Priorities of road network development to support national food flows in Merauke District with SWOT and AHP methods

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Abstract. Agricultural land in Merauke Regency has the potential to produce approximately 5.2 million tons of rice a year with 1.2 million hectares of land. this figure has fulfilled 5.41 percent of the national rice yield. Traffic facilities in Merauke Regency are less able to support Merauke as a National Food Barn, causing the distribution of logistics to be not smooth. Planning strategies with effective development and development priorities are solutions to the limitations of the development budget. Based on the results of the Strength Weakness Opportunities Threats (SWOT) analysis, an aggressive strategy for road infrastructure development and the results of the Analytical Hierarchy Process (AHP) showed that the main segments need to develop was was the Tanah Miring - Salor road, Semangga - Tanah Miring road, road section Kuprik - Semangga and Kurik - Kumbe road segments, Salor - Kurik road and Wendu - Kumbe road section.

1. Introduction

Peatlands and non-conservation forests of 1.2 million hectares in Merauke Regency are known to have the potential to become productive paddy fields. The land has a relatively flat contour which allows for mechanization of agriculture. President of the Republic of Indonesia Ir. Joko Widodo has designated Merauke Regency as a "national food barn" or national food-producing center in his speech. This area estimated to be able to produce 5.2 million tons of rice in a year, this figure is equivalent to 5.41 percent of rice produced by Indonesian farmers, 88.92 percent of all Papua Provinces, or 76.24 percent of all rice yields on the island of Papua.

Kurik District, Semangga District, and Tanah Miring District are helped by 6 main roads namely Kuprik - Semangga road, Wendu - Kumbe road, Semangga - Tanah Miring road, Tanah Miring - Salor road, Salor - Kurik road and Kurik road section - Kumbe as shown in figure 1. Administratively the road is categories as a Provincial road. Based on the aim of the road network, the Kuprik - Semangga road is a 7-meter wide collector road and Wendu - Kumbe, Semangga - Tanah Miring, Tanah Miring - Salor, Salor - Kurik and Kurik sections - Kumbe is a primary local road with a width of 6 meters [1–3]. The national food barn has not been realized because of constraints in the development of transportation infrastructure in Merauke Regency. In 2015, Merauke Regency has a total road reached 1,820,211 kilometers. The length of paved roads is less than that of non-paved roads with a percentage reaching 38.63 percent compared to 61.37 percent [4]. This has resulted in the ineffectiveness of the traffic of commodities, important materials, and basic materials to help people mobility.
Transportation can be defined as people or goods moving activity from a place to another [5]. Developing transportation infrastructure and accessibility can improve basic community services in improving the quality of economy [6–8]. The necessary of an effective and efficient system and delivery time in accordance with scheduling is the purpose of transportation planning in the logistics system [9].

Long term planning strategies and determining development priority and effective traffic infrastructure is one solution to the limited the high cost of building transportation networks and development budget. This is in accordance with the pattern of community activities and needs that are based on the reality of regional transportation arrangements [10,11].

2. Methods
The use of the Strength, Weaknesses, Opportunities, and Threats (SWOT) method is a strategy of assessing roads internally and externally. Analysis of surplus or deficit is used to find out the rice supply in an area which is then followed by the Analytical Hierarchy Process (AHP) method as a priority determination of road network development. AHP to solve complex problems with many variables that can be developed in developing road infrastructure networks and agriculture, [12–16].

2.1. Location a research

2.2. Model method and development
The measurement of strategy and priority for developing road network are used by the SWOT method by conducting a questionnaire of operators, users and public and AHP of owners, operators, users, and the public. This study uses qualitative methods and quantitative methods.

3. Results

3.1. Area development
The results of the SWOT analysis shown in Figure 3 show the value of road infrastructure with good and appropriate performance of community expectations in the Tanah Miring - Salor road section placed on Quadrant II and thereafter are Kuprik - Semangga, Semangga - Miring and Kurik roads - Kumbe shows road network performance opportunities that are considered good and have high expectations for road improvement. Expectation of high mobility with less than optimal road performance found at Salor - Kurik road section in Quadrant I. This is concluded that the Salor - Kurik
road is still in a damaged state and the community hopes to do Wendu - Kumbe road and road expansion in Quadrant IV with status the road is good and hopes for a low road increase.

