Research report

Study of Soil Quality in Areas with Vegetative Cover and Bare Soil

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Research title : Study of Soil Quality in Areas with Vegetative Cover and Bare Soil

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Related variables: Physical characteristics of soil, soil's texture soil color, soil temperature, soil moisture, soil pH, and soil nutrient content in areas with vegetative cover and bare soil. There are differences among these variables

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Abstract

The study on soil quality in areas with and without vegetative cover aimed to compare soil characteristics in two locations: the Botanical Garden of Wichienmatu School and The investigation focused on soil physical properties, temperature, moisture, pH, and soil nutrient content as indicators of soil quality. The study revealed differences in soil characteristics between areas with and without vegetative cover. In vegetated areas, the soil was loamy with an average temperature of 28.3 degrees Celsius, moisture content of 2.3, and a pH level of 6. Soil nutrient levels (N, P, K) were low. In non-vegetated areas, the soil was sandy loam with an average temperature of 27.5 degrees Celsius, moisture content of 5.5, and a pH level of 6. Soil nutrient levels (N, P, K) were higher than in vegetated areas. The study also observed higher temperature and lower relative humidity in the air at the Botanical Garden, contributing to higher soil moisture compared to the Forest Conservation Unit in Trang Province.

Keywords : Soil quality, vegetative cover

Introduction

Differences exist in the Forest Conservation Unit in Trang Province (Yantakhao-Palian) , where there are numerous large trees near water sources, and the soil has a hilly profile with trees covering the surroundings. In contrast, the Botanical Garden of Wichienmatu School has flat terrain, not close to water sources, and the soil is flat with grass covering the surface.

Therefore, the researchers are interested in studying the physical characteristics of soil, soil texture, soil color, soil temperature, soil pH, and soil nutrient content in areas with and without vegetative cover in the Botanical Garden of Wichianmatu School and the Forest Conservation Unit in Trang Province, Yantakhao-Palian zone.

Research Objectives

1. To study the soil quality in areas with vegetative cover and without vegetative cover.

2. To compare the soil quality in areas without vegetative cover and areas with no vegetative cover.

Research Questions

Do the physical characteristics of soil's , soil's texture, soil's color, soil's temperature, soil's pH, and soil' s nutrient content differ in areas with and without vegetative cover?

Research Hypothesis

Do the physical characteristics of soil's , soil's texture, soil's color, soil's temperature, soil's moisture, soil's pH, and soil's nutrient content differ in areas with and without vegetative cover

Related Variables

Dependent Variables Independent Variables : Vegetative Cover

Independent Variables: Soil's Quality

Control Variables : Instruments used for soil quality measurements

Method

Soil quality refers to the study of the structural characteristics of soil, soil texture, soil color, and soil temperature and moisture.

Acidity-alkalinity and soil nutrient elements

Vegetative cover refers to plants that cover the soil in the study area, typically including grass species.

Materials and equipment for the research methodology

1. Materials and Equipment

1. Soil sample preparation equipment	6.Water syringe
2.Thermometer	7.Field soil texture checking manual
3.Soil NPK measurement device	8.Soil color comparison book
4.Indicator paper	9.CU Smart lans
5.Soil samples	10.Digital hygrometer

Primary Measurements Method of GLOBE

1.Primary Method of Soil Measurement (Soil)

2.Primary Method of Atmospheric Measurement (Atmosphere)

1. Study Area

The area includes the Botanical Garden of Wichienmatu School and the Forest Conservation Unit in Trang Province (Yantakhao-Palian zone).

2.Research Methodology

1.Determination of sampling points in the Botanical Garden of Wichianmatu School and the Forest Conservation Unit in Trang Province (Yantakhao-Palian) includes areas with vegetative cover and areas without vegetative cover. Soil samples are collected from each area at one point.

Soil Sampling

1.Soil Structure Measurement Method

Studying the physical characteristics of soil involves examining the soil structure using the CU Smart lens to measure size, shape, and record soil structure data. Data collection is performed three times at each study point.

2.Method for measuring soil color

2.1 Pick soil particles from each layer of the soil sample, observe, and record in the data sheet whether the soil particles are moist, dry, or wet. If dry, slightly moisten them with water from the prepared bottle.

2.2 Divide the soil particles into two parts.

2.3 Stand to allow sunlight to shine over your shoulder onto the soil color comparison book and the soil sample being measured for soil's color.

