Journal of Mathematics Instruction, Social Research and Opinion
Vol. 3, No. 1, March 2024, pp. 87 – 98, https://doi.org/10.58421/misro.v3i1.196
ISSN 2962-7842

Composite Performance Index (CPI) Method For Determining Recipients of Community-Based Development (CBD) Assistance Programs At The Dawuan Sub-District Office

Kosim Kosim[1], Junaenni Januarizcha[2]
[1, 2]Sekolah Tinggi Ilmu Komputer Poltek Cirebon, Indonesia

Article Info

Article history:

Received 2023-11-20
Revised 2024-01-05
Accepted 2024-01-07

Keywords:

CBD Beneficiaries
Beneficiary criteria
Pre-prosperous community
CPI
Recommendation

ABSTRACT

The eligibility of recipients of government assistance programs for rural communities is an essential problem in this study. The distribution of recipients of government assistance programs was found to be misdirected. Some rich people receive government assistance programs, but some poor people do not receive government assistance programs. One of the government assistance programs is Community Based Development (CBD), a community development activity directed at increasing community access to achieve better socioeconomic conditions than before development activities to become more independent with a better quality of life and welfare. Everyone wants this assistance program, but the eligibility level of recipients is a problem in distributing it. The research method used is Research and Development (R&D). To solve this problem, a decision support system must be created to assist the Dawuan District Office assess the beneficiaries' eligibility. The Composite Performance Index (CPI) method is needed to determine the provision of CBD assistance by using the criteria of income, housing conditions, education, and environment in the calculation. Each criterion's data from each alternative is weighted and summed to get the CPI value and used for ranking. Based on the results of system testing, the data from the calculation of the CPI method can be used as recommendations that follow the eligibility level of the beneficiaries. The most considerable CPI value is 285 on behalf of Mr. Sarip, who first prioritizes getting assistance from the CBD program. The second priority is on behalf of Mr. Budi, who has a CPI score of 265, to be the following reference as a recipient of assistance from the CBD program.

Corresponding Author:

Kosim
Sekolah Tinggi Ilmu Komputer Poltek Cirebon, Indonesia
Email: kosimssi81@gmail.com

1. INTRODUCTION

Income is one of the indicators to measure community welfare, so income reflects economic progress in a society. This progress can be seen from three aspects, namely income levels, income growth and development, and income distribution. The three aspects of income in the economy and its activities are organized and planned to run balanced, ultimately achieving steady and dynamic economic stability. The policies implemented are the transfer of development resources from the centre to the regions in the form of Presidential Instructions, the expansion of the reach of credit institutions for small people, and the development of institutions related to poverty reduction. Nevertheless, the attention of the current government still requires more targeted special tips to overcome the considerable poverty [1].

Local governments have pursued various programs to alleviate poverty, including the Inpres Desa Tertinggal Program, Joint Business Group Program, Direct Cash Subsidy Program, Prosperous Family Business Credit, Prosperous Family Income Improvement Business Program, National Program for Community Empowerment, and Community Based Development (CBD) Program with the hope that the number of low-income families that exist today can be reduced and there is an increase in community welfare from year to year.

Implementing the Community-Based Development (CBD) program in Majalengka is running quite well because the financial assistance provided to low-income families is used for productive economic activities to create employment opportunities, additional capital, and business development. The success or failure of the Community Based Development (CBD) program, which is fostered sustainably by the Pekraman Village through the Program Management Team (TPP), is inseparable from government intervention, namely through CBD facilitators.

CBD funds are expected to provide sustainable benefits to the community. It is known that the rural poor mostly live in a circle of deprivation, helplessness, vulnerability to disease, lack of education, low income, and physical and mental isolation. These limitations affect the continuity of the CBD program after providing CBD credit, whether these funds continue to roll over or get stuck. Other obstacles in implementing this CBD program are internal obstacles from poor target groups, including cultural, natural, and powerlessness, and external obstacles originating from the institutional and administrative aspects of the local government bureaucracy.

In implementing the CBD program in Majalengka Regency, Dawuan Sub-district is inseparable from internal and external obstacles. The selection of aid program recipients in Dawuan Sub-district is still carried out by recording through field observations without using empirical or computerized calculations, which results in the results of the aid program recipients appearing subjective and not transparent. The distribution of recipients of government assistance programs was found to be misdirected. Some rich people receive government assistance programs, but some poor people do not receive government assistance programs. This means that the research object is the village community in the Dawuan sub-district.

