



Comparison of Soil Quality Between the Botanical Garden Area and the Waste Burning Site  
Within Wichienmatu School

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### **Abstract**

This research focuses on measuring and comparing soil properties between the botanical garden area and the waste burning site within Wichienmatu School. The objective is to study and analyze the soil quality in both areas by examining factors such as soil structure, moisture content, pH levels, fertility, temperature, and texture.

The results indicate that the soil in the botanical garden is primarily clay, while the soil in the waste burning area is a clay-loam mixture. The soil temperature in the botanical garden is lower than that of the waste burning site.

Regarding pH levels, the soil from the botanical garden is generally neutral, whereas the soil from the waste burning site tends to be more alkaline. In terms of moisture content, the soil in the botanical garden retains less moisture compared to the soil in the waste burning area.

Soil fertility tests revealed that nitrogen levels in the botanical garden soil are significantly lower than those in the waste burning area. Similarly, phosphorus and potassium levels are also lower in the botanical garden soil compared to the waste burning site.

**Keywords:** Soil properties, Waste burning soil, Botanical garden soil, Wichienmatu School

### **Introduction**

#### **Background and Significance**

Soil is a natural material formed from the weathering of rocks and minerals, along with the decomposition of plant and animal remains. It is influenced by environmental factors such as climate, landscape, and the time taken for its development. These processes result in different types of soil, which cover the Earth's surface as a thin layer, serving as a foundation for plant growth and a habitat for various organisms.

Soil quality varies across different areas, depending on its composition and mineral content. Soil is a crucial natural resource that supports life, particularly in agriculture, plant growth, and maintaining ecological balance. High-quality soil promotes fertility and sustains ecosystems. However, certain human activities, such as waste burning, can negatively impact soil properties by introducing pollutants, toxins, and heavy metals. These contaminants alter the soil's chemical, physical, and biological characteristics.

The botanical garden at Wichienmatu School is a well-maintained area where various factors are controlled to ensure soil fertility and ecological balance. Comparing the soil quality of this managed environment with that of an area affected by waste burning provides valuable insights into how human activities influence soil health. This

study aims to highlight the differences between these two areas and emphasize the environmental impacts of waste disposal practices.

**Research Questions:**

Is there a difference in the soil quality between the botanical garden area and the waste burning area within Wichienmatu School, Trang Province? If so, how do they differ?

**Research Hypothesis:**

The soil in the botanical garden area at Wichienmatu School has a different quality compared to the soil in the waste burning area at the same school.

**Variables Involved****Independent Variables:**

- Soil from the botanical garden area of Wichienmatu School, Trang Province
- Soil from the waste burning area within Wichienmatu School, Trang Province

**Dependent Variable:**

- The quality of soil in both the waste burning area and the botanical garden area of Wichienmatu School, Trang Province

**Control Variables:**

- Time duration for soil sample collection
- Amount of soil collected

**Methods and instruments used for measurement****Materials and Equipment**

- Soil sample images
- Multi-purpose measuring instrument
- Distilled water
- Glassware
- Equipment for preparing soil samples
- NPK measurement instrument
- Beakers
- Soil thermometer
- Plastic tubes for inserting thermometer during temperature measurement (7 cm and 12 cm)
- Standard comparison thermometer
- Soil texture guidebook

## **Research Methodology**

### **Determining Study Points**

**Determining study points at the following coordinates :** Botanical garden area: Latitude: 7.5042122, Longitude: 99.6304674. Waste burning area: Latitude: 7.5046610, Longitude: 99.6286266

### **Section 1: Measuring Soil color**

Go to the targeted soil areas (waste burning and botanical garden).

Pick up a soil grain from the area you want to study and let sunlight pass through it. Observe and record the color of the soil that is exposed.

### **Section 2: Measuring Soil Structure**

- Collect soil samples using different methods for studying soil characteristics. Record preliminary data such as environmental conditions.
- Place undisturbed soil samples in hand, observe closely, and examine soil structure, noting size, shape, and structure type as shown in the soil structure diagrams.
- Measure and record size, shape, and structure on data sheets.
- Collect data at each study point once.

### **Section 3: Measuring Soil Moisture**

- Go to the targeted soil areas (waste burning and botanical garden).
- Use the multi-purpose measuring instrument to measure soil moisture at a depth of approximately 7 cm.
- Repeat this process 3 times.
- Calculate the average from the results and record the findings.

