

# Decision Support System for Community Housing Subsidy Recipients

Adhi Nugraha <sup>a\*</sup>, Alvian Widiyanto <sup>b</sup>, M. Irfan <sup>b</sup>, M. Nasar <sup>b</sup>, Merinda Lestandy <sup>c</sup>

<sup>a</sup>Jurusan Teknik Industri, Fakultas Teknik, Universitas Muhammadiyah Malang, Indonesia

Jl. Raya Tlogomas No. 246 Malang, Jawa Timur, Indonesia

<sup>b</sup>Jurusan Teknik Elektro, Fakultas Teknik, Universitas Muhammadiyah Malang, Indonesia

Jl. Raya Tlogomas No. 246 Malang, Jawa Timur, Indonesia

<sup>c</sup>Jurusan D3 Teknik Elektronika, Fakultas Teknik, Universitas Muhammadiyah Malang, Indonesia

Jl. Raya Tlogomas No. 246 Malang, Jawa Timur, Indonesia

\*Corresponding author: [adhinugraha@umm.ac.id](mailto:adhinugraha@umm.ac.id)

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## ABSTRACT

Human needs consist of primary, secondary, and tertiary needs. In primary needs, the house is one of the most critical primary needs in supporting one's life. However, not all residents in Indonesia can meet these needs. Therefore, the government provides subsidized housing ownership programs for people with low income. This study aims to propose a decision support system in determining the proper housing subsidy recipients. The method used in weighting is Analytic Hierarchy Process (AHP). Previous research was still limited to the selection of subsidized housing for developers and potential buyers. This method is projected to provide results in the form of a priority sequence of alternative solutions based on test results. The results were considered capable of providing a better solution for selecting prospective recipients of the housing subsidy program.



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## 1. Introduction

House is an essential primary need for humans. People think that owning a house is a long-term investment [1][2]. The higher demand for housing has an impact on the higher house prices. This phenomenon decreases the purchasing power of people with income below the average. This problem has prompted the government to create a subsidized housing program. However, the implementation of the subsidized housing program often does not go according to plan. Identification and accuracy of recipients are the main problematic factors [3]. Most of the houses in the subsidy program were occupied by upper to middle-class owners. The main target of subsidized recipients is the lower-middle class. An appropriate system for determining subsidy recipients is needed to assist in determining the recipient of subsidies. Therefore, the government is urged to find the proper procedure in determining the recipient of the subsidy. The use of the proper method can provide an alternative in making decisions. One alternative that can be developed is



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using a Decision Support System (DSS) [4]. DSS functions to solve problems and communicate problems with structured situations [5][6]. DSS can summarize information, patterns, and trends using analytical models. DSS systems can also help identify, solve problems, and make decisions to find the best alternative [7] [8].

Several previous studies have been very limited in discussing DSS issues in the housing sector as well as in terms of subsidy recipients. Nasibu [1] solved selecting mortgages using the Analytic Hierarchy Process (AHP) method. Oei [2] used the AHP and Borda methods in solving the DSS for home purchases. Another study was conducted by Hudaya [9], who discussed determining the eligibility of subsidies using the Adaptive Neuro-Fuzzy Inference System method. A DSS system based on AHP was proposed by Sarwindah and Marini [10] for consumers who chose subsidized housing. Simanjorang, et al. [11] developed an analysis of the DSS for needy rice subsidy recipients. Siregar, et al. [12] implemented a DSS for subsidized housing selection using the Weighted Aggregated Sum Production Assessment Method. Even the DSS based on the Simple Multi-Attribute Rating Technique has also been proposed by Saputra and Mawartika [6] in choosing housing.

Several other studies have also been investigated. Mahendra and Putri [13] used the AHP method for the house selection process. House selection is faster because it is assisted by Expert Choice Software. Ardiyanto, et al. [14] applied web-based AHP to the housing selection process. Primanda, et al. [15] utilized AHP and Simple Additive Weight to select the best cost. AHP was then used by Rais [16] for the determination of strategic housing locations. Based on previous research, most studies generally discuss the problem of house selection. To the researchers' knowledge, there has been no research discussing DSS in the selection of recipients of subsidized housing assistance. Therefore, this study proposes a DSS to provide a solution to selecting subsidized housing recipients.