The conclusion of the road network performance improvement strategy IFAS and EFAS is an aggressive strategy in accordance where roads can be improved such as conducting road concrete, paving to widening the road.

3.2. Surplus or deficit
Rice commodity production and the difference in population in every district causing unbalanced food needs so that in some districts experiencing surplus and Deficit in others. The uneven distribution of production makes the need for logistic transportation networks very necessary in order to reduce the disparity between regions [17].

The average consumption of the Papua region capita in a day reaches 0.333 kg / day or in one meal/ kg of rice for 6 people. [18,19].

Table 1. Amount of surplus or income from rice in Merauke Regency in 2016

| District name | Surplus (ton) | Deficit (ton) | District name | Surplus (ton) | Deficit (ton) |
|---------------|--------------|---------------|---------------|--------------|---------------|
| Kimaam        | -138.41      |               | Malind        | 24,462.71    | -5,770.29     |
| Waan          | -213.71      |               | Merauke       | 1,397.42     |               |
| Tabonji       | -374.41      |               | Naukenjerai   | 36,597.47    |               |
| Ilwayab       | -691.43      |               | Semangga      | 58,866.46    |               |
| Okaba         | -393.20      |               | Tanah Miring  | 3,277.53     |               |
| Tubang        | -190.22      |               | Jagebob       | 3,277.53     |               |
| Ngguti        | -252.46      |               | Sota          | -336.31      |               |
| Kaptel        | -178.57      |               | Muting        | -516.85      |               |
| Kurik         | 47,376.15    |               | Elikobel      | 649.70       |               |
| Animha        | -88.68       |               | Ulilin        | 246.06       |               |
| **Total**     | **172,873.50**| **-9,144.54** | **Total**     | **172,873.50**| **-9,144.54** |

Source: Analysis results, 2018

From the results of table 1 it can be concluded that Merauke District Surplus is 171,361.50 tons.

3.3. Road network development priorities
The AHP method uses a questionnaire with a plan chart in accordance with attachment 1. The Vector of Eigenvalue obtained after the consistency normalization test data in accordance with attachment 2. The higher the value of the road benefits the greater the Eigen Vector value. The following is the result of AHP analysis according to the priority sequence and diagram of the calculated Eigen Vector value:

Table 2. Eigenvector values according to the priority sequence

| Criteria | Sub criteria         | Value |
|----------|----------------------|-------|
| Delivery | Easy to reach         | 0.44  |
|          | On-time               | 0.31  |
|          | Fluent and fast       | 0.21  |
|          | Regular               | 0.04  |
| Quality  | Low pollution         | 0.66  |
|          | Comfortable           | 0.13  |
The data in table 2 shows the Delivery variable is the main criterion in determining the development of the road network with sub-criteria that are easy to reach, timely, smooth and fast.

| Criteria          | Value |
|-------------------|-------|
| Secure            | 0.10  |
| Safe              | 0.07  |
| Orderly           | 0.04  |
| Cost              | 0.20  |
| Efficient         | 0.42  |
| Rates             | 0.31  |
| Accessibility     | 0.15  |
| Capacity          | 0.08  |
| Integrated        | 0.03  |

Source: Analysis results, 2018

The highest number of vector Eigen numbers obtained in the alternative picture is the Tanah Miring - Salor road, Semangga - Tanah Miring road, Kuprik - Semagga road section and Kurik - Kumbe road section. The next supporting priority is the Salor - Kurik road section and the Wendu - Kumbe road section.

**Figure 2. Priority diagram for road network development**

The highest number of vector Eigen numbers obtained in the alternative picture is the Tanah Miring - Salor road, Semangga - Tanah Miring road, Kuprik - Semagga road section and Kurik - Kumbe road section. The next supporting priority is the Salor - Kurik road section and the Wendu - Kumbe road section.

**4. Conclusion**

The strategy of developing and improving the road network to realize the national food barn in Merauke Regency is an aggressive strategy where roads can be increased such as making road concrete, paving up to widening the road. Deficit surplus shows the need for regional deployment as a reference for developing a road network. Tanah Miring Road, Semangga Road, Kuprik Road, Kurik Road is a priority for the improvement of the road network for the smooth distribution of rice food and to help the realization of the national food barns. Then, Salor and parts of the Wendu road become supporting infrastructure.

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