Effects of soil quality on the carbon storage of seagrass in Pak Klong Beach and Ao Kham, Trang

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Abstract

This research aims to study the effects of soil quality on the carbon storage of seagrass in Pak Klong Beach and Ao Kham, Trang. Two study sites were defined: Pak Klong Beach and Ao Kham Beach. collected soil and seagrass samples in both sites by placing specific random quadrats in areas with 50–75% dense seagrass, divided into 4 groups, with Group 1–3 types randomly separated according to the type of sea grass, including *Enhalus acoroides, Halophila major,* and *Cymodocea rotundata*. As for the fourth group, the area with 3 sea grass species was randomly grouped together. Analyze the soil quality and take seagrasses to compare the carbon storage of each type of seagrass at both sites and analyze the amount of carbon storage. The results of the study found that soil quality affects seagrass carbon storage. If the organic matter content is high, it will also lead to a large amount of carbon storage, and the carbon storage of Ao Kham has a higher amount of carbon storage from seagrass than Pak Klong Beach. The carbon storage of each type of seagrass is different. And the species with the most carbon storage was *Enhalus acoroides,* followed by *Cymodocea rotundata* and *Halophila major,* respectively. As for the seagrass that lives in groups, it can store more carbon than any single seagrass habitat. And the carbon storage of seagrass in the underground part is higher than in the above-ground part.

Keywords: Seagrass, Soil quality, Carbon storage

Research Question and Hypothesis

1. Are the amounts of carbon stored in seagrass around Pak Klong Beach and Ao Kham different?
2. Does soil quality affect the carbon storage of seagrass?
3. Does each type of seagrass collect carbon storage differently?
4. Do the underground part and the above-ground part of seagrass collect carbon storage differently?
5. Do the seagrass that lives in groups and single seagrass habitats collect carbon storage differently?

Introduction and Review of Literature:

Seagrass is a group of flowering plants that have evolved to live in the ocean. The appearance structure is similar to the grass growing on land, consisting of 3 parts: roots, rhizomes,

and leaves. Roots are used to absorb nutrients from the soil. They also help to adhere to the ground and stabilize seagrass. The rhizome is a part of the stem that grows below the surface of the soil. The leaves are a part of photosynthesis that creates food. According to the type of seagrass, it has flat leaves and round tubes. The leaves of seagrass are an important feature of seagrass classification, and these seagrasses have been found in Trang Beach area.

Seagrass is the final stage of trapping sediment. The complex root system of seagrass seals carbon underground. Remove carbon from circulation without decomposition. It does not increase greenhouse gases that contribute to global warming and is also an important source of carbon storage, capable of storing more carbon than ordinary forests. Twice, it will not release carbon into the atmosphere after death.

According to local surveys and environmental data collection, the presence of seagrass in Trang Province has significantly decreased. Therefore, researchers are interested in studying the effects of soil quality on the carbon storage of seagrass in Pak Klong Beach and Ao Kham, Trang. according to the type of sea grass, including *Enhalus acoroides, Halophila major,* and *Cymodocea rotundata*. By comparing the carbon storage of seagrass. This study is to provide guidelines for restoring seagrass as a carbon storage.

Research Methods and Materials

Materials

1. Universal Indicator paper
2. Field inspection guide for soil characteristic
3. Soil NPK Test Kit
4. Hot Air Oven
5. Muffle furnace
6. Digital scale

Methods

1. Study sites

Study the effects of soil quality on the carbon storage of seagrass take samples from 2 study sites were defined: Pak Klong Beach (Latitude 7.6244 , Longitude 99 .2611) and Ao Kham Beach (Latitude 7.5022, Longitude 99.301036). Do the GLOBE Land cover.

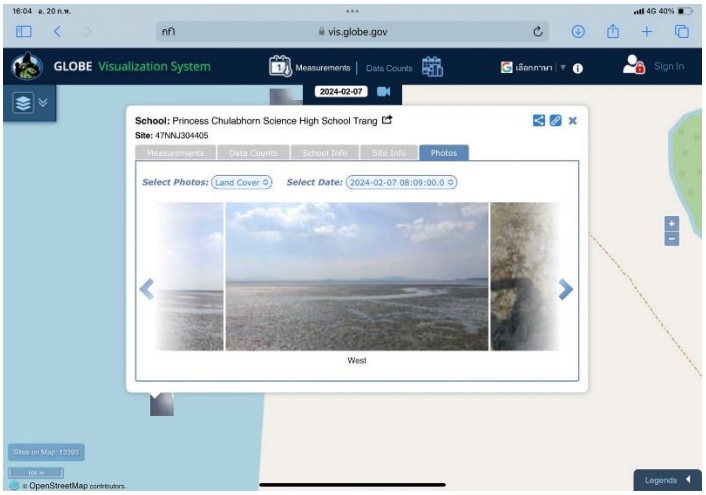


Figure 1: Show the GLOBE Land cover study sites.