Along with technology development, using computers in various fields is a must. Computer-based Information Systems, one of which is the decision support system, are interactive computer information systems that can provide alternative solutions for decision-makers [2].

This research is limited to how to design and build a Decision Support System in determining the recipients of the CBD assistance program for villages with information sources from the Central Bureau of Statistics, the National Family Planning Coordinating Board, and other related agencies. The decision support system is designed using mathematical modelling based on several criteria, including the criteria of the poor category as the main element and supported by the income component and the health component as supporting elements. The model and criteria for poor people refer to the applicable government regulations.

To determine whether the poor or not, the government through the Central Bureau of Statistics has poverty criteria that can be used as a benchmark to assess whether someone is poor or not, including: (1) The floor area of the residence is less than 8 m2 per person; (2) The type of floor is made of soil or bamboo or wood; (3) The type of wall is unplastered; (4) Does not have a toilet; (5) The source of lighting does not use electricity; (6) The source of drinking water comes from a well; (7) Fuel for daily cooking uses firewood/charcoal/ kerosene; (8) Can only afford to eat once or twice a day; and (9) Income is below 600 thousand rupiah per month.

Some research results have been carried out using the CPI method, including Nur Sakinah Tanjung et al. with the results of her research in the form of a decision support system for selecting exemplary teachers based on several aspects, namely the ability to study, responsibility, creativity, communication. The conclusion obtained from this research is that the existence of a decision support system can minimize errors and the selection of exemplary teachers subjectively [3]. Budi Sudrajat, in his research, states that using the CPI method makes it easier to decide on multi-criteria problems in selecting OSIS administrators with several criteria and choices arranged into a hierarchy [4]. In the study, Putri Dani Adelina et al. [5] used the CPI method to deal with the problem of chef selection. This study shows that a decision support system can provide more effective results in selecting chefs. Robbi Rahim et al., in their research, found that the use of CPI in the process of admitting new students is more effective so that students quickly get information about the admission of prospective students. The results showed that the CPI method can be used as a decision-making tool to minimize errors and subjective acceptance [6]. Finally, Ari Agung Prastowo et al., in their research, state that using the CPI method serves to assess candidates for village heads and process them to get the best ranking results. The results are that the village head election decision support system application has successfully determined the best village head candidate based on the CPI method [7].

This research aims to create a design and implement it as a decision support system for determining recipients of the CBD assistance program for village communities in the Dawuan sub-district, using the Composite Performance Index (CPI) method [2]. This method has accurate and targeted results in helping decision-making. This method has

good selectivity in determining an alternative and can determine the objectives of conflicting criteria, which can be beneficial (Benefit) or unfavourable (Cost). With the CPI method in the selection process for recipients of aid programs that are more feasible, quite feasible, and less feasible, the government can accommodate aid funds with the right target [3]. Hopefully, this research will benefit people eligible for CBD government assistance recommendations.

2. METHOD

The research and development method is used in this research. This method is a research method used to produce a specific product and test the effectiveness of the product [8]. The research techniques used to support this research are (1) Observation, which is a technique or approach to obtaining primary data by directly observing the data object [8], [9]. Observations were carried out at the Dawuan District Office for a period of two months, starting from February to March 2023, to obtain primary data that supports the research; (2) An interview is a two-way communication to obtain data from respondents [8], [9]. Based on the interview results, the criteria used to determine whether a person was categorized as eligible for the CBD assistance program were obtained.

This study used four criteria: income, housing conditions, education level, and living environment. The first criterion is income. Income is any additional economic capacity received or obtained by taxpayers from Indonesia and outside Indonesia, which can be used for consumption or to increase the wealth of the relevant taxpayer by name and in any form, such as salary, wages, and honorarium [10]. The second criterion is the condition of the house. According to Law No. 1/2011 on Housing and Settlement Areas, a house is defined as a building that serves as a livable residence, a means of building a family, a reflection of the dignity of its occupants, and an asset of its owner [11]. The third criterion is the level of education. The level of education is "an activity of a person in developing his abilities, attitudes, and forms of behaviour, both for future life where through certain organizations or not organized" [12]. The last criterion is the living environment. The living environment is everything around living things, both biotic and abiotic, which continuously interact reciprocally [13].