2.4 Record the soil's color values in the data sheet. Data collection frequency is once at each study point.

3.Soil's Texture Measurement

Use a chart of soil's structure sample images to examine soil's texture.

4.Method for measuring pH values

4.1 Weigh 20 grams of dried and sieved soil sample and place it in a beaker.

4.2 Add distilled water, either 20 or 100 milliliters, to achieve a soil-to-water ratio of 1:1.

4.3 Stir the soil-water mixture with a stirring rod for 30 seconds, then let it stand for 3 minutes. Repeat this process 5 times.

4.4 After stirring the soil 5 times, let it stand until the soil in the beaker settles. Clear water will be visible at the top.

4.5 Immerse the pH meter, adjusted to standard values, into the clear water area without letting it touch the soil at the bottom. Wait until the reading stabilizes, then record the pH value.

5.Method for measuring soil fertility

5.1 Weigh 20 grams of dried and sieved soil sample and place it in a beaker.

5.2 Add distilled water, either 20 or 100 milliliters, to achieve a soil-to-water ratio of 1:1.

5.3 Use a soil auger to mix for 30 seconds, then let it stand for 3 minutes. Repeat this process 5 times.

5.4 After mixing the soil 5 times, let it stand until the soil in the beaker settles. Clear water will be visible at the top.

5.5 Immerse the nitrogen meter, adjusted to standard values, into the clear water area without letting it touch the soil at the bottom. Wait until the reading stabilizes, then record the nitrogen value.

5.6 Immerse the phosphorus meter, adjusted to standard values, into the clear water area without letting it touch the soil at the bottom. Wait until the reading stabilizes, then record the phosphorus value.

5.7 Immerse the potassium meter, adjusted to standard values, into the clear water area without letting it touch the soil at the bottom. Wait until the reading stabilizes, then record the potassium value.

6.Method for measuring soil's temperature

Measure the temperature of the soil at each point by using a soil temperature meter at a depth of 5 centimeters, then read the soil temperature.

7.Method for measuring soil's moisture

Measure the soil moisture at each point using a soil moisture meter at a depth of 5 centimeters, then read the soil moisture value.

8. Method of measuring atmospheric conditions.

8.1 Measure the air temperature using a digital hygrometer.

8.1.1 Read the temperature directly from the digital hygrometer .

8.2 Measure the relative humidity in the air using a digital hygrometer as follows:

8.2.1 Read the relative humidity value directly from the digital hygrometer

Results

Geographical coordinates.

Table 1 Geographical coordinates.

Study locations

Conducting a study to compare soil quality in areas with vegetation cover in the botanical garden and areas without vegetation cover in the forest conservation unit at Tng.3

Study locations	Geographic coordinates	
	Latitude (N)	Longitude (E)
Botanical garden, Wichienmatu School	7.50520	99.62891
Forest Conservation Unit at Tambon Thung Khai, Amphoe YanTaKhao, Trang Province	7.48182	99.63712

2.Comparing soil characteristics and soil types using a soil sample image.

Table 2 Show the physical characteristics of the soil in the Botanical Garden and the Forest Conservation Unit in Tng.3

Study locations	Soil's structure	Soil's color	Soil's aggregation	Soil's texture	Soil's image
Botanical garden, Wichienmatu School	Spherical	Dark brown	Loamy	Loamy sand	
Forest Conservation Unit, Tng.3	Spherical	Black	Loamy	Loam	

In Table 2, it is found that in the Botanical Garden of WichaiMatu School, there is soil coverage by plants. The soil structure has characteristics of rounded clumps with a dark brown color, and the soil texture is loamy with some sand content. On the other hand, in the forest conservation unit at Tng.3, there is no soil coverage by plants. The soil's structure shows characteristics of rounded clumps with a black color, and the soil's texture is loamy.

3.The study includes temperature, N P K values, acidity-alkalinity, and soil moisture in the Botanical Garden.

