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IDENTIFICATION OF SUITABILITY OF RICE PLANTING LAND IN SIPAKU VILLAGE, SIMPANG EMPAT DISTRICT AREA ASAHAN DISTRICT

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ABSTRACT
Land suitability is the degree to which a piece of land is suitable for a particular use. The suitability of the land can be assessed for current conditions (actual land suitability) or after improvements have been made (potential land suitability). In a modern agricultural system, managing nutrients in the soil is very important so that soil productivity is maintained and its fertility is maintained. In obtaining land suitability classes for rice plants (Oriyza sativa L.) in the Sipaku Area Village, the matching method was used. The matching method is carried out by matching data from laboratory analysis of soil taken at the sample location. It was concluded that the suitability classes for paddy fields were found at SPL 1, SPL 2 and SPL 3 with the actual land suitability classes being marginally suitable / S3 and quite suitable / S2 with limiting factors for the rooting media in the form of drainage, into the soil, and nutrient retention in the form of pH, nutrient availability. in the form of soil CEC, soil texture, and flood hazard in the form of inundation, while the potential land suitability class is quite suitable / S2 with limiting factors for root media in the form of drainage, soil depth, and nutrient retention in the form of pH, nutrient availability in the form of soil CEC, soil texture, toxicity in the form of salinity and flood hazards in the form of inundation, while the potential land suitability class is very suitable / S1 and quite suitable / S2. The depth of the plow layer has a positive effect on the availability of water for rice plants so that it is related to the production of lowland rice plants.

KEYWORDS: Land suitability, limiting factors, rice plants, production.

INTRODUCTION
Land suitability evaluation is a method for determining the potential of an area whose assessment is based on objective land suitability. The evaluation results are in the form of a policy for determining agricultural crop commodities to be cultivated in the area, with the determination of classes and subclasses based on the toughest limiting factors. Land suitability is an effort to obtain harvest production from commodities the maximum. The suitability of this land can be seen on a real basis from survey results of land management that is still less than optimal. This land management process is needed to obtain maximum results which are usually also called potential land suitability. Land suitability is based on determining the condition of the physical properties of the soil, soil chemistry and the environment, namely climate and topography.

By carrying out surveys carried out in an area, it will very important benefits are obtained. The main objective of a soil survey is to obtain important specific information about soil types and present it on a single map, so that it can be interpreted by people who need basic facts about land. Evaluation of land suitability is very necessary for planning productive and sustainable land use in the area being studied. Chemical and physical properties include climate, soil, topography, surface rocks and land use requirements or plant growth requirements, the matching method is compare land characteristics in each land map unit (SPL) with the criteria for land suitability classes for rice crops.

In today's modern agricultural system, managing nutrients in the soil is very important so that soil productivity is maintained and its fertility is maintained. This is understandable because agricultural production is very dependent on how much the optimal need for nutrients can be met by the soil as a medium for plant growth. If the soil is unable to provide sufficient amounts of nutrients, then agricultural production will not be satisfactory. Because soil fertility is directly related to plant growth and production, studies on soil nutrients and evaluation of soil fertility need to be carried out as a consideration in fertilizing measures to increase plant production and health (Susila, 2013).

Soil quality assessment can be done through assessing the physical, chemical and biological properties of soil or indicators that describe important processes in soil soil, apart from that, soil quality tests can be measured from changes in soil function in response to management in the context of land use. Considering the importance of land as life, protecting soil quality as well as protecting air and water quality is an important thing to implement (Padmawati et. al., 2017). This research was carried out to determine the limiting factors and suitability classes of paddy fields in the Sipaku Area Village.

