Land Suitability Evaluation for Rice Field:
Farmers' Effort to Decrease Land Limitation in Mekarsari, South Kalimantan

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Abstract—Land in Mekarsari Sub District could be classified as the swampy land. Swampy land was used as the rice field. The objectives of research was to evaluate the land suitability for rice field, and to analyze the farmers effort to overcome land limitation in Mekarsari Sub-district. Land unit map was used as the sampling location of research. Number of land unit was 36 unit. Land unit was earned from map overlay, i.e. landform map, landuse map, slope map, and soil map. The result of research showed that Mekarsari area was classified as suitable (S2), with the area was 143.50 Km². The limitation factor of land suitability was temperature, cation exchange capacity, and drainage. The farmers efforts to decrease the land limitation were using the Banjar system, such as preparing the seed in early wet season, and using the fertilizer to increase the cation exchange capacity.

Keywords—land, suitability, rice field, farmers effort

I. INTRODUCTION

Land evaluation is the early processes to produce the data and information of land resources. The land resources data and information uses to determine the policy of agriculture development. Land potency to develop the comodity is one of effort to get the high quality of agriculture product. The assenment of land potency can be used to revise the agricultural system [1]. Land evaluation is one of method to determine land potential based on criteria of land suitability classification [2].

Land is used to meet the needs such as food, clothing and agricultural development efforts, livestock and plantations related to the land. Land is the series of attributes in earth surface, such as soil, water, plant, et.al [3].

Land use has the high relation to land utilization and land evaluation. Land utilization is related to present or current land use due to the dynamic of human activity in earth surface. Land utilization is not only related to agriculture activity but also related to industry, and services [4].

Land evaluation assess the land for specific purpose. Land evaluation activity consists of implementation, survey interpretation, and study of landform, soil, vegetation, climate, and another land aspect [5].

Barito Kuala District has the low plain. The topography of Barito Kuala is 0.2-3 m below sea level. The condition of Barito Kuala causes the area as the centre of rice production in Kalimantan Selatan Province [6].

Mekarsari Sub-district is one of Sub-district in Barito Kuala. Mekarsari has 9 villages. The area of Mekarsari is about 13,350 Hectare. The area is dominated by tidal land. The tidal land is used as the rice field. Total of rice field in Mekarsari is about 7,867 Hectare [6].

Mekarsari becomes the centre of tidal rice field due to the high potential of tidal land. The objectives of research are to evaluate the land suitability for rice field, and to analyze the farmers effort to overcome land limitation in Mekarsari Sub-district.

II. METHOD

Land unit map is used as the sample area. Land unit map is obtained from landform map, slope map, soil map and landuse map. The research area has 36 land unit. Land unit map is presented in Fig 1.

Primary data is collected based on land unit map. Primary data consists of rooting medium, nutrient retention, and terrain. Secondary data consists of temperature and rain fall.

Land suitability evaluation uses matching method. Matching method compares between suitability criteria and field land data and laboratory data. Land quality and characteristic classification is presented in Table 1 [2]. Matching method uses the limitation factor. Land suitability classification for rice [7] follows:

1. S1 (very suitable): Land unit has less than one small limitation.
2. S2 (suitable): Land unit has more than one small land limitation or one of medium limitation.
3. S3 (slightly suitable): Land unit has more than medium limitation or one of heavy limitation.
4. N1 (not suitable temporarily): Land units have two or more heavy limits that can still be repaired.
5. N2 (not suitable permanently): Units of land have an
irreparable weight restriction
To understand the farmers effort to decrease the land limitation uses the result of previous research [8]. The result of previous research is related to the farmers activity in tidal rice field.

![Land Unit Map of Mekarsari Subdistrict](image)

**Fig 1. Land Unit Map of Mekarsari Subdistrict**

<table>
<thead>
<tr>
<th>No.</th>
<th>Land Quality/ Land Characteristic</th>
<th>Land Suitability Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Water Available</td>
<td>S1: &lt;3, S2: 3-9, S3: 9-15, N1: 20, N2: &gt;30</td>
</tr>
<tr>
<td>3</td>
<td>Rooting Medium (r)</td>
<td>S1: Good, S2: Normal, S3: Hampered, S4: Poor, S5: &lt;50, N1: &lt;80, N2: &gt;80</td>
</tr>
<tr>
<td>4</td>
<td>Nutrient Retention (f)</td>
<td>S1: Medium, S2: Low, S3: Very low, N1: &gt;7.0, N2: &gt;8.5</td>
</tr>
<tr>
<td>5</td>
<td>Terrain/Potential/ Mechanization (s/m)</td>
<td>S1: &lt;3, S2: 2-8, S3: &gt;8, N1: 2-10, N2: &gt;15</td>
</tr>
</tbody>
</table>

### III. RESULT AND DISCUSSION

#### A. Land Characteristic

**1) Landform**

Landform in Mekarsari presented in Table 2.