2. Data collection

Collected soil and seagrass samples in both sites by placing specific random quadrats in areas with 50–75% dense seagrass, divided into 4 groups, with Group 1–3 types randomly separated according to the type of sea grass, including *Enhalus acoroides, Halophila major*, and *Cymodocea rotundata.* As for the fourth group, the area with 3 sea grass species was randomly grouped together.

Figure 2: Show the study sites.

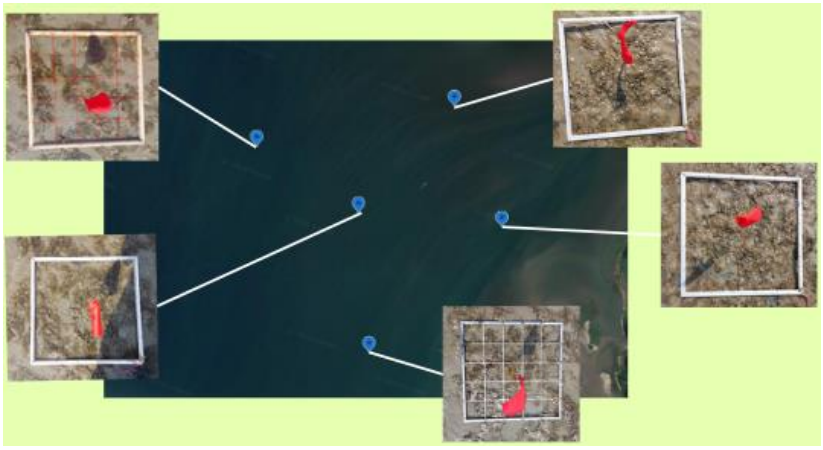


Figure 3: Show placing specific random quadrats in areas with 50–75% dense seagrass map.

3. Collection of soil quality

Measured soil quality according to the GLOBE method by measuring soil characteristic, soil pH, soil NPK and organic matter in the soil as follows:

1. Determine the sampling point. The sampling area was randomly divided into 5 points per group.
2. Collect soil samples. By laying out quadrate size 50X50 cm. and collecting soil samples within the quadrate from the surface of the soil down to a depth of 30 cm. Soil is mixed before randomly collecting 400 grams of soil samples of each sample (total 40 samples). put in separate bags to study soil properties according to different indices in the laboratory including pH, NPK, and organic matter. Soil pH was measured using a Universal Indicator paper. Soil NPK values were measured using a soil NPK test kit and the remaining soil samples were weighed before drying. The soil samples were dried at 95-105 ℃ for 24 hrs. and the moisture content was calculated. Then measure the organic matter. by bringing the soil that has been treated to remove moisture to be dried at a temperature of 450℃ for 4 hrs. The soil was weighed and the organic matter content in the soil was calculated to be %Loss on Ignition(%LOI). The formula (%OC) was selected and analyzed the amount of organic carbon using formular 1.
3. Send data to GLOBE Data Entry.

Formular 1: $\%LOI = \%\text{Organic Matter} = \frac{(\text{Mass before combustion} - \text{Mass after combustion})}{\text{Mass before combustion}} X\ 100$

Calculated Organic carbon(%OC) from analyze organic matter content(%LOI) can be done in two cases as follow:

Formular 2: $\%OC = -0.21 + 0.40(\%LOI)$ If $\%LOI < 0.20$

Formular 3: $\%OC = -0.33 + 0.43\ (\%LOI)$ If $\%LOI > 0.20$

4.Analysis the presence of carbon storage in seagrass

Collect 4 groups of seagrass samples by laying out quadrate. Including *Enhalus acoroides, Halophila major*, and *Cymodocea rotundata.* As for the fourth group, the area with 3 sea grass species was randomly grouped together. Clean and pat dry the samples. Separated and weighed the underground part includes roots and rhizomes, and the above-ground part includes stems and leaves. Then dried the samples at 50 °C for 24 hrs. The dried samples were weighed. The carbon storage in seagrass as calculated using **formular 4.**