MATERIALS AND METHODS

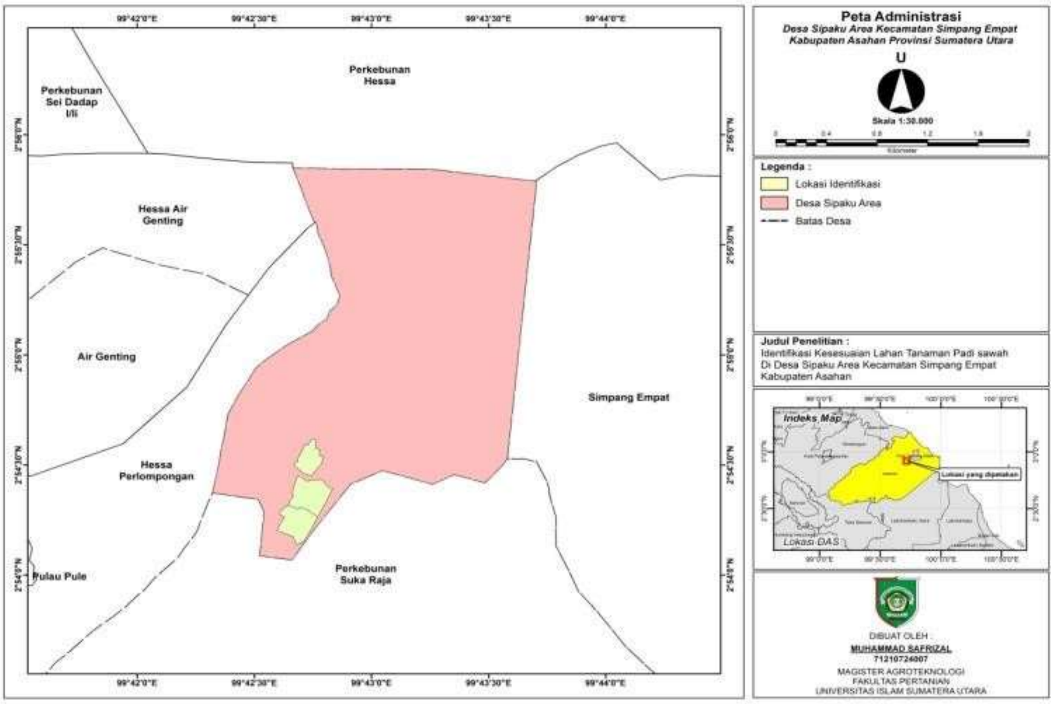
This research was carried out on irrigated rice fields in Sipaku Village, Simpang Empat District, Asahan Regency, North Sumatra Province, covering an area of ± 210 ha. The tools used are the Global Positioning System (GPS) to determine the coordinates and height of a place, a ground drill is used to take soil samples, paper labels, plastic bags, rubber bands, hoes, cameras to document activities and conditions in the area. The materials used are soil samples taken from each SPL.

In obtaining land suitability classes for rice plants (Oriyza sativa L.) in the Sipaku Area Village, the matching method was used. The matching method is carried out by matching data from laboratory analysis of soil taken at the sample location. Next, its suitability is checked against the suitability class criteria for lowland rice plantations. In this way, the data obtained will have actual value and improvement efforts will be a limiting factor in obtaining potential land suitability classes for developing rice plants in the Sipaku Area Village.

1. RESULTS AND DISCUSSION

Administration

Sipaku Area Village is located in Simpang Empat District, Asahan Regency. The geographical location of Simpang Empat District is at latitude 58'48 and east longitude North 2 050'00"- 20990 33'87"- 990 50'21. The observation point is in Sipaku Village, Simpang Empat District, Asahan Regency.



Gambar 1: Peta administrasi Desa Sipaku Area Kecamatan Simpang Empat Kabupaten Asahan.

Surveys

Based on the results of surveys and interviews conducted with farmers at the research location, Sipaku Village, Simpang Empat District, Asahan Regency, the following data were obtained. The results of the first interview at the SPL 1 location obtained harvest yields of around 4 tonnes/ha from a land area of 4.8 ha., which means the production results obtained are relatively low. The rice plant variety he uses is IR32.

