Quality of Water and Soil Affecting Carbon Sequestration in Napla Subdistrict, Mueang District, Trang Province

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Abstract

The objective of this research is to study the effects of water and soil quality on carbon sequestration in Tenera oil palm in Napla Subdistrict, Mueang District, Trang Province. The study compares areas with and without water sources by collecting data from a 10×10 meter plot in each area. The analyzed soil quality factors include moisture, temperature, pH, and the levels of essential nutrients (N, P, K), along with an assessment of the carbon sequestration capacity in oil palm trees.

The results indicate that areas with water sources have higher soil moisture, pH, and nutrient levels (N, P, K) compared to areas without water sources. The average soil moisture in areas with water sources is 1.83%, while it is 1.32% in areas without water sources. The soil pH in areas with water sources is 6.83, whereas it is 6.60 in areas without. Additionally, the average levels of N, P, and K in the soil of areas with water sources are 7.83 mg/L, 7.50 mg/L, and 29.97 mg/L, respectively, which are higher than those in areas without water sources (4.11 mg/L, 3.72 mg/L, and 11.44 mg/L, respectively). Regarding carbon sequestration, oil palm trees in areas with water sources can sequester an average of 378 KgCOâ‚‚eq, compared to 270 KgCOâ‚‚eq in areas without water sources. These findings indicate that water and soil quality, particularly soil moisture and nutrient levels, are directly related to the carbon sequestration capacity of Tenera oil palm trees.

Research Question

Objectives of the Research

1. To study how water quality affects the carbon sequestration capacity of Tenera oil palm in Napla Subdistrict, Mueang District, Trang Province.
2. To study how soil quality affects the carbon sequestration capacity of Tenera oil palm in Napla Subdistrict, Mueang District, Trang Province.

Research Questions

1. Does the presence of a water source affect the carbon sequestration capacity of Tenera oil palm more than areas without a water source?
2. Does soil quality affect the carbon sequestration capacity of Tenera oil palm more than areas with water sources?

Research Hypotheses

1. Water quality affects the carbon sequestration capacity of Tenera oil palm.
2. Soil quality affects the carbon sequestration capacity of Tenera oil palm.

Introduction

Thailand is one of the countries where oil palm of the Tenera variety is widely cultivated, especially in the southern region, which has suitable climate and terrain conditions. The Tenera oil palm is not only an important economic crop that generates income for the country but also plays a role in carbon sequestration in the soil and wood, helping to reduce the amount of carbon dioxide in the atmosphere, a major cause of global warming. A study comparing the amount of carbon sequestration in Tenera oil palms in areas with and without water sources will help understand the impact of water sources on the plant's carbon sequestration and contribute to developing methods to improve oil palm cultivation for sustainable carbon storage.
This project studies the relationship between water and soil quality and the carbon sequestration capacity of Tenera oil palm trees by comparing the amount of carbon stored in oil palms located in areas with water sources and those in areas without water sources. This aims to understand the role of environmental factors affecting carbon sequestration. Additionally, it proposes guidelines for oil palm cultivation that enhance carbon sequestration efficiency, such as selecting areas with suitable soil and water quality, and improving the soil. These measures will promote sustainable oil palm farming, reduce environmental impacts, and increase the potential for carbon absorption in agricultural ecosystems.

Research Methods

Research Methodology

Submit the data to GLOBE Data Entry

Study carbon storage in two nearby cultivated areas of Tenera palm species using a sample area of 10 × 10
meters in Na Phi Subdistrict, Mueang District, Trang Province.
Some properties of soil in palm orchards are sampled at a depth of 20 centimeters, 12 points in total, 2 areas
with and without water sources to analyze soil particles, N, P, K, acidity and moisture content within the soil.

Zone	Geographical coordinates	
	Latitude (N)	Longitude (E)
Tenera palm, Watery area.	7.601973	99.668772
Tenera palm, Waterless area.	7.6027675	99.6687620

GLOBE Measurement Methods

Soil Measurement Protocols (Pedosphere)
Soil Cover Measurement Protocols (Biosphere)

Materials and equipment and research methodology

1. Flask
2. pH paper
3. Foil Paper
4. Beaker
5. Glass Rod
6. Distilled Water
7. Filter Paper
8. Dropping Pipette
9. Balance Scale
10. Spatula
11. Filter Funnel
12. Moisture Meter
13. Thermometer
14. Clinometer
15. NPK Test Kit

Research Results

Geographical coordinates Study the area of the Tenera palm tree, Na Pha Subdistrict, Mueang District, Trang Province. The coordinates are as shown in Table 1.

