A Comparison of Soil Properties in the Sufficiency Economy Garden Area and the Waste Incineration Chimney Area at Phak Mai Wittayanukul School.

Research Team

Mr. Supawit Chanchaeng

Mr. Worapol Sombatwong

Mr. Peerapat Chaengpromma

Research Advisors

Mrs. Darunee Samerpak

Mr. Samruan Samerpak

Ms. Sasiwimon Pangma

Phakmaiwittayanukul School

Huai Thap Than District, Sisaket Province, Thailand

Research Report Title: A Comparison of Soil Properties in Sufficiency Economy. Garden Areas and Waste Incineration Chimney Areas

Researchers: Mr. Suphawich Chantharajang
Mr. Woraphol Sombatwong
Mr. Peerapat Chaengpromma

Advisor: Mrs. Darunee Samerpak
Mr. Samruan Samerpak
Ms. Sasiwimon Pangma

School: Phak Mai Wittayanukul School
Huai Thap Than District, Sisaket Province

Abstract

This research aimed to compare the chemical and physical properties of soil between the self-sufficient garden area and the waste incineration chimney area at Phak Mai Wittayanukul School. pH, major nutrient content (nitrogen, phosphorus, and potassium), moisture content, color, and soil texture were analyzed. The results showed that the soil in the self-sufficient garden area was of better quality, with an average pH of 6.5, which is suitable for plant growth, while the soil in the waste incineration chimney area had a relatively acidic pH. Furthermore, the amount of major nutrients, especially phosphorus, was significantly higher in the cultivated area, and the soil in the chimney area also exhibited greater moisture content and looser structure. The research indicates that cultivation contributes to improving both the chemical and physical properties of the soil and that the findings can be used as a guideline for managing and restoring degraded soil to achieve fertility and sustainability.

Keywords : Soilproperties;Soil pH; Major nutrients; Self-sufficient garden;Waste incineration area; Soil quality

Background and Significance

Soil is a vital natural resource for the survival of humans, animals, and plants, especially in agriculture, which relies on soil for cultivation and nutrients. Maintaining soil quality to ensure its fertility and suitability for plant growth is therefore of paramount importance. However, soil degradation is a continuous problem caused by various factors, one of the most significant direct impacts on soil is the open burning of waste.

Burning waste is often used as an easy and economical way to dispose of it, but in reality, it has many environmental impacts on air, water, and especially soil. The combustion process releases chemicals, toxins, and heavy metals such as lead, mercury, cadmium, and dioxins. These substances can persist and accumulate in the soil for a long time, causing chemical and physical changes in the soil, such as a decrease in pH, compacted soil structure, reduced soil microorganisms, and a decrease in essential plant nutrients such as nitrogen (N), phosphorus (P), and potassium (K).

In contrast, soil in areas with continuous cultivation, especially in organic farming or well-managed agriculture, is usually enriched with compost, manure, and various organic materials. This results in good soil structure, looseness, nutrient richness, and a pH suitable for plant growth.

The researchers were therefore interested in studying and comparing the soil properties in these two types of areas in order to find out the facts about the impact of waste burning on the soil and to raise awareness of the importance of proper waste management. Furthermore, the information gathered will be used to disseminate knowledge about soil conservation to the community and promote environmentally friendly behaviors.

Research questions

1. How do the chemical properties of the soil in a self-sufficient garden area differ from those in an area with a land incineration chimney?
2. How do the physical properties of the soil in a self-sufficient garden area differ from those in an area with a land incineration chimney?

Research hypothesis

1. The chemical properties of the soil in self-sufficient garden areas differ from those in land incineration areas.
2. The physical properties of the soil in self-sufficient garden areas differ from those in land incineration areas.

Materials, equipment, and research methodology

1. shovel

2. pH, nitrogen, phosphorus, and potassium test kit.

3. Soil collection bags

4. Pen/pencil

5. mobile phone

6. Notebook

1. Study Area and Site Selection

The study area is located at Phak Mai Wittayanukul School, Phak Mai Subdistrict, Huai Thap Than District, Sisaket Province.