The results of the first interview at the SPL 2 location obtained production results around 7 tonnes/ha from a land area of 7.5 ha, which means the harvest obtained is classified as moderate. The rice plant varieties he uses are Trisakti and Mixture of Other Varieties (CVL). SPL 3 location gets production results around 8.5 tonnes/ha from a land area of 8.5 ha, which means the yields obtained are relatively high. The rice plant variety he uses is IR32.

Climate

Based on data from PT. The Telima Heritage of Teluk Manis Plantation obtained rainfall in the Sipaku Village area, Simpang Empat District, Asahan Regency in the last 5 years (2018-2022) was 2,044.6 mm/year. According to the land suitability criteria for irrigated lowland rice by Djaenudin, *et al.*, (2011), the rainfall required for irrigated lowland rice is > 1,500 mm/year, so the rainfall in Sipaku Village, Simpang Empat District, Asahan Regency is 2,024.6 mm/year classified as S1 / Very suitable (> 2,024.6 mm/year). According to the land suitability criteria for irrigated lowland rice by Djaenudin, *et al.*, (2011), the average temperature required for irrigated lowland rice plants is 24-290C, and the humidity required for irrigated lowland rice plants is 33-90%.

Table 1: Rainfall Data (CH) for the last 5 years for the period 2018 to 2022.

Month			Rainfall	Rainfall		Average
	2018	2019	2020	2021	2022	
January	141	127	216	125	40	129,6
February	40	41	88	24	93	57,1
March	41	79	12	122	63	63,4
April	165	189	115	172	118	151,6
May	205	109	343	165	232	210,7
Juny	119	167	216	116	174	158,3
July	170	212	225	184	64	170,9
Agust	129	115	83	352	472	230
September	400	55	333	69	157	202,8
October	211	379	185	82	243	219,8
November	191	257	281	261	459	289,62
December	126	175	221	103	180	160,8
Total	1937	1904	2317	1774	2293	2044,6

Source: PT. The Telima Heritage of Teluk Manis Plantation, 2023

Table 1 shows that rainfall and rainy days in the last 5 years, namely from 2018-2022. Data on rainfall and rainy days sourced from PT. Telima Plantation Heritage, Asahana Regency, Province North Sumatra due to the location of the source of complete climate data. The author uses this rainfall data to find the number of water balance calculations or look for dry months which will later be included in the land suitability class table.

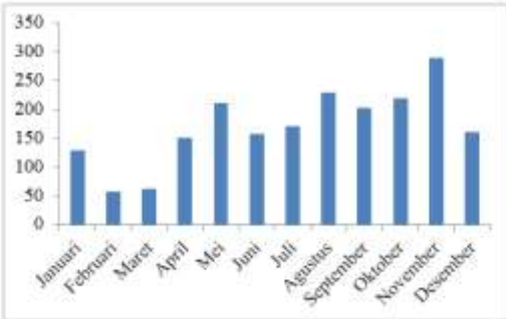


Figure 2: Average Rainfall (CH) for 5 years (2018 to 2022).

Table 2: Water Balance Calculation Results.

Month	Water Balance Calculations							
	HH	CH	CP	ET	KA	CA	DN	DA
Januari	6,6	129,6	200	150	179,6	179,6	0	0
Februari	4,4	57,1	136	150	43,1	43,1	0	0
Maret	4,8	63,4	140	150	53,4	53,4	0	0
April	7,4	151,6	200	150	201,6	200	1,6	0
Mei	8,4	210,7	200	150	260,7	200	60,7	0
Juni	7,8	158,3	200	150	208,3	200	8,3	0
Juli	7,8	170,9	143	150	163,9	163,9	0	0
Agustus	9,6	230	200	150	280	280	0	0
September	9,4	202,8	86,2	150	139	139	0	0
Oktober	11,6	219,8	172,2	120	272	272	0	0
November	16,8	289,62	200	120	369,62	200	169,62	0
Desember	8,6	160,8	200	150	210,8	200	10,8	0
Surplus	103,2	2.044,62					251,02	

Information: HH = Rainy Day (day); CH = Rainfall (mm); CP = Initial water reserves (mm); max 200 mm, ET = Evapotranspiration (mm) If HH <10 then ET =150mm but if HH>10 then ET =120 mm; KA = Water Balance (mm) That is (CP+CH)-ET ; CA = Final water reserves (mm) If KA>200 mm then CA = 200 mm but if KA<200 mm then CA=KA; DN = Drainage (mm) DN= KA-CA (ifKa ; DA = Water Deficit (mm).

