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Mitigation and Adaptation Peatland through Sustainable Agricultural Approaches in Indonesia: a Review

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A B S T R A C T

Rapid and massive damage on peatland mainly due to conversion to a production system in the presence of perennial crops for the purpose of financially profitable agribusiness, such as oil palm plantations and other industries, can lead to increased greenhouse gases. Greenhouse gas emissions are influenced by biophysical processes are complex, such as peat decomposition and compaction, nutrient availability, soil water content, and soil water content. When land clearing increased significantly in the area of peatland is not followed by the application of sustainable agriculture, then, will peat land would become flammable and the greater the volume of CO_2 gas that emits into the atmosphere that causes global warming and climate change. This paper reviews about the expansion of agriculture and plantations on peatland and action needs to be done by following sustainable agricultural systems. Noting the condition of peatland that have been severely damaged due to the expansion of oil palm plantations, the mitigation and adaptation in the land through sustainable agricultural system is highly recommended to reduce the more severe damage to the peatland areas and minimize the release of CO_2 into the atmosphere.

1. INTRODUCTION

1.1. Research Background

Globally, in the world, peatland cover an area of 400 million hectares, equivalent to 3 percent of earth's land area. These ecosystems store most of the existing carbon in the world [1]. This amount is equivalent to the amount of carbon to be emitted into the atmosphere from burning fossil fuels each year. One third of the carbon stored in peatland with in total 191 gigatonnes located in the tropics [2] , in which 60 percents or approximately 25 million acres in Southeast Asia. The majority of peatland in Southeast Asia are found in Indonesia (21 million hectares), while Malaysia about 2.5 million hectares. Thailand has about 45,000 hectares and a relatively small area is found in Vietnam, Brunei and the Philippines.

Most of Indonesia's peatland are located on the island of Sumatra, especially Riau, Kalimantan, Papua, and a small percentage in Sulawesi region. Peatland have some significant values, both extractive and non-extractive. As extractive materials, peat can be ustilized as energy material (e.g.: charcoal briquettes), seedlings media, and dry land reclamation media. While as non-extractive material, peatland can serve as a habitat for animals.

The spread of peatland is predominantly located in the east coast of the Sumatra Island, western and southern coast of the Kalimantan Island, as well as south and north coast of New Guinea. The more accurate dissemination and data of peatland width in Indonesia is uncertain, except Sumatra peat which was relatively widely studied during the opening of Tidal Projects 1969-1984 [3]. Swampland area consists of peatland and mineral soil (non-peat) in Indonesia is estimated 39 million hectares, i.e. approximately one-fifth (19.8 percent) Indonesia's land area. Based on the figure, there are approximately 13.5 to 18.4 million hectares peatland soil or an average of 16.1 million hectare.

Based on natural fertility, peat is divided into three groups, namely eutrophic (high mineral content, neutral or alkaline reaction of peat), oligotrophic (mineral content, particularly calcium [Ca] is low, the reaction sour), and mesotrophic (located in between with the pH about 5, medium alkaline content). Thickness or depth of peat also determines the level of natural fertility and potential suitability for crops. According to Ref. [3], divide the peat in four classes, namely shallow (50-100 centimeter), somewhat deep (100-200 centimeter, deep (200-300 centimeters), and very deep (more than 300 centimeter).

The sustainability of peatland is currently headed for extinction in an alarming rate. Most of the natural ecosystems in Sumatra and Kalimantan have been converted to agricultural land and oil palm plantations [4]. Peat ecosystem is a unique region

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