the form of a table. These results can be seen in Table 19.

$$Q_1=0.5((0.5*0.1)+(0.4*0.1)+(0.4*0.1)+(0.8*0.05)+(0.8*0.05)+(0.75*0.05)+(0.6*0.05)+(0.8*0.05)+$$
$$(0.4*0.05)+(0.5*0.05)+(0.1*0.1)+(0.75*0.05)+(0.6*0.05)+(0.75*0.05)+(0.75*0.05)+(0.6*0.05)$$
$$=0.2725$$

c) Stage 2 preference weight value

The next stage is determining the preference weight value. Multiplication between normalized matrices is performed to obtain preference weight values. The multiplication results can be seen in Table 20.

$$Q_1=0.5((0.5)^{0.1}*(0.375)^{0.05}*(0.3)^{0.05}*(0.875)^{0.05}*(0.8)^{0.1}*(0.7)^{0.1}*(0.6)^{0.1}*(0.8)^{0.1}*(0.3)^{0.1}*(0.6)^{0.1}*$$
$$(0.1)^{0.1}*(0.75)^{0.05}*(0.6)^{0.05}*(0.75)^{0.05}*(0.75)^{0.05}*(0.6)^{005}=0.240729293$$

Alt	Stage 1 preference value
A1	0.2725
A2	0.27625
A3	0.29625
...	...
A100	0.3675

Table 19. Preference weight value

Alt	Stage 2 Preference Weight Value
A1	0.240729293
A2	0.247058255
A3	0.261272757
...	...
A100	0.349963551

Table 20. Stage 2 preference weight value

d) Stage 3 preference weight value

The following stage is the sum of the preference weight values of stage 1 and stage 2. The sum of the preference weight values is carried out to obtain the stage 3 preference weight values. So that the results are obtained in Table 21. So that the results are obtained in Table 21.

$$Q1 = 0.2725 + 0.240729293 = 0.513229293$$

e) Ranking results

After obtaining the results of the preference weights, an alternative ranking is carried out based on the highest to the lowest preference weight values as shown in Table 22.

Alt	Stage 3 preference weight value
A1	0.513229293
A2	0.523308255
...	...
A100	0.717463551

Table 21. Stage 3 preference weight value

Alt	Preference Value	Rank
A1	0.513229293	48
A2	0.523308255	41
...	...	...
A100	0.717463551	1

Table 22. Ranking results

3.3. VIKOR method process

a) Normalize matrix

$$R_{11} = \frac{X1^+ - X11}{X1^+ - X1^-} = \left(\frac{4-2}{4-1}\right) = 0.67 \qquad R_{12} = \frac{X2^+ - X12}{X2^+ - X2^-} = \left(\frac{10-4}{10-4}\right) = 1$$

$$R_{13} = \frac{X3^+ - X13}{X3^+ - X3^-} = \left(\frac{10-4}{10-4}\right) = 1 \qquad R_{14} = \frac{X4^+ - X14}{X4^+ - X4^-} = \left(\frac{10-8}{10-2}\right) = 0.25$$

$$R_{15} = \frac{X5^+ - X15}{X5^+ - X5^-} = \left(\frac{10-8}{10-2}\right) = 0.25 \qquad R_{16} = \frac{X6^+ - X16}{X6^+ - X6^-} = \left(\frac{4-3}{4-1}\right) = 0.33$$

$$R_{17} = \frac{X7^+ - X17}{X7^+ - X7^-} = \left(\frac{10-6}{10-3}\right) = 0.57 \qquad R_{18} = \frac{X8^+ - X18}{X8^+ - X8^-} = \left(\frac{10-8}{10-2}\right) = 0.25$$

$$R_{19} = \frac{X9^+ - X19}{X9^+ - X9^-} = \left(\frac{10-4}{10-4}\right) = 1 \qquad R_{110} = \frac{X10^+ - X110}{X10^+ - X10^-} = \left(\frac{4-2}{4-1}\right) = 0.67$$

$$R_{111} = \frac{X11^+ - X111}{X11^+ - X11^-} = \left(\frac{10-1}{10-1}\right) = 1 \qquad R_{112} = \frac{X12^+ - X112}{X12^+ - X12^-} = \left(\frac{4-3}{4-1}\right) = 0.33$$

$$R_{113} = \frac{X13^+ - X113}{X13^+ - X13^-} = \left(\frac{10-6}{10-2}\right) = 0.5 \qquad R_{114} = \frac{X14^+ - X114}{X14^+ - X14^-} = \left(\frac{4-3}{4-1}\right) = 0.33$$

$$R_{115} = \frac{X15^+ - X115}{X15^+ - X15^-} = \left(\frac{4-3}{4-1}\right) = 0.33 \qquad R_{116} = \frac{X16^+ - X116}{X16^+ - X16^-} = \left(\frac{10-6}{10-2}\right) = 0.5$$

