

A Site-Specific Fertilizer Recommendation Based on the Phosphorus and Potassium Status in Mempawah District, West Kalimantan

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ABSTRACT

The recommendations of Phosphorus (P) and Potassium (K) fertilization for rice are still not site-specific yet due to a lack of required soil data information. The P and K status of the paddy fields that provide information on the low, medium, and high P and K nutrient status are very useful for determining recommended the site-specific fertilizer in the the district area. The purpose of the research was to determine the site-specific fertilizer recommendation for paddy field based on their P and K status. This research was based on the field survey and the soil analysis in the laboratory. The soil samples were taken using a grid system, and the P and K levels were assessed by using a 25% HCl extraction. Soil samples were taken in a composite manner on all paddy fields in which their status have been identified. The composite soil samples were determined from 10 - 15 individual samples (sub-samples) with a sampling distance of each sub-sample of 25-50 m in the field. The soil samples were taken in the overlay with a depth of 0-20 cm. Taking sub-samples were done by a diagonal or a zigzag method according to the conditions of paddy fields. The results of the study presented that the nutrient status of P and K and the fertilizer recommendations in paddy fields for rice plants located in 9 sub-districts in Mempawah Dsistrict had shown that nutrient status of P, on average, were from moderate to high levels, meanwhile, the nutrient status of K was from low to high levels. Recommendations for fertilizing rice fields in several sub-districts in Mempawah Regency are mostly 150 kg NPK (15:15:15) ha⁻¹, 200 kg Urea ha⁻¹ and 25 kg KCl ha⁻¹.

Keywords: Fertilizer recommendation, nutrient status, paddy fields, site-specifik location

ABSTRAK

Rekomendasi pemupukan P dan K untuk padi di Kabupsawah ten Mempawah saat ini masih bersifat umum, belum spesifik lokasi, karena kurangnya informasi data tanah yang diperlukan. Status hara P dan K pada lahan sawah akan memberi informasi tentang lahan-lahan mana yang berstatus hara P dan K dalam golongan rendah, sedang, dan tinggi dan ini sangat bermanfaat untuk menentukan rekomendasi pemupukan spesifik lokasi. Tujuan penelitian ini adalah ingin mengetahui rekomendasi pemupukan spesifik lokasi untuk tanaman padi di lahan sawah. Penelitian ini merupakan kegiatan survei lapang dan analisis tanah di laboratorium. Pengambilan contoh tanah dilakukan melalui dilakukan dengan sistem grid, dan dalam menilai kadar P dan K menggunakan ekstrak HCl 25%. Contoh tanah diambil secara komposit pada seluruh areal lahan sawah yang ditentukan status haranya. Contoh tanah komposit ditentukan dari 10-15 contoh individual (sub contoh) dengan jarak pengambilan di lapang untuk setiap sub contoh antara 25-50 m. Contoh tanah diambil pada lapisan olah dengan kedalaman 0 - 20 cm. Pengambilan sub contoh dilakukan dengan cara diagonal atau cara zigzag sesuai kondisi lahan sawah. Hasil penelitian Status Hara P dan K dan rekomendasi pemupukan di lahan sawah untuk tanaman padi di 9 Kecamatan di Kabupaten Mempawah menunjukkan bahwa status hara P, rata – rata dari berstatus sedang sampai tinggi. Sedangkan satu hara K, rata-rata dari rendah sampai tinggi. Rekomendasi pemupukan padi sawah di beberapa kecamatan di Kabupaten Mempawah sebagian besar dengan takaran NPK (15:15:15) 150 kg ha⁻¹, Urea 200 kg ha⁻¹ dan KCl 25 kg ha⁻¹.

Kata Kunci: Padi sawah, status hara, spesifik lokasi, rekomendasi pupuk

INTRODUCTION

One of the many efforts in stabilizing a national food self-sufficiency is to optimize paddy fields for rice farming by increasing the rice production and productivity. Increased production and productivity of rice in paddy fields, among others, are by increasing the soil productivity and soil fertility. Increased productivity and soil fertility are concerning to the nutrient input given to the soil in the form of fertilizer. Up to present, the farmers have not been rationally used fertilizers according to crop needs and the ability of the soil to provide nutrients, the soil properties, the water quality, and the management by farmers. The disadvantages of fertilization aside from being a waste of resources, it also will disrupt the balance of nutrients in the soil and cause the environmental pollution (Adiningsih *et al.* 1989; Moersidi *et al.* 1989), Nagumo *et al.* (2013) reported that excess phosphorus (P) has accumulated in Japanese paddy soils due to continuing used of P fertilizer. Moreover, the diminishing marginal utility of soil Olsen-P was also found, indicating that high-level P application in the present condition could not increase soil Olsen-P contents anymore (Shi 2015). While, giving a small amount of fertilizer can not provide optimal production levels. If a sufficient fertilization is not carried out, the plant will take the nutrients from the soil. If the soil is fertile, in the short term, rice crops will not show a decrease in production, but in the long term, there will be a decrease in soil and plant productivity. If the soil is not fertile, rice plants will show productivity far lower than the actual productivity potential (Sukarman *et al.* 2012).

A simpler approach for establishing fertilizer recommendations for major crops is urgently required to improve the application efficiency of commercial fertilizers in China. To address this need, a method was developed based on field data drawn from the China Program of the International Plant Nutrition Institute (IPNI) rice experiments and the investigations were carried out in the southeastern China from 2001 to 2012. The results showed that using the agronomic efficiencies and a sustainable yield index (SYI), this new method for establishing fertilizer recommendations robustly estimated the mean rice yield (7.6 Mg ha^{-1}) (Jin 2012; Chuan *et al.* 2019; Liu *et al.* 2017).

The nutrient depletion, imbalanced use of fertilizer nutrients, inappropriate tillage, and rainwater management practices often result in the land degradation. Declining soil health contributes

to climate change through loss in soil productivity, biodiversity, soil carbon, and moisture and ecosystem services (Raj *et al.* 2019). Xu *et al.* (2014) reported that compared to the current farmers' fertilizer practices (FP), nutrient efficiency (NE) maintained grain yield and profitability, but it decreased 30.4% of nitrogen (N) fertilizer (68 kg N ha^{-1}) and 11.3% of phosphorus (P) fertilizer ($7 \text{ kg P}_2\text{O}_5 \text{ ha}^{-1}$), while potassium (K) fertilizer rate increased by 38.8% ($19 \text{ kg K}_2\text{O ha}^{-1}$). NE increased agronomic efficiency of applied N (AEN) by 47.0%, N recovery efficiency (REN) by 51.0%, and partial factor productivity of applied N (PFPN) by 35.5%. More importantly, NE decreased by 21.5 and 49.7 kg ha^{-1} of apparent N loss for summer maize and spring maize as compared to FP, respectively.

The recommendations for the amount of P and K fertilizer applied for rice are still general, not site-specific due to the lack of information/data needed. In other words, the recommendations for fertilizing paddy rice in each region are still uniform, not based on the soil nutrient content. The P and K nutrient status of paddy fields that provide information about P and K in the low, medium, and high nutrient status are very useful for determining site-specific fertilizer recommendations.

Up to the present, the P and K fertilization for lowland rice is around 100-150 kg TSP per hectare per season and 100 kg KCl per hectare per season. Determination of these recommendations is carried out without considering the nutrient content of P and K in the soil and nutrient requirements for rice plants, making it less efficient (Jamil *et al.* 2012). Therefore, it is necessary to know the nutrient content of P and K in wetland so that the determination of fertilizer dosage will be more rational.

