UNIVERSITI PUTRA MALAYSIA

A FEASIBILITY STUDY FOR RUBBER (*Hevea brasiliensis*) REPLANTING AT TSB KAMPUNG SIMAT, JOHOL DISTRICT KUALA PILAH, NEGERI SEMBILAN, MALAYSIA

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FP 2015 123

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BY

MUHAMMAD BIN MAHUSIN

A project report PRT 4999 (Final Year Project) submitted to the Faculty of Agriculture, Universiti Putra Malaysia, as a requirement for the award of the first degree in Bachelor Science of Agriculture.

DEPARTMENT OF LAND MANAGEMENT

FACULTY OF AGRICULTURE

UNIVERSITI PUTRA MALAYSIA

2014/2015

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2014/2015

CERTIFICATION

This project report entitled of A Feasibility Study For Rubber (*Hevea* brasiliensis) replanting at TSB Kampung Simat, Johol District, Kuala Pilah, Negeri Sembilan, Malaysia is prepared by Muhammad Bin Mahusin and submitted to the Faculty of Agriculture in partial fulfillment of the requirement of PRT 4999 (Final Year Project) for award of the degree of Bachelor Science of Agriculture.

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ACKNOWLEDGEMENT

Alhamdulillah, millions of thanks to Ar-Rahman Ar-Rahim for giving me strength, health and time to accomplish my project in these few months. With his love and kindness I still can breathe and live healthy and happily in this world.

I would like to express my deepest thanks to my family, my beloved father Mr. Mahusin and my mother Mrs. Che Eshah, my wife Mrs. Noridayu Binti Kamarulzaman, my child Ahmad Mustaqim and Nur Auni Nasuha, my brothers and sister for their love, support and their courage.

I would like to express my gratitude and appreciation to my project supervisor Dr. Roslan bin Ismail, Department of land Management, Faculty of Agriculture, UPM for his guidance, support and patience throughout my final year project. He is a dedicated lecturer and my project supervisor. I also would like to thank to all staff of Espek Research and Advisory Services (ERAS), Kuala Pilah RISDA Districts Office, Department of Training, RISDA Head Quarters, RISDA staff Mr. Jamaludin Mat Tahir, Mr. Mohd Fadhil bin Ahmad, Mr. Mustafa and to all those involved assisting me in completing this thesis.

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ABSTRACT

A study was conducted at TSB Kampong Simat, Johol, Negeri Sembilan to determine soil feasibility study for *Hevea brasiliensis* replanted in that area. The size of the study area was 60 hectares with 37 smallholders as land owners. The reading of GPS coordinate was from 2.5596° to 2.574° North and 102.265° to 102.28° East with elevation from the sea level was 125 meter to 160 meters. Terrains in this area were undulating to hilly. The distance of the study area from down town Kuala Pilah, Negeri Sembilan is around 30 km. The scale of study used was 1:50,000 (Semi-detail survey). The objectives of this study were: 1) To determine the land size (Ha) based on a reconnaissance soil survey of the soil types in TSB Kampung Simat, Johol District, Kuala Pilah, Negeri Sembilan for rubber replanting; 2) To determine soil the physic-chemical characteristics of the soil in the study area for rubber replanting; 3) To evaluate soil-crop suitability for rubber replanting in the study area. A total of 10 composite soil samples at a depth of 0 to 15 cm and 15 to 30 cm using screw auger were collected using the zigzag sampling method. The laboratory analyzes for the soil samples were conducted at Espek Research and Advisory Services, (ERAS) laboratory, located at Bangi Training Centre, Selangor. Soil analysis carried out to determine the physical and chemical properties of the soils. Two soil series were identified are Tai Tak Series (Pedon 1) and Rengam/r Series (Pedon 2). The colour of Tai Tak Series was identified from dark yellowish brown (10 YR 4/6), yellowish brown (10 YR 5/8) and brownish yellow (10 YR 6/8). The percentage of clay is 52 %, silt content of 16 % and sand content is 32 % in the subsoil texture. While Rengam/r Series, the colour was identified from strong brown (7.5 YR 5/6) to yellowish red (5 YR 5/8) shows high iron content in this soil. From the results, the pH value of the study area was lower than optimum pH required for the rubber