### **Section 4: Measuring Soil pH (Acidity/Alkalinity)**

- Go to the study areas (waste burning and botanical garden).
- Use the multi-purpose measuring instrument to measure the soil pH by inserting it 5-7 cm into the soil and wait for it to stabilize.
- Repeat this process at 3 points in both areas.
- Calculate the average and record the results.

### **Section 5: Measuring Soil Fertility**

- Go to the study areas (waste burning and botanical garden).
- Use the NPK meter to measure the soil's nitrogen, phosphorus, and potassium levels.
- Repeat the process 3 times at each point.
- Calculate the average results and record the findings.

### **Section 6: Measuring Soil Temperature**

- Before using the soil thermometer, calibrate it to ensure accurate readings. Submerge both soil thermometers in distilled water at room temperature for 2 minutes. If the temperature difference between the soil thermometer and the standard thermometer is no more than 2°C, the thermometer is considered accurate.
- Define 3 measurement points, each approximately 25 cm apart.
- Measure soil temperature at a depth of 5 cm by placing the thermometer into designated soil spots.
- Wait 2 minutes for stabilization, then read the first temperature. Wait 1 minute before reading the second and third temperatures.
- Record the data and ensure the measurements are completed within 20 minutes at both areas.

#### Section 7: Measuring Soil Texture

- Take the soil samples and place them in the palm of your hand.
- Add a small amount of distilled water to the soil.
- Use your fingers to knead the soil and assess its texture using the soil texture guidebook.
- Record the observed soil texture.

#### Research Results

**Table 1: Soil Color Comparison between Botanical Garden and Waste Burning Area at Wichienmatu School, Trang Province**

| Soil Color Botanical Garden |       | Soil Color Waste Burning Area |       |
|-----------------------------|-------|-------------------------------|-------|
| Botanical Garden 1          | Brown | Waste Burning Area1           | Black |
| Botanical Garden 2          | Brown | Waste Burning Area2           | Black |
| Botanical Garden 3          | Brown | Waste Burning Area3           | Black |

**Table 2: Soil Structure Comparison between Botanical Garden and Waste Burning Area at Wichienmatu School, Trang Province**

| Soil Structure Botanical Garden |                | Soil Structure Waste Burning Area |                |
|---------------------------------|----------------|-----------------------------------|----------------|
| Botanical Garden1               | Rounded Clumps | Waste Burning Area1               | Rounded Clumps |
| Botanical Garden2               | Rounded Clumps | Waste Burning Area2               | Rounded Clumps |

|                   |                |                     |                |
|-------------------|----------------|---------------------|----------------|
| Botanical Garden3 | Rounded Clumps | Waste Burning Area3 | Rounded Clumps |
|-------------------|----------------|---------------------|----------------|

Table 3: Soil Texture Comparison between Botanical Garden and Waste Burning Area at Wichienmatu School, Trang Province

| Soil Texture Botanical Garden |      | Soil Texture Waste Burning Area |            |
|-------------------------------|------|---------------------------------|------------|
| Botanical Garden1             | Clay | Waste Burning Area1             | Loamy Clay |
| Botanical Garden2             | Clay | Waste Burning Area2             | Loamy Clay |
| Botanical Garden3             | Clay | Waste Burning Area3             | Loamy Clay |

Table 4: Soil Temperature Comparison between Botanical Garden and Waste Burning Area at Wichienmatu School, Trang Province

| Soil Temperature Botanical Garden |       | Soil Temperature Waste Burning Area |    |
|-----------------------------------|-------|-------------------------------------|----|
| Botanical Garden1                 | 27.5  | Waste Burning Area1                 | 27 |
| Botanical Garden2                 | 27    | Waste Burning Area2                 | 29 |
| Botanical Garden3                 | 26    | Waste Burning Area3                 | 28 |
| Average                           | 26.83 | Average                             | 28 |

Table 5: Soil pH Comparison between Botanical Garden and Waste Burning Area at Wichienmatu School, Trang Province

| Soil pH Botanical Garden |     | Soil pH Waste Burning Area |   |
|--------------------------|-----|----------------------------|---|
| Botanical Garden1        | 7.5 | Waste Burning              | 8 |

|                   |      |                     |   |
|-------------------|------|---------------------|---|
|                   |      | Area1               |   |
| Botanical Garden2 | 8    | Waste Burning Area2 | 6 |
| Botanical Garden3 | 7.5  | Waste Burning Area3 | 7 |
| Average           | 7.67 | Average             | 7 |