Triharto *et al.* (2014) reported that rainfed lowland in Durian Village, Labu Sub-district, Deli Serdang Regency had a low to moderate N-total status, P status was very low and K status was very high. Manurung (2017) reported that the total N-soil content in peatlands in Sungai Purun Village Mempawah Regency is almost entirely including the medium category covering 97.49% of the area of the study. Status P varies from very low, low, medium and very high, very high status has the largest area (87.6%). Very high K status has the largest area (38.1%). The diversity of nutrient status in several locations and soil types indicates that fertilizer recommendations in several areas should be different. This can be caused by the differences in the parent materials, the intensity to

broken down, the erosion effect, the biological influence, the hydrological differences, and the errors in the analysis (Yudichandra *et al.* 2016).

Nutrient status in soil is strongly influenced by the level of land management carried out by farmers. Rice fields that are managed intensively and continuously fostered are thought to have increased levels of soil nutrients, especially levels of P and K, and experienced nutrient imbalances. On the other hand, in paddy fields that are not managed intensively or rarely being fertilized, there will be a decrease in nutrient levels, especially K nutrients that are easily leached out. For this reason, we need the information on soil nutrient status, especially P and K, to support the accuracy of site-specific fertilizer recommendations. According to Nandor *et al.* (2013) who testing various fertilizer recommendation systems in Hungary, the fertilizer recommendation system that is cost-effective and environmentally friendly and the correctness of the method is very important in the recommendation of an appropriate fertilizer. Indonesia adopts a balanced fertilization, a framework that is founded on the site-specific nutrient management. The fertilizer is added to the soil to achieve balanced and optimum nutrient availability (Sulaiman *et al.* 2012).

The status of P and K nutrients of paddy fields is useful for compiling recommendations for fertilizing location-specific lowland rice and the direction of fertilizer needs at the district and sub-district level. Mempawah Regency is the largest food crop producing center, especially rice in West Kalimantan. A reliable nutrient status information in Mempawah Regency can be obtained by extracting a large amount of soil characteristics data that spreads in the area of Mempawah Regency. To obtain fertilizer recommendations, it is necessary to have comprehensive data so that fertilizer recommendations can be applied appropriately, which one of the soil nutrient status data.

The purpose of this study was to determine fertilizer recommendations for lowland rice-based on P and K nutrient status in several sub-districts in Mempawah District, West Kalimantan Province. In determining fertilizer recommendations in the area of Mempawah Regency, data on the characteristics of paddy soils will be carried out, such as pH, C-organic, Cation Exchange Capacity (CEC), bases saturation and other soil properties.

MATERIALS AND METHODS

Survey Preparation

The research was carried out in July - December 2017 on paddy fields in Mempawah Regency, West Kalimantan Province. This research was based on a field survey and the soil analysis in the laboratory and making nutrient status maps, especially P and K. Materials and tools used included soil survey equipment, chemicals for soil analysis, and other materials and tools as well as supporting maps such as administrative maps, land maps, topographic maps, land use maps, and others. The operational map was made on a scale of 1: 25,000 which was made from topographical maps as a guide when conducting the survey.

Soil Sampling

The soil samples were taken using a grid system, and P and K levels were assessed by using 25% HCl extraction. Sampling of composite soil was carried out according to the method of Soepartini *et al.* (1994). Soil samples were taken in a composite manner on all paddy fields in which their status have been identified.

Sampling was done on "signs" that have been made in the field map. At each retrieval mark that has been made, one composite soil sample was taken. Composite soil samples were determined from 10-15 individual samples (sub-samples) with a sampling distance of each sub-sample of 25-50 m in the field. The tool used for soil sampling was a Belgian drill or rice field drill. Soil samples were taken in the overlay with a depth of 0 - 20 cm.

Taking sub-samples was done by a diagonal or zigzag method according to the conditions of paddy fields in several places. After all of the composite samples had been collected, the composite soil samples were then being analyzed in the laboratory to examine the nutrient content, especially P and K.

Soil Nutrient Criteria

Classification of soil P nutrient status was divided into three classes based on 25% P_2O_5 extract HCl levels, namely high P status (> 40 mg P_2O_5 (100g)⁻¹), moderate P status (20-40 mg P_2O_5 (100g)⁻¹), and low P (< 20 mg P_2O_5 (100g)⁻¹). Distribution of nutrient status of soil K was divided into three groups based on 25% K_2O content of HCl extract, namely: high K nutrient status (> 20 mg K_2O (100g)⁻¹), moderate K nutrient status (10-

Table 1. Criteria for P₂O₅ and K₂O nutrient status.

Nutrient status	Criteria	
	mg P ₂ O ₅ kg ⁻¹	mg K ₂ O kg ⁻¹
Low	< 20	< 10
Moderate	20 - 40	10 - 20
High	> 40	> 20

Source: Center for Research and Development of Agricultural Land Resources. Bogor (2014)

20 mg K₂O (100g)⁻¹), and nutrient status Low K (<10 mg K₂O (100g)⁻¹). The determination of P and K with 25% HCl extract was based on the results of a study by Moersidi *et al.* (1991), Soepartini (1995) in Java, and Soepartini *et al.* (1994) in Lombok.

The nutrient status criteria is refer to the criteria for assessing the status of chemical properties and soil fertility of the Bogor Soil Research Institute (Table 1).

The recommendation regarding fertilizer refers to the Minister of Agriculture Regulation Number 40/Permentan/0 T.140/04/2007 concerning, P, and K Fertilization Recommendation on Site Specific Rice Fields. This recommendation is based on criteria between 3 nutrient status of P (low, medium, high) and 3 nutrient status of K (low, medium, and high). This recommendation is preferred for compound fertilizer due to its widely availability in the market.

RESULTS AND DISCUSSION

Paddy fields in this study are paddy fields that are patched and limited by a dike rice field, a channel to channel water that is usually planted with rice. Land in the area of Mempawah Regency according to its utility is divided into three types of land, namely paddy fields, non-rice fields, and non-agricultural land. In 2017, paddy fields in the area of Mempawah

Regency decreased by around 2.49%, which initially was 18,400 hectares became 17,943 hectares (CBS 2017). The sub-district rice fields in Mempawah Regency are as shown in Table 2.

The P nutrient status in paddy fields in Mempawah District is generally classified as moderate to very high, as in Sungai Kunyit Sub-district, most of the paddy fields have low P status, while in Sungai Pinyuh, Anjongan, Segedong, and Siantan Sub-districts most of the status P nutrients are high. The nutrient status of K is classified as low to very high, such as in the Districts of Siantan, Segedong, Toho, East Mempawah, Mempawah Hilir, Anjongan, Sungai Kunyit, and Sadaniang classified as high K status. As has been done by Muhammad *et al.* (2018) that the P and K nutrient status classes of paddy fields in Pandeglang district Banten Province varied from low to high.

P and K Nutrient Status of Paddy Soil and Fertilizer Recommendations for Paddy Plants per Sub-District in Mempawah District

Siantan Sub District

The area of paddy fields in Siantan Sub-district is 3,762 ha which is spread in several villages such as Wajok Hilir, Wajok Hulu, Jungkat, and Sungai Nipah. The nutrient status of P₂O₅ in paddy fields in the Siantan sub-district is high, with an average

Table 2. Rice field area per sub-district in Mempawah District.

No	Sub-district	Rice field area (ha)
1	Siantan	3.762
2	Segedong	4.265
3	Sungai Pinyuh	1.525
4	Anjongan	1.550
5	Mempawah Hilir	905
6	East Mempawah	484
7	Sungai Kunyit	1.174
8	Toho	2.498
9	Sadaniang	1.780
Total		17.943

Source: Mempawah Regency Central Bureau of Statistics (2017).