growth. The increased of pH value was depended of the based saturation. The soil pH can effect of the CEC value. At very low pH value, the CEC was also generally lowed. Tai Tak series and Rengam/r Series were low CEC value less than 10 $cmol_c/kg$ soil. CEC is an important consideration not only for nutrients already present in the soils, but also for those applied in the fertilizers in other ways. The application of fertilizer for immatured rubber can used from RISDA recommended rate. Classification of soil series were adapted based on soil taxonomy, which is a USDA Soil Taxonomy System (Soil Survey Staff, 2010) and Malaysia Taxonomy System (Paramanathan, 2009). Tai Tak Series for this site fall into Class 2 in soil suitability classes with three moderate limitations of gradient, CEC and soil texture for rubber growth. Hence, Rengam/r Series fall into Class 3 in soil suitability classes with one serious limitation of gradient and two moderate limitations of CEC and texture for rubber growth in this site. However, with proper soil management practices and good agriculture practices for rubber cultivation, these soils have potential for optimum rubber production in the future.

ABSTRAK

Satu kajian telah dijalankan di TSB Kampung Simat, Johol, Negeri Sembilan untuk mengenal pasti kesesuaian tanah untuk tanam semula getah (*Hevea brasiliensis*) di kawasan tersebut. Luas kawasan kajian ialah sekitar 60 hektar dengan 37 orang pemilik. Koordinat kawasan kajian ialah di 2.5596° hingga 2.574° di Bujur Utara dan 102.265° hingga 102.28° di Bujur Timur dengan ketinggian dari paras laut antara 125 hingga 160 meter. Bentuk rupa bumi di kawasan ini adalah berombak ke berbukit. Jarak kawasan kajian dengan Bandar Kuala Pilah ialah sekitar 30 km. Skala yang digunakan untuk kajian ini ialah 1:50,000 (Semi-detail survey). Objektif kajian ini ialah: 1) Untuk menentukan jenis tanah dan luas kawasan berdasarkan data daripada kajian tinjauan untuk tanam semula getah; 2) Untuk menentukan karakteristik fizikal dan kimia tanah di kawasan kajian untuk tanam semula getah; 3) Untuk membuat penilaian kesesuaian tanah-tanaman untuk tanam semula getah. Sebanyak 10 sampel komposit tanah diambil pada kedalaman 0 hingga 15cm dan 15 hingga 30cm menggunakan 'screw auger'. Persampelan komposit tanah ini menggunakan 'zigzag method'. Analisis makmal bagi kesemua sampel tanah telah dijalankan di Espek Research and advisory Services (ERAS), beralamat di Pusat Latihan Bangi, Selangor. Dua siri tanah telah dikanal pasti iaitu siri Tai Tak (profil 1) dan Siri Rengam/r (profil 2). Warna bagi tanah Siri Tai Tak ialah daripada coklat kuning kehitaman (10 YR 4/6), kuning keperangan (10 YR 5/8) dan coklat kekuningan (10 YR 6/8). Peratus kandungan liat ialah 52%, kandungan lodak 16% dan kandungan pasir ialah 32% untuk tekstur tanah. Manakala warna tanah Siri Rengam/r telah dikenal pasti daripada warna coklat kuat (7.5 YR 5/6) ke kuning kemerahan (5 YR 5/8) menunjukkan kehadiran ion ferum yang tinggi di dalam tanah ini. Daripada data analisis yang telah dijalankan, nilai pH bagi kawasan kajian

menunjukkan tahap lebih rendah daripada keperluan nilai pH optima bagi pertumbuhan tanaman getah. Peningkatan nilai pH bergantung kepada tahap ketepuan bes. Nilai pH akan mempengaruhi nilai Kadar Pertukaran Kation (KTK). Pada tahap pH rendah, nilai KTK umumnya rendah. Tanah Siri Tai Tak dan Siri Rengam/r mempunyai nilai KTK di bawah 10 cmolc/kg tanah. Nilai KTK merupakan komponen penting bukan sahaja untuk ketersediaan nutrient di dalam tanah tetapi juga untuk kecekapan penyerapan nutrient daripada pembajaan. Kadar pembajaan bagi anak getah muda adalah mengikut syor RISDA. Klasifikasi tanah telah dijalankan berdasarkan sistem taksonomi tanah oleh USDA (Soil Survey Staff, 2010) dan Malaysian Taxonomy System (Paramananthan, 2009). Tanah Siri Tai Tak dikelaskan dalam Kelas 2 berdasarkan kelas kesesuaian dengan tiga batasan sederhana iaitu kecerunan, KTK dan tekstur tanah untuk pertumbuhan tanaman getah. Manakala tanah Siri Rengam/r dikelaskan dalam Kelas 3 berdasarkan kelas kesesuaian dengan satu batasan serius iaitu kecerunan dan dua batasan sederhana iaitu KTK dan tekstur tanah untuk pertumbuhan tanaman getah. Walau bagaimanapun dengan amalan pengurusan dan pertanian yang baik untuk tanaman getah, tanah-tanah ini mempunyai potensi ke arah produktiviti getah yang optimum pada masa hadapan.