In DSS, the popular method used is AHP [2][17]. AHP method is carried out based on Pairwise comparisons and a hierarchy of criteria [18]. This method is chosen because this method can solve complex problems with structured procedures. AHP aims to distribute subsidized housing assistance more targeted to the middle to lower economic class. The AHP method is implemented with the PHP programming language using three criteria: family dependents, income, and occupation. PHP programming is implemented to produce the right decision support application system for web-based subsidized home subsidy receivers [11][19]. With the development of this DSS, it is hoped that housing subsidy recipients' selection process will be more straightforward and more targeted.

This paper's composition is presented as follows: Research method and data collection are presented in section 2. Results and discussion, as well as system testing, are presented in section 3. Meanwhile, section 4 discusses the conclusions of the entire study.

## 2. Methods

### 2.1 Problem Analysis

At present, the process of allocating subsidized housing from the government is still not optimal. The selection process is considered to be unable to reach the people who need it. Many houses should be allocated to the middle to lower economic class but owned by the middle and upper economic classes. This case occurred because of the lack of data management carried out by the developers and government. Therefore, a DSS is needed so that subsidy recipients are more targeted. This subsidized housing selection process is



a case study involving a variety of complex instruments. Seeing the urgency of this problem, a DSS is needed to help make appropriate decisions. AHP method is the proper method to be applied in problems with multi-object properties such as this problem [8]. This method can solve problems that have many alternatives and criteria that produce the best decisions.

## 2.2 AHP Diagram Block

In this subsection, this study proposes a block diagram to illustrate the pattern of the proposed DSS. The initial stage is determining criteria and identifying data. Some of the data required are National Identity Card Number, No-House Owning Certificate, Letter of Assistance Recipient, Taxpayer Identification Number, and Family Card Number. If the participant does not meet the initial qualifications, the participant cannot continue to the next stage. The second stage is filling out forms related to the criteria for selecting beneficiaries. In stage 2, several criteria and sub-criteria are used concerning the selection of housing subsidies. The criteria used are Family Dependents, which have five sub-criteria, income has three sub-criteria, and occupation has four sub-criteria. A more detailed description regarding the AHP process diagram can be seen in Fig. 1.

If the input process is correct and the applicable provisions can execute the AHP calculation process. The final result of the calculation is the ranking of potential beneficiaries.

## 2.3 Data Collection

The data processed in this study were derived from a questionnaire related to the process of selecting beneficiaries. The data were then converted into a Pairwise Comparison table by the provisions of Saaty [18]. For more apparent data, see Table 1 to Table 4.

Table 1. Pairwise Comparison Criteria

CRITERIA	Family Dependents	Income	Occupation
Family Dependents	1	1/5	4
Income	5	1	5
Occupation	1/4	1/5	1

Table 2. Pairwise Comparison Sub-Criteria for Family Dependents

Family Dependents	> 3 Child	3 Child	2 Child	1 Child	Have no Children
> 3 Child	1	3	5	5	7
3 Child	1/3	1	3	3	5
2 Child	1/5	1/3	1	2	3
1 Child	1/5	1/3	1/2	1	2
Have no Children	1/7	1/5	1/3	1/2	1