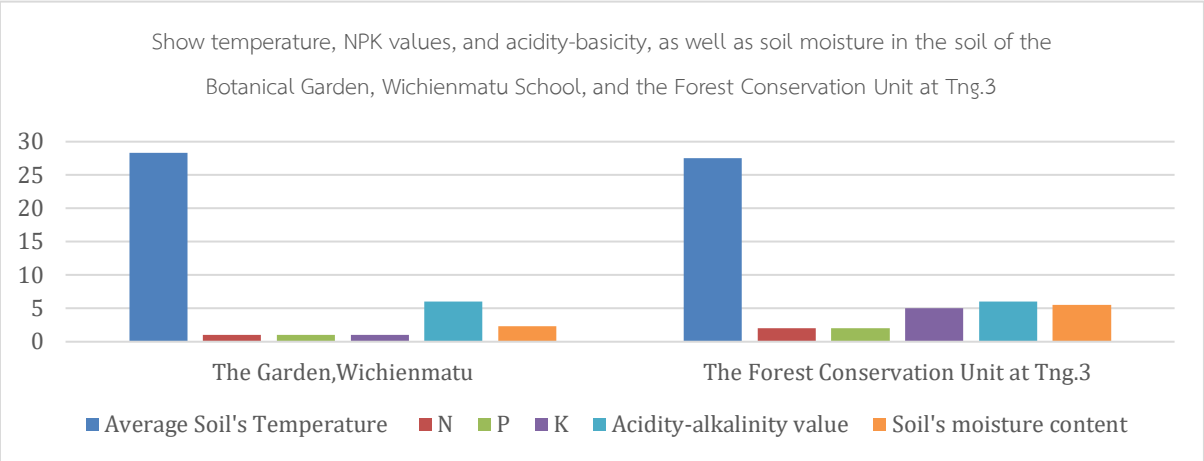
Wichienmatu School and Forest Protection Unit at Tng.3

Table 3 Show temperature, NPK values, and acidity-basicity, as well as soil moisture in the soil of the Botanical Garden, Wichienmatu School, and the Forest Conservation Unit at Tng.3

Study locations	Average Soil Temperature (°C)	Nutrients			Acidity-alkalinity value	Soil moisture content
		N	P	K		
Botanical Garden, Wichienmatu School	28.3	1	1	1	6	2.3
Forest Conservation Unit, Tng.3	27.5	2	2	5	6	5.5

Note : High = 5, Medium = 2, Low = 1

From Table 3, it is found that in the botanical garden area of Wichienmatu School, where there is ground cover vegetation, the average temperature is 28.3 degrees Celsius. The N P K values are 1, with an acidity-alkalinity value of 6, and soil moisture content of 2.3. In contrast, in the forest conservation unit at Tng.3 , where there is no ground covervegetation, the average temperature is 27.5 degrees Celsius. The N value is 2, P value is 2, K value is 5, with an acidity-alkalinity value of 6, and soil moisture content of 5.5.



4.Study of temperature and humidity relationship in the atmosphere.

Table 4 Shows of temperature and humidity relationship in the atmosphere at the botanical garden of Wichianmatu School

Botanical garden of Wichianmatu School	Round 1	Round 2	Round 3	average
Temperature (℃)	36.5	36.5	36.8	36.6
Relative humidity (%)	42	40	40	40.67

From Table 4, it is found that the botanical garden of Wichieanmatu School has an average temperature of 36.6 degrees Celsius and an average humidity of 40.67%

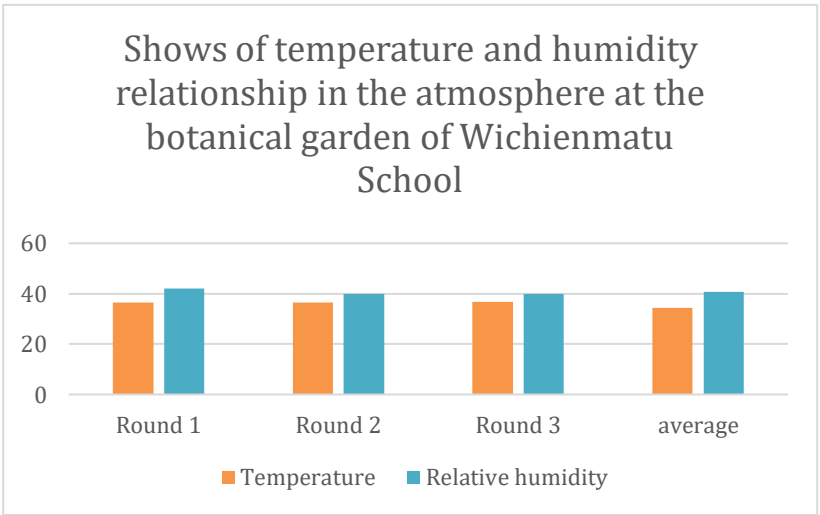
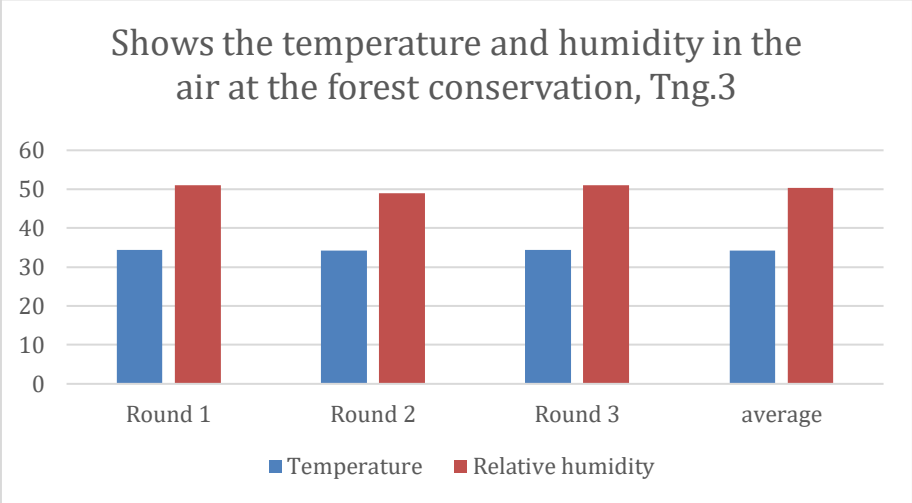


