Sawatrattana Phimuk School Trang , Thailand

Comparison of the physical and chemical properties of soil and the yield of Jasmine rice variety in paddy fields with different irrigation systems and terrain characteristics affecting rice yield in Lamoh Subdistrict, Nayong District, Trang Province Thailand

Comparison of the physical and chemical properties of soil and the yield of Jasmine rice variety in paddy fields with different irrigation systems and terrain characteristics affecting rice yield in Lamoh Subdistrict, Nayong District, Trang Province

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Introduction

Rice is an essential economic crop in Nayong District, Trang Province, particularly in Lamoh Subdistrict, where the geographical conditions, including sloped terrain, soil characteristics, and a circulating irrigation system, make it suitable for rice cultivation. The climate in this area is also favorable, with monsoon winds prevailing throughout most of the year.

Farmers in Nayong District cultivate rice using both broadcasting and transplanting methods. The Jasmine rice variety is the preferred choice among local farmers due to its quality and yield. Since soil quality plays a significant role in determining rice production, this research focuses on studying the physical and chemical properties of soil in different terrains. The study also examines chemical interactions, such as the use of chemical fertilizers and organic matter. Key soil characteristics analyzed include temperature, moisture content, nitrogen, phosphorus, and potassium levels, both during the growing period and after harvest.

Research Questions

1. In the paddy fields of Lamoh Subdistrict, Nayong District, Trang Province, which have sloped terrain and use a circulating irrigation system, does the NPK fertilizer dissolve and accumulate in the lower-lying areas?
2. Does the accumulation of dissolved NPK fertilizer in lower-lying areas contribute to an increase in Jasmine rice yield?

Research Hypotheses

1. The physical and chemical properties of soil in the elevated areas of Lamoh Subdistrict, Nayong District, Trang Province, differ from those in the lower-lying areas.
2. Differences in the physical and chemical properties of soil in these two areas affect the yield of Jasmine rice.

Materials and Equipment Used in the Research

1. Beaker
2. Thermometer
3. Richmoto analog soilmeter
4. Soil test kit for **pH** and **NPK** analysis
5. Test tubes
6. Glass stirring rod

Research Methodology

Study Area

This research was conducted in Jasmine rice paddy fields in Lamoh Subdistrict, Nayong District, Trang Province. The study site is located at the coordinates 7.5896008°N latitude and 99.780946°E longitude.