Formular 4: Carbon Storage in seagrass (MgC/ha) = $\frac{\%OC \times \text{Dried weigh of seagrass in area (Mg)}}{\text{Area of seagrass (ha)}}$

Results:

1. The quality of soil in the seagrass a in Pak Klong Beach and Ao Kham, Trang

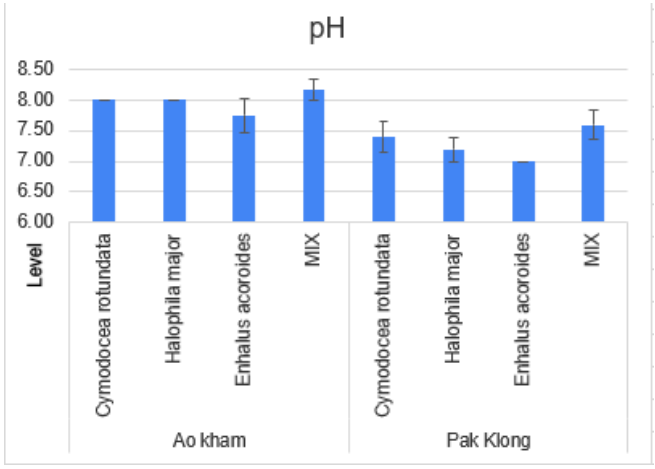


Figure 4 Shows a bar chart that showing pH comparisons.
of each type of sea grass in Pak Klong Beach and Ao Kham, Trang

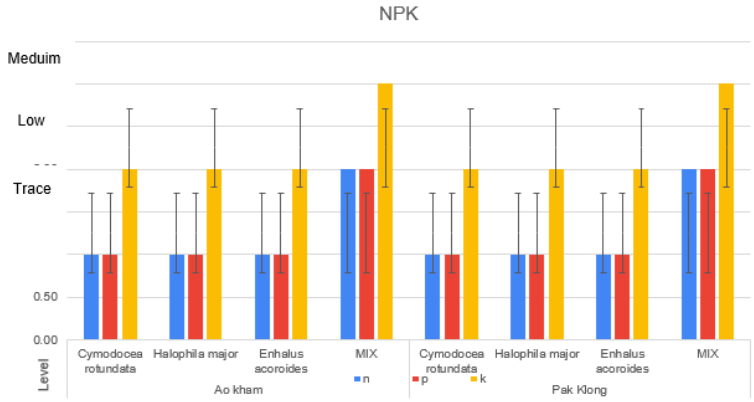


Figure 5 Shows a bar chart that showing N P K comparisons.
of each type of sea grass in Pak Klong Beach and Ao Kham, Trang

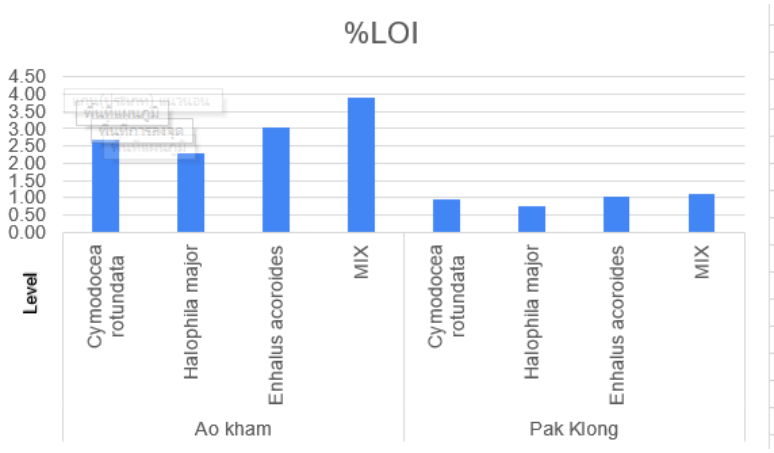


Figure 6 Shows a bar chart that showing %LOI comparisons.