<table>
<thead>
<tr>
<th>No</th>
<th>Symbol</th>
<th>Landform</th>
<th>Area (km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>O1</td>
<td>Basin of peat anticline, material pebble, sand, clay and mud</td>
<td>120.50</td>
</tr>
</tbody>
</table>

**Table 2. Landform in Mekarsari**

Genesis of landform in Mekarsari is organic processes landform, fluvial processes landform and marine processes.
landform. Organic processes landform consists of basin of peat anticline, material pebble, sand, clay and mud (O1), and limb of peat anticline, material pebble, sand, clay and mud (O2) that the area of both landform are about 120.50 km$^2$ and 10.44 km$^2$. Area of marine landform (M2) is about 4.76 km$^2$. Area of fluvial landform (F1) is about 7.80 km$^2$.

Basin of peat anticline and limb of peat anticline landforms are formed by the sedimentation of dead plants, that landform is formed of peat soil. The region is a peat dome. The process of peat development causes a decline in the area of peat dome into a basin.

Fluvial landform is formed by river processes. Natural levee is formed by sedimentation processes of river. Marine landform is formed on seawater, i.e. wave and tides. Tides processes was formed tidal flat, material consists of pebble, sand, silt, clay and mud [9].

The process of peat development causes a decline in the area of peat anticline into a basin.

Soil in Mekarsari is the swamp area, hence the area has the bad drainage. Cation exchange capacity is the indicator of soil fertility. The area has the good of rooting medium, pH and mechanization potention. Tidal water flow causes the water change in research area, hence the pH of water is classified normal.

Community in tidal area has been adapted with the tidal environment. They has been implemented the rice cultivated cycle. Community in Mekarsari uses the Banjar System in preparing of land until paddy haversting [8]. Banjar system in land preparing consist of tajak-puntal-balik-hambur. Seedbed system consists of taradak-ampak-lacak. Arrangement system consists of tongkonan [11]. Agriculture system has the conventional, due to the using the traditional agricultural tools. Varietas local of paddy in research area is planted in once a year.

Land preparing uses the simple tools called tajak. Land is added fertilizer and calc. Function of fertilizer is to repair the cation exchange capacity. Rice is suitable in swamp area, due to the swamp area has the bad drainage. Cation exchange capacity is related to organic matter available for plant. Cation exchange capacity is the indicator of soil fertility. The area has the good of rooting medium, pH and mechanization potention. Tidal water flow causes the water change in research area, hence the pH of water is classified normal.

Land use in research is agriculture, swampy forest, and settlement. Agriculture area consists of rice field, and vegetable field. Swampy forest is managed by local community. Settlement is located in along of river. Land use in Mekarsari is presented in Table 5.

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<table>
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<th>No</th>
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<th>Landuse</th>
<th>Area (km²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>Agriculture</td>
<td>85.96</td>
</tr>
<tr>
<td>2</td>
<td>SF</td>
<td>Swampy Forest</td>
<td>54.87</td>
</tr>
<tr>
<td>3</td>
<td>S</td>
<td>Settlement</td>
<td>2.67</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total area</td>
<td>143.5</td>
</tr>
</tbody>
</table>

4) Slope

Slope of Mekarsari is flat (0-3 %). The elevation in area is 0-5 m. Mekarsari is the swamp area, hence the area has the low elevation.

**B. Land Suitability for Rice Field Land**

Research area has the rainfall about 1,700 mm/year. The number of dry month in research area is about 2 month. The climate of research area based on based on Schmidt Ferguson classification is B (wet) with value of Q is 0.255.

All of land unit of research area is classified as suitable (S2). Land limitation is drainage, temperature and cation exchange capacity. Rice is suitable in swamp area, due to the swamp area has the bad drainage. Cation exchange capacity is related to organic matter available for plant. Cation exchange capacity is the indicator of soil fertility. The area has the good of rooting medium, pH and mechanization potention. Tidal water flow causes the water change in research area, hence the pH of water is classified normal.

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swamp environment. People adapt to bad drainage. The existence of such adaptation causes a decrease in the effect of the limitation for the farmers.

IV. CONCLUSION

Mekarsari has 36 units of land. These land units have characteristics such as landforms of basin of peat anticlinal, limb of peat anticlinal and natural levee, and tidal flat. Characteristic of land is fine texture of clay and silty clay; flat slope; and agriculture, swampy forest and settlements landuse. Land suitability for rice field in Mekarsari is suitable (S2) with total area of 143.50 km². The land boundaries are drainage, temperature and cation exchange capacity. Banjar system is used to decrease the land limitation.

Fig 2. Land Suitability for Rice Field

REFERENCES