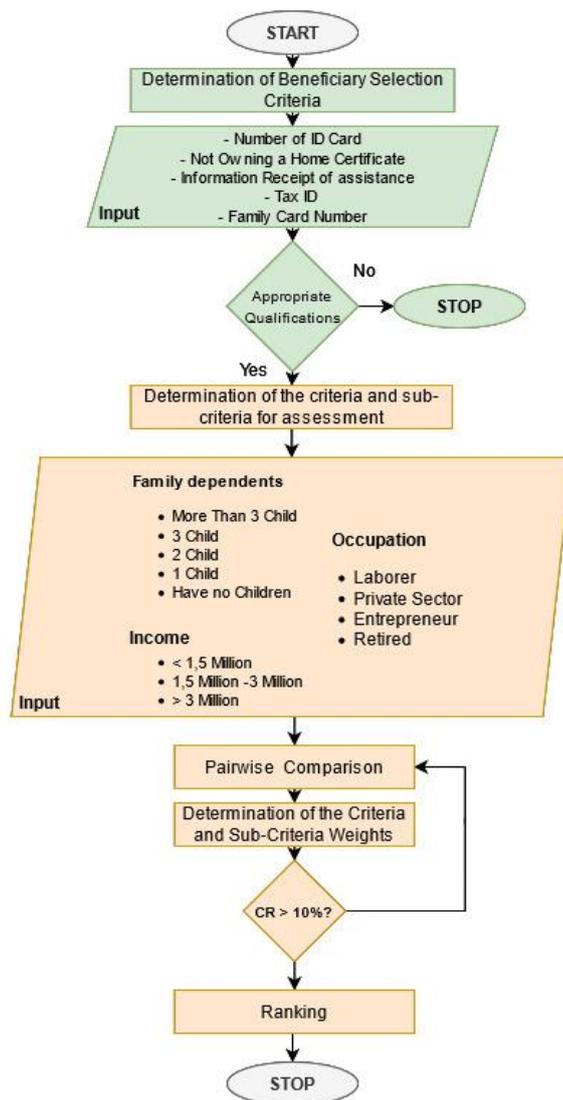


Fig. 1. Block Diagram of Analytic Hierarchy Process (AHP)

Table 3. Pairwise Comparison Sub-Criteria Family Income (in IDR)

Income	< 1.5 Million	1.5 - 3 Million	> 3 Million
<1,5 Million	1	2	3
1,5 - 3 Million	1/2	1	2
> 3 Million	1/3	1/2	1

Table 4. Pairwise Comparison Sub-Criteria Family Occupation

Occupation	Laborer	Private Sector	Entrepreneur	Retired
Laborer	1	3	3	5
Private Sector	1/3	1	2	3
Entrepreneur	1/3	1/2	1	2
Retired	1/5	1/3	1/2	1

### 3. Results and Discussion

This section describes implementing and testing the DSS for subsidized housing recipients using the AHP method. This section consists of program implementation, the weighting of criteria and sub-criteria, and system testing.

#### 3.1 Program Implementation

After the DSS was created, the next step was to implement a web-based application. Fig. 2 describes the user's home page. The homepage display has a menu of profiles (personal identity), documents (requirements for submitting subsidized housing), criteria (system support using the AHP method), and announcements (results of calculations carried out with several alternative recipients).