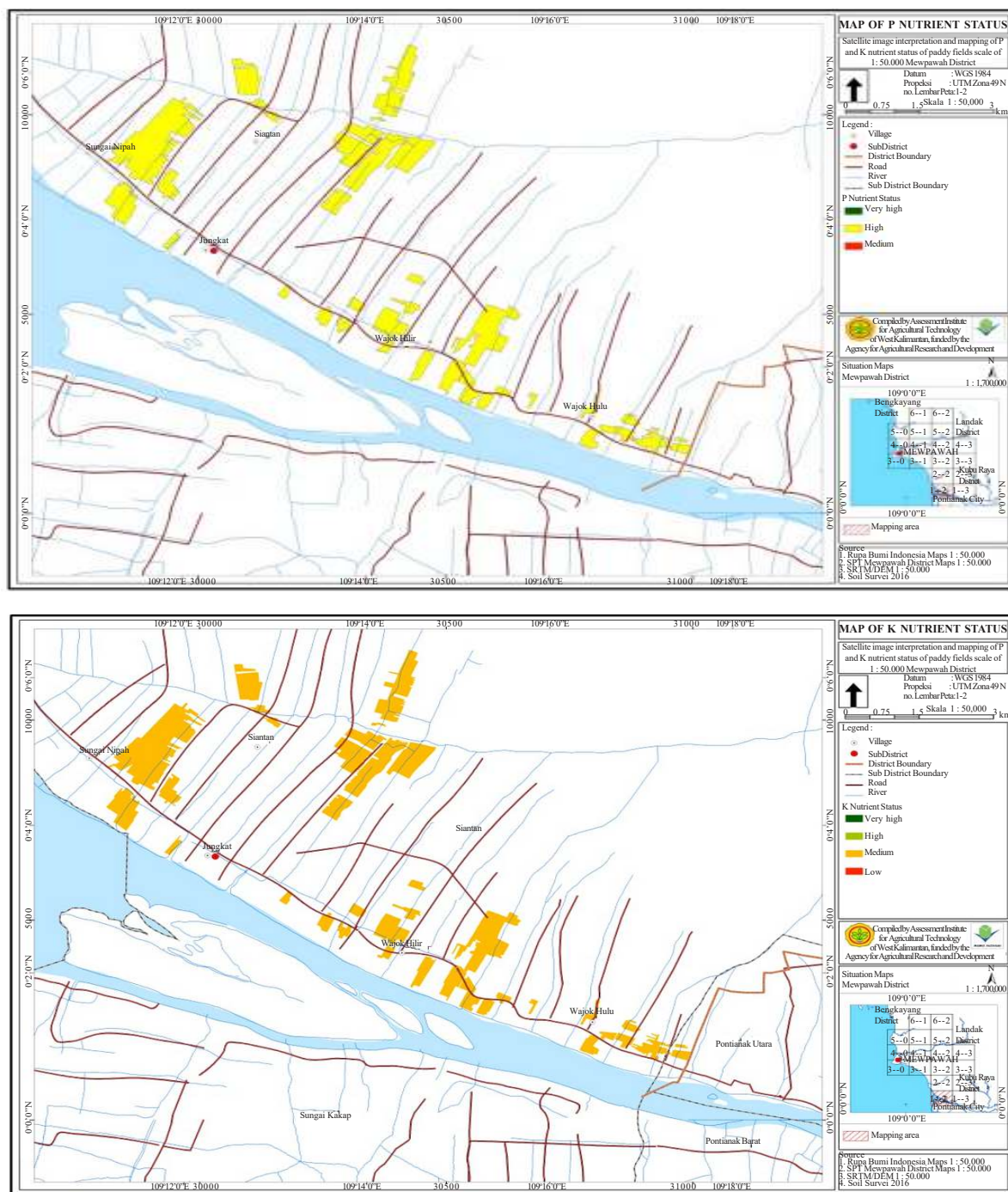


Figure 1. P and K nutrient status of paddy soil in Siantan Sub-District.

P_2O_5 of $57.86 \text{ mg } (100g)^{-1}$, as well as the nutrient status of K_2O which is also high, on average K_2O of $56.04 \text{ mg } (100g)^{-1}$. The fertilizers recommendation for paddy fields for rice plants in Siantan Sub-district are 150 NPK (15:15:15) ha^{-1} and 200 kg Urea ha^{-1} 25 kg KCl ha^{-1} or 200 kg NPK (10:10:10) ha^{-1} , 200 kg Urea ha^{-1} and 25 kg KCl ha^{-1} (Figure 1).

Segedong Sub District

The area of paddy fields in Segedong Sub District is 4,265 hectares. The nutrient status of P_2O_5 in the

paddy fields of the Segedong Sub-district is high, that is, on average P_2O_5 of $56.13 \text{ mg } (100g)^{-1}$, as well as the nutrient status of K_2O is also relatively high, namely K_2O of $52.66 \text{ mg } (100g)^{-1}$, especially in Peniti Luar village, Peniti Dalam village and Peniti Besar village. Fertilizer recommendations Rice fields for rice in Segedong Sub District are 150 kg NPK (15:15: 15) ha^{-1} , 200 kg Urea ha^{-1} and 25 kg KCl ha^{-1} or 200 kg NPK (10:10:10) ha^{-1} , 200 kg Urea ha^{-1} and 25 kg KCl ha^{-1} (Figure 2).

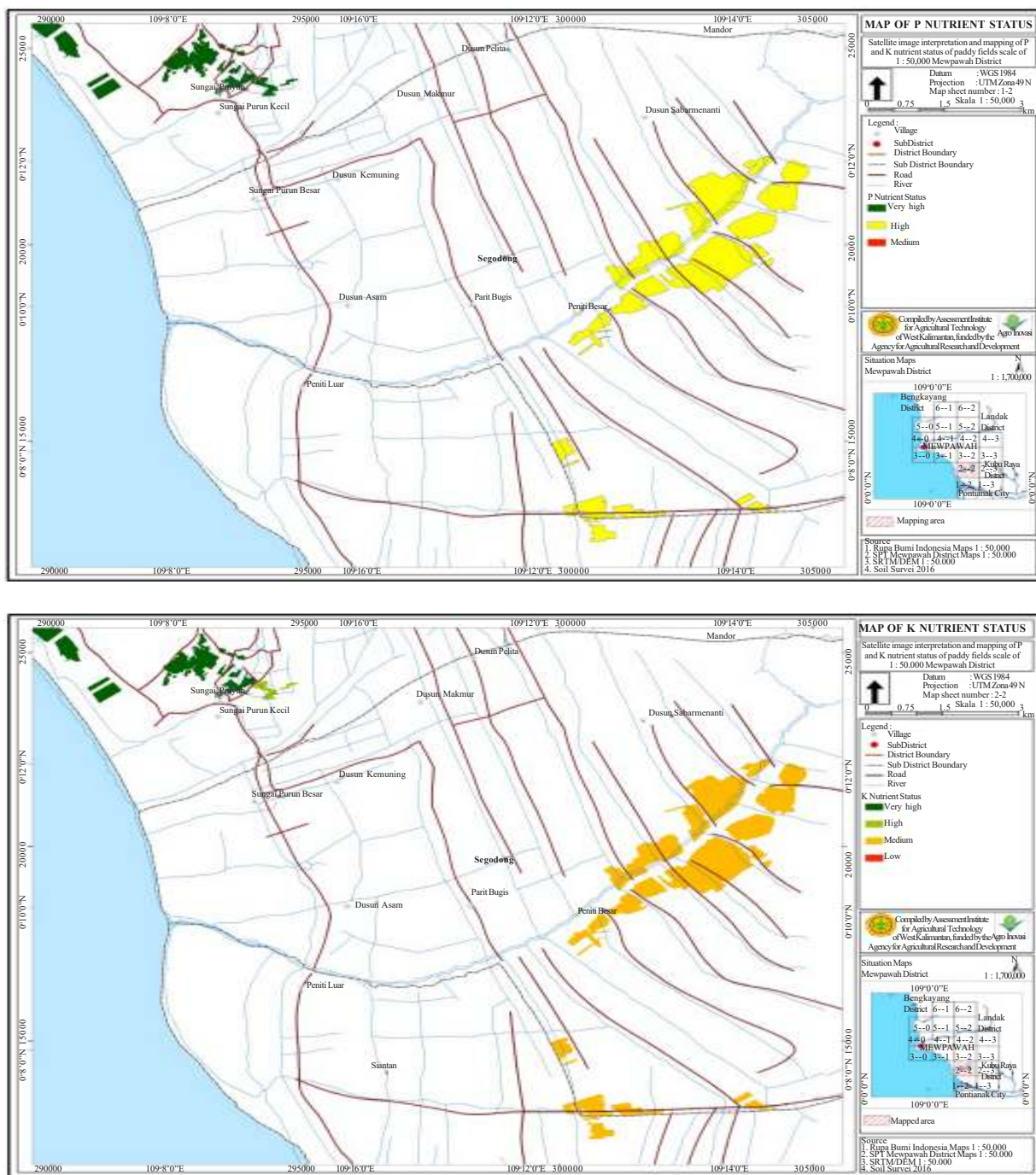


Figure 2. P and K nutrient status of paddy soil in Segedong District.

