Research Report

Study of mineral elements in soil on the carbon sequestration capacity of Dipterocarpus alatus Roxb.

Research Team

Miss Warintorn Ritdee

Miss Natnicha Siripan

Miss Thanatchaporn Crutmas

Advisor

Teacher Kwanjai Kanchanasri.

Teacher Atchariya Samhui.

Wicienmatu School,Mueang,Trang Province,Thailand

Abstract

Research Title : "Study of Soil Trace Elements on Carbon Sequestration Capacity of Dipterocarpus alatus Roxb"

Abstract : This research investigates the mineral content in soil concerning the carbon sequestration capacity of Dipterocarpus alatus Roxb.

Research Team : Miss Warintorn Ritdee Miss Natnicha Siripan Miss Thanatchaporn Crutmas

Advisor : Teacher Kwanjai Kanchanasri Teacher Atchariya Samhui.

School : Wichienmatu, Trang Province

This study aims to develop a suitable method for calculating and processing carbon sequestration in Dipterocarpus alatus Roxb using appropriate algebraic equations. The study data includes (1) the collection of algebraic equations, (2) the coefficients of small and large Dipterocarpus alatus Roxb, and (3) NPK values in the soil. The objective is to select a suitable equation for developing a simple tool to calculate carbon sequestration in Dipterocarpus alatus Roxb using only height and diameter data. The input data has undergone feedback and suggestions from experts and has been tested by calculating the carbon sequestration of 10 Dipterocarpus alatus Roxb, revealing a total sequestration of 173,855.14 kilograms. Additionally, (2) the measurements of variables related to the carbon sequestration process in Dipterocarpus alatus Roxb showed that the net rate of carbon sequestration in small trees is lower than in large trees. This is attributed, in part, to the smaller size and differences in height and circumference, resulting in a lower rate of carbon sequestration in small trees.

Keywords: Carbon Dioxide, a ubiquitous gas in the atmosphere, plays a crucial role in sustaining the life of humans, animals, and plants. It is a fundamental substance that plants utilize in the photosynthesis process to produce nutrients.

Introduction

Origin and Significance

Regarding the 9th reign, which emphasized the conservation of various tree species, including Dipterocarpus alatus Roxb, there is a desire to explore the carbon sequestration quality of Dipterocarpus alatus Roxb. This study aims to investigate whether rubber trees contribute significantly or minimally to carbon sequestration, considering the current global warming scenario with rising temperatures. The focus is on understanding the carbon quantity in rubber trees concerning their size and age to assess their impact on carbon sequestration.

Research Objectives:

1. Assess the carbon sequestration capacity in small (5 trees) and large (5 trees) Dipterocarpus alatus Roxb with varying ages.

2. Examine the soil quality and its impact on the carbon quantity in Dipterocarpus alatus Roxb.

Research Questions:

1. How does the carbon sequestration differ among rubber trees of varying ages?

2. What is the impact of soil quality differences on the carbon sequestration quantity in Dipterocarpus alatus Roxb?

Research Hypotheses:

1. Different sizes of Dipterocarpus alatus Roxb result in varying carbon sequestration quantities.

2. Soil quality has an impact on the carbon sequestration quantity in Dipterocarpus alatus Roxb.

Materials, Equipment, and Research Procedures:

1. Calorimeter
2. Measuring tape
3. Vernier caliper
4. Notebook
5. Soil mineral element testing kit
6. Rope

Study Site Identification:

Ban Pa Yang, Na Yong District, Trang Province.

Research Procedure:

1) Research Preparation Stage

1.1) Define the study focus and the topic to be investigated.

1.2) Conduct a literature review to gather relevant knowledge and theories related to the research.

1.3) Specify the objectives of the study.

1.4) Identify the sampling locations within the study area. The starting point of the study is at latitude 7.557457, longitude 99.707122, and the endpoint is at latitude 7.557592, longitude 99.708453.2)

2) Implementation Stage

1) Define the area, size, and diversity of Dipterocarpus alatus Roxb.

2) Study the phenotypic characteristics.

3) Set up experimental plots using ropes around Dipterocarpus alatus Roxb.

4) Measure the height and circumference of Dipterocarpus alatus Roxb, including the coverage of the crown (bottom part in the Dipterocarpus alatus Roxb. plantation area).

5) Study ground cover vegetation.

6) Investigate the biomass.

7) Calculate carbon sequestration.