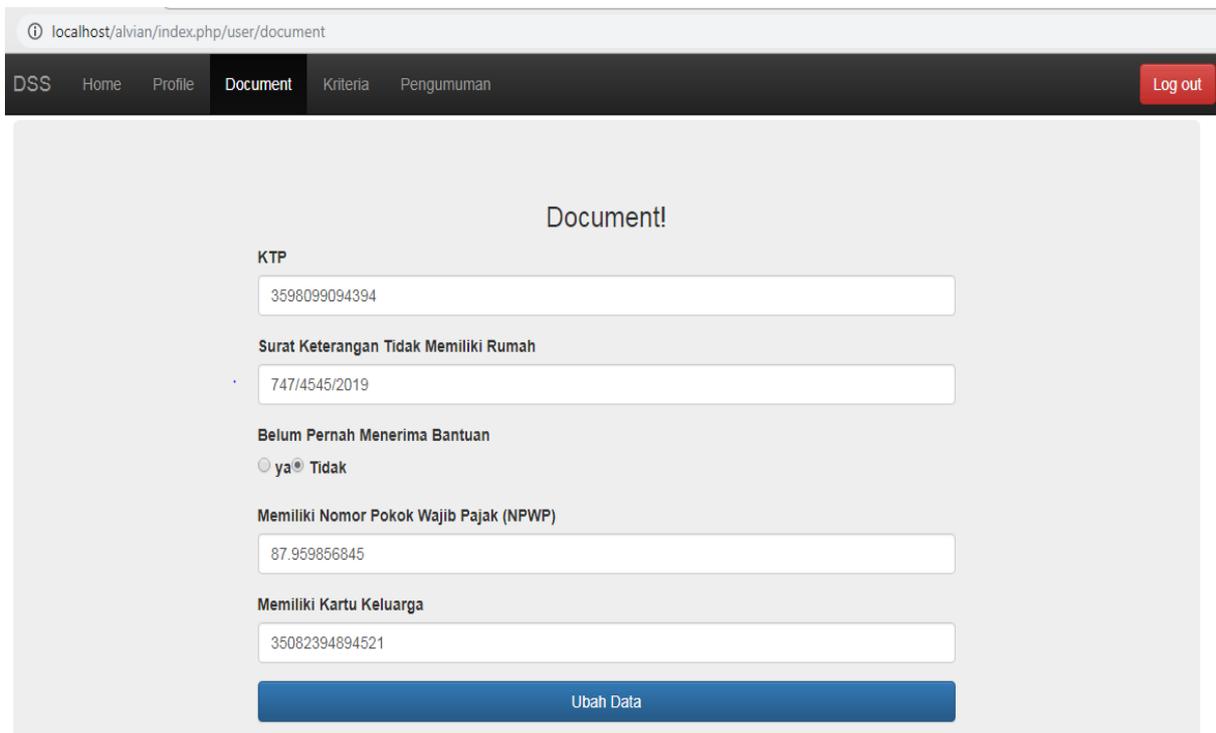
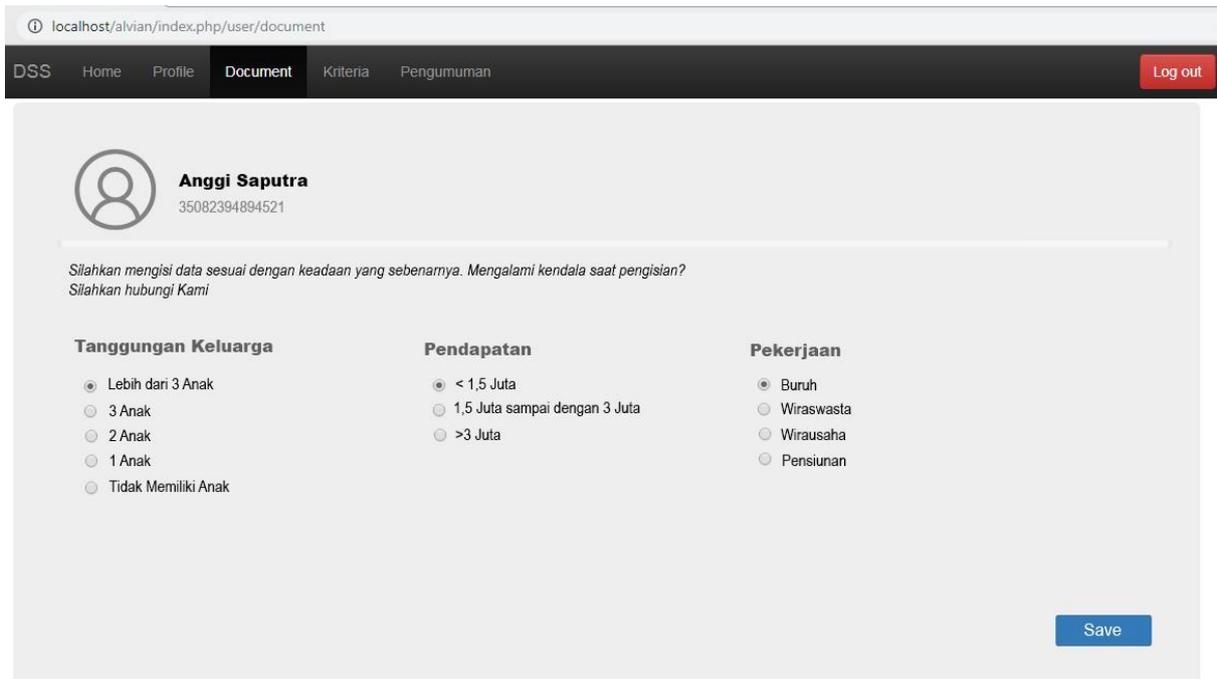


Fig. 2. User Home Page Eligibility (in Indonesian version)

The further stage was to fill in the user assessment page based on the existing selection criteria. There was a menu of options regarding Family, Income, and Occupation of Dependents on this page. Each of these menus has a choice of sub-criteria used. Users were asked to choose according to circumstances. This procedure is described in Fig. 3.