Table 1. Criteria

	Income	Housing Condition	Education level	Living environment
1	≥ 3 million	Very Livable	S_1	Not Very Densely Populated
2	2 ≤ In < 3 million	Liveable	D_3	Not densely populated
3	1 ≤ In < 2 million	Livable Enough	SMA	Quite Dense Population
4	0.5 ≤ In < 1 million	Not Habitable	SMP	Dense Population
5	< 0.5 million	Very Uninhabitable	SD	Very Dense Population

A system is a network of related procedures to perform a particular activity or purpose [14]. At the same time, a decision support system is part of a computer-based information system used to support decision-making in an organization or company [15].

The purpose of making this decision support system is to determine who deserves a social rock program from the government. The social assistance program assists with money or goods from local governments to individuals, families, groups, or communities that are not continuous and selective, which aims to protect against possible social risks [16].

One of the Decision Support Systems is the Composite Performance Index (CPI), which can be used to determine or rank various alternatives based on several criteria [6]. Completion of CPI in finding the best alternative, namely: (1) Identify positive trend criteria (the higher the value, the better) and negative trend (the lower the value, the worse); (2) For positive trend criteria, the minimum value on each criterion is transformed to one hundred, while other values are transformed proportionally higher; (3) For negative trend criteria, the minimum value on each criterion is transformed to one hundred, while other values are transformed proportionally lower. The index used to determine the assessment or ranking of various alternative decisions based on several criteria from each alternative is formulated as follows:

a) Determining the Initial Alternative Assessment Matrix

In the first step, we determine the value of each existing alternative.

$$\boldsymbol{X} = \begin{bmatrix} x_{11} & \cdots & x_{1n} \\ \vdots & \ddots & \vdots \\ x_{m1} & \cdots & x_{mn} \end{bmatrix} \quad (1)$$

where are:

X = Initial Alternative Assessment Matrix

x_{ij} = Matrix element of i-th alternative on j-th criterion

b) Calculate the CPI transformation matrix

$$a_{ij} = \frac{\boldsymbol{x_{ij}}}{\boldsymbol{min}(x_{ij})} \times 100 \text{ ; i = 1,2,..,m dan j = 1,2,..,n} \quad (2)$$

$$\boldsymbol{A} = \begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{m1} & \cdots & a_{mn} \end{bmatrix} \quad (3)$$

where are:

A = CPI transformation matrix

a_{ij} = CPI transformation matrix element of i-th alternative on j-th criterion

c) Determining the weight matrix

$$\boldsymbol{B} = \begin{bmatrix} b_1 \\ b_2 \\ \vdots \\ b_m \end{bmatrix} \quad (4)$$

Where is:

B = Weighting matrix

d) Determining the CPI value

$$\boldsymbol{I} = \boldsymbol{A} \times \boldsymbol{B} = \begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{m1} & \cdots & a_{mn} \end{bmatrix} \begin{bmatrix} b_1 \\ \vdots \\ b_m \end{bmatrix} \quad (5)$$

Where is:

I = CPI Value

In addition, this research uses a software development method, the Rational Unified Process (RUP). RUP is an iterative, architecture-centered, and case-based approach to software development. RUP provides a well-defined structure for the software project journey cycle [17]. The design used in this study includes (1) UML, which has become a standard language in making software blueprints. Modeling with UML can provide visualization, specification, construction, and documentation of a software system. The use of UML is suitable for modelling enterprise systems to web-based applications and even for real-time embedded systems [17]; (2) Flowchart is a chart that shows system procedures logically [14]; (3) Entity Relationship Diagram (ERD) is a way to unify network views and connected databases [18], [19]; (4) Normalization process is defined as a technique that breaks down data in specific ways to handle data processing problems in databases [18], [20], [21]; and (5) Data dictionary is a catalogue of facts about the data and information needs of an information system [22].