The results of calculating the normalization of the VIKOR method are summarized in the table. The following table represents the results of the normalization. So that the results are obtained in Table 23.

b) Weight normalization

Prior to the step of calculating the values of S and R. Normalization of the matrix is carried out by multiplying the matrix with each predetermined weight. Weight normalization is continued for all criteria, so that the results are obtained in Table 24.

Number of family members   Residential build
Weight: 0.1   Weight: 0.1

A1=0.1*0.66667=0.06667
A2=0.1*1=0.1
A3=0.1*0.66667=0.06667
…..
A100=0.1*0.66667=0.06667

A1=0.1*1=0.1
A2=0.1*0.5=0.05
A3=0.1*0=0
…….
A100=0.1*1=0.1

Table 23. VIKOR matrix normalization

Alt	Criteria					
	C1	C2	C3	C4	...	C16
A1	0.67	1	1	0.25	...	0.5
A2	1	0.5	1	0.75	...	0.75
A3	0.67	0	1	0.25	...	1
...	...	...	...	...	...	...
A100	0.67	1	0	0.25	...	0.5

Table 24. VIKOR weight matrix normalization

Alt	Criteria					
	C1	C2	C3	C4	...	C16
A1	0.06	0.1	0.1	0.01	...	0.02
A2	0.1	0.05	0.1	0.03	...	0.03
A3	0.06	0	0.1	0.01	...	0.05
...	...	...	...	...	...	...
A100	0.06	0.1	0	0.01	...	0.02

c) Calculating S value

Calculating the value of S is done by adding up all the columns from the normalization based on equation as follows:

$$S1=0.0667+0.1+0.1+0.0125+0.0125+0.01667+0.02857+0.0125+0.05+0.0333+0.1+0.1667+0.025+0.01667+0.01667+0.025=0.632738$$

d) Determining the value of R

Determining the value of R is done by finding the maximum value of the column values in each alternative based on equation as follows:

$R_1=0.01$ $R_4=0.01$
$R_2=0.01$ until
$R_3=0.01$ $R_{100}=0.01$

e) S and R value

After adding the value of S and determining the value of R, then the maximum and minimum values of the values of S and R are determined as shown in Table 25.

Table 25. S and R from max and min value

S+	S-	R+	R-
0.8067	0.3605	0.1	0.05

f) Calculating VIKOR index value

The last step in the VIKOR method is done by calculating the VIKOR value index. By adding up the values of S and R in each alternative and the maximum and minimum values of S and R, based on equation as follows. So that the results are obtained in Table 26.

$$Q_1=0.5\frac{(0.632738-0.8067)}{(0.8067-0.3605)} + (1-0.5)\frac{(0.1-0.1)}{(0.1-0.05)} = 0.75208$$

g) Ranking results

After getting the results from the VIKOR value index. Then the value ranking is carried out by determining the lowest index value as a prioritized alternative value. The results of the rating can be seen in Table 27.

3.4. Results testing

a) Accuracy test

The accuracy test of the method is carried out with the aim of knowing the best method to be able to determine the recipient of the BPNT program. The test was carried out by comparing the results of the decisions of BPNT program recipients from the Social Service of Samarinda City and the results of the calculations of

the two methods. One method will be chosen to be the best method if it has a higher level of accuracy. The results of testing the level of accuracy can be seen in Table 28.

Table 26. VIKOR index value	
Alt	VIKOR index value
A1	0.805024455
A2	0.800355714
A3	0.730324589
...	...
A100	0.5

Table 27. Ranking results		
Alt	VIKOR index value	Rank
A1	0.805024455	49
A2	0.800355714	47
A3	0.730324589	19
...	...	...
A100	0.5	6

Table 28. Accuracy test results

Alt	Description	WASPAS	VIKOR
A1	ACCEPTED	SAME	SAME
A2	REJECTED	SAME	SAME
A3	ACCEPTED	SAME	SAME
...	...	...	...
A100	ACCEPTED	SAME	SAME