Maps of study site

Zone	Geographical coordinates
Tenera palm, Watery area.	
Tenera palm, Waterless area.	

GLOBE Badges

I AM A DATA SCIENTIST

We conducted this project using the principles of scientists studying the relationship between soil quality and carbon capture capabilities of Tenera palm trees using quantitative research processes focusing on field data and statistical analysis. To analyze chemical and physical properties, the data were recorded and processed using statistical methods to compare soil quality differences. The results are presented in tabular and chart form to show the relationship between soil quality and carbon retention potential, which is beneficial to soil resource management and palm forest conservation.To improve carbon capture efficiency and reduce the impact of climate change, and then use the information to further develop

I AM A COLLABORATOR

We've been working effectively on a multi-party collaboration, whether it's a dedicated research team planning, designing experiments, collecting data, analyzing results and summarizing findings systematically, and sharing our responsibilities for accurate and complete information. The project also received support and cooperation from external agencies. Wichianmat School supported the necessary budget, equipment, and technical support. Farmers and communities in the Tenera palm plantation area provided information about the experimental area and allowed full research. These demonstrate that sharing of knowledge and collaboration not only improves research efficiency, but also helps to analyze and solve problems creatively, making our project successful and highly reliable at every stage of the project.

I MAKE AN IMPACT

We conducted a study on water and soil quality that affects the carbonation of Tenera palm trees to assess the water and soil quality that affects the carbonation of Tenera palm trees.The study found that water and soil quality influenced the carbon retention of Tenera palm trees and that the results of the study could be disseminated to palm growers that cultivating palm trees would increase carbon retention, resulting in strong, sustainable and fruitful palm trees.

Result

Measurement of soil quality

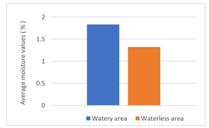
Table The soil structure of the Tenera palm at Na Phi Subdistrict, Mueang District, Trang Province, areas with water sources and areas without water sources.

Area	Measured value		
	Adhesion	Soil color	Soil texture.
Watery area	Tighter	7.5 YR 3/3	Silty clay loam
Waterless area	Tighter	7.5 YR 2.5/3	Silty clay loam

According to Table , soil adhesion characteristics at a depth of 20 cm were found. It is located the area with a water source. It has the same adhesion characteristics: tight, soil color has the same value of 7.5YR 3/3 and soil adhesion characteristics at a depth of 20 cm. It is in an area where there is no water source.It has the same characteristics as tight. The soil color has the same value of 7.5 YR 2.5/3.

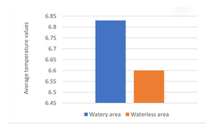
Area	Average moisture values (%)	Average temperature values (° C)	Average pH values	Average N P K values (mg/L)		
				N	P	K
Watery area	1.83	25.58	6.83	7.83	7.50	29.97
Waterless area.	1.32	26.39	6.60	4.11	3.72	11.44

shows the mean soil moisture, the mean soil temperature, the pH of soil, and the average soil temterature. The N P K of soil in each area was found to have the following values:
3.1) The area with water sources has an average soil humidity of 1.83% with an average soil temperature of 25.58%, a pH of 6.83%, an N P K average of 7.83 mg/L, 7.50 mg/L, 29.97 mg/L, respectively.
3.2) Areas without water sources have an average soil humidity of 1.32% with an average soil temperature of 26.39% with a pH of 6.60 with an NPK average of 4.11 mg/L 3.72 mg/L 11.44 mg/L, respectively

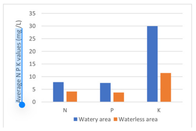


Comparison moisture values of Tenera palm Watery area and Waterless areaShows a comparison from bar chart 1 where the average soil moisture content in each area was found to have the following values: The average humidity in the area where there is a water source is 1.83% and the average humidity in the area where there is no water source is 1.32% and the average humidity in the area where there is a water source is higher than in the areawithout water source.