Research Results

4.1) Development of a Method for Calculating Carbon Sequestration Quantity in Dipterocarpus alatus Roxb The experimental study on soil quality's impact on carbon sequestration in Dipterocarpus alatus Roxb yielded valuable results. The calculation method for tree height was determined as follows: Tree height = Distance from the tree represented (T) + Height of the measuring person.

Dipterocarpus alatus Roxb is a big tree			
The beginning that	Circle line(CM)	height(M)	Carbon dioxide emissions
1	290	236.794	24533.47 Kilograms of carbon
2	354	224.263	34128.00 Kilograms of carbon
3	236	249.721	17399.00 Kilograms of carbon
4	400	255.39	48868.29 Kilograms of carbon
5	360	251.12	39283.62 Kilograms of carbon

Dipterocarpus alatus Roxb is a small tree			
The beginning that	Circle line(CM)	height(M)	Carbon dioxide emissions
1	107	180.45	2824.23 Kilograms of carbon
2	60	181.275	948.34 Kilograms of carbon
3	80	181.275	1634.13 Kilograms of carbon
4	80	192.453	1729.40 Kilograms of carbon
5	100	182.2	2506.66 Kilograms of carbon

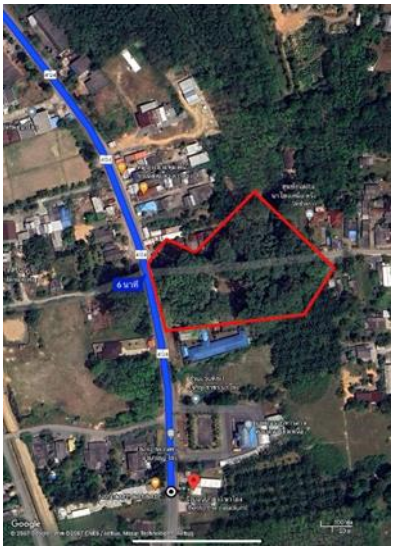
Source https://eng.forest.ku.ac.th/project/carbon

The main minerals in the soil.

The main minerals in the soil Dipterocarpus alatus Roxb is a big tree			
The beginning that	N	P	K
1	46	29	23
2	52	21	17
3	35	14	9
4	35	10	10
5	35	10	22

The main minerals in the soil Dipterocarpus alatus Roxb is a small tree			
The beginning that	N	P	K
1	45	43	33
2	56	25	16
3	75	32	19
4	20	9	8
5	42	27	26

The geographical coordinates for the study area in Dipterocarpus alatus Roxb. plantations, Na Yong district, Trang province, are being investigated.



A satellite photo of rubber plantations in Nayong District, Trang Province.

A table displaying geographic coordinates.

Natural study routes.	**Geographical coordinates.**	
	Latitude (N)	Longitude (E)
Starting point.	7.557457	99.707122
End point.	7.557592	99.708453

Summary and Discussion of Experimental Results

From the experimental study on the impact of soil quality on carbon sequestration in rubber trees, the following conclusions were drawn:

1.) The ability to sequester carbon in Dipterocarpus alatus Roxb of different ages, specifically small (5 trees) and large (5 trees), was examined. The calculations, involving the distance represented by (T) plus the height of the measuring person, indicated that large Dipterocarpus alatus Roxb sequestered more carbon dioxide compared to small ones.

2.) Soil quality significantly influenced the quantity of carbon sequestration in Dipterocarpus alatus Roxb, mitigating the impact of atmospheric changes. Large soil particles contribute to effective carbon storage, enhancing soil stability and water retention. This, in turn, positively affects soil fertility

Acknowledgment

The completion of this research project was made possible through the generous support of the Research and Training Center's director and the director of the Climate Change Group. They recognized the importance of developing methods to assess carbon sequestration and exchange processes in Dipterocarpus alatus Roxb, aligning with the set objectives.

The researchers would like to express gratitude to Teacher Kwanjai Kanjansrimet and Teacher Atchariya Samhui, who provided valuable guidance and information as environmental research advisors. Special thanks go to friends who assisted in the environmental research.

Finally, sincere appreciation is extended to the entire research team for their collaborative efforts, leading to the success of this research project. The researchers are profoundly grateful for the contributions made by each team member.

References

Soil pH and NPK testing: https://www.ponpe.com/tech/767-soil-ph-npk.html

Assessment of carbon sequestration in trees: https://eng.forest.ku.ac.th/project/carbon