Table 6: Soil Moisture Comparison between Botanical Garden and Waste Burning Area at Wichienmatu School, Trang Province

| Soil Moisture Botanical Garden |      | Soil Moisture Waste Burning Area |      |
|--------------------------------|------|----------------------------------|------|
| Botanical Garden1              | 8    | Waste Burning Area1              | 8    |
| Botanical Garden2              | 7    | Waste Burning Area2              | 8    |
| Botanical Garden3              | 7    | Waste Burning Area3              | 10   |
| Average                        | 7.33 | Average                          | 8.67 |

Bar Chart Comparison between Average Soil Temperature, pH, and Moisture in the Botanical Garden and Waste Burning Area

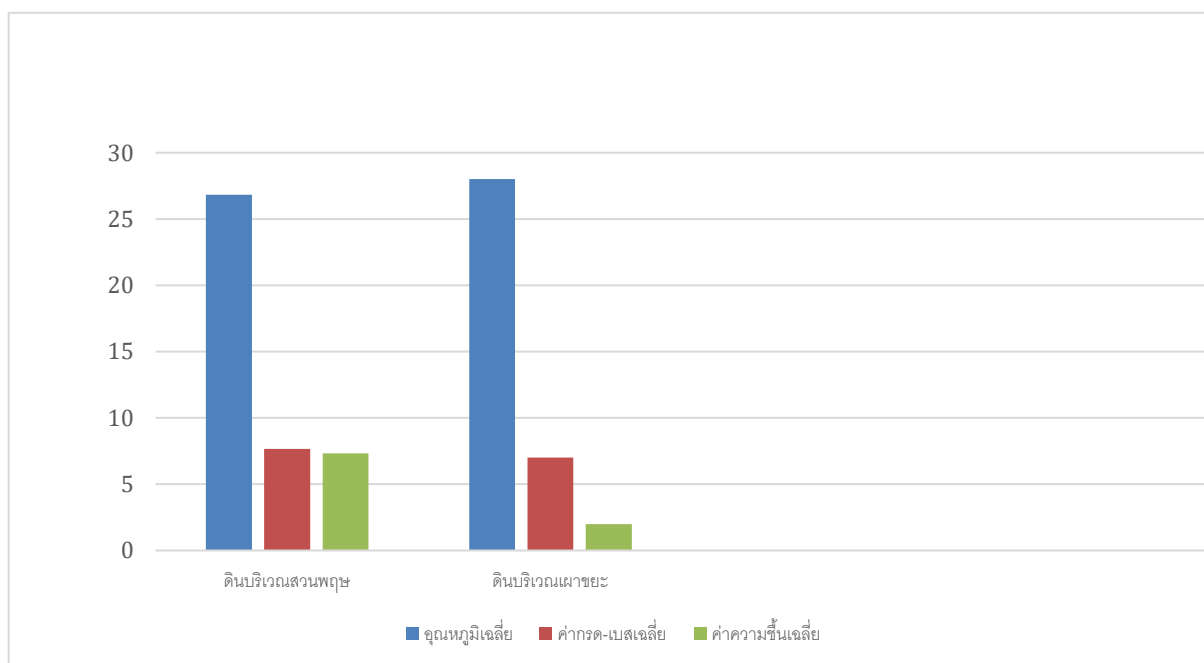


Table 7: Nitrogen Content Comparison in Soil between Botanical Garden and Waste Burning Area at Wichienmatu School, Trang Province

| N Botanical Garden Soil |       | N Waste Burning Area Soil |    |
|-------------------------|-------|---------------------------|----|
| Botanical Garden Soil1  | 18    | Waste Burning Area1       | 41 |
| Botanical Garden Soil2  | 14    | Waste Burning Area2       | 26 |
| Botanical Garden Soil3  | 12    | Waste Burning Area3       | 26 |
| Average                 | 14.67 | เฉลี่ย                    | 31 |