Sungai Pinyuh Sub District

The area of paddy fields in Sungai Pinyuh Sub District is 1,525 hectares. The nutrient status of P_2O_5 in paddy fields in Sungai Pinyuh Sub-district is classified as moderate to high, which is between $29.37 \text{ mg (100g)}^{-1}$ and $56.56 \text{ mg (100g)}^{-1}$, while for K_2O nutrient status is high at $67.50 \text{ mg (100g)}^{-1}$. Fertilization recommendations for paddy fields for rice plants in Sungai Pinyuh Sub district at medium P_2O_5 nutrient status and high K_2O are $200 \text{ kg NPK (15:15:15) ha}^{-1}$ and $175 \text{ kg Urea ha}^{-1}$ or $250 \text{ kg NPK$

$(10:10:10) \text{ ha}^{-1}$ and $175 \text{ kg Urea ha}^{-1}$. Whereas for nutrient status of high P_2O_5 and high K_2O are $150 \text{ kg NPK (15:15:15) ha}^{-1}$, $200 \text{ kg Urea ha}^{-1}$ and $25 \text{ kg KCl ha}^{-1}$ or $200 \text{ kg NPK (10:10:10) ha}^{-1}$, $200 \text{ kg Urea ha}^{-1}$ and $25 \text{ kg KCL ha}^{-1}$ (Figure 3).

Anjongan Sub District

The area of paddy fields in the Sub District of Anjongan is 1,550 hectares. The nutrient status of P_2O_5 in the wetland area of the Anjongan Sub-district is high, with an average of $56.89 \text{ mg (100g)}^{-1}$, and some are very high as in Anjongan Melancar

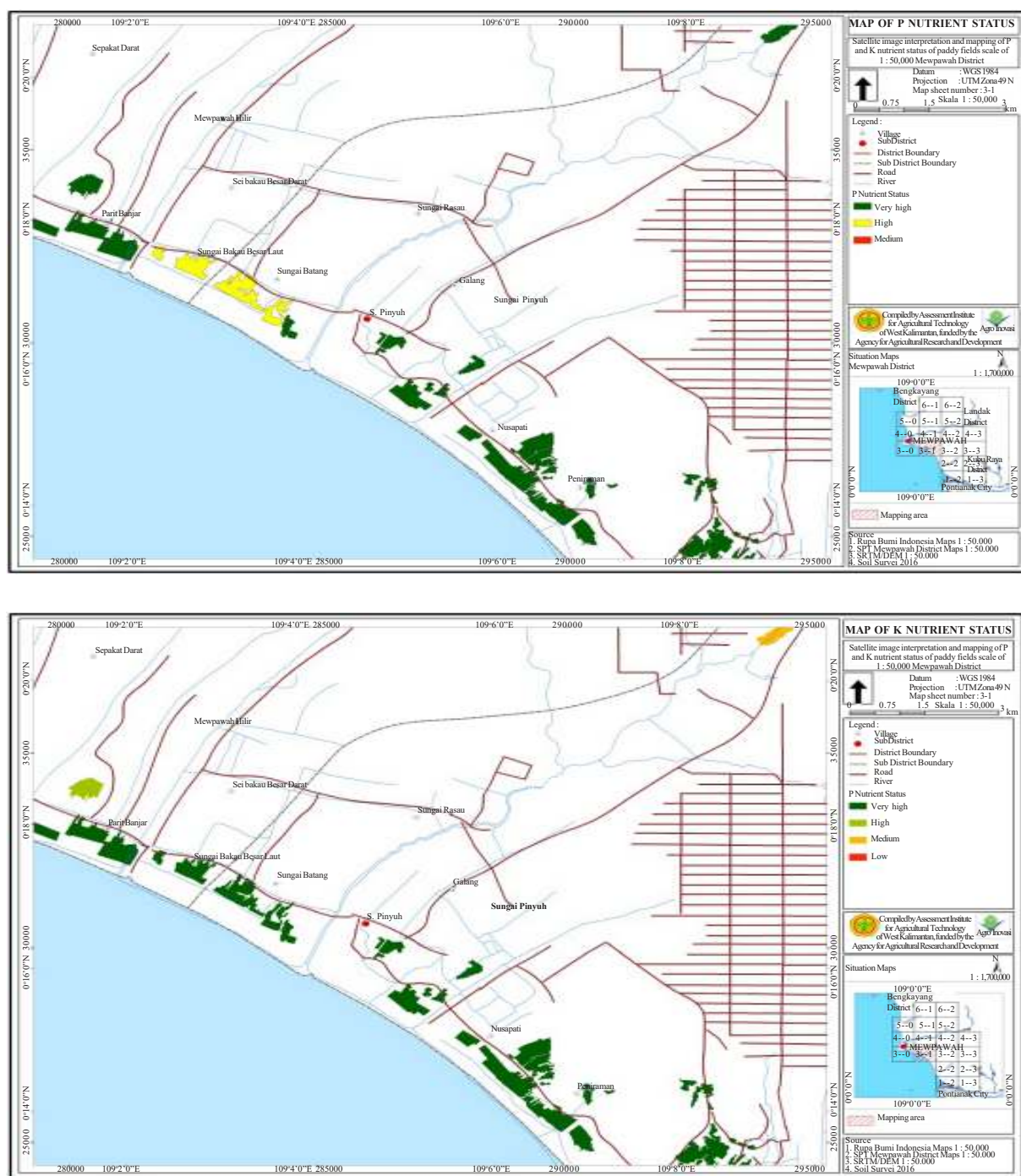


Figure 3. P and K nutrient status of paddy soil in Sungai Pinyuh Sub District.

Village, which is 120.82 mg (100g)⁻¹. The nutrient status of K₂O is classified as low, medium, and high, which is 18.52 mg (100g)⁻¹ up to 47.67 mg (100g)⁻¹.

Fertilizer recommendations on nutrient status of high P₂O₅ and medium K₂O in Dema village and Kepayang village are 150 kg NPK (15:15:15) ha⁻¹, 200 kg Urea ha⁻¹ and 25 kg KCl ha⁻¹ or 200 kg NPK (10:10:10) ha⁻¹, 200 kg Urea ha⁻¹ and 25 kg KCl ha⁻¹. Fertilizer recommendations on high nutrient status P₂O₅ and K₂O in Pak Bulu village are 150 kg NPK (15:15:15) ha⁻¹, 200 kg Urea ha⁻¹

and 25 kg KCl ha⁻¹ or 200 kg NPK (10:10:10) ha⁻¹, 200 kg Urea ha⁻¹ and 25 kg KCl ha⁻¹. Fertilizer recommendations on P₂O₅ nutrient status are high and low K₂O in Anjongan Kepayang village are 150 kg NPK (15:15:15) ha⁻¹, 200 kg Urea ha⁻¹ and 75 kg KCl ha⁻¹ or 200 kg NPK (10:10:10) ha⁻¹, 200 kg Urea ha⁻¹ and 75 kg KCl ha⁻¹. Fertilizer recommendations on nutrient status P₂O₅ are high and medium K₂O in Anjongan Melancar village and Anjongan Dalam village are 150 kg NPK (15:15:15) ha⁻¹, 200 kg Urea ha⁻¹ and 25 kg KCl ha⁻¹ or 200 kg NPK (10:10:10) ha⁻¹, 200 kg Urea ha⁻¹ and 25 kg KCl ha⁻¹ (Figure 4).