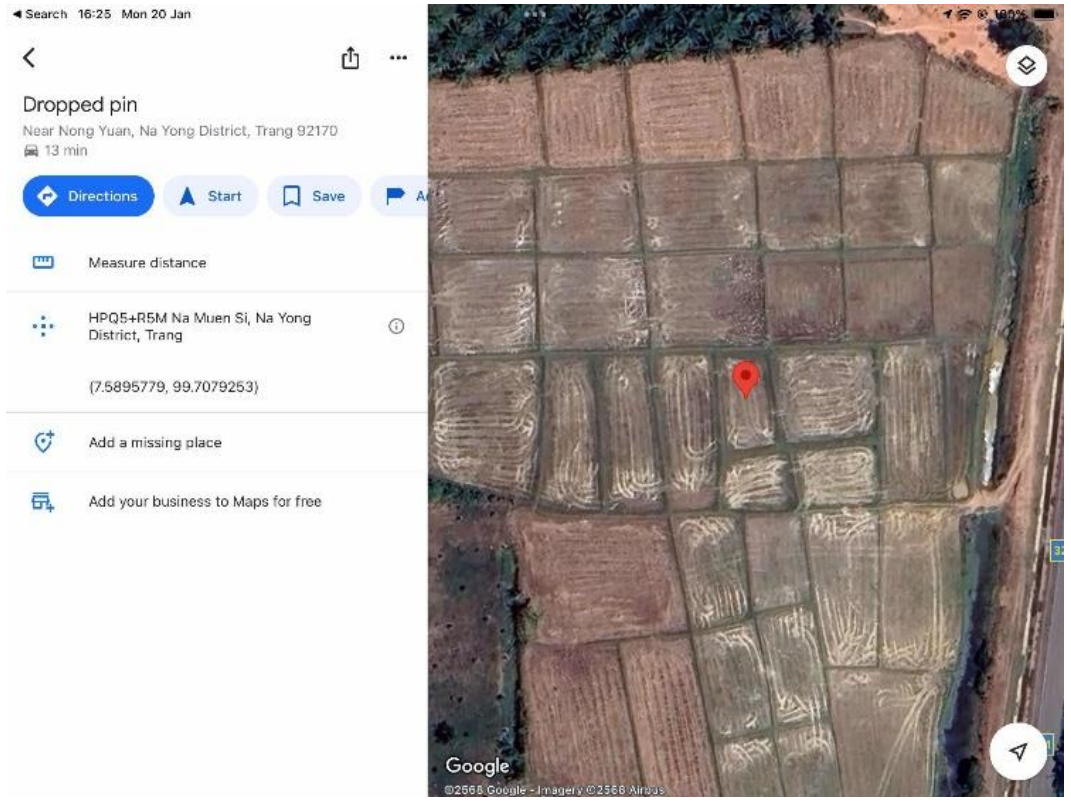


Figure 1 Study site: Jasmine rice paddy fields in Lamoh Subdistrict, Nayong District, Trang Province (Source: Google Maps)

Sample Collection and Preparation

Collect samples from 5 different points and combine the soil samples in a plastic bag as a representative soil sample. Search using Google Maps.

The researcher collected soil samples from the rice field plot.

Measure physical properties, moisture level, soil light intensity, and pH using a Richmoto needle meter.

Dig the soil to a depth of 15 centimeters.

Insert the Richmoto needle meter into the soil and leave it for 1 minute.

Observe the changes.
Repeat the experiment if the variation does not exceed 1%.
Then, record the experimental results.

Measuring soil temperature with a thermometer follows the principles and methods of soil measurement (Pedosphere (Soil))

Dig the soil to depths of 3, 5, and 10 centimeters.

Place the thermometer to measure the soil temperature for 1 minute.

Repeat once (the value will not change by more than 2°C). Observe the changes and record them in the Globe Data Entry.

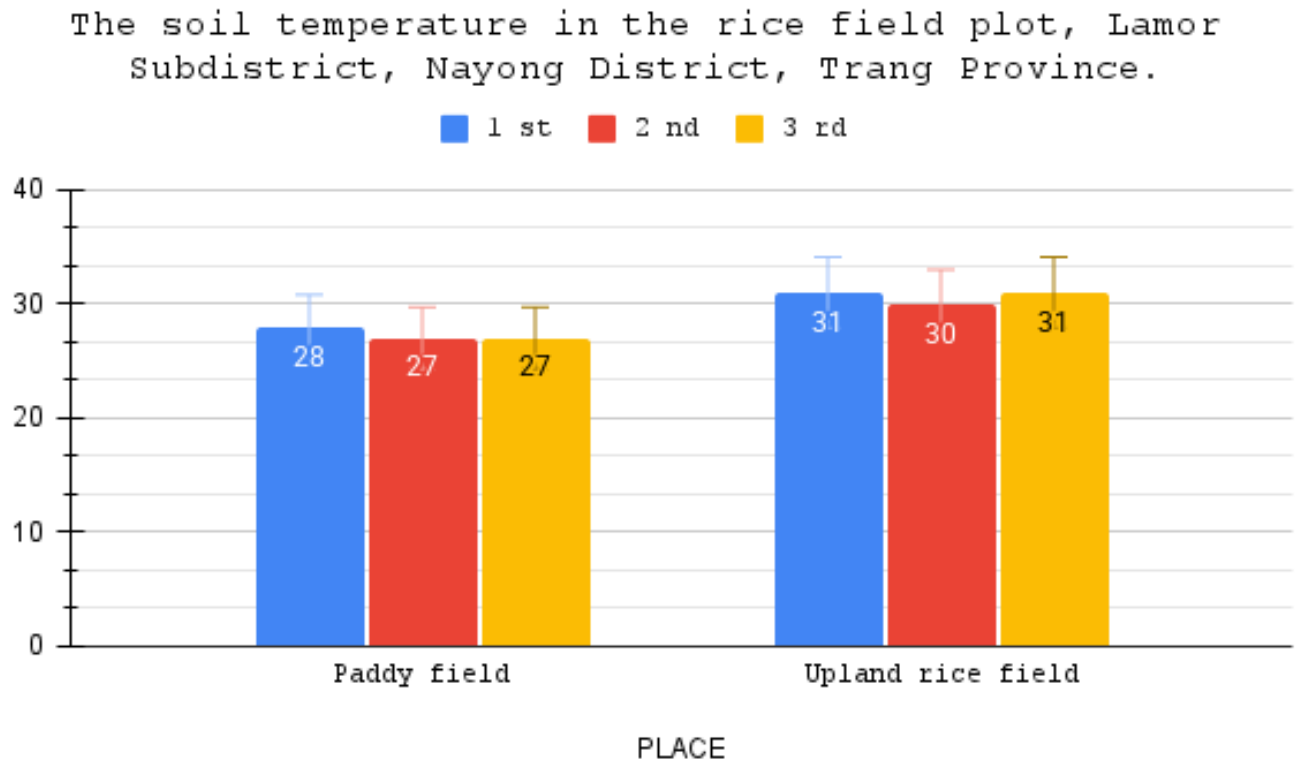
Test the chemical properties, including pH (acidity and alkalinity) and the levels of nitrogen, phosphorus, and potassium in the soil.