INTRODUCTION

1.1 Background

Malaysia is the third largest producer of natural rubber in the world behind Indonesia and Thailand (Department of Statistics, Malaysia, 2011). Tropical climate factor and land suitability for rubber plantation in Malaysia have made rubber an important commodity in Malaysia, as this scenario gives significant economic return to the industry players. The total area of rubber cultivation in Malaysia is estimated about 1,029,000 hectares up to year 2011 (Department of Statistics, Malaysia, 2011 and Noordin, 2013). In Malaysia, smallholder cultivation with rubber accounted up to 95% of the total area as recorded in 2011 (International Rubber Study Group, 2011). In order to assist the smallholders and to improve the rubber sector in Malaysia - Rubber Industrial Smallholders Development Authority (RISDA) were developed by the government. RISDA were incorporated in January 1, 1973. It was incorporated by an Act of Parliament through the Act 85, RISDA, 1972 and Ordinance of the Rubber Industry (Replanting), 1952. This agency is also responsible to provide advisory services and efficient management practice of the rubber planting to the smallholders. Under RISDA plan, rubber replanting scheme was implemented to replace uneconomic rubber farm of smallholders. Up to date, there are several rubber replanting schemes managed by RISDA such as individually replanting scheme, grouping replanting scheme and commercial replanting scheme. In order for rubber replanting to be successful, soil feasibility study (inclusive of soil survey) needs to be conducted in the rubber replanting area to assess the soil suitability for replanting program.

The soil feasibility study incorporates soil data necessary to determine the important characteristics of soils, to classify soils into defined types and other classification units, to establish and to plot on maps the boundaries among kinds of soils (Soo, 1979). In this study, the focus is on a rubber plantation. Thus, soil feasibility study for rubber planting is an important element that needs to be conducted in the planning process to develop planting area's suitability of soils for rubber cultivation. It is important to determine the physical, chemical and biological properties of the soils. The physical properties of the soils such as colour, texture, structure, consistency, pores, roots, drainage, boundary and special characteristic that is available in the soil need to be determined. The chemical properties of the soils such as soil pH, cation exchange capacity (CEC), organic carbon, macro and micronutrient content will also need to be determined. Besides that, biological characteristic of the soil such as interaction between soil organism (macro and micro) and their influence of soil fertility is also other aspects need to be taken into consideration. However, this aspect is beyond the scope of this final year project (FYP) study.

Commonly, in Malaysia, soil survey or soil feasibility study is only conducted for large – scale agricultural project such as plantation sectors and special agriculture project under government supervision, simply - because it involves high costs and requires specialist expertise of soil surveyor. Basic information on soil survey and land used for agriculture in Malaysia has been carried out through desk study and preliminary soil suitability assessment by the Department of Agriculture (DOA, Malaysia) and by Param Agricultural Soil Surveys (M) Sdn. Bhd. Hence, there are lack of detail or semi-detail soil survey data for smallholders sector accessibility. Therefore, this study focus on the soil feasibility for rubber replanting

from smallholders sector perspective. This study includes soil physical, chemical and soil suitability for rubber replanting. Data from this study can be used to improvise management practices of smallholders, thus improve good agriculture practice (GAP) for rubber replanting in this study area. Besides that, the work methodology can be emulated to other smallholder rubber areas.