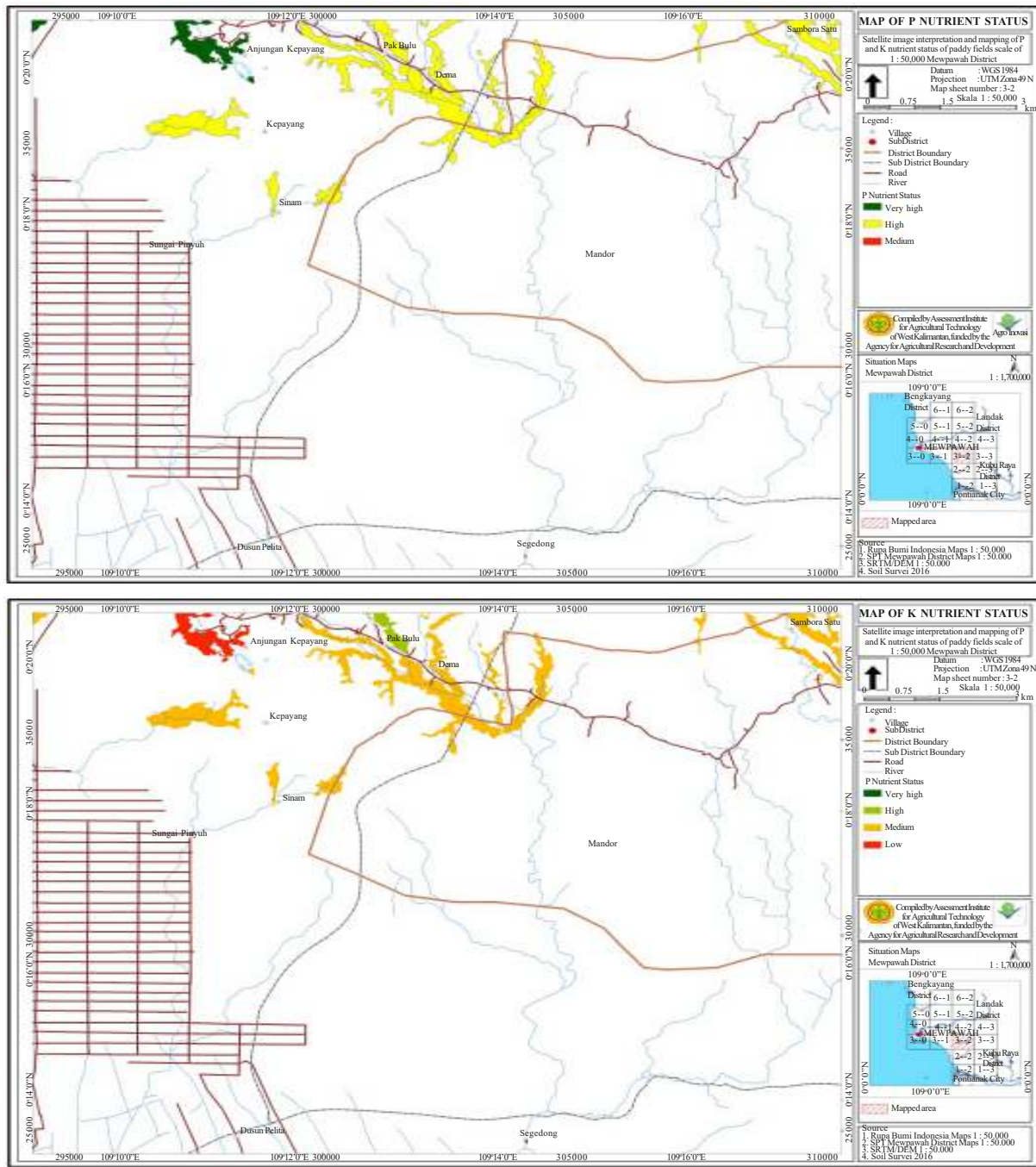


Figure 4. P and K nutrient status of paddy soil in Anjungan Sub District

Mempawah Hilir Sub District

The area of paddy fields in Mempawah Hilir Subdistrict is 905 hectares. The status of P₂O₅ nutrients in the paddy fields of Mempawah Hilir Subdistrict is classified as low to high, namely between 10.83 - 47.71 mg (100g)⁻¹. The nutrient status of K₂O is classified as medium, which is an average of 28.23 mg (100g)⁻¹. Fertilization recommendations on high nutrient status P₂O₅ and medium K₂O are 150 kg NPK (15:15:15) ha⁻¹, 200 kg Urea ha⁻¹ and 25 kg KCl ha⁻¹ or 200 kg NPK (10:10:10) ha⁻¹, 200 kg Urea ha⁻¹ and 25 kg KCl ha⁻¹ (Figure 5).

Mempawah Timur Sub District

The area of paddy fields in Mempawah Timur Sub District is 484 hectares. The nutrient status of P₂O₅ in paddy fields in the Mempawah Timur Sub-district is medium and high, from 28.21 - 42.60 mg (100g)⁻¹. The nutrient status of K₂O is classified as moderate to high, namely between 34.84 - 47, 84 mg (100g)⁻¹. Fertilizer recommendations on nutrient status of moderate P₂O₅ and high K₂O in Sungai Bakau Besar Laut village are 200 kg NPK (15: 15 :15) ha⁻¹ and 175 kg Urea ha⁻¹ or 250 kg NPK (10 :10 :10) ha⁻¹ and 175 kg Urea ha⁻¹. Fertilizer