From the data in Table 28, it can be seen that the data on BPNT recipients using the WASPAS and VIKOR methods are compared with the real data from the Social Service of Samarinda City. In the WASPAS method, there are 80 equal alternatives and 20 different alternatives, while in the VIKOR method there are 80 equal alternatives and 20 different alternatives. The level of conformity and discrepancy between the same and different data on the WASPAS method can be seen in the following results:

$$Suitability\ Data = \frac{suitability\ data}{amount\ of\ data} \ x\ 100\% = \frac{80}{100} \ x\ 100\% = 80\%$$

$$Mismatch\ Data = \frac{mismatch}{amount\ of\ data} \ x\ 100\% = \frac{20}{100} \ x\ 100\% = 20\%$$

b) Sensitivity test

Based on the results obtained from the calculation of the two methods, then a comparative analysis of two methods was carried out using a sensitivity test. Sensitivity test was conducted to find out how sensitive the ranking changes produced by the two methods were. The calculation results of the WASPAS and VIKOR methods using weights (0.1; 0.1; 0.1; 0.05; 0.05; 0.05; 0.05; 0.05; 0.05; 0.05; 0.1; 0.05; 0.05; 0.05; 0.05; 0.05) changes will be made to one criterion first, while the other criteria are fixed and carried out on each criterion. Then an analysis is carried out on each maximum result of changes in the value of the weight of the criteria with the value of the initial conditions with the results of the decisions in Table 29.

Table 29. Initial condition

Alt	WASPAS	Rank	VIKOR	Rank
A1	0.513229	48	0.805024	49
A2	0.523308	41	0.800356	47
A3	0.557523	20	0.730325	19
...	...	...	...	...
A100	0.7174636	1	0.5	6
Max	0.7174636		1	

Then the first change was made for the C1 criteria by increasing 0.5. The weights used became (0.6; 0.1; 0.1; 0.05; 0.05; 0.05; 0.05; 0.05); 0.05; 0.05; 0.1; 0.05; 0.05; 0.05; 0.05; 0.05). The first test results are obtained in Table 30.

Then a second change was made for the C1 criteria by increasing 1. The weights used became (1.1; 0.1; 0.1; 0.05; 0.05; 0.05; 0.05; 0.05; 0.05; 0.1; 0.05; 0.05; 0.05; 0.05; 0.05). The results of the second test are obtained in Table 31.

The calculation is continued to criteria C16. Then do the sum of the changes (%) of each increase in the weight of each of these criteria. The results of the sensitivity test are shown in Table 32.

Table 30. C1 criteria (+0.5)				
Alt	WASPAS	Rank	VIKOR	Rank
A1	0.567721	54	0.618253	54
A2	0.462279	86	0.897132	86
A3	0.605998	38	0.578433	39
...	...	...	...	...
A100	0.7174636	1	0.5	6
Max	0.8773926		1	
%	0.1599291		0	

Table 31. C1 criteria (+1)				
Alt	WASPAS	Rank	VIKOR	Rank
A1	0.642865	53	0.637906	54
A2	0.463015	86	0.935599	86
A3	0.676886	41	0.612977	39
...	...	...	...	...
A100	0.792482	31	0.536111	35
Max	1.1273926		1	
%	0.4099291		0	

Table 32. Sensitivity test results

Criteria	WASPAS	VIKOR	Change	
			WASPAS	VIKOR
Awal	0.7174	1	-	-
C1 (+0.5)	0.8773	1	0.1599290	0
C1 (+1)	1.1273	1	0.4099290	0
C4 (+0 5)	0.9522	0.9240	0.2347919	-0.075918
C4 (+1)	1.2022	1	0.4847919	0
C5 (+0 5)	0.8915	1	0.1740698	0
...	...	...	...	...
C15 (+0 5)	0.9674	1	0.25	0
C15 (+1)	1.2174	1	0.5	0
C16 (+0 5)	0.7885	1	0.071117	0
C16 (+1)	0.8774	1	0.160014	0
Total			9.78067%	-0.0759%

4. CONCLUSION

Based on the results of the research that has been carried out in determining the recipients of the BPNT program, the authors conclude that this research produces a decision support system for BPNT recipients with the WASPAS and VIKOR methods that can be used by related parties who organize the BPNT program. Meanwhile, the method that is considered appropriate in determining the recipient of the BPNT program based on the sensitivity test and accuracy test is the WASPAS method from the VIKOR method with a sensitivity test value of 9.780678997% while VIKOR is -0.0759182%, and each method with an accuracy level the same is 80% and not the same by 20%. Suggestions for further research are to use more complete and varied poverty criteria. Criteria must be adjusted to appropriate poverty indicators in each region. Researchers can also use other decision support methods to get better accuracy values.

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