Research Title : A Comparative Study of Temperature and Moisture Drainage in Transplanted and Direct-Seeded Rice Fields
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Abstract

Thailand is an agricultural country where rice cultivation plays a crucial role in the economy and livelihoods of its people. The two primary rice cultivation methods, transplanted rice fields and direct-seeded rice fields, differ in terms of water management and soil structure. This study aims to compare soil drainage and temperature between these two cultivation methods through field experiments measuring soil moisture and temperature over four weeks.The results indicate that transplanted rice fields exhibit superior water retention compared to direct-seeded rice fields in the long term. In the first week, soil moisture in transplanted rice fields reached 18.37%, whereas in direct-seeded fields, it was 8.98%. However, moisture levels in transplanted rice fields declined rapidly in the second week before stabilizing in the third and fourth weeks, remaining significantly higher than in direct-seeded fields. This finding suggests that transplanted rice fields are more effective at retaining soil moisture over time.Regarding soil temperature, direct-seeded rice fields consistently exhibited higher temperatures than transplanted fields throughout the study period. In the first week, soil temperature in transplanted rice fields was 23.67°C, while in direct-seeded fields, it was 25°C. The temperature increased progressively, reaching 24.33°C in transplanted rice fields and 27.33°C in direct-seeded fields by the fourth week. The key factors influencing these differences were soil moisture levels and water retention, with the presence of standing water in transplanted fields helping to lower soil temperature during early growth stages.This study highlights the advantages of transplanted rice fields in maintaining soil moisture and regulating soil temperature compared to direct-seeded fields. These findings provide valuable insights into selecting appropriate cultivation methods based on environmental conditions and water management strategies. Effective water management can enhance rice yield and promote sustainable agriculture in the long term.

Keywords: transplanted rice fields, direct-seeded rice fields, soil drainage, soil moisture, soil temperature

Introdustion

Thailand is a country where agriculture plays a significant role in the economy, particularly rice farming, which is the primary occupation for many farmers. Rice cultivation in Thailand includes both transplanted and direct-seeded rice methods, each with different approaches to water and soil management. Transplanted rice involves growing rice seedlings in a prepared field before transplanting them into flooded areas, while direct-seeded rice is the process of sowing rice seeds directly into the soil without prior preparation or transplanting. These methods have long-term effects on soil moisture drainage and the soil's structure.

Key factors influencing soil moisture drainage include soil preparation, water management, and the use of fertilizers and chemicals. In transplanted rice, fields are flooded, which slows down the moisture drainage. In contrast, direct-seeded rice does not involve flooding, allowing for faster moisture drainage. The use of fertilizers and chemicals also impacts soil moisture, as they can affect the quality and structure of the soil.

A comparative study of moisture drainage in fields cultivated with both rice-growing methods will help farmers choose the most appropriate method for their specific soil and environmental conditions. This will enhance water resource efficiency, increase yields, and maintain soil quality over the long term. Additionally, it will help farmers understand optimal water management practices and the effective use of fertilizers and chemicals to reduce environmental impacts and preserve soil health in the long run. Therefore, this study is vital for promoting sustainable agriculture and improving the efficiency and quality of rice production.

Objective

1. To study moisture drainage in black soil and broadcast rice fields
2. To compare the moisture drainage rates in black soil and broadcast rice fields

Research question

- Which method of moisture drainage in black soil and broadcast rice fields is more effective

Hypothesis

- Moisture drainage in paddy fields is more efficient with broadcasting than with transplanting.

Methodolog

The project to A Comparative Study of Temperature and Moisture Drainage in Transplanted and Direct-Seeded Rice Fields has reviewed relevant documents and research, and thus designed the following experiment.

3.1 Part 1 A Comparative Study of Soil Moisture Drainage Properties Drainage in Transplanted and Direct-Seeded Rice Fields

Measuring davice

1) Digital scale

2) Soil sample holder

Experimental method

1. Determine study points and collect soil data at 3 points in in transplanted and 3 points in a broadcast rice field. Design and collect samples randomly to gather soil samples. Show the area of the transplanted rice field compared to the broadcast rice field.

- Soil sampling and weighing the soil
- Baking the soil for 24 hours
- weighing the soil after baking

2. Analyze data to find soil moisture in Transplanted and Direct-Seeded Rice Fields.

3. Compare the relationship of moisture drainage in Transplanted and Direct-Seeded Rice Fields.

3.2 Part 2 A comparative study of temperatures in Transplanted and Direct-Seeded Rice Fields

Measuring davice

1) Duro model needle soil thermometer

Experimental method

1. Determine study points and collect soil data at 3 points in in transplanted and 3 points in a broadcast rice field. Design and collect data, showing the areas by Transplanted and Direct-Seeded Rice Fields.