From Table 2 above, it can be seen that there are no dry months so that rice planting can be done in any month, but the most appropriate rice planting must take into account the criteria for growing conditions for the rice plant. So that the rice plants planted are not easily attacked by pests and diseases get good production so as to avoid large losses.

The rice fields in the research area are also irrigated fields where the water supply can be regulated at any time, so planting can be done at any time.

Soil Analysis

Soil analysis is a process for measuring the chemical composition and physical properties of soil to evaluate soil fertility and condition. Soil analysis is usually carried out in laboratories equipped with special equipment to measure various parameters such as pH, nutrient levels and organic content. The results of soil analysis can provide important information about soil fertility and condition, such as nutrient availability, soil acidity, organic matter content, and so on. This information can be used to determine the type and amount of fertilizer needed to grow optimal plants, improve the structure and improve soil quality.

After conducting surveys and interviews with farmers, the next thing to do was take soil samples using a hand drill using the SRS method. Soil drilling is done by drilling into the ground until you find the depth of the steel tread. Soil taken from the hole which is in the middle of the drill bit (hand drill). After that, the soil that has been drilled is put into plastic samples and marked on each plastic as a differentiator, then the soil that has been taken is taken to the laboratory where the chemical properties of the irrigated rice soil will then be analyzed. The analysis results obtained are as follows:

Table 3: Results of Analysis of Rice Fields in Sipaku Village, Simpang Empat District, Asahan Regency.

Parameter	Sample 1	Sample 2	Sample 3
C-Organik (%)	2.97 (S)	2.23 (S)	3.36 (S)
N-Total (%)	0.26 (S)	0.20 (R)	0.29 (S)
P-Bray I (ppm P)	10.52 (R)	9.18 (SR)	5.20 (SR)
K-dd (me/100g)	0.29 (R)	1.11 (T)	0.76 (R)
pH	5.33 (AM)	5.24 (AM)	5.06 (AM)
KTK	14.87 (R)	13.58 (R)	16.70 (R)
EC (mmho/cm)	9.4 S)	7.8 (S)	11.2 (T)
Tekstur tanah			
- Pasir (%)	76.04	47.37	54.15
- Debu (%)	15.25	30.70	20.63
- Liat (%)	8.71	21.93	25.22
Name Soil Tekstur	Sandy Loam	Clay	Sandy Clay Loam

Source: North Sumatra Agricultural Technology Research Institute (BPTP) Testing Laboratory Information: (R) Low, (S) Medium, (T) High (based on the criteria of Hardjowigeno, 2010). Soil pH (AM) Slightly Sour, P-Bray I (SR) Very Low, (R) Low, (S) Medium, (T) High, (ST) Very High (based on LPT criteria, 1983). Salinity (SR) Very Low, (R) Low, (S) Medium, (T) High (based on US Salinity Laboratory criteria)

Based on observations of soil characteristics (soil texture) as a reference in making SPL as follows:

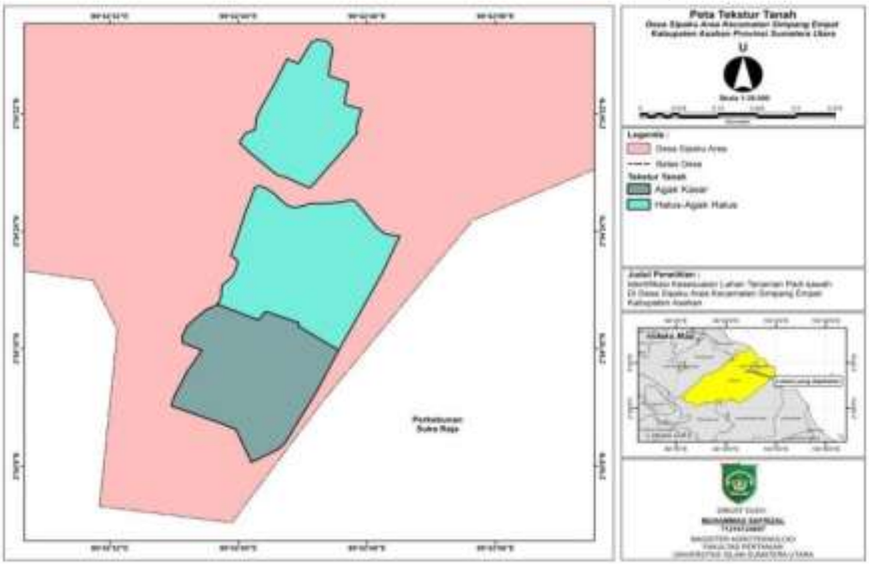


Figure 3: Soil Texture Map in Sipaku Village, Simpang Empat District, Asahan Regency.

Land Map Unit (SPL)

Land map units (SPL) are determined based on overlay techniques on climate, topography and soil type maps. Due to the homogeneous climate and topography in the Sipaku Village Area, Simpang Empat District, Asahan Regency, the SPL for irrigated rice plants was divided into 3 groups based on soil texture.

The rice fields in Sipaku Village, Simpang Empat District, Asahan Regency can be divided into 3 land map units. Land Map Unit (SPL) 1 covers an area of 4.8 ha, Land Map Unit (SPL) 2 covers an area of 7.5 ha and Land Map Unit (SPL) 3 covers an area of 8.5 ha, consisting of actual and potential land suitability classes.

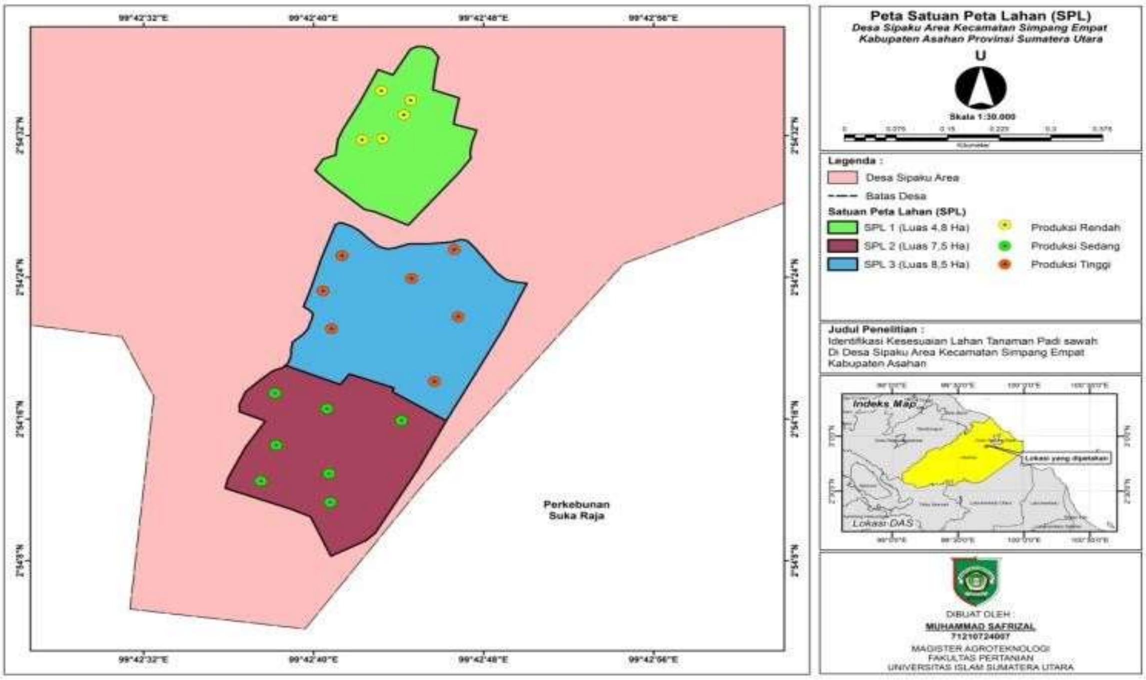


Figure 4: Unit distribution map of Sipaku Village, Simpang Empat District Area Asahan Regency.