The dried soil sample weighing 100 grams is dissolved in 250 milliliters of distilled water and left to settle for 3 hours.

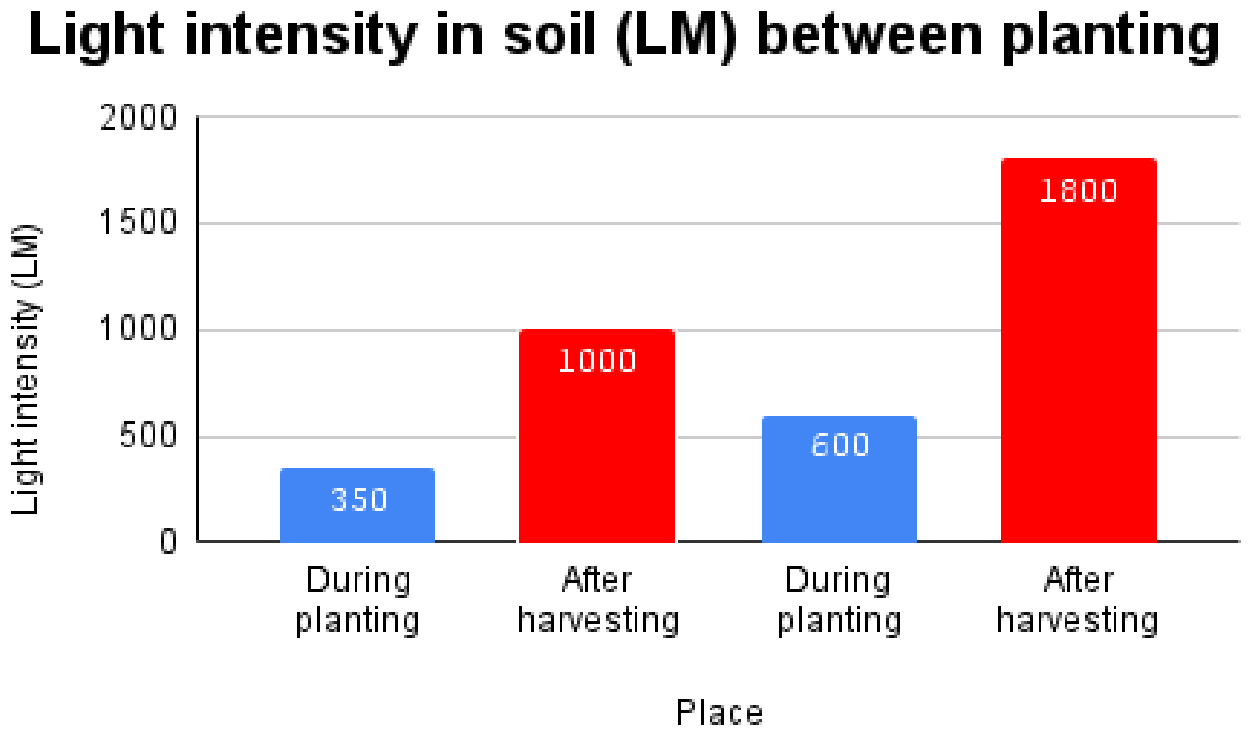
Observe the changes and record the experimental results.

