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THE EFFECTS OF ORGANIC AND INORGANIC FERTILIZER ON THE GROWTH OF *ZOYSIA MATRELLA* AND PHYSICO- CHEMICAL CHARACTERISTICS FROM STEEP SLOPE

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BY

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A project report submitted to Faculty of Agriculture, University Putra Malaysia, in fulfilment of the requirement of PRT 4999 (Final Year Project) for the award of the degree of Bachelor of Agricultural Science

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CERTIFICATION

This project report entitled **"The Effects of Organic and Inorganic Fertilizer on The Growth of *Zoysia matrella* and Physico- Chemical Characteristic from Steep Slope"** is prepared by **Nurul Husna Binti Shamsol Kamal** and submitted to Faculty of Agriculture in fulfilment of the requirement of PRT 4999 (Final Year Project) for the award of Bachelor of Agriculture Science.

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ABSTRAK

Objektif kajian ini adalah; 1) untuk menyiasat kesan baja pada ciri-ciri fizikal dan kimia tanah dalam jangka masa pendek dan 2) untuk mengkaji kesan penggunaan baja terhadap jumlah biojisim dan ketumpatan akar tumbuhan dan; 3) untuk mengenal pasti spesies tumbuhan yang sesuai untuk mengawal hakisan pada cerun. Kajian ini telah dijalankan di cerun di sekitar kawasan Fakulti Pertanian, Universiti Putra Malaysia dengan 5 rawatan dan 4 replikasi serta menggunakan Reka Bentuk Rawak Lengkap Berblok (RCBD) . Rawatan yang terlibat ialah; rawatan 1, tanpa baja (Kawalan), rawatan 2, NPK + EFB (NEFB), rawatan 3, NPK + Biogreen Energy^{TM} (NBG), rawatan 4, EFB + Biogreen Energy^{TM} (EFBBG) dan rawatan 5 adalah gabungan NPK + EFB + Biogreen Energy^{TM} (NEFBBG). Berdasarkan hasil kajian, gabungan NPK + EFB + Biogreen Energy^{TM} (NEFBBG) telah menunjukkan nilai min yang tertinggi pada rongga tanah, pH tanah, kestabilan agregat tanah, elemen larut resap pada fosforus dan kalium, kandungan P dalam tanah, dan jumlah karbon. Jadi jelaslah bahawa penggunaan baja organic memberi kesan ke atas fizikal dan kimia tanah.Baja organik juga menunjukkan keputusan yang positif, terutamanya dalam kadar pertumbuhan Zoysia matrella. Kesimpulannya, penggunaan baja gabungan memberikan hasil yang lebih baik berbanding penggunaan baja organik dan tak organik secara berasingan.

ABSTRACT

The objectives of the study were; 1) to investigate the short-term effects of fertilizers on soil physical and chemical characteristics; 2) to study the effect of soil treatments and plant species on the dry matter yield and root density and; 3) to identify the suitable plant species for controlling erosion on the steep slope. This study was conducted on the steep slope at Faculty of Agriculture, University Putra Malaysia with 5 treatments and 4 replications by using Randomized Completely Block Design (RCBD). The treatments were; treatment 1, without fertilizer (Control), treatment 2, NPK+ EFB (NEFB), treatment 3, NPK+ Biogreen Energy^{TM} (NBG), treatment 4, EFB + Biogreen Energy^{TM} (EFBBG) and treatment 5 was a combination of NPK+ EFB + Biogreen Energy^{TM} (NEFBBG). Based on the result, the combination of NPK+ EFB + Biogreen Energy^{TM} (NEFBBG) was showed the highest means value on soil porosity, soil pH, soil aggregate stability, soil leachates (phosphorus and potassium), available P in soil, and total carbon. So, the application of combination fertilizer showed a positive result on improving chemical and physical characteristic of soil. The organic fertilizer had showed significant result for *Zoysia matrella*'s growth development. As a conclusion, a combination of organic and inorganic fertilizer can give the best result as compared to the other treatments in this experiment.