Suitability of SPL (Land Map Unit) Land in Sipaku Village, Simpang Empat District Area, Asahan Regency for Irrigated Rice *(Oryza sativa* L.)

Even though it is not yet supported by an adequate irrigation system, irrigated rice fields in the Sipaku Village Area, Simpang Empat District, Asahan Regency still have a level of suitability for rice plantations that have the potential to be developed. The research results show that the actual land suitability at all sample points is in class (fairly suitable) / S2, while the potential land suitability is very suitable / S1.

Class S3 (according to marginal) is land that has severe limiting factors, and these limiting factors will greatly influence its productivity, requiring more additional input than land classified as S2. Overcoming the limiting factors in S3 requires high capital, so there is a need for help or intervention from the government or the private sector. Meanwhile, S2 (quite suitable) is land that has limiting factors, and these limiting factors will affect its productivity, requiring additional input. These barriers can usually be overcome by farmers themselves. Meanwhile, the most desired is Class S1 (very suitable), namely land that does not have significant or real limiting factors for sustainable use, or the limiting factors are minor and will not have a real effect on land productivity (Center for Water Resources Education and Training and Construction, 2016).

Based on Table 4, the results of matching land characteristics can be seen with the land suitability criteria for irrigated lowland rice Djaenudin, *et al.*, (2011), then the actual land suitability class for irrigated lowland rice is at SPL 1 is S3 (marginally appropriate) with limiting factors for root media in the form of drainage, soil depth, nutrient retention in the form of pH, nutrient availability in the form of CEC, soil texture, danger of flooding in the form of puddles. SPL 2 and SPL3 are S2 (quite suitable) with limiting factors for the rooting medium in the form of soil depth, nutrient retention in the form of pH, nutrient availability in the form of CEC, soil texture, toxicity in the form of salinization, and danger of flooding in the form of inundation. Soil texture is permanent so it cannot be repaired. C- Organic, soil pH and CEC can be improved by adding organic material and composting rice straw. This is supported by Adiningsih, 1984 in Setyorini, *et al.*, (2004) who stated that straw can increase levels of organic C, exchangeable K, exchangeable Mg, cation exchange capacity (CEC) of soil, available Si and soil aggregate stability. Land suitability is quite suitable/S2 at SPL 1, SPL 2, and SPL 3 with limiting factors such as drainage, CEC, pH, and waterlogging. Drainage and inundation can be improved by repairing the system. This is supported by Rayes (2007) who states that the quality/characteristics of land for water availability can be improved by creating an irrigation/watering system.

Meanwhile, CEC and soil pH can be improved by liming, adding organic material and composting straw.

This is supported by Adiningsih, 1984 in Setyorini, *et al.*, (2004) who stated that straw can increase levels of organic C, exchangeable K, exchangeable Mg, cation exchange capacity (CEC) of soil, available Si and soil aggregate stability. With the existence of land improvement efforts, the potential land suitability classes for irrigated rice plants at SPL 1, SPL 2 and SPL 3 are very suitable / S1. The limiting factor is soil texture.

Table 4: Land suitability classes for irrigated paddy fields (Oryza sativa L.) Sipaku Village, Simpang Empat District Area, Asahan Regency.