- **Test the pH value of the soil.** → **Drop 1 drop of pH test solution.**
- **Test the nitrogen (N) content in the soil.** → **Drop 1 drop of Ammonia Nitrogen Activator solution and 1 drop of Ammonia Nitrogen Solution.**
- **Test the phosphorus (P) content in the soil.** → **Drop 1 drop of Phosphorus Extractant Solution.**
- **Test the potassium (K) content in the soil.** → **Drop 1 drop of Potassium Extractant Solution.**

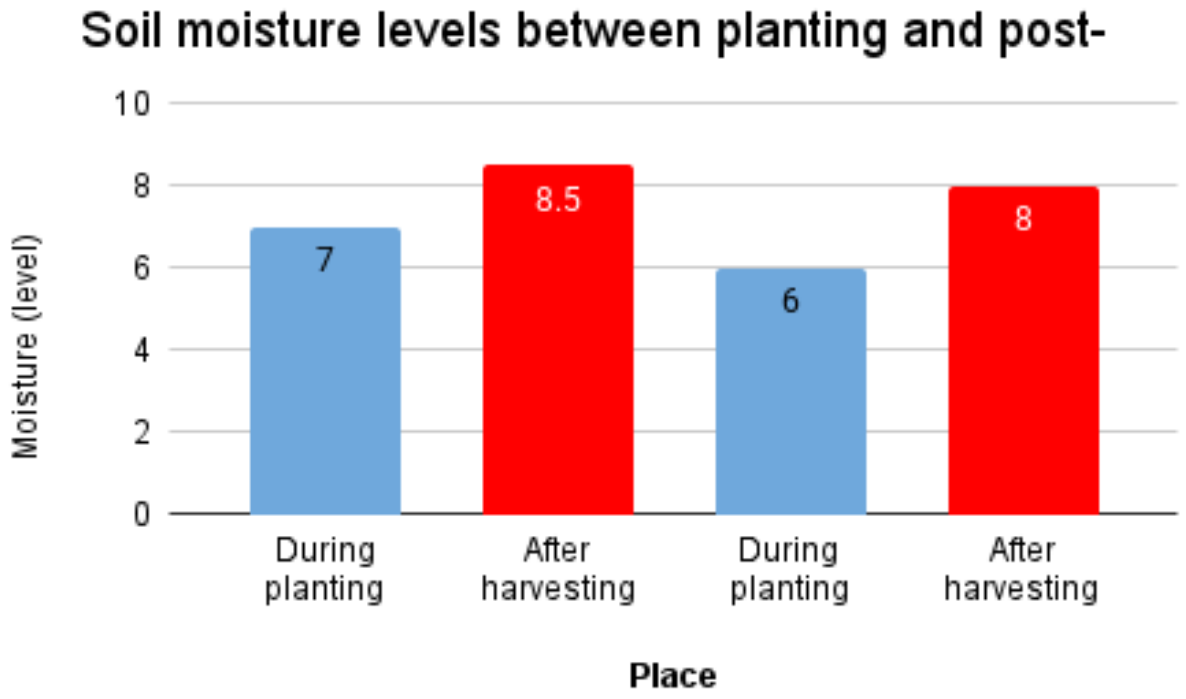
Analysis of the physical properties of the soil after harvest.
The results of the soil temperature analysis in the rice field plot, Lamor Subdistrict, Nayong District, Trang Province.