A preliminary study in this area was conducted on April 11, 2014 to collect primary data (topography map, geology map, design of plan areas, number of farmers, acreage size and etc.). Secondary data (data of temperature, annual rainfall, sosio-economic, vegetation, previously field records and etc.) were also collected from the field records. A preliminary study will facilitate the implementation of primary feasibility study in this area. The primary feasibility study carried out on May 8 and 9, 2014 and were assisted by two (2) Assistant Agriculture Officer of RISDA. Therefore, a soil feasibility study using medium to low approximate scale (survey intensity) with scale 1:50,000 – 1:150,000 as such use methods of semi-detailed soil survey will be the further focus.

Following the preliminary data collection, a total of 20 soil composite samples at two different depths were collected; 0-15 cm and 15-30 cm depth using screw auger with the zigzag sampling method. In addition to that, two soil profiles (Pedon 1 and Pedon 2) will be described in the study areas to observe change in soil series, if any. The morphological characteristic of each soil horizon will be recorded and subjected to physical and chemical analyses.

1.2 The Objectives of The Study Were:

i. To determine the land size (Ha) based on a reconnaissance soil survey of the soil types in TSB Kampung Simat, Johol District, Kuala Pilah, Negeri Sembilan for rubber replanting.

ii. To determine soil the physic-chemical characteristics of the soil in the study area for rubber replanting.

iii. To evaluate soil-crop suitability for rubber replanting in the study area.

1.3 Study Site Description

Study areas were identified for replanting rubber under the replanting scheme of RISDA on year 2014. The study area is located in TSB Kampung Simat, Johol, Negeri Sembilan and the size of the study area is 60.0 hectares with 37 smallholders as land owner. GPS coordinates of the study area are from 2.5596° to 2.574° North and 102.265° to 102.28° East with elevation from the sea level is 125 meters to 150 meters. The topography of the area is undulating to hilly (6 to 20 degrees). Besides that, the main vegetation previously was found in the study area is a uneconomic rubber tree. In addition, temperature regime and annual rainfall for the study area is estimated to be similar for the entire of Peninsular Malaysia with a temperature range in 22 to 34°C, and annual rainfall around 1800 - 2800mm/year.

1.4 Accessibility

This study area is located at the Kampung Simat, Johol in the District of Kuala Pilah, Negeri Sembilan Darul Khusus. Kuala Pilah is a main and administrative town of the district, which is about 25 km from Kuala Pilah in the north and about 20 km to Tampin town in the south. The main access to the study area is by the state route no. 9 (Tampin-Kuala Pilah) and trough route of Kampung Air Mawang, Johol, Negeri Sembilan.

1.5 Problem Statement

Soil feasibility study for rubber (*Hevea brasiliensis*) replanting was conducted at TSB Kampung Simat, Johol, Negeri Sembilan Darul Khusus for the rubber replanting area from smallholders perspective. This area was chosen because it is located in the rubber zone in Kuala Pilah District, Negeri Sembilan and owned by the smallholders. Based on *Reconaissance Soil Map, Peninsular Malaysia* by Department of Agriculture, (DOA, 2002). In 2014, majority of rubber trees age are over 20 years. Thus, their latex productivity is very low. Moreover, the number of trees per hectares was decrease and also some rubber trees were damaged or killed by diseases, wind damaged and etc. In addition, maintenance cost of rubber farm has increased proportionately to their yield. Thus, the smallholders as an owners have done the grouping rubber replanting scheme manage by RISDA. A soil feasibility study is one of the parts of the rubber replanting process need to be conducted in this area to assess the soil suitability for the successful replanting program.

Based on the past record, the smallholders in the TSB Kampung Simat (study area) never had soil data information in relation to fertilizers and yield output. This is mainly because most of the owners have minimal records of their farm activity.

Moreover, a soil feasibility study or semi-detail soil survey require very expensive costs. Therefore, in the past, rubber planting was more of a guesswork with minimal data on the soil suitability classification for rubber.

Thus, through this study, soil data and soil map will accompany this soil report for TSB Kampung Simat. This will be the first scientific report that presents the soil series and inventory of the soils found in the study area, their geomorphological, physical and chemical characteristics that affects rubber growth and farm management. Through out this study, suggestion will be put forward for better rubber replanting practice using GAP methods. It is expected this methodology can be used as a guide for other smallholders sector in smallholder areas. This work will progress based on four stages noted as; 1) Desk study and field survey. 2) Analytical soil data on the laboratory. 3) Interpretation of soil data and discussion, and 4) Preparation of the soil map and final soil data report with a soil map for the smallholders rubber area of TSB Kampung Simat.

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