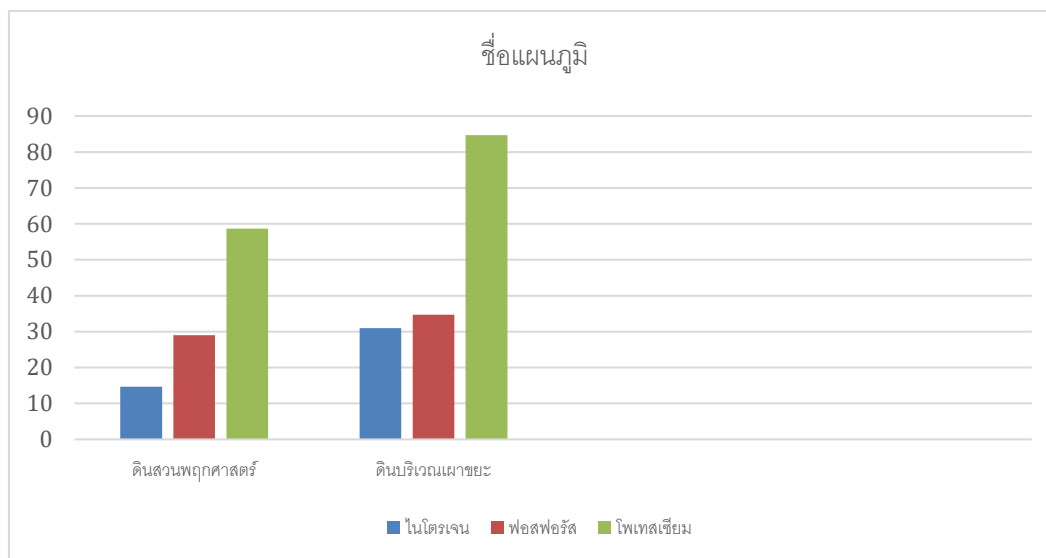
Table 8: Phosphorus Content Comparison in Soil between Botanical Garden and Waste Burning Area at Wichienmatu School, Trang Province

| P Botanical Garden Soil |    | P Waste Burning Area Soil |       |
|-------------------------|----|---------------------------|-------|
| Botanical Garden1       | 34 | Waste Burning Area1       | 38    |
| Botanical Garden2       | 22 | Waste Burning Area2       | 25    |
| Botanical Garden3       | 31 | Waste Burning Area3       | 41    |
| Average                 | 29 | Average                   | 34.67 |

Table 9: Potassium Content Comparison in Soil between Botanical Garden and Waste Burning Area at Wichienmatu School, Trang Province

| K Botanical Garden Soil |    | K Waste Burning Area Soil |     |
|-------------------------|----|---------------------------|-----|
| Botanical Garden1       | 86 | Waste Burning Area1       | 109 |

|                   |       |                     |       |
|-------------------|-------|---------------------|-------|
| Botanical Garden2 | 43    | Waste Burning Area2 | 63    |
| Botanical Garden3 | 47    | Waste Burning Area3 | 82    |
| Average           | 58.67 | Average             | 84.67 |



The chart compares the average values of nitrogen, phosphorus, and potassium from both the waste burning area and the botanical garden at Wichienmatu School, Trang Province.

### Summary and Discussion of Research Results

From the measurements of soil structure, soil temperature, soil pH, soil moisture, and soil fertility, it can be concluded that the soil in the botanical garden area is clay, while the soil in the waste burning area is loamy clay. The soil temperature in the botanical garden area is lower than that of the soil in the waste burning area. In terms of pH, the soil from the botanical garden area has a neutral average value, while the soil in the waste burning area has a basic average value. The moisture content in the soil from the botanical garden area is lower than that of the soil from the waste burning area. Regarding soil fertility, the nitrogen content in the soil from the botanical garden is much lower than in the soil from the waste burning area. The phosphorus content in the soil from the botanical garden is lower than in the soil from the waste burning area, and the potassium content in the soil from the botanical garden is much lower than in the soil from the waste burning area.

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## References

**Causes and Effects of Pollution** <https://www.rmuti.ac.th>

**Effects of Incinerated Waste on Soil** <https://bsru.net>

**What is Soil?** [http://osl101.ldd.go.th/easysoils/s\\_meaning.htm](http://osl101.ldd.go.th/easysoils/s_meaning.htm)

**Soil Fertility** <https://ngthai.com/science/30913/soil-fert/>

**Soil Properties** [http://oss101.ldd.go.th/web\\_AboutSoils/AboutSoilProperty57.htm](http://oss101.ldd.go.th/web_AboutSoils/AboutSoilProperty57.htm)

**Soil Pollution** <https://ngthai.com/science/27458/soil-pollution/>



Picture 1 Determining Study Points



Picture 2 Measuring Soil Moisture



Picture 3 Measuring Soil  
Temperature



Picture 4 Soil Texture Measurement



Picture 5 Measuring Soil Fertility