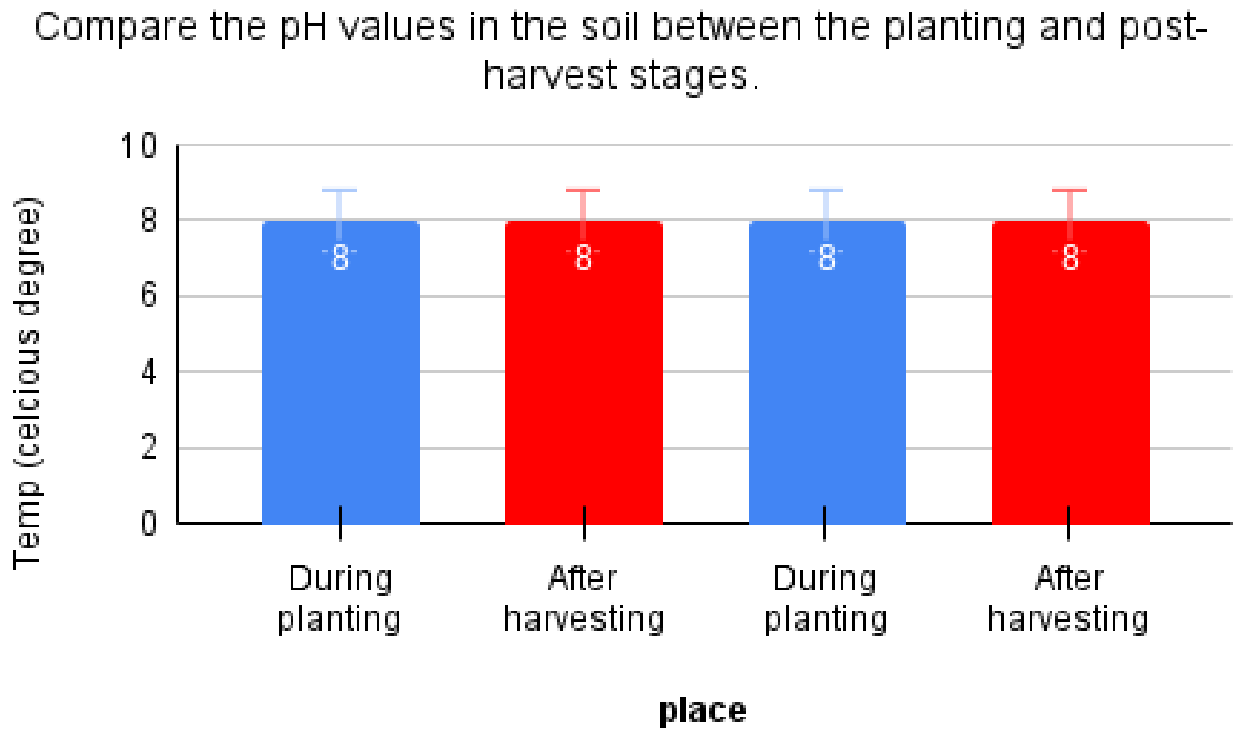
Analysis of the physical properties of the soil after harvest.
The results of the light intensity analysis of the soil in the rice field plot, Lamor Subdistrict, Nayong District, Trang Province.



Analysis of the physical properties of the soil after harvest.
The results of the soil moisture analysis in the rice field plot, Lamor Subdistrict, Nayong District, Trang Province.