CHAPTER 1

INTRODUCTION

For the past 50 years, soil erosion on steep slopes increased drastically from year to year throughout the world. Soil erosion has largely been attributed to poor farming practices, deforestation, road and dam construction (Liang et al., 2009; Stokes et al., 2010). Soil erosion occurs in many forms. Everything on land moves and it may be erosive because gravity pulls soil down the slope either slowly as in soil creep or rapidly as in a landslide. Erosion on a bare slopes are a common scene in the tropics. Almost all of the bare slopes are susceptible to landslides. The landslide is a common but may turn to a serious geologic hazard in many parts of the world. The force of falling raindrops may dislodge soil particles, which are then can led to landslide. A serious landslide may cause damage in property fatalities and injuries.

Bare soil surfaces in Malaysia are extremely susceptible to landslide due high intensity of rainstorms. Basically, landslide may become a great problem when the usage of the earth changes due to human activities. This kind of rapid process usually enhances by human practices such as deforestation, mining and construction. The erosion potential can increase if the ground has no or very little vegetative cover. Previous research has presented that cover crop is effective in controlling erosion. Various species of turf grass are much employed as ground cover and become the vital roles of landscape development in sloping areas. This form of vegetative cover can act as a protective barrier between the soil and the natural elements from raindrop impact and splash, tends to slow down the movement of surface runoff and allows excess surface water to get through. The dominance of the vegetation in controlling soil will depend on the type, extent and amount of the blanket.

Vegetation also can influence the stability of slope when the roots act as reinforcement to the soil. There are many changes in soil when erosion takes place, namely its physical and chemical properties. The physical properties include are changes in soil texture and soil structure. Malaysia geographical map shows that mountains and hills are less than 25% of the terrain, but slope failures or landslides are a frequently reported. From one aspect, it appears, that the frequency of slope failures is due to the monopoly of the rain. Small quantity and distribution of rain can affect the erosion while a large quantity of rain in a short period of time can have severe erosion such as landslide and runoff. Both can occur if the rain falls faster than the soil can absorb it. This will be occurring at steeper slope, longer in slope length and more convex shape of the slope (Treoh et al., 1991).

In Malaysia from 1975 to 2007 there are about 460 landslides were reported. From these 30 cases were classified as major landslides (Huat et al., 2007). These failures involved huge economic losses as well as fatalities. Also establish that there were hundreds more 'unreported' minor slope failures. The recent case reported on 7 January 2014 at the Mahameru highway, which lead to various investigations on the slope's safety at highway. From the early investigation report said the landslide cause of the heavy rain, weak slope and poor drainage. (Malay Mail Online, 8January). These common problems of landslides caused by weak or bare slope without or having a less vegetative cover to maintain the soil strength.

1.1 JUSTIFICATION

One of the ways to control this problem is by attempting to cultivate the grass. Grass can play many functional parts, but the option to choose a right species is significant. Here, characteristic of grass will be accustomed to limit their ability to take in the landslides. Grass is fast growing vegetation and provide a dense protective ground cover. Based from Gyssels et al. (2005), grass protect the surface directly from rain splash and the roots and rhizomes help to bind the soil. While when the water running in the soil the grass root will be able to hold soil particles firmly and can enhance the porosity of the soil. Thus, the soil with the grass coverage is able to withstand and undergo flow of water efficiently inside the soil. Manila grass (*Zoysia matrella*) is believed to have the ability to control erosion on the sloping area.

Characteristics of manila grass:

-high tolerant- heat, cold, frost and shade tolerant (Aldous and Chivers, 2002)

-adapted to wet and saline sites (Wang 1995)

- vigorous root systems- strong, deep and extensive rhizome (Christian, 2011)

Yet, this vegetative approach needs to be applied with suitable fertilizer treatment in order to help the root developments, otherwise this approach will not be successful. From this study, the two types of fertilizers will be used which are organic and inorganic fertilizers. Both of them will show different effects towards the plant growth. Therefore, an experiment was conducted in order to observe either this grass have the ability to control erosion or which fertilizers can give better effect on root growth and soil fertility status.

1.2 OBJECTIVES

1) To investigate the short-terms effects of fertilizers on soil physical and chemical characteristics.

2) To study the effects of soil treatments and plant species on the total biomass and root density.

3) To identify the suitable plant species for controlling erosion on the steep slope.

1.3 HYPOTHESIS

Combination of organic and chemical fertilizer improve the soil chemical, physical properties and growth of *Zoysia matrella* in term of dry matter yield and root density.

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