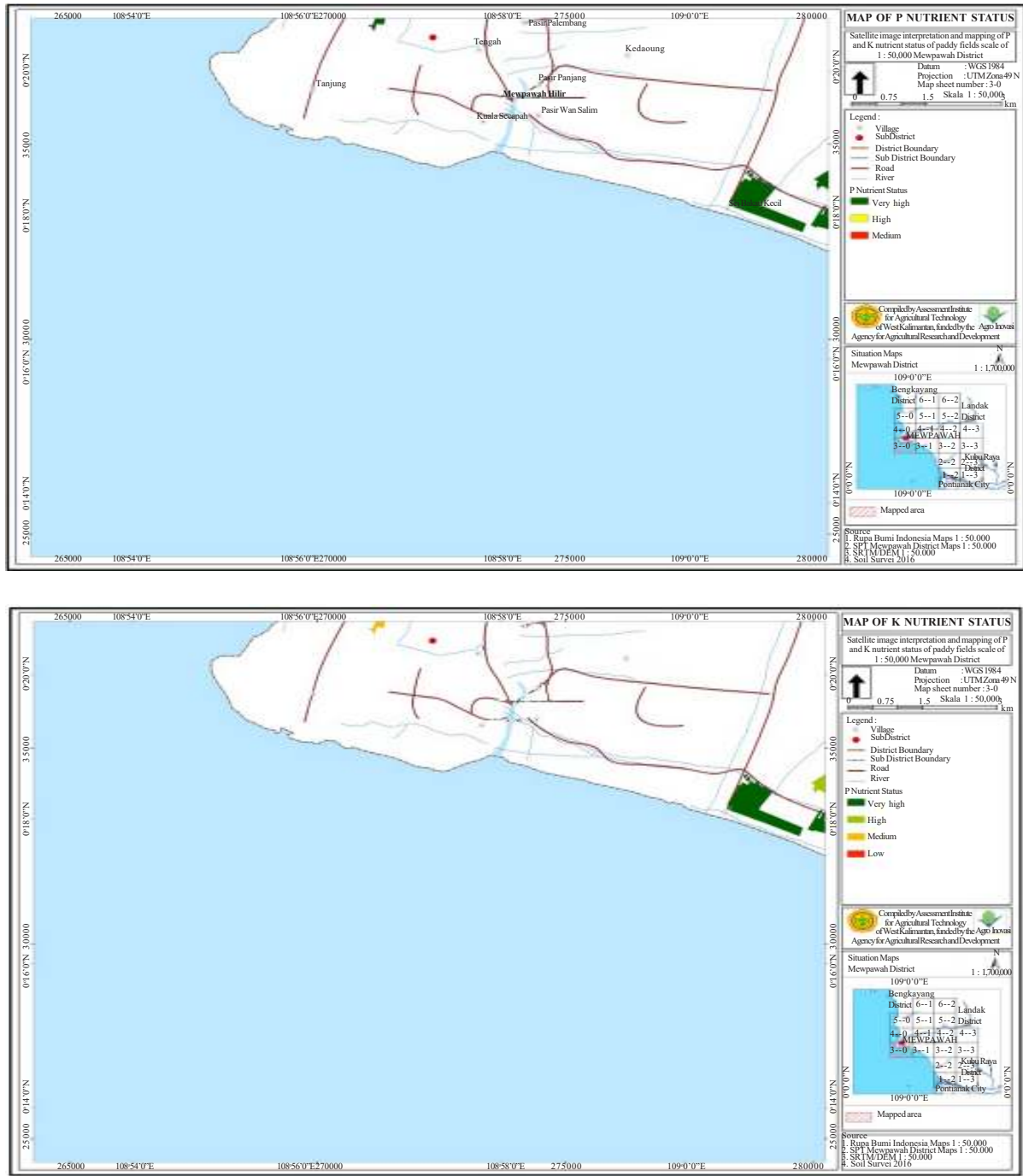


Figure 5. P and K nutrient status of paddy soil in Mempawah Hilir Sub District.

recommendations on nutrient status of high P_2O_5 and medium K_2O in Parit Banjar village are 150 kg NPK (15:15:15) ha^{-1} , 200 kg Urea ha^{-1} and 25 kg KCl ha^{-1} or 200 kg NPK (10:10:10) ha^{-1} , 200 kg Urea ha^{-1} and 25 kg KCl ha^{-1} (Figure 6).

Sungai Kunyit Sub District

The area of paddy fields in Sungai Kunyit Sub District is 1,184 hectare. The nutrient status of P_2O_5 in paddy fields in Sungai Kunyit Sub-district is high, with an average of 53.32 $mg (100g)^{-1}$. The nutrient status of K_2O is classified as moderate to high,

namely 28.23 - 41.39 $mg (100g)^{-1}$. Fertilizer recommendations on nutrient status of high P_2O_5 and high K_2O in Sei Duri I village, Sei Duri II village, Bukit Batu village and Sei Bundung Laut village are 150 kg NPK (15:15:15) ha^{-1} , 200 kg Urea ha^{-1} and 25 kg KCl ha^{-1} or 200 kg NPK (10:10:10) ha^{-1} , 200 kg Urea ha^{-1} and 25 kg KCl ha^{-1} . Fertilization recommendations on nutrient status of high P_2O_5 and medium K_2O in Sei Kunyit Laut village, Sei Limau village, Sei Dungun village and Mendalok village are 150 kg NPK (15:15:15) ha^{-1} , 200 kg Urea ha^{-1} and 25 kg KCl ha^{-1} or 200 kg NPK

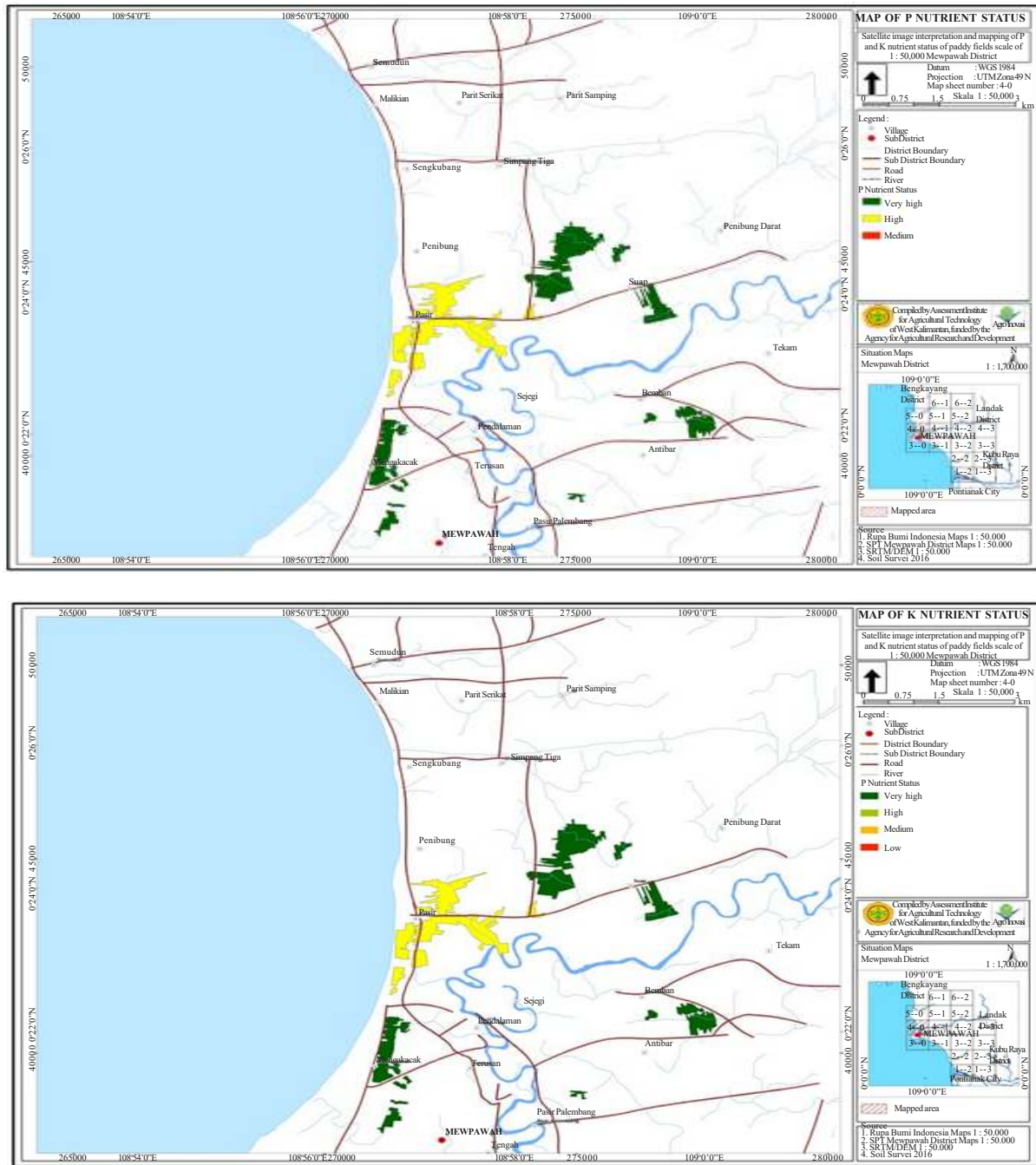


Figure 6. P and K nutrient status of paddy soil in Mempawah Timur Sub District.

(10:10:10) ha⁻¹, 200 kg Urea ha⁻¹ and 25 kg KCl ha⁻¹ (Figure 7).