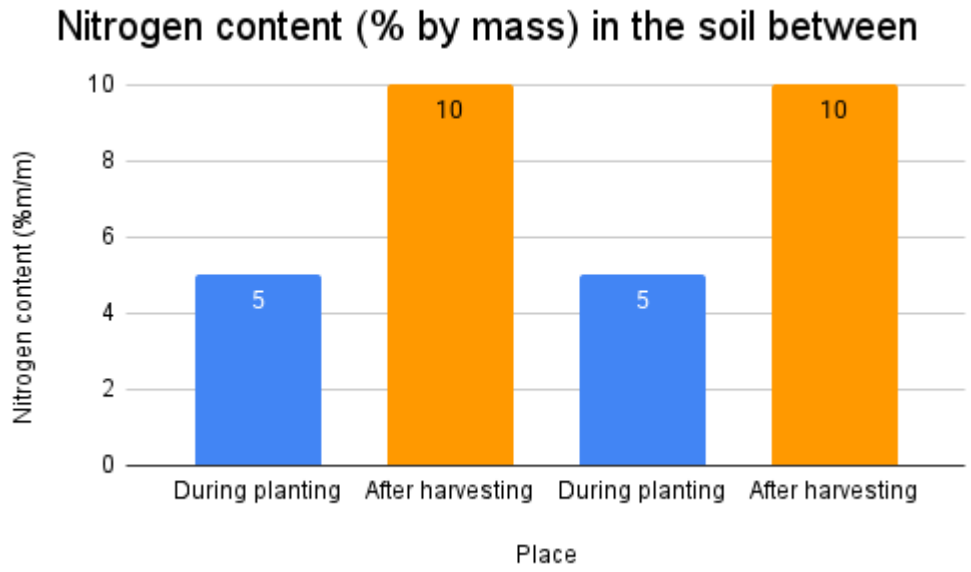


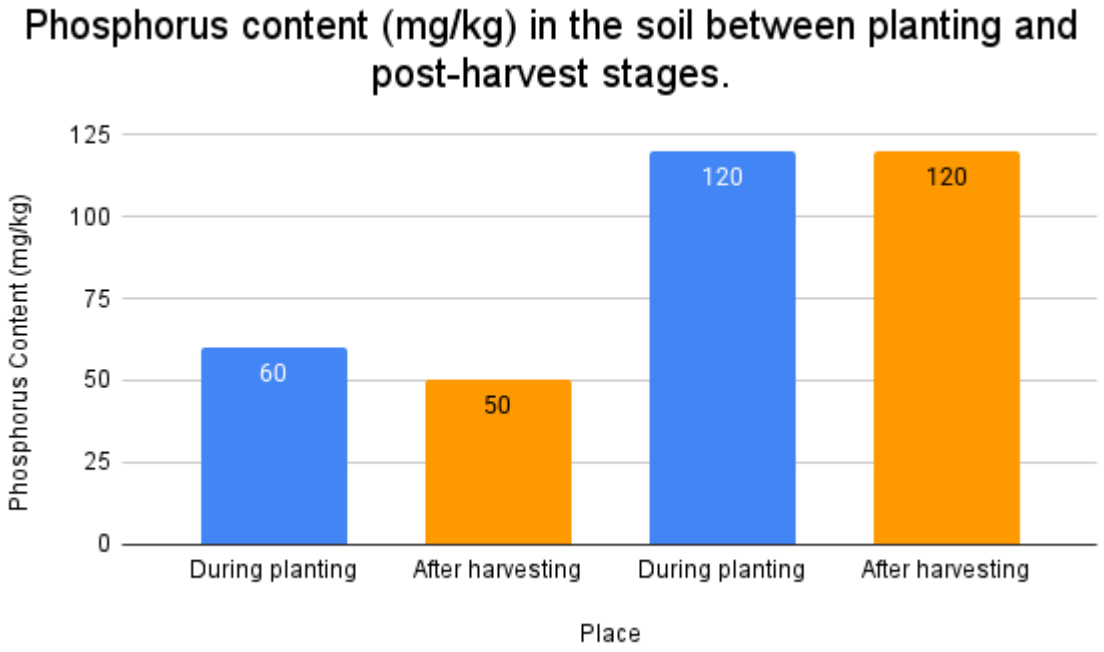
Analysis of the physical properties of the soil after harvest.
The results of the pH analysis of the soil in the rice field plot, Lamor Subdistrict, Nayong District, Trang Province.



Analysis of the Soil Chemical Properties

Based on the analysis of the soil chemical properties during rice cultivation (December 2024) and after harvest (January 2025) in the rice field plot, Lamor Subdistrict, Nayong District, Trang Province.