Table 5 Shows the temperature and humidity in the air at the forest conservation unit, Tng.3

Unit for Forest Conservation Unit, Tng.3	Round 1	Round 2	Round 3	average
Temperature	34.4	34.3	34.4	34.3
Relative humidity	51%	49%	51%	50.3%

From Table 5, it is found that the Forest Conservation Unit, Tng.3 , has an average temperature of 34.3 degrees Celsius and an average humidity of 50.3%.



Discussion and Experimental Results Summary

Discussion of Results

From the study of the physical characteristics of the soil, moisture, temperature, acidity-alkalinity, and nutrient elements in the soil, it was found that in the botanical garden of Wichienmatu School with vegetation cover and the Forest Conservation Unit, Tng.3 , without vegetation cover, the soil quality was examined. In the botanical garden of Wichienmatu School with vegetation cover, the soil structure had round clods with dark brown soil color, and the soil texture was sandy loam with a temperature of 28.3 degrees Celsius, N P K values equal to 1, acidity-alkalinity value equal to 6, and soil moisture content equal to 2.3. Meanwhile, in the study of soil quality in the Forest Conservation Unit, Tng.3 , without vegetation cover, the soil structure had round clods with black soil color, and the soil texture was loamy with a temperature of 27.5 degrees Celsius, nitrogen equal to 2, phosphorus equal to 2, potassium equal to 5, acidity-alkalinity value equal to 6, and soil moisture content equal to 5.5.

From the study of temperature and humidity in the air, it was found that the botanical garden of Wichienmatu School has an average temperature of 36.6 degrees Celsius and an average humidity of 40.67%. Meanwhile, the Forest Conservation Unit, Tung 3, has an average temperature of 34.3 degrees Celsius and an average humidity of 50.3%.

Conclusion

From the study of soil quality in areas with vegetation cover, such as the botanical garden of Wichienmatu School, and areas without vegetation cover, such as the Forest Conservation Unit, Tng.3, differences were observed. The soil structure in areas with vegetation cover appeared as round clods with dark brown color and sandy loam texture, with lower nutrient

content compared to the Forest Conservation Unit, Tng.3, This is because areas with vegetation cover primarily consist of grass species, which have fibrous root systems leading to higher nutrient uptake for growth, resulting in lower soil nutrient levels compared to areas without vegetation cover. Additionally, the comparison of soil quality in areas with vegetation cover revealed flat terrain, further from water sources, fewer dense large trees, higher temperatures, and higher humidity. Soil moisture content was lower compared to the Forest Conservation Unit, Tng.3

Declaration of Conformity

The project on "Studying Soil Quality in Areas with and without Vegetation Cover" involves several stages, starting from research and data collection, proceeding with implementation, analysis of results, and compiling the project into a volume until its successful completion. Throughout this period, the project team has received assistance, guidance, and encouragement from various individuals. The team is deeply grateful for the support and kindness extended by everyone involved. Therefore, we would like to express our sincere thanks to each and every one of you.

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The project team

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