For Software Tools in this study using: (1) PHP, Personal Home Page Tools, is a scripting language bundled with HTML, running on the server side. Most of its commands are derived from C, Java, and Pearl, with some additional PHP-specific functions. It allows web application developers to quickly and efficiently serve dynamic, interactive, server-generated HTML pages. PHP is also intended to replace older technologies such as CGI (Common Gateway Interface) [23], and (2) MySQL is an implementation of a relational database management system (RDBMS) that is distributed free of charge under the General Public License (GPL). Any user can freely use MySQL, but with the restriction that the software must not be used as a commercial derivative product. MySQL is a derivative of one of the main concepts in pre-existing databases: Structured Query Language (SQL). SQL is a concept of database operations, especially for selection and data entry, that allows data operations to be done quickly and automatically [24];

3. RESULTS AND DISCUSSION

The Composite Performance Index method is one of the calculation methods of composite performance index-based decision-making. It is used for assessments with non-uniform criteria. The following are the stages of applying the CPI method: In the first step, we determine the value for each alternative as shown in the table below:

Table 2. Initial Alternative Assessment Matrix

No	Income	Housing Condition	Education Level	Living Environment
1	1	2	4	3
2	2	3	3	2
3	4	1	5	4
4	5	2	2	3

The table above illustrates that if the first respondent answers with a one at the income level, the respondent has an income of more than three million rupiah. Likewise, suppose the first respondent answers with a value of 2 in the criteria for housing conditions, 4 at the education level, and 3 in the neighbourhood. In that case, it means that

the condition of the first respondent's house is livable with the last level of education at junior high school, and the neighbourhood conditions are pretty densely populated.

The table above, when made into a matrix, will become:

$$\boldsymbol{X} = \begin{bmatrix} 1 & 2 & 4 & 3 \\ 2 & 3 & 3 & 2 \\ 4 & 1 & 5 & 4 \\ 5 & 2 & 2 & 3 \end{bmatrix}$$

The next step is to calculate the CPI transformation value on each row in the matrix with the following results:

$$\boldsymbol{A} = \begin{bmatrix} 100 & 200 & 400 & 300 \\ 100 & 150 & 150 & 100 \\ 400 & 100 & 500 & 400 \\ 250 & 100 & 100 & 150 \end{bmatrix}$$

This value is obtained by using equation (2) above, and the calculation is as follows:

For the first row of the matrix

$$a_{11} = \frac{1}{1} \times 100 = 100$$

$$a_{12} = \frac{2}{1} \times 100 = 200$$

$$a_{13} = \frac{4}{1} \times 100 = 400$$

$$a_{14} = \frac{3}{1} \times 100 = 300$$

For the second row of the matrix

$$a_{21} = \frac{2}{2} \times 100 = 100$$

$$a_{22} = \frac{3}{2} \times 100 = 150$$

$$a_{23} = \frac{3}{2} \times 100 = 150$$

$$a_{24} = \frac{2}{2} \times 100 = 100$$

For the third row of the matrix

$$a_{31} = \frac{4}{1} \times 100 = 400$$

$$a_{32} = \frac{1}{1} \times 100 = 100$$

$$a_{33} = \frac{5}{1} \times 100 = 500$$

$$a_{34} = \frac{4}{1} \times 100 = 400$$

For the fourth row of the matrix

$$a_{41} = \frac{5}{2} \times 100 = 250$$

$$a_{42} = \frac{2}{2} \times 100 = 100$$

$$a_{43} = \frac{2}{2} \times 100 = 100$$

$$a_{44} = \frac{3}{2} \times 100 = 150$$

After that is determining the weight matrix, as follows:

$$\boldsymbol{B} = \begin{bmatrix} 0.4 \\ 0.1 \\ 0.2 \\ 0.3 \end{bmatrix}$$

The weight value of a matrix is obtained from interviews with the head of community welfare affairs in the Dawuan sub-district or expert information on each criterion for recipients of the CBD assistance program, namely income, housing conditions, education level, and living environment. The next step is to calculate the CPI transformation matrix and its weight matrix by multiplying the two, resulting in the CPI value.

$$\boldsymbol{I} = \boldsymbol{A} \times \boldsymbol{B} = \begin{bmatrix} 100 & 200 & 400 & 300 \\ 100 & 150 & 150 & 100 \\ 400 & 100 & 500 & 400 \\ 250 & 100 & 100 & 150 \end{bmatrix} \begin{bmatrix} 0.4 \\ 0.1 \\ 0.2 \\ 0.3 \end{bmatrix} = \begin{bmatrix} 40 + 20 + 40 + 90 \\ 40 + 15 + 30 + 30 \\ 160 + 10 + 100 + 120 \\ 100 + 10 + 20 + 45 \end{bmatrix}$$

$$\boldsymbol{I} = \begin{bmatrix} 190 \\ 115 \\ 390 \\ 175 \end{bmatrix}$$

Using the same method and different cases, the following results of programming on the CBD beneficiary program decision support system: logging in first to run the program, as shown in Figure 1 below.

