

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



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Abstract

The study examines the effects of water and soil quality on carbon storage in Tenera oil palm in Na Phi Subdistrict, Mueang District, Trang Province. Data were collected from 10×10 meter plots in areas with and without water sources, analyzing soil moisture, pH, nutrient levels (N, P, K), and carbon storage in oil palm trees.

Results show that areas with water sources had higher soil moisture (1.83% vs. 1.32%), pH (6.83 vs. 6.60), and nutrient levels (N: 7.83 mg/L, P: 7.50 mg/L, K: 29.97 mg/L vs. N: 4.11 mg/L, P: 3.72 mg/L, K: 11.44 mg/L). Oil palm trees in areas with water stored more carbon (756 KgCO₂eq vs. 632 KgCO₂eq). This indicates that soil moisture and nutrient levels are directly related to the carbon storage capacity of Tenera oil palms.

Research Question

The objectives of the research

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

Research questions

- Does the area with water sources affect the carbon retention of the Tenera palm better than the area without water sources?
- Does the quality of soil affect the carbon footprint of the Tenera palm?

Research hypotheses

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

Introduction

Thailand is one of the countries where the Tenera variety of oil palm 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 water sources and those without water sources will help understand the impact of water sources on plant 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, the study proposes guidelines for oil palm cultivation that enhance carbon sequestration efficiency, such as selecting areas with suitable soil and water quality and improving soil quality. These measures will promote sustainable oil palm farming, reduce environmental impacts, and increase the potential for carbon absorption in agricultural ecosystems.

The findings of this survey are consistent with the research findings of Somsak Sukhwang and colleagues (March 2016), which measured the carbon sequestration of trees in landscape Node aka.

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

- Flask
- pH paper
- Foil Paper
- Beaker
- Glass Rod
- Distilled Water
- Filter Paper
- Dropping Pipette
- Balance Scale
- Spatula
- Filter Funnel
- Moisture Meter
- Thermometer
- Clinometer
- 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 in 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 temperature. 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

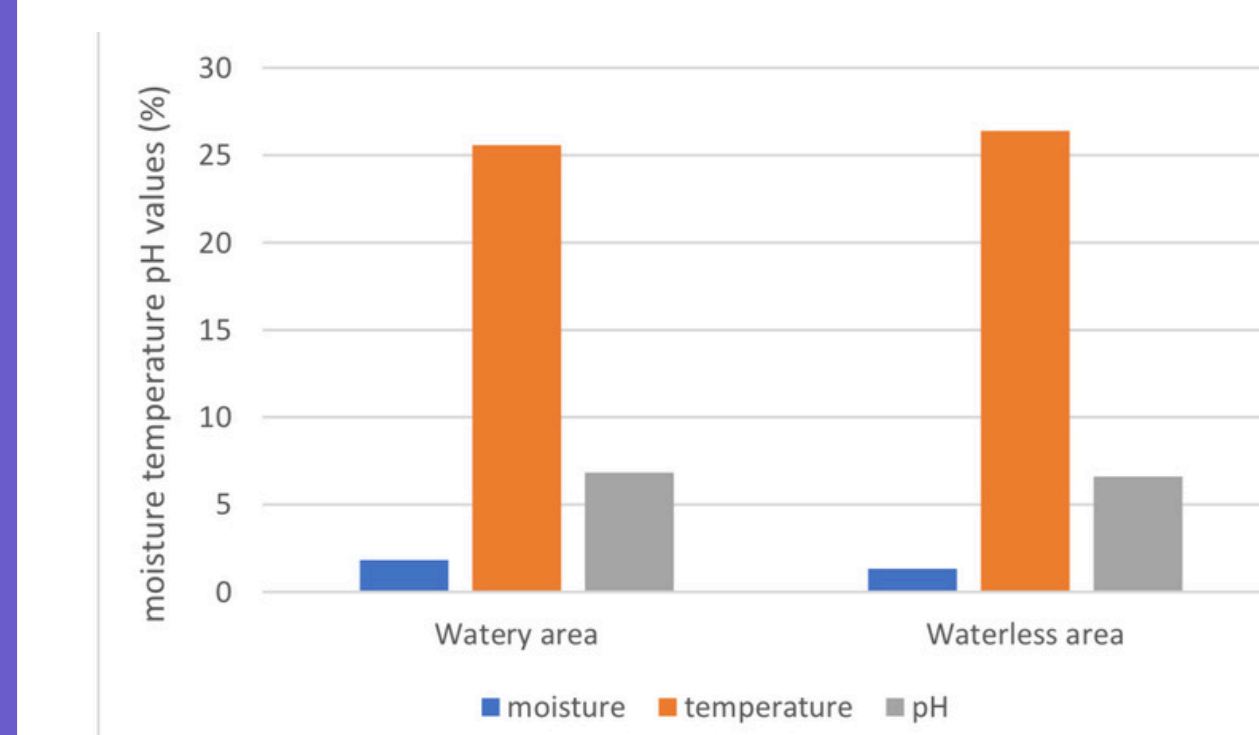


Chart 1 Comparison moisture values of Tenera palm Watery area and Waterless area shows a comparison from bar chart 1 where the average soil moisture content in each area was found to have the following values:

- The area with water has an average humidity of 1.83% with an average temperature of 25.58 and a pH of 6.83.
- The area without water has an average humidity of 1.32%, a temperature average of 26.39 and a pH average of 6.60

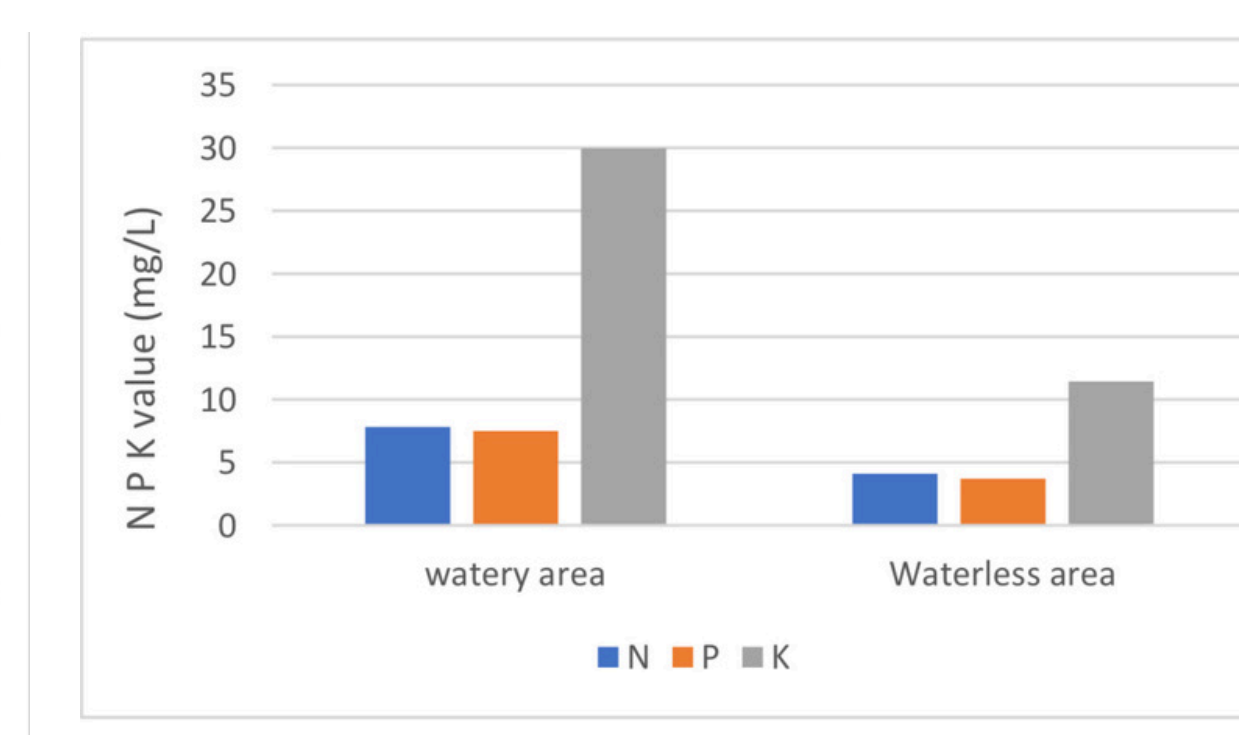


Chart 2 Comparison temperature values of Tenera palm Watery area and Waterless area From the 2nd bar chart graph showing the comparison of NPK values in soil in each area, it was found to have the following values: The average NPK was 7.83 mg/L 7.50 mg/L 29.97 mg/L, respectively, and the average NPK was 4.11 mg/L 3.72 mg/L 11.44 mg/L, respectively.

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

Area	Carbon sequestration per rai (KgCO ₂ eq / Rai)	Total biomass per rai (Kg / Rai)	The carbon dioxide absorption capacity of perennial trees (KgC / Rai)
Watery area	756	124.94	51.61
Waterless area.	623	104.40	43.12

Table 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 756 KgCO₂eq and the average carbon footprint was 623 KgCO₂eq, the average total carbon footprint was 124.94 kg, and the average total carbon footprint was 104.40 kg. The average carbon footprint was 51.61 kgC and non-aqueous area, the average carbon content is 43.12 kgC

Discussion and conclusion

Summary and discussion of experimental results

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 effect of water quality on carbon storage of Tenera palm, Na Phi Subdistrict, Mueang District, Trang Province. The results showed that the average carbon storage area was 756 KgCO₂eq and the average carbon storage area was 632 KgCO₂eq. This is consistent with the objective because the area where

the water source is located affects the amount of carbon storage, resulting in higher carbon retention than the area without water source.

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.

The analysis results were as follows: The area with water sources averaged 756 KgCO₂eq and the area without water, the average carbon storage at 632 biosphere above total ground was 74.04 kg, the area with total biological mass was 124.94 kg, and the area without total biological mass was 104.40 kg. The average carbon content of water is 51.61 kgC and the average carbon content of non-aqueous area is 43.12 kgC.

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