#### 3.2 Weights of Criteria and Sub-Criteria

Using the web-based AHP program that has been created, this study determined each criterion and sub-criteria's weight. The results of weighting the criteria and sub-criteria can be seen in Fig. 4 to Fig. 7.



localhost/alvian/index.php/user/document

DSS Home Profile **Document** Kriteria Pengumuman Log out

**Anggi Saputra**  
35082394894521

Silahkan mengisi data sesuai dengan keadaan yang sebenarnya. Mengalami kendala saat pengisian?  
Silahkan hubungi Kami

**Tanggungans Keluarga**

- Lebih dari 3 Anak
- 3 Anak
- 2 Anak
- 1 Anak
- Tidak Memiliki Anak

**Pendapatan**

- < 1,5 Juta
- 1,5 Juta sampai dengan 3 Juta
- >3 Juta

**Pekerjaan**

- Buruh
- Wiraswasta
- Wirausaha
- Pensiunan

Save

Fig. 3. User Selection Criteria Determination page (in Indonesian version)

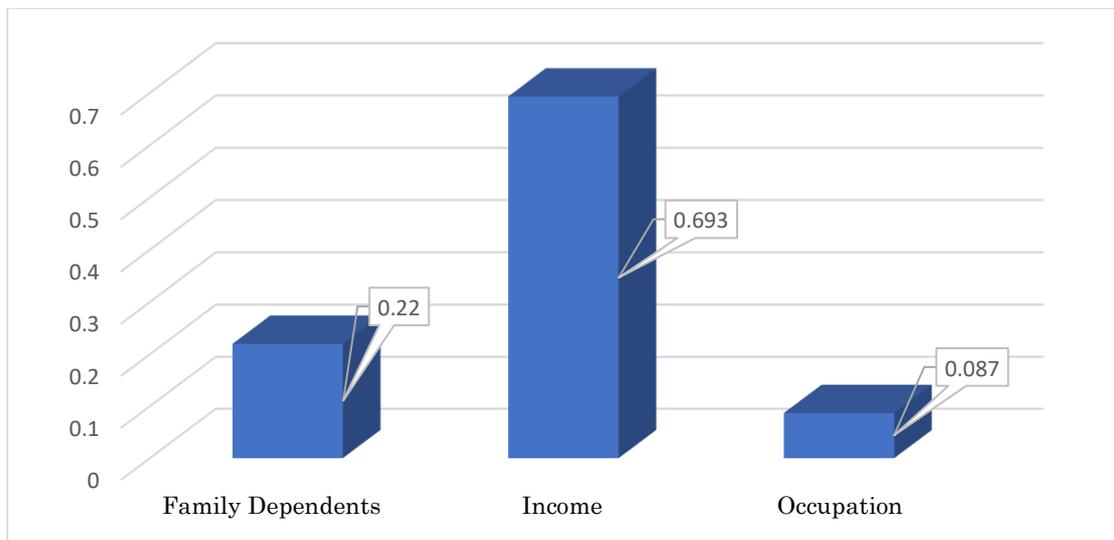


Fig. 4. The Weight of the Selection Criteria for House Subsidy Participants

Fig. 4 shows that the "income" criterion was the criterion with the heaviest weight. The second rank was occupied by the criterion "Family dependents" and in the last rank was occupied by the criterion "Employment/Occupation". This result shows that income is the main criterion in selecting recipients of subsidized housing assistance.