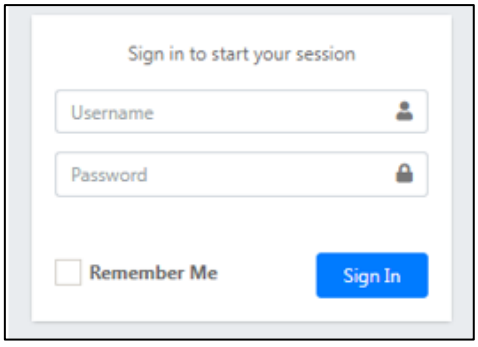


Figure 1. Login

After being successful, the main menu appears. The main menu has several menus, including Community Data, Criteria Data, and CPI Calculation, as shown in Figure 2.

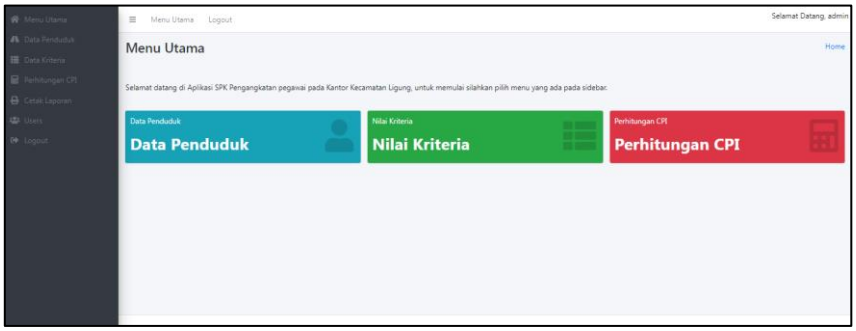


Figure 2. Main Menu

In the main menu, the population and criteria data are filled in according to the data of residents who want to be proposed as beneficiaries of the CBD program and the criteria according to the four criteria set.

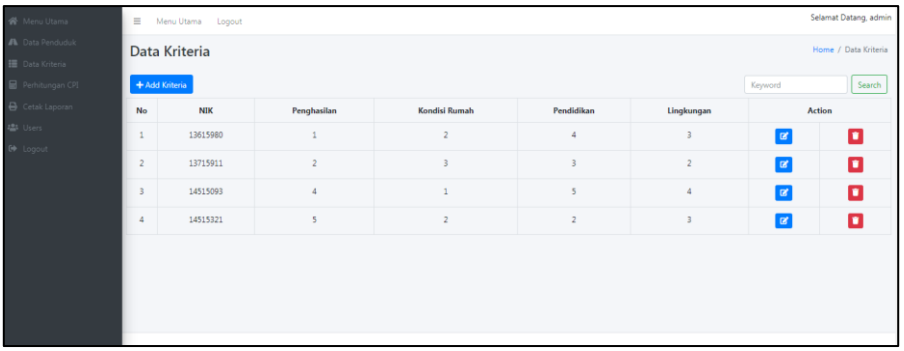
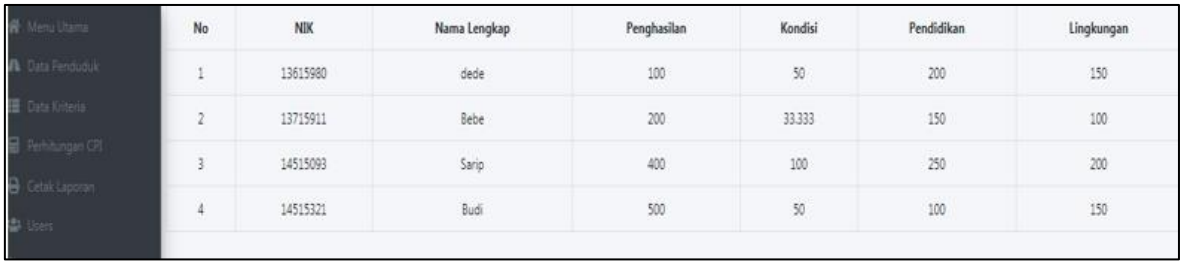


Figure 3. Criteria Data

After the criteria data is filled in for each citizen's name submitted as a candidate for the CBD assistance program, the CPI transformation matrix is calculated with the results shown in Figure 4.