Comparison temperature values of Tenera palm Watery area and Waterless area From the 2nd bar chart graph showing the comparison of average soil temperature in each area, it was found to have the following values: The average temperature is 25.58 °C in the water supply area, and the average temperature is 26.39 °C in the water supply area. The average temperature is higher than the water supply area.



Comparison pH values of Tenera palm Watery area and Waterless area From the 3rd bar chart showing the pH comparison in each soil area, it was found that the pH in the water supply area was 6.83 and the pH in the water supply area was 6.60. The pH of the water supply area was higher than the water supply area.Average N P K values (mg /L)

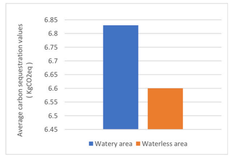


Comparison N P K values of Tenera palm Watery area and Waterless area From the fourth bar chart showing the comparison of NPK in each soil area, it was found that the average NPK was 7.83mg/L, 7.50mg/L, 29.97mg/L, and the average NPK was 4.11mg/L, 3.72mg/L, 11.44mg/L, respectively.

Table 4 compares the carbon footprint of areas with water sources and areas without water sources.

Area	Average carbon sequestration values ($kgCO_2eq$)	Average "Bio-molecular mass above all ground. WT" (kg)	Average Biomass underground (Ratio)	Average Total Biomass (kg)	Average carbon content (kgC)
Watery area	378	88.62	36.33	124.94	51.61
Waterless area	270	74.04	30.36	104.40	43.12

shows the average carbon retention for each area. It was found to have the following values:The average carbon footprint of the water area was 378 KgCO2eq and the average carbon footprint was 270 KgCO2eq, the total surface area was 88.62 kg, and the total surface area was 74.04 kg. The averageunderground surface area was 36. 33 Ratio and non-aqueous area average underground biological mass at 30.36 Ratio average total biological mass at 124.94 kg and non-aqueous area average 104.40 kg, carbon content at 51.61 kgC and carbon content at 43.12 kgC.



Comparison carbon sequestration values of Tenera palm Watery area andWaterless area
From the 5th bar chart graph showing the comparison, the carbon storage volume in each soil area was found to have the following values: In areas near water sources, the average carbon retention was 378 KgCO2eq, and in areas without water sources, the average carbon retention was 270 KgCO2eq. It was found that areas with water sources had higher carbon retention than areas without water sources.

Discussion

Based on the study of carbon retention in Tenera palm trees, the comparison between areas near or far from water sources has improved carbon retention efficiency, which is for both purposes:

1) To study the quality of water has an effect on carbon storage of Tenera palm, Na Phi Subdistrict, Mueang District, Trang Province. The survey was conducted on the basis that Tenera palm in the vicinity of water is more carbon storage than in the vicinity of water.

2.) to study the quality of soil affecting the carbon retention of Tenera palm, Na Phi Subdistrict, Mueang District, Trang Province. The survey was conducted on the basis that soil in the area has higher mineral value than soil in the area.

It was found to have the following values: The water area has an average carbon retention rate of 378 KgCO2eq and the non-aqueous area has an average carbon retention rate of 270 KgCO2eq, the water area has a total biological mass of 88.62 kg, and the non-aqueous area has an average biological mass of 74. 04 kg The water area has an average subterranean biological mass of 36.33 ratio and the non-aqueous area has an average subterranean biological mass of 30.36 ratio, the average total biological mass of 124.94 kg and the non-aqueous area 104.40 kg, the average carbon content of 51.61 kgC, and the average carbon content of 43. 12 kgC

Conclusion

The results are as follows:

- In areas with water, the average carbon sequestration value was 378 KgCO2eq, while in areas without water, it was 270 KgCO2eq.
- In areas with water, the total average above-ground biomass was 88.62 kg, while in areas without water, it was 74.04 kg.
- In areas with water, the average underground biomass was 36.33 Ratio, while in areas without water, it was 30.36 Ratio.
- In areas with water, the total average biomass was 124.94 kg, while in areas without water, it was 104.40 kg.
- In areas with water, the average carbon content was 51.61 kgC, while in areas without water, it was 43.12 kgC.

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