Land Characteristics	SPL 1		SPL 2		SPL 3	
	Data	IFP	Data	IFP	Data	IFP
Temperature (tc)						
- Average Temp. (^{o}C)	24-29	0	24-29	0	24-29	0
Water Availibility (wa)						
Rainfall (mm/tahun)	2,044	0	2,044	0	2,044	0
Rooting Medium (rc)						
- Drainase	Hampered	1	Hampered	1	Hampered	1
- Rough Material (%)	< 3	0	< 3	0	< 3	0
- Soil Depth (cm)	40-60 cm	2	25-40 cm	2	25-40 cm	2
Nutrient Retention (nr)						
- C-Organic (%)	2.97	0	2.23	0	3.36	0
- pH	5.33	1	5.24	1	5.06	1
Nutrient availability (na)						
- N-Total	Curently		Low		Curently	
- P-Bray	Low		Very Low		Very Low	
- K-dd	Low		Very High		Curently	
- KTK (ppm)	14.87	1	13.58	1	16.70	0
Soil Tecsture (t)						
- Sand (%)	76.04		47.37		54.15	
- Dust (%)	15.25		30.70		20.63	
- Clay (%)	8.71		21.93		25.22	
Name Soil Tecsture	Sandy Loam	2	Clay	1	Sandy Clay Loam	1
Toksisitation (xc)						
- EC (mmho/cm)	9.4	0	7.8	3	11.2	3
Sulphidic Danger (xs)						
- Sulphidic Depth	-		-		-	
Erotion Danger (eh)						
- Slope (%)	0-3	0	0-3	0	0-3	0
- Erotion Danger	Very Low	0	Very Low	0	Very Low	0
Flood Danger (fh)						
- Puddle	F22	1	F22	1	F22	1
LIMITERS FACTOR	7 (0) 4 (1) 2 (2)		6 (0) 5 (1) 1 (2) 1 (3)		7 (0) 4 (1) 1 (2) 1 (3)	
KKL ACTUAL	S3 rc2.nr1.na1.t2.fh1		S2 rc2.nr1.na1.t1.fh1		S2 rc2.nr1.t1.xc1.fh1	
KKL POTENTIAL	S2		S1		S1	

From Table 4 above, it shows that there are no dry months, so if you want to carry out 2 planting seasons per year, then the start of the second planting month can be done in May because the amount of rainfall is moderate and harvesting can be done in August because the amount of rainfall is already low. Soil salinity levels at SPL 1, SPL 2 and SPL 3 shows the value N1. There are several methods that can be used to reduce salinity on agricultural land, namely by dredging the soil, using a continuous washing system flowing with water, and land reclamation using ameliorant materials. One of the efforts considered to be the most effective in improving saline soil is reclamation using ameliorant materials. Ameliorant materials that can be used include: gypsum, rice straw, zeolite, dolomite.

Soil pH levels at SPL 1, SPL 2 and SPL 3 indicate the level of land suitability class S1. The pH level of soil base saturation can be improved by adding fertilizer containing $K+$, $Ca2+$, $Mg2+$ for example KCl, CaCO3, MgSO4 fertilizer. Soil pH can be improved by liming, adding organic material and composting straw (Setyorini, 2004). The soil pH in Table 4.4 above is the result of air-dry soil analysis, not the soil pH result from the sedimentary soil of rice fields, so it is possible that the results will be different.

Based on matching data from SPL 1, SPL 2, and SPL 3 from Tebel, actual and potential land suitability classes for lowland rice crops in the Village Sipaku Area, Simpang Empat District, Asahan Regency, obtained results Actual land suitability at SPL 1 is S3 (marginally appropriate) with limiting factors for root media in the form of drainage, soil depth, nutrient retention in the form of pH, nutrient availability in the form of CEC, soil texture, danger of flooding in the form of puddles, and the land suitability class is classified as S2 (fairly suitable). SPL 2 and SPL 3 Actual land suitability is S2 (quite suitable) with limiting factors for rooting media in the form of soil depth, nutrient retention in the form of pH, nutrient availability in the form of CEC, soil texture, toxicity in the form of salinization, and the danger of flooding in the form of puddles where these limiting factors can be carried out by efforts to create channels. good irrigation, liming, adding organic material to the soil and setting up a good groundwater system. The suitability of potential land for SPL 2 and SPL 3 is classified as S1 (very suitable).