No	NIK	Nama Lengkap	Penghasilan	Kondisi	Pendidikan	Lingkungan
1	13615980	dede	100	50	200	150
2	13715911	Bebe	200	33.333	150	100
3	14515093	Sarip	400	100	250	200
4	14515321	Budi	500	50	100	150

Figure 4. CPI transformation matrix

If the results of the CPI transformation matrix in Figure 4 are multiplied by the weight of each criterion, the results are shown in Figure 5. The weight for the income criteria is 0.4, the weight for the housing condition criteria is 0.3, the weight for the education level criteria is 0.1, and the weight for the living environment is 0.2.

No	NIK	Nama Lengkap	Penghasilan	Kondisi	Pendidikan	Lingkungan
1	13615980	dede	40	5	60	30
2	13715911	Bebe	80	3.3333	45	20
3	14515093	Sarip	160	10	75	40
4	14515321	Budi	200	5	30	30

Figure 5. The result of the CPI transformation matrix with its weights

From the results shown in Figure 5, the CPI value obtained for each prospective recipient of the CBD program assistance are:

$I_1 = 40 + 5 + 60 + 30 = 135$
$I_2 = 80 + 3.3 + 45 + 20 = 148{,}5$
$I_3 = 160 + 10 + 75 + 40 = 285$
$I_4 = 200 + 5 + 30 + 30 = 265$

If the CPI values above are sorted from largest to smallest, they are 285, 265, 148,5, and 135. The greater the CPI value obtained, the greater the chance for a person to be selected as a recipient of the CBD assistance program. The most considerable CPI value is 285 on behalf of Mr. Sarip, who first prioritizes getting assistance from the CBD program. The second priority is on behalf of Mr. Budi, who has a CPI score of 265, to be the following reference as a recipient of assistance from the CBD program. The third priority is on behalf of Mr. Bebe, with a CPI value of 148.5, to be the third reference as a recipient of assistance from the CBD program. The fourth priority is on behalf of Mr. Dede, who has a CPI score of 135 as the fourth reference as a recipient of assistance from the CBD program.

If the number of quotas as recipients of the CBD assistance program is more significant than four people, then the four names above will be used as people who get priority to receive the CBD assistance program. Conversely, if the number of quota recipients of the CBD assistance program in each village is two, then the first and second priority people will be proposed as eligible people to receive the CBD assistance program.

These results follow Budi Sudrajat's research, which states that selecting student council administrators with the CPI method makes it easier to help and support decisions on several criteria and choices hierarchically. Likewise, Putri Dani's research results show that the CPI method can handle Chef selection problems, and finally, Ari Agung Prastowo's research shows that the CPI method makes it easy to assess candidates for village heads and provide the best ranking based on available criteria. The above research also makes it easy with the CPI method to recommend prospective recipients of CBD program assistance based on four existing criteria.

4. CONCLUSION

After going through the stages of discussion and discussion above, the conclusions are: (1) The CPI method in determining the provision of assistance for the CBD program

uses several criteria for its calculation: income, housing conditions, education level, and living environment. Each criterion data from each alternative is weighted and summed up to get a CPI value that can be used as the final ranking value, and (2) Based on the results of system testing, the data from the calculation of the CPI method can provide a recommendation for providing CBD program assistance that is following the needs at the Dawuan District Office. The application system was created to help the calculation process of receiving CBD program assistance using the composite performance index calculation method. However, the system built cannot be used online, so it needs development by storing system files on hosting storage media and giving domain names so that users can access the system more efficiently. The most considerable CPI value is 285 on behalf of Mr. Sarip, who first prioritizes getting assistance from the CBD program. The second priority is on behalf of Mr. Budi, who has a CPI score of 265, to be the following reference as a recipient of assistance from the CBD program. The third priority is on behalf of Mr. Bebe, with a CPI value of 148.5, to be the third reference as a recipient of assistance from the CBD program. The fourth priority is on behalf of Mr. Dede, who has a CPI score of 135 as the fourth reference as a recipient of assistance from the CBD program.

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