Toho Sub District

The area of paddy fields in Toho Sub District is 2,498 hectares. The nutrient status of P₂O₅ in the paddy fields of the Toho Sub-district is high, with an average of 55.38 mg (100g)⁻¹. K₂O nutrient status is high to very high, namely from 30.87 mg (100g)⁻¹ to 43.12 mg (100g)⁻¹. Fertilizer recommendations on nutrient status of high P₂O₅ and medium K₂O in Terap village, Palaheng village, Sepang village,

Pakutan village, Benuang village, Sembora village and Toho Hilir village are 150 kg NPK (15:15:15) ha⁻¹, 200 kg Urea ha⁻¹ and 25 kg KCl ha⁻¹ or 200 kg NPK (10:10:10) ha⁻¹, 200 kg Urea ha⁻¹ and 25 kg KCl ha⁻¹. Fertilizer recommendations on high nutrient status P₂O₅ and K₂O in Kecurit village are 150 kg NPK (15:15:15) ha⁻¹, 200 kg Urea ha⁻¹ and 25 kg KCl ha⁻¹ or 200 kg NPK (10:10:10) ha⁻¹, 200 kg Urea ha⁻¹ and 25 kg KCl ha⁻¹ (Figure 8).

Sadaniang Sub District

The area of paddy fields in Sadaniang Sub-district is 1,743 hectares. The nutrient status of P₂O₅

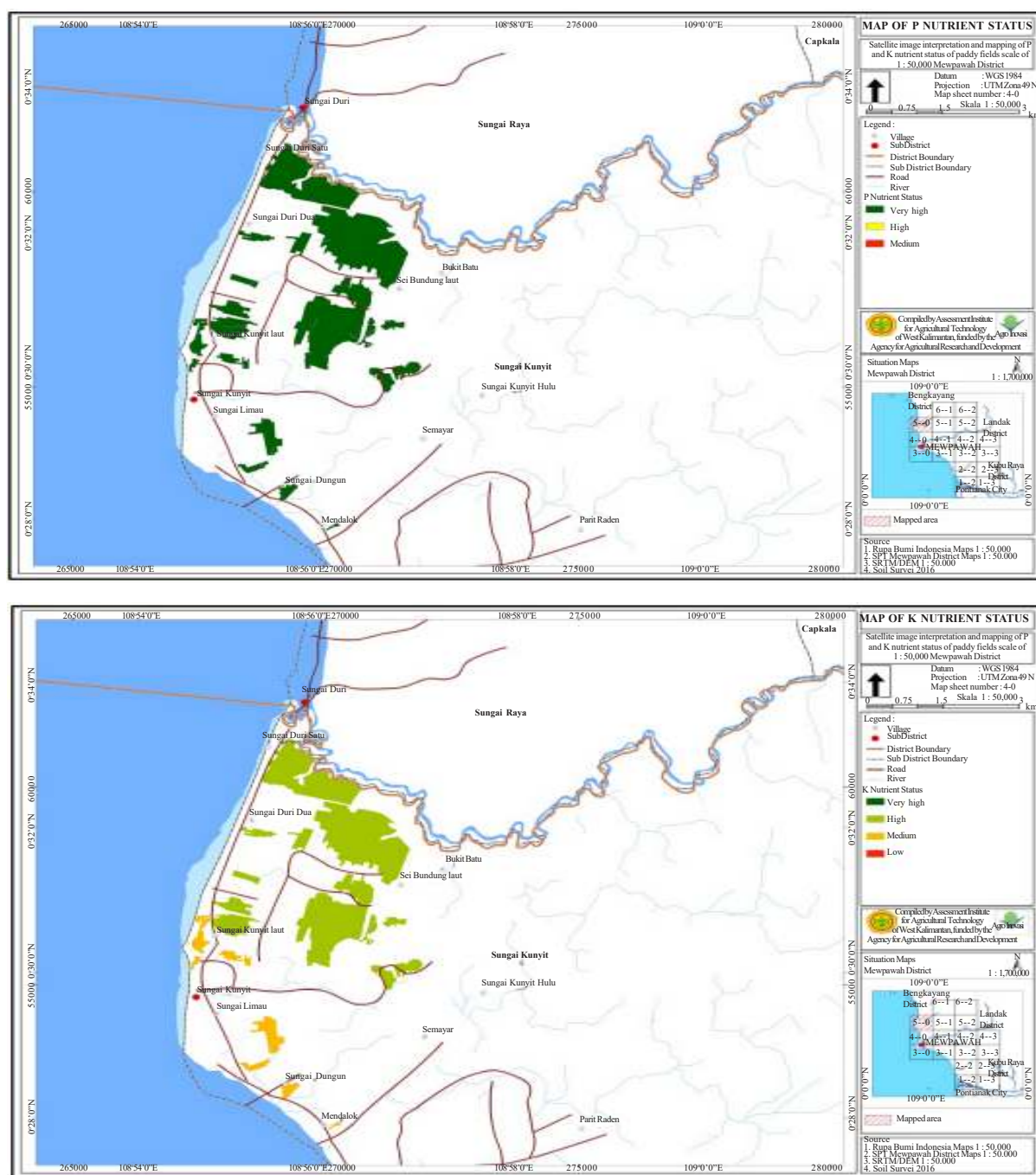


Figure 7. P and K nutrient status of paddy soil in Sungai Kunyiit Sub District

in the paddy fields of the Sadaniang Sub-district is classified as moderate to high which ranged from 22.74-58.67 mg (100g)⁻¹. The nutrient status of K₂O from low to high which ranged from 08.43 - 42.06 mg (100g)⁻¹. Fertilizer recommendations on medium P₂O₅ nutrient status and low K₂O in Pudak village are 200 kg NPK (15:15:15) ha⁻¹, 175 kg Urea ha⁻¹ and 50 kg KCl ha⁻¹ or 250 kg NPK (10:10:10) ha⁻¹, 175 Urea ha⁻¹ and 50 kg KCl ha⁻¹.

Fertilizer recommendations on P₂O₅ and K₂O nutrient status are medium in Bawing village, Palanjau village, Pentek village are 200 kg NPK (15:15:15) ha⁻¹ and 175 kg Urea ha⁻¹ or 250 kg NPK

(10 :10 :10) ha⁻¹ and 175 kg Urea ha⁻¹. Fertilizer recommendations on nutrient status of medium P₂O₅ and high K₂O in Pudak village are 200 kg NPK (15:15:15) ha⁻¹ and 175 kg Urea ha⁻¹ or 250 kg NPK (10 :10 :10) ha⁻¹ and 175 kg Urea ha⁻¹. Fertilizer recommendations on nutrient status of high P₂O₅ and medium K₂O in Bumbun village are 150 kg NPK (15:15:15) ha⁻¹, 200 kg Urea ha⁻¹ and 25 kg KCl ha⁻¹ or 200 kg NPK (10:10:10) ha⁻¹, 200 kg Urea ha⁻¹ and 25 kg KCl ha⁻¹. Fertilization recommendations on P₂O₅ and K₂O nutrient status are high in Sekabuk village and Pentek village are 150 kg NPK (15:15:15) ha⁻¹, 200 kg Urea ha⁻¹ and 25 kg KCl