The limiting factor that has the greatest influence on plant growth is called actual land suitability. To increase the resulting suitability class or what is called potential land suitability, improvements need to be made. The resulting land suitability class also does not take into account irrigation conditions in the research area, so further research is still needed to be utilized optimally.

Sipaku Village Area, Simpang Empat District, Asahan Regency, the SPL for irrigated rice plants is divided into 3 groups based on soil texture. The rice fields in Sipaku Village, Simpang Empat District, Asahan Regency can be divided into 3 land map units. Land Map Unit (SPL) 1 covers an area of 4.8 ha, Land Map Unit (SPL) 2 covers an area of 7.5 ha and Land Map Unit (SPL) 3 covers an area of 8.5 ha, consisting of actual and potential land suitability classes.

After matching and assessing SPL 1 SPL 2 and SPL 3, it is known that SPL 1, SPL 2 and SPL 3 are very suitable / S1 for irrigated lowland rice plants and SPL 1 and SPL 2 are quite suitable / S2 for irrigated lowland rice plants (Table 5).

Table 5: Land suitability classes for irrigated rice fields in Sipaku Village, Simpang Empat District, Asahan Regency.

SPL	Land Suitability Class		Land Area (ha) (Sample)
	Actual	Potential	
SPL 1	S3 rc2.nr1.na1.t2.fh1	S2	4,8 Ha
SPL 2	S2 rc2.nr1.na1.t1.fh1	S1	7,5 Ha
SPL 3	S2 rc2.nr1.t1.xc1.fh1	S1	8,5 Ha
	Total		20,8 Ha

From Table 5 above, the area of irrigated rice fields in Sipaku Village Area, Simpang Empat District, Asahan Regency is 20.8 ha. The actual land suitability class SPL 1 indicates that the actual land is classified into class S3 (marginally suitable) and SPL 2 and SPL 3 indicate that the actual land is classified into class S2 (quite suitable). Meanwhile, the potential land suitability class SPL 1 is classified as class S2 (quite suitable) and SPL 2 and SPL 3 are classified as class S1 (very suitable). The three SPLs have different potential land suitability classes at SPL 1 from SPL 2 and SPL 3, and by washing the soil with continuous water flow to reduce the level of soil salinity and liming the soil to increase the soil pH.

The limiting factors that are very dominant or difficult to overcome are the effective depth and texture of the soil, which are limiting factors that greatly influence the productivity of rainfed rice fields. The stages and method of applying dolomite and manure/compost are as follows: Dolomite is sown evenly two weeks before planting. Manure and compost are also spread evenly over the land one week before planting according to the recommended dosage. The aim of applying dolomite is to increase the soil pH to the optimal direction and increase the Ca nutrient, which from the results of soil analysis shows that the Ca nutrient in this land is at a low concentration. Manure/ compost really needs to be given because the organic material content in this land is very low to very low. With the application of manure/compost it is hoped that there will be a balance between plants in absorbing the soil. Organic materials have a large negative charge so they can absorb the nutrients provided and the results of the weathering of existing minerals and organic materials (Siregar, D. 2016).

CONCLUSION

1. The suitability classes for paddy fields were found at SPL 1, SPL 2 and SPL 3 with the actual land suitability classes being marginally suitable / S3 and quite suitable / S2 with limiting factors for the rooting media in the form of drainage, into the soil, and nutrient retention in the form of pH, nutrient availability in the form of soil CEC, soil texture, and flood hazard in the form of inundation, while the potential land suitability class is quite suitable / S2 with limiting factors for rooting media in the form of

drainage, into the soil, and nutrient retention in the form of pH, nutrient availability in the form of soil CEC, soil texture, toxicity in the form of salinity and flood hazards in the form of puddles, while the potential land suitability classes are very suitable / S1 and quite suitable / S2.

2. The depth of the plow layer has a positive effect on the availability of water for rice plants so that it is related to the production of lowland rice plants.

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