of each type of sea grass in Pak Klong Beach and Ao Kham, Trang

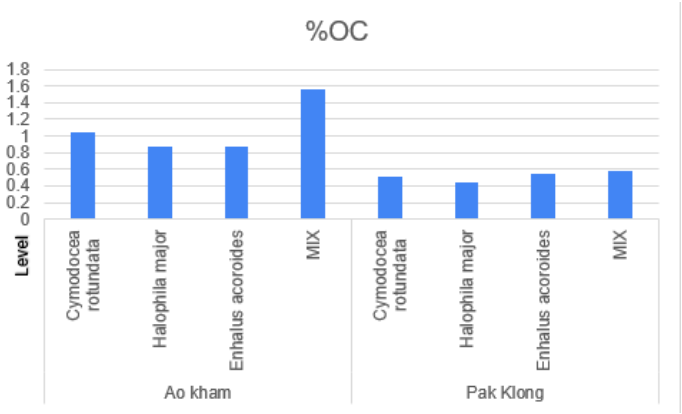


Figure 7 Shows a bar chart that showing %OC comparisons.

of each type of sea grass in Pak Klong Beach and Ao Kham, Trang

2. The amount of carbon storage of each type of seagrass in Pak Klong Beach and Ao Kham, Trang

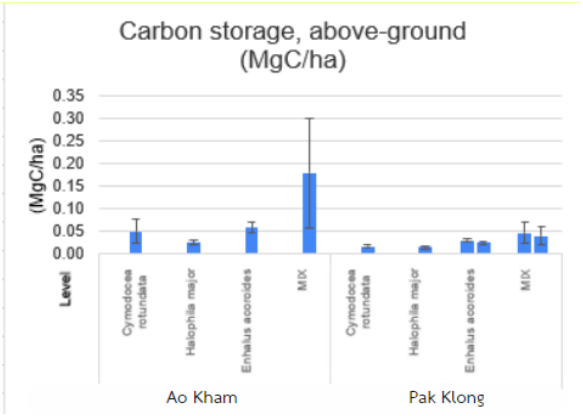
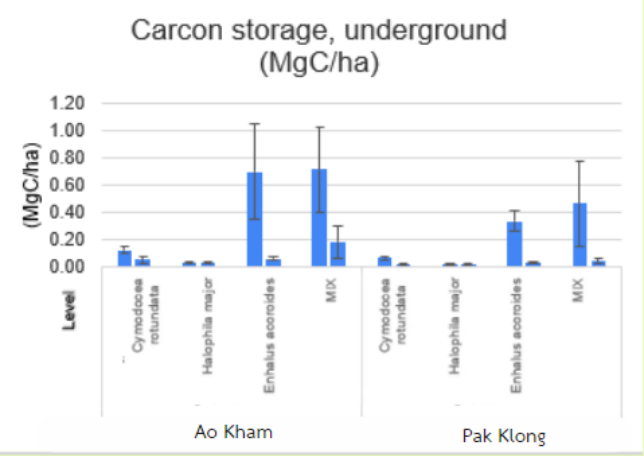


Figure 8 Shows a bar chart that showing the amount of carbon storage that above-ground part collected comparisons in Pak Klong Beach and Ao Kham, Trang



. Figure 9 Shows a bar chart that showing the amount of carbon storage that underground part collected comparisons in Pak Klong Beach and Ao Kham, Trang

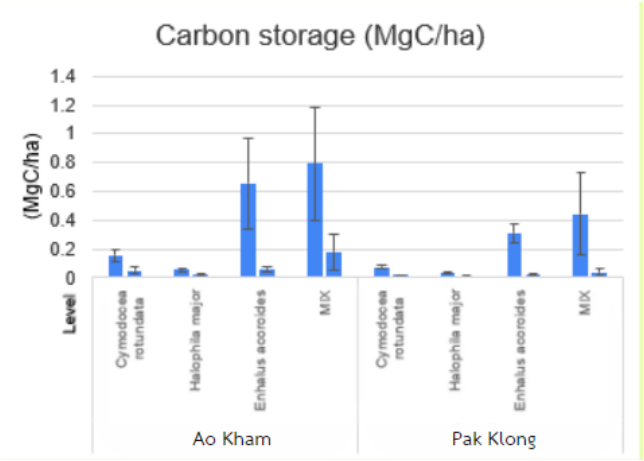


Figure 10 Shows a bar chart that showing the amount of carbon storage that both part collected comparisons in Pak Klong Beach and Ao Kham, Trang

Discussion:

1.The quality of soil in the seagrass a in Pak Klong Beach and Ao Kham, Trang

The pH value of each type of seagrass was not different and the Ao Kham area had a higher pH value than the Pak Klong Beach area. Soil nutrients, N and P values were not different among all seagrass species and were not different in the areas of Ao Kham and Pak Khlong Beach. As for the K, the area with 3 sea grass species was randomly grouped together , Enhalus acoroides, Halophila major, and Cymodocea rotundata were more abundant respectively and not different in both areas because K affects the growth of rhizomes and roots. By the root system of grouped seagrasses, Enhalus acoroides ,Halophila major and Cymodocea rotundata have their respective densities. % LOI in the same area was different by grouped seagrasses, Enhalus acoroides

,Halophila major and Cymodocea rotundata being the most abundant, respectively. and two areas Ao Kham is higher than Pak Klong Beach due to differences in root system density. The grouped seagrass has a multi-layered root system with a high root system density, so it can store organic matter better than other types of seagrass. %OC in the same area was different by grouped seagrasses, Enhalus acoroides ,Halophila major and Cymodocea rotundata being more abundant respectively and when comparing the two areas, Ao Kham area was higher than Pak Klong Beach as well as %LOI.

2. The amount of carbon storage of each type of seagrass in Pak Klong Beach and Ao Kham, Trang

Comparing the amount of carbon accumulated in the above-ground seagrass, was found out that the amount of carbon accumulated in the above-ground seagrass was not different for all types of seagrass and the two areas were not different. Comparing the amount of carbon stored in the underground part of seagrass in each type in Pak Klong Beach and Ao Kham, Trang had the highest amount of carbon stored in each type by seagrass grouped seagrasses, Enhalus acoroides, Halophila major and Cymodocea rotundata respectively. In both areas, the root system of the seagrass clusters has many layers to retain sediment better, and Pak Meng Beach is higher than Pak Klong Beach. The amount of carbon accumulated in the total seagrass of each type of seagrass. The amount of carbon stored in each type of seagrass in seagrass grouped seagrasses, Enhalus acoroides, Halophila major and Cymodocea rotundata respectively was higher in both areas and Ao Kham than in Pak Klong Beach, as was the amount of carbon stored in seagrass. Underground because seagrasses store most of their carbon in their root structures

Conclusion:

The Ao Kham area has higher levels of seagrass carbon storage than the Pak Klong Beach area. Soil quality affects the carbon storage of seagrass. If there is a large amount of organic matter, it results in a large amount of carbon storage. The carbon storage capacity of each type of seagrass is different, with grouped seagrass having the highest amount of carbon storage, followed by sea grass, round-leaf sedge grass. giant kaffir lime leaf grass, respectively, the underground seagrass has a higher carbon storage capacity than the aboveground seagrass Seagrass habitats in clusters It has the ability to store more carbon than any single seagrass habitat.

Acknowledgments:

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Optional Badge Descriptions:

1. **I am a collaborator**

Doing this research requires the cooperation of many groups, including friends. Working together with friends helps to collect the sample and make the information more detailed and clear. Advisor teacher, and scientists from Walailak University, who provided advice on analysing the results and calculating the amount of carbon storage in seagrass. Providing very clear information for this study. and the Bo Hin Farmstay community, which made data collection easier. Provide basic information about the preliminary data collection. Brainstorming and collaboration are two of the many advantages of collaboration. We returned with the study's findings at the conclusion and shared them with the local community to best utilise its potential to protect the environment.

2. I make an impact

Seagrass is the final stage of trapping sediment. The complex root system of seagrass seals carbon underground. Remove carbon from circulation without decomposition. It does not increase greenhouse gases that contribute to global warming and is also an important source of carbon storage, capable of storing twice as much carbon as ordinary forests. Seagrass levels in Trang Province have considerably dropped, based on surveys conducted by our team and environmental data collected. For this reason, the environment and communities have greatly benefited from our study. Mixing seagrass cultivation helps to collect more carbon storage because of the different root systems of each type of seagrass. And maintain soil quality, as it affects the carbon storage of seagrass. This study's knowledge and information are intended to provide guidelines for restoring the decreased seagrass as a carbon storage system.

3. I am a data scientist

In this research, we analyzed the data into graphs to observe data correlation and increase the accuracy of the data. Soil quality data was collected, including the amount of NPK, pH and the amount of organic matter in the soil, comparing the amount of carbon storage of seagrass, the species with the most carbon storage was *Enhalus acoroides,* followed by *Cymodocea rotundata* and *Halophila major,* respectively. As for the seagrass that lives in groups, it can store more carbon than any single seagrass habitat. Data were collected randomly and repeated 3 times. Use the principles of collecting and interpreting results according to science and GLOBE principles.