There are two locations:

1.1 Sufficiency Economy Garden

1.2 Waste Incineration Chimney

1.1 Sufficiency Economy Garden

1.2 Incinerator chimney

2. Soil Sampling

2.1 Number of Samples: Collect one soil sample from each area, randomly selecting from different locations within the area.

2.2 Depth: Use a shovel or hoe to auger the soil to a depth of approximately 30 centimeters, which is the topsoil layer where plant roots absorb the most nutrients.

2.3 Weight/Volume: Collect approximately 500 grams of soil from each sample point and mix them together to represent the area.

2.4 Storage: Place the soil samples in bags, clearly labeling the area code, date, time, and location of collection.

3. Soil Property Testing

3.1 Allow the collected soil samples to dry in the shade for 1-2 days until moderately dry.

3.2 Use a ready-made soil test kit to analyze the soil properties, including:

- pH value
- Major nutrient content: Nitrogen (N), Phosphorus (P), Potassium (K)

3.3 Record the test results in the results table. Photographs will be taken during the testing process to be included in the report.

4. Data Comparison

4.1 Compare the soil analysis results from both areas in terms of:

- Soil color
- Soil texture
- pH value
- Amount of major nutrients
- Soil moisture

4.2 Analyze the results to determine which area is more suitable for crop cultivation and which area is affected by waste burning.

Research results

In this study, researchers collected soil samples from two locations:

1. A self-sufficient garden
2. A waste incineration chimney

The soil properties, including soil color, soil moisture, soil texture, pH, and the amount of major nutrients such as nitrogen (N), phosphorus (P), and potassium (K), were then analyzed. The results of the analysis are summarized in the following table.

Results recording table

1. Table for recording the chemical properties of the soil.

Study Point	pH value	Nitrogen (N)	Phosphorus (P)	Potassium (K)
waste incineration chimney	5	high	high	high
Sufficiency Economy Garden	7	medium	low	low

2. Table for recording the physical properties of the soil.

Study Point	Soil color	Soil moisture	Soil texture
waste incineration chimney	dark	WET+	dense
Sufficiency Economy Garden	Light sugar	WET+	Loose, crumbly

Summary of operations

In conducting the research project "Comparison of Soil Properties in Sufficiency Economy Gardens and Waste Incineration Chimneys," the researchers followed a systematic research process, from studying relevant data and planning the project to collecting soil samples from two areas: the sufficiency economy garden and the waste incineration chimney. The soil samples were then analyzed for their physical and chemical properties, including color, texture, moisture content, pH, and the amount of major nutrients N-P-K.

The results showed that the soil in the sufficiency economy garden was loose, relatively light in color, had suitable moisture content, a pH close to neutral (approximately 7), and moderate levels of major nutrients N-P-K, suitable for plant growth. This indicates good soil management and continuous maintenance, such as the use of organic fertilizers and appropriate cultivation practices.

In contrast, the soil in the waste incineration chimney was dense, dark in color, had a low pH (approximately 5), indicating high acidity, and contained excessively high levels of N-P-K nutrients, exceeding the optimal levels for cultivation. This may negatively affect plant nutrient absorption. The main causes are the heat and residues from waste incineration, which degrade soil structure, reduce aeration and water infiltration, and decrease the number of soil microorganisms.

These findings reflect that... Land management and waste management practices have a significant impact on soil properties. Areas with proper cultivation and maintenance have high soil quality, while areas where waste is burned experience soil degradation, potentially leading to long-term environmental and agricultural problems.

Therefore, it is crucial to promote the reduction of waste burning and encourage the use of appropriate waste management methods such as waste sorting, composting, and recycling to help maintain soil quality and ensure long-term environmental sustainability.

Suggestions

1. Further soil analysis is needed, including assessments of microbial contamination, residual toxins, and heavy metals, to clearly demonstrate the impact of waste incineration.
2. Promote proper waste management methods such as sorting, recycling, and composting organic matter.

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Badges

1. I Make an Impact

Description: This research stemmed from a local problem related to waste burning, which can impact soil quality. The research team compared soil properties in cultivated areas and areas where waste was burned to assess the effects of human activities on soil and the environment. The research findings help raise community awareness of the negative consequences of waste burning and can be used as guidelines for improving soil management, reducing waste burning, and promoting sustainable soil resource use, leading to positive impacts on the community and the environment as a whole.