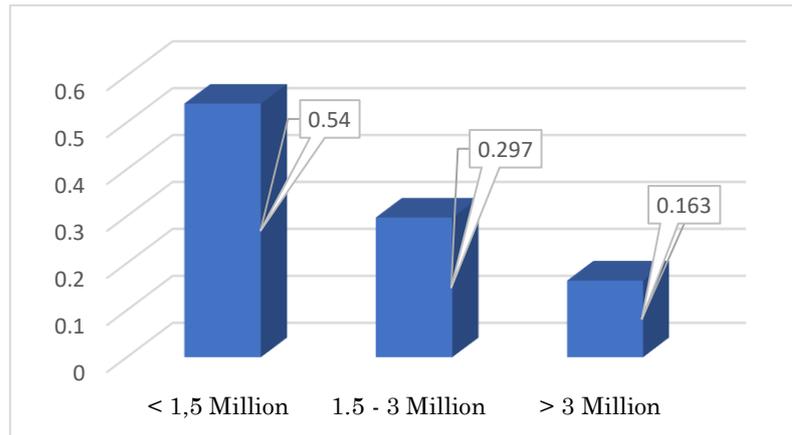


Fig. 5. Weights of Income Sub-Criterion

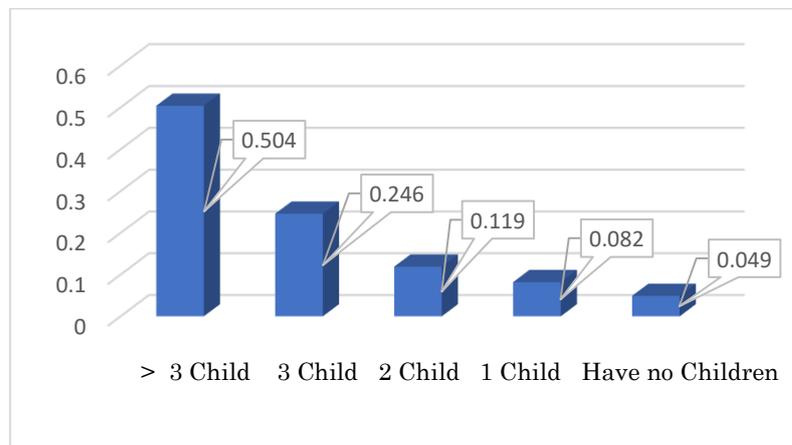


Fig. 6. Weight of Family Dependents Sub-Criterion

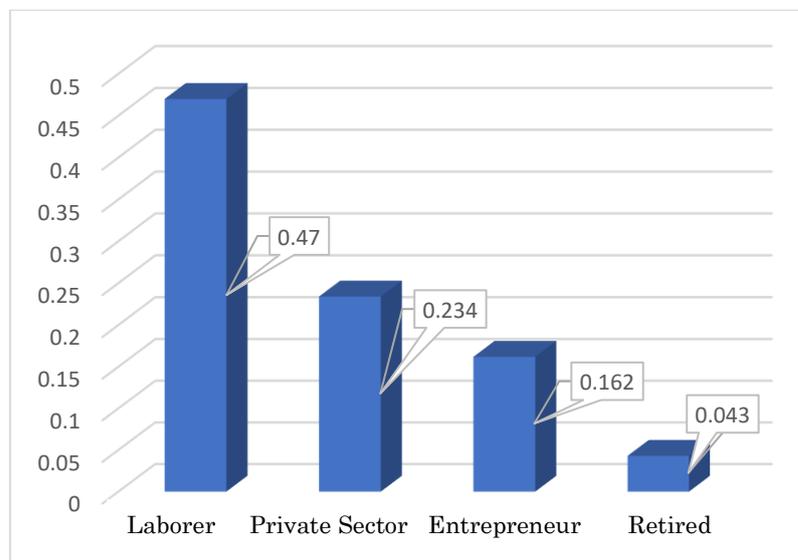


Fig. 7. Weight of Occupation Sub-Criterion

Based on Fig. 5 to Fig. 7, subsidized assistance recipients were prioritized for communities with less than 1.5 million incomes with dependent children of more than 3. In addition, the selected occupation as a laborer was prioritized as a recipient. This of course illustrates that the target of the government is those who need assistance.

### 3.3 Testing

The application testing phase was carried out to determine the accuracy of the DSS design that has been utilized. This test required identity data. Identity data for DSS testing is presented in

Table 5. Furthermore, the DSS determined alternative rankings as presented in Table 6.

