UNIVERSITI PUTRA MALAYSIA

SEDIMENT CARBON STORAGE OF MANGROVE FOREST AT SUNGAI TINGGI, PERAK.

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SEDIMENT CARBON STORAGE OF MANGROVE FOREST AT SUNGAI TINGGI, PERAK.

By

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A Project Report Submitted in Partial Fulfillment of the Requirements for the Degree of Bachelor of Forestry Science in the Faculty of Forestry Universiti Putra Malaysia

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DEDICATION

My Dear Family:

Mat Din Bin Derani

HasnahBinti Mat Zain

MuhamadHafizi Bin Mat Din

MuhamadHaqimi Bin Mat Din

To all my friends,

Nor Farah Wahidah Abdul Aziz

MuhamadWafiuddinRamlee

Thank you for your encouragements supports

And the sacrifices that you have given.

Thank you for everything. May Allah Bless All of us.

ABSTRACT

Sediment have a potential in storing carbon gases from the atmosphere and plays an important role in carbon cycle at mangrove ecosystem. In mangrove ecosystem sediments were found abundancely in the river brink. Therefore, to prove this statement, the study of carbon storage in the sediment was carried out at Sungai Tinggi in Matang Mangrove Forest, Perak. The objectives of this study are to provide a fundamental information of sediment carbon stored and to compare the carbon storage potential among three different zones and five different depths. One transet line was established along the river and divided into three zones (Upstream, Middle stream, Downstream). A total of 75 sediment samples were collected using peat auger in five different depths (0-15 cm, 15-30 cm, 30-50 cm, 50-100 cm, >100 cm). The standard method was used in sediment preparation and laboratory analysis. The obtained data was analyzed using SAS 9.2 to find mean comparison between zones and depths. As a result, middle stream with 10.819^{a} (±0.234) % was obtained the highest content of total organic carbon compare to the other zones and shows significant different. In term of sediment depth, total organic carbon percentage was highest in depth five (>100 cm) with 12.528^{a} (±0.281) %. As a conclusion, sediment is one of the potential for carbons stored but more research are need to be done to prove that the total organic carbon percentage are encourage by mangrove zones and depths.

ABSTRAK

Sedimenmempunyaipotensiuntukmenyimpan gas karbondariatmosferadanmemainkanperananpentingdalamkitarankarbon di ekosistembakau. Dalamsedimenekosistembakaudidapatibanyak di persisiransungai. Olehitu, untukmembuktikankenyataanini, kajianpenyimpanankarbondalamsedimentelahdijalankan di Sungai Tinggi di HutanPayaLautMatang, Perak. Objektifkajianiniadalahuntukmenyediakanmaklumatasaskarbonsedimendisimpanandanuntukmembandingkanpotensisimpanankarbon di antaratigazon yang berbezadanlimakedalaman yang berbeza. Satubaristransettelahdibuat di sepanjangsungaidandibahagikankepadatigazon (Huluan, aliran Tengah, Hiliran). Sebanyak 75 sampelsedimentelahdikumpulkanmenggunakangerimitgambut di limakedalaman yang berbeza (0-15 cm, 15-30 cm, 30-50 cm, 50-100 cm,> 100 cm). Kaedah standard telahdigunakandalampenyediaansedimendananalisismakmal. Data yang diperolehidianalisismenggunakan SAS 9.2 untukmencariperbandinganantarazondankedalaman. Keputusannya, aliranpertengahandengan 10.819^{a} (± 0,234)% didapatikandungantertinggidaripadajumlahkarbonorganikberbandingdenganzon lain danmenunjukkanperbezaan yang signifikan. Dari segikedalamansedimen, jumlahperatusankarbonorganikadalah paling tinggipadakedalamanlima (> 100 cm) dengan 12.528^{a} (± 0,281)%. Kesimpulannya, sedimenmerupakansalahsatupotensiuntukkarbondisimpantetapilebihbanyakpenyelidikanperludilakukanuntukmembuktikanbahawajumlahperatusankarbonorganikdipengaruhiolehzonbakaudankedalaman.

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APPROVAL SHEET

I certify that this research project report entitle “Sediment Carbon Storage of Mangrove Forest at Sungai Tinggi, Perak” by MuhamadHuzwa Bin Mat Dinhas been examined and approved as a partial fulfillment of the requirement for the degree of Bachelor of Forestry Science in the Faculty of Forestry, Universiti Putra Malaysia.