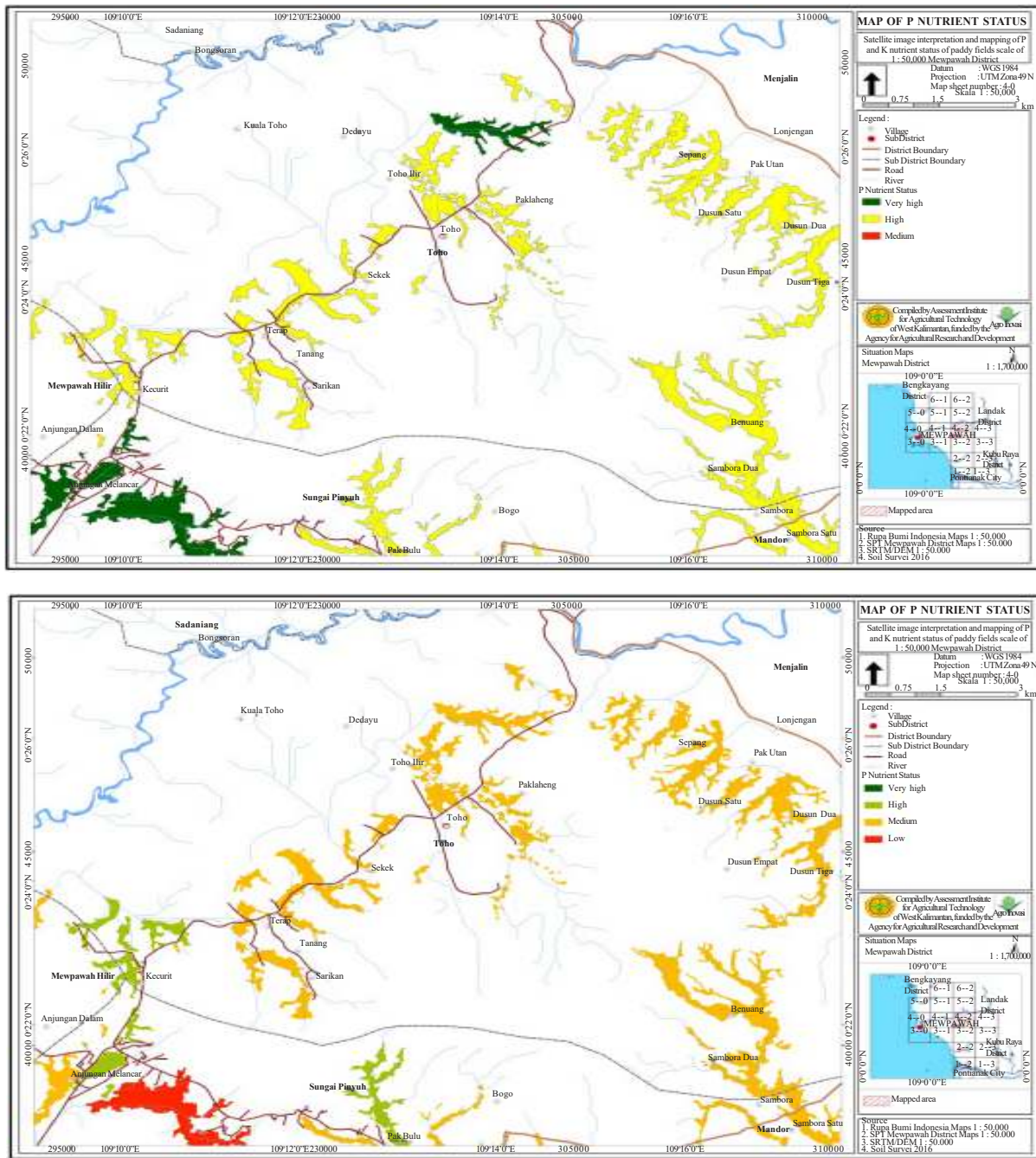


Figure 8. P and K nutrient status of paddy soil in Toho Sub District.

ha⁻¹ or 200 kg NPK (10:10:10) ha⁻¹, 200 kg Urea ha⁻¹ and 25 kg KCl ha⁻¹ (Figure 9).

CONCLUSIONS

Based on the P and K nutrients status in Mempawah District, it can be concluded that paddy fields with high P nutrient status are spread in 46 villages in 9 Sub-districts and medium P status of paddy fields is spread in 8 villages in 3 Sub-districts, meanwhile, there are no paddy fields that have low P nutrient status. Paddy fields with high K nutrient status are spread in 24 villages in 8 sub-districts,

with medium K nutrient status are spread in 21 villages in 6 sub-districts, and with low K nutrient status are spread in 2 villages in 2 sub-districts.

Recommendations for fertilizing rice fields in several sub-districts in Mempawah Regency are mostly 150 kg NPK (15:15:15) ha⁻¹, 200 kg Urea ha⁻¹ and 25 kg KCl ha⁻¹.

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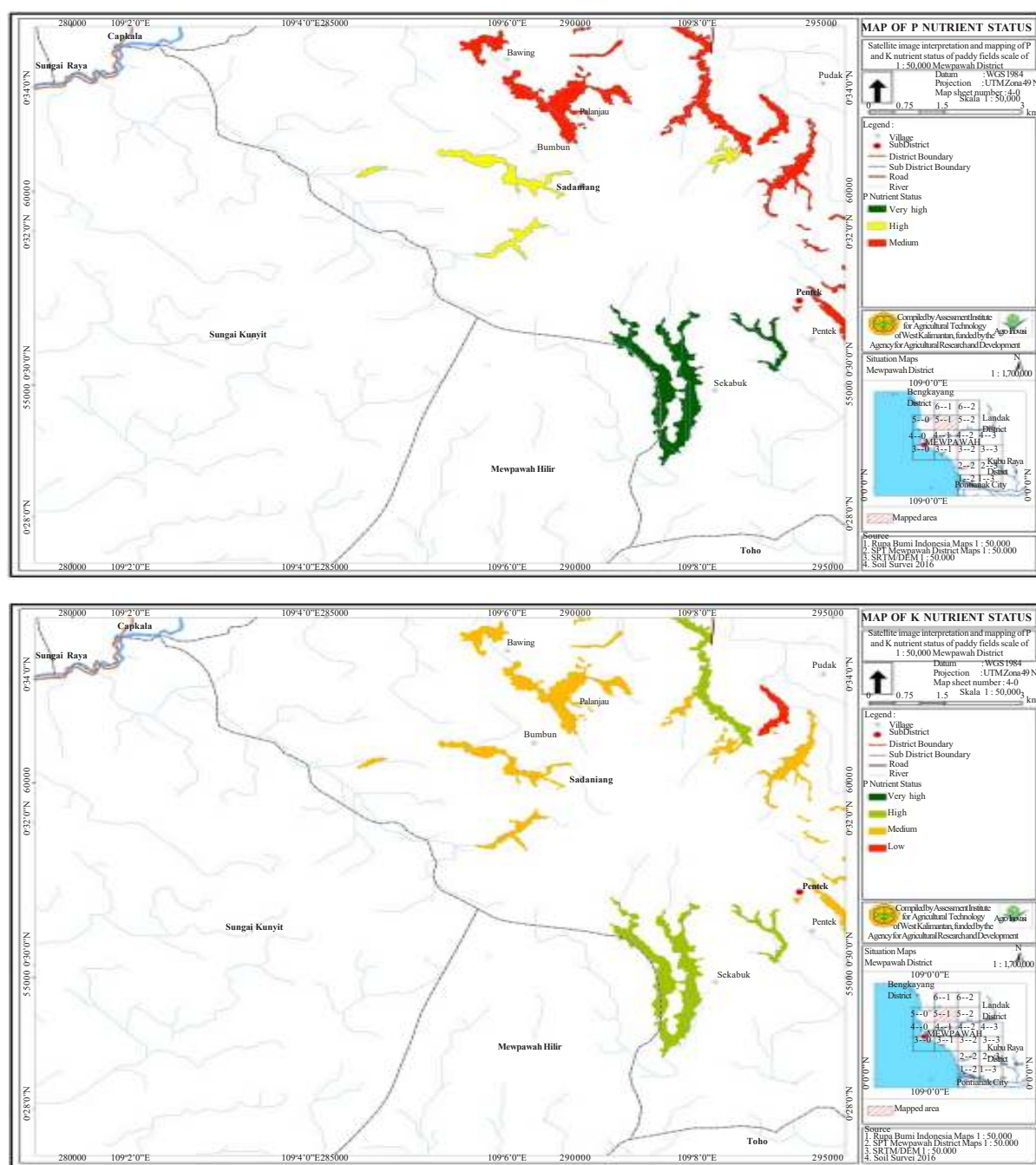


Figure 9. P and K nutrient status of paddy soil in Sadaniang Sub District.

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