2. I am a Problem Solver

Description: This environmental research helps the research team understand the problem of waste burning and its impact on soil quality in community areas. Through the study of soil properties and a comparison between cultivated areas and areas where waste is burned, the research team applied knowledge from earth system science to analyze the problem and propose solutions, such as reducing waste burning and implementing appropriate soil management. This contributes to solving environmental problems and creating a better world.

3. I am a Collaborator

Description: This research project is the result of collaborative work by all research team members. Each member had clearly defined roles and responsibilities and supported each other throughout the research process, from soil sampling and data analysis to conclusion. Collaboration with external instructors or experts would have enhanced the accuracy of the research process, increased the reliability of the data, and resulted in a higher quality and more complete research project.

Appendix

Appendix A

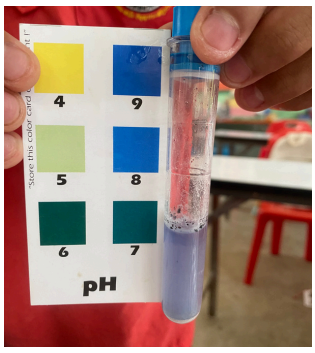
1. Images of soil sampling.

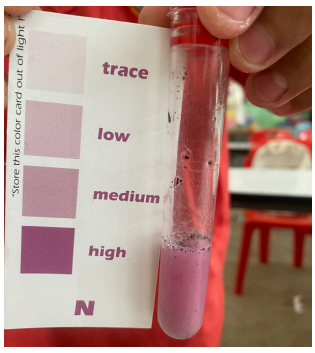
Waste incineration area

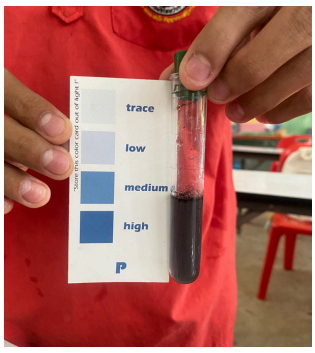
Self-sufficient garden area

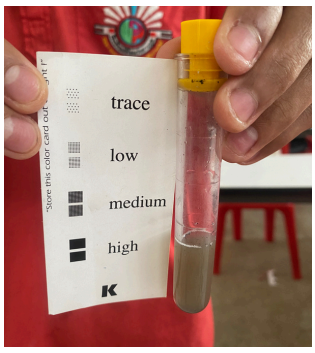
2. The image shows the process of taking soil samples for chemical property testing, specifically the values of PH, N, P, and K.

The image shows the measurements of these values as follows:

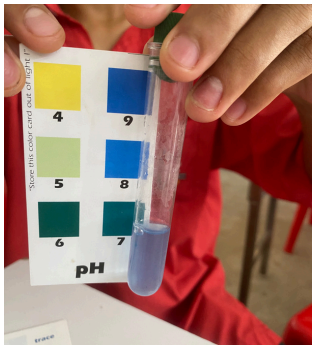


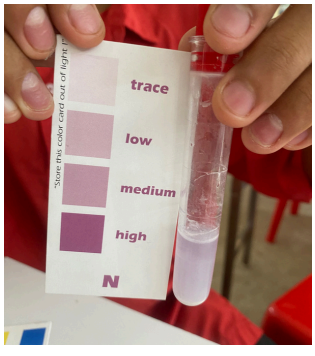


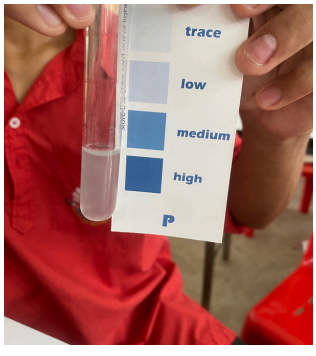




Waste incineration area







Self-sufficient garden area

Appendix B

1. Measure the physical properties of the soil, namely soil temperature and soil moisture.

The image shows the measurement process as follows:

Waste incineration area

Self-sufficient garden area