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SOM	Soil Organic Matter
TOC	Total Organic Carbon
EC	Electrical Conductivity
CEC	Cation Exchange Capacity
GPS	Global Positioning System
USDA	United States Department of Agriculture
SAS	Statistical Analysis System
ANOVA	Analysis of Variance

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CHAPTER 1

INTRODUCTION

1.1 General Background

Mangrove forests are a salt-tolerant forest ecosystem found in the intertidal region of sheltered coastlines (Hamilton& Snedaker, 1984). Mangroves forests, also known as mangal, in the tropical regions,are commonly found at tidal areas such as estuaries (Ellison, 1999).Mangroves exist at the interface between land and sea in subtropical and tropical latitudes. Plants can grow well because of the low wave energy and mangrove work as a shelter that enable the deposition of sediment (Daniel, 2009).Worldwide, mangrove forest are found in the tropical and subtropical region. In Malaysia, mangrove forest can be found in area located along sheltered coastlines protected from strong waves and cover an area of approximately 641,172 ha (Erinet al.,2010).

Mangrove have a lot of important role such as protecting and maintaining the coastal water quality, reducing the impact of the wave and flood damage and also acting as nursery and feeding area for commercial and artisanal fishery species (Kuenzer & Gebhardt, 2011). Not only that,mangroves also playcrucial roles in global carbon cycling since it hold a large pool of carbon andserve as the potential carbon sinks and sources to the atmosphere.Sediment is a mixture of loose sand, clay, silt and other soil particle which usually exist in thelow part of marine environment. Ongley (1996) stated that sediments play an important role in elemental cycling in the aquatic environment because it transports nutrients and also

contaminant.Soil erosion and decomposition of plants and animals are the source of sediment.

Sediment play an importantrole in marine environment as it caring nutrient. However, it can leave negative impact to the forest when the water transport too much sediment because not only nutrient, but it also carried contaminant such as acid and metal that can damage the ecosystem.This phenomena was called unnatural sedimentation. Unnatural sedimentation typically comes from construction site and agricultural runoff (Chou et al., 2010).Ellison (1999) stressed that human disturbance produced a lot of sedimentation that causing problem to mangrove.Sedimentation may also become harmful when the root of mangrove tree are being buried. When this happen, there is less gasses exchange between roots and water.Thus, lessening the ability of the trees to respire and preventing an important physiological process.Chouet al. (1999) claim that excessive of sedimentation can prevents the light from reaching the mangrove root.

Other than that, mangrove forest will be harmed if the sedimentation impedes the tidal system on which they depend for vital nutrient. If there is no tide bringing in nutrient and get rid of the harmful excessive sediment, the health of mangrove forest will decrease. Ellison (2000) found that planting mangrove in an area with hampered tidal system will not be successful because they are dependent upon tidal flow to survive.Sedimentation affects all organisms differently. It can greatly changes the ecosystem by killing some of the native species. According to Chou et al. (2010) sediment often

results in the introduction of invasive species that are able to flourish in the newly introduced environment. Furthermore, sedimentation also can kill the native species in an area entirely.

The worldwide carbon cycle can be characterized as one of the major biogeochemical cycle due to its part in managing the centralization of carbon dioxide. Climate change is caused by the increasing of carbon dioxide concentrations in the atmosphere. Since the forest and other agriculture play an important role in helping to reduce the availability of carbon dioxide in the atmosphere. Soil and vegetation such as woody plant and plant residue can store the carbon (Tisdale et al., 1995).

1.2 Problem Statement

Carbon dioxide is one of the greenhouse gases lead to the climate change. Climate change happen due to the increasing concentration of the carbon dioxide in the atmosphere. As the climate change happen, this is become a huge problem to earth and human's life and one of the factor that lead to this problem happen is the release of excessive carbon dioxide. However, mangrove forests have a big potential to decrease carbon dioxide from the atmosphere by sequestering the carbon dioxide gases and stored into the soil.

Therefore, this study has been conducted to identify the carbon storage of the sediment and to compare the carbon storage of the sediment

betweendifferent zonation which consist of upstream, middle stream and downstream in the mangrove forest river located at Sungai Tinggi, Kuala Trong. Thus, the study is carrying out to determine the carbon storage of the sediment at Sungai Tinggi River.

1.3 Objectives

The objectives of this research are:

I. To identify the sediment carbon storage of mangrove forest at Sungai Tinggi.

II. To compare the sediment carbon storage ofmangrove forest between different zonations (Up Stream, Middle Stream and Down Stream) of the Sungai Tinggi.

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