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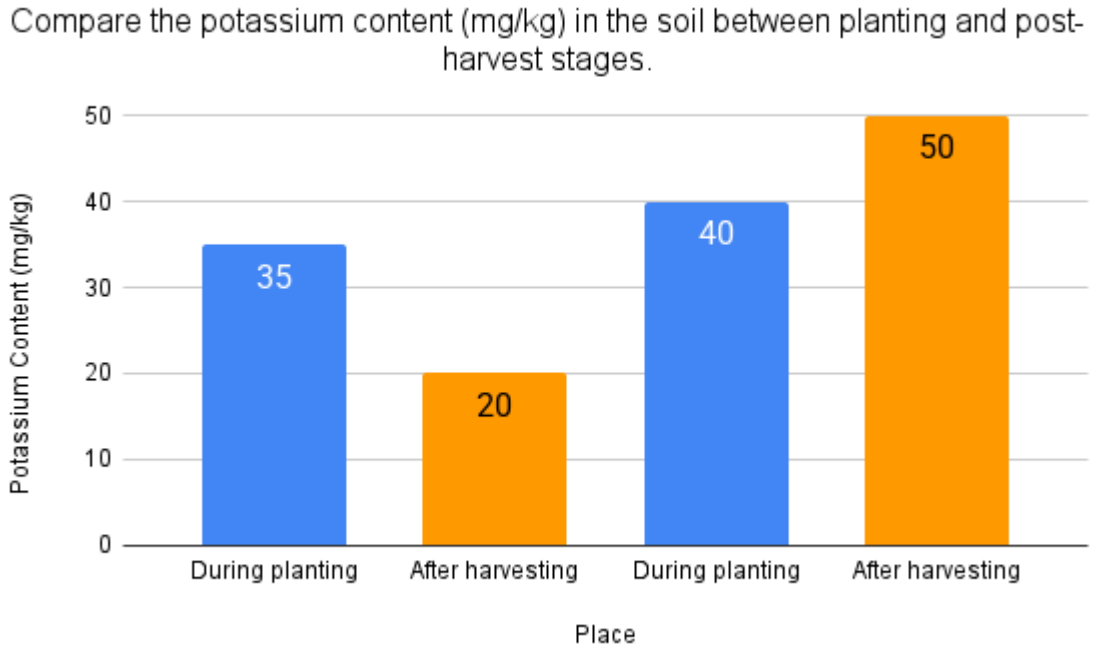

Jasmine rice yield.

Table of Jasmine rice yield after harvest from the rice field plot in Lamor Subdistrict, Nayang District, Trang Province.

Place	Sack quantity	kilograms
Paddy field	31	1,240.00
Upland rice field	22	880.00

Note:

Each sack weighs approximately 40 kilograms.

Research Summary

Physical Properties of Soil in Paddy Fields (Lamoh Subdistrict, Nayong District, Trang Province)

The study of soil physical properties revealed that the lowland paddy field had clay-textured soil. After sun-drying for 3-4 days, the soil was ground into a fine texture (Land Development Science Bureau, 2004; Land Development Department, n.d.). The soil particles exhibited a gray color, with an in-field soil temperature of 27°C, moisture level 7, and light intensity 1,200 LM.

The upland paddy field also had clay-textured soil, which, after sun-drying and grinding, appeared brown. The in-field soil temperature was 27°C, moisture level 7.75, and light intensity 675 LM.

Research Summary

Chemical Properties of Soil in Paddy Fields (Lamoh Subdistrict, Nayong District, Trang Province)

The study analyzed pH levels, nitrogen, phosphorus, and potassium content. The results showed that soil in both the lowland and upland paddy fields had a basic pH of approximately 8.0.

- Lowland paddy field soil contained 7.5% nitrogen by mass, 100 mg/kg phosphorus, and 45 mg/kg potassium.
- Upland paddy field soil contained 7.5% nitrogen by mass, 55 mg/kg phosphorus, and 27.5 mg/kg potassium.

Research Summary

Part 3: Jasmine Rice Yield in Paddy Fields (Lamoh Subdistrict, Nayong District, Trang Province)

- Lowland paddy field: 31 sacks (1,240 kg).
- Upland paddy field: 22 sacks (880 kg).

Discussion

The study of physical and chemical properties of soil in lowland and upland paddy fields during and after the rice cultivation period in Lamoh Subdistrict, Nayong District, Trang Province showed that the circulating irrigation system caused fertilizers and dissolved nutrients from upland areas to flow down to the lowland fields. This resulted in higher rice yield in lowland areas compared to upland areas.

Jasmine rice typically grows best in slightly acidic soil and requires about four months (120 days) for cultivation. However, this study found that both soil samples had a pH of 8 (alkaline). This alkaline condition might have resulted from fertilizer application and incomplete nutrient dissolution. Despite this, the rice still grew successfully within three months (90 days).

Recommendations

The study found that lowland fields with a circulating irrigation system tend to accumulate essential fertilizers, increasing rice yield. To prevent nutrient loss from upland fields, additional measures such as constructing bunds (levees) or calculating water flow rates should be considered to reduce fertilizer runoff and maximize plant nutrient retention.

Acknowledgments

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