Table 5. List of Prospective Housing Subsidy Recipients

No	Alternative Name	Family Dependents	Income	Occupation
1	Anggi saputra	>3	<1,5 Million	Laborer
2	Dimas pamungkas	3	<1,5 Million	Laborer
3	Baruna putra	1	> 3 Million	Private Sector
4	Wahyu wirawan	2	<1,5 Million	Laborer
5	Dino hidayat	2	> 3 Million	Private Sector
6	Farid darmawan	1	<1,5 Million	Laborer
7	Dani alves	>3	1,5 - 3 Million	Retired
8	Budi santoso	3	1,5 - 3 Million	Retired
9	Jefri amin	3	> 3 Million	Private Sector
10	Rizki darmawan	3	1,5 - 3 Million	Entrepreneur
11	Ringgo ferdinand	2	1,5 - 3 Million	Retired
12	Iklil malahin	2	> 3 Million	Retired
13	diko pratama	1	1,5 - 3 Million	Retired
14	Alvian widianto	>3	> 3 Million	Private Sector
15	Delliar khafid	>3	> 3 Million	Retired

Table 6. Determination of Alternative Ranking

Alternative Name	Family Dependents	Income	Occupation	Total	Rank
Anggi saputra	0.22*0.504	0.693*0.54	0.087*0.47	0.52599	1
Dimas pamungkas	0.22*0.246	0.693*0.54	0.087*0.47	0.46923	2
Wahyu wirawan	0.22*0.119	0.693*0.54	0.087*0.234	0.44129	3
Farid darmawan	0.22*0.082	0.693*0.54	0.087*0.47	0.43315	4
Dani alves	0.22*0.504	0.693*0.297	0.087*0.043	0.320442	5
Budi santoso	0.22*0.246	0.693*0.297	0.087*0.043	0.263682	8
Rizki darmawan	0.22*0.246	0.693*0.297	0.087*0.162	0.274035	7
Ringgo ferdinand	0.22*0.119	0.693*0.297	0.087*0.043	0.274035	6
Diko pratama	0.22*0.082	0.693*0.297	0.087*0.043	0.227602	10
Alvian widianto	0.22*0.504	0.693*0.163	0.087*0.234	0.244197	9
Delliar khafid	0.22*0.504	0.693*0.163	0.087*0.043	0.22758	11
Iklil malahin	0.22*0.119	0.693*0.163	0.087*0.043	0.14288	15
Jefri amin	0.22*0.246	0.693*0.163	0.087*0.043	0.187437	12
Dino hidayat	0.22*0.119	0.693*0.163	0.087*0.234	0.159497	13
Baruna putra	0.22*0.082	0.693*0.163	0.087*0.043	0.151357	14

Based on Table 6, the results of the subsidy acceptance test are represented in Fig. 8. The test is used to select seven primary candidates for subsidized housing recipients.

Berikut ini adalah yg berhak menerima bantuan sesuai kuota

No	Nama	Username	Rank	Bobot Hasil Akhir
1	anggi saputra	anggi	1	0.52599
2	dimas pamungkas	dimas	2	0.46923
3	wahyu wirawan	wahyu	3	0.44129
4	farid darmawan	farid	4	0.43315
5	dani alves	dani	5	0.32044
6	ringgo ferdinand	ringgo	6	0.27403
7	rizki darmawan	rizki	7	0.27403

[Cetak sesuai kuota](#)

Fig. 8. Results of the ranking of subsidy recipients (in Indonesian version)

#### 4. Conclusion

This study discusses the DSS in the selection of housing subsidies. This study implemented the Analytic Hierarchy Process (AHP) method based on the web. The results showed that income was the main criterion in selecting subsidized housing recipients, followed by family dependents and occupation criteria. The results also suggested that the DSS could be applied in the selection of subsidized housing assistance recipients. The future researcher suggests that it is necessary to consider other relevant criteria to select subsidized housing recipients. Furthermore, the characteristics of the information on the selection of subsidized housing recipients need to be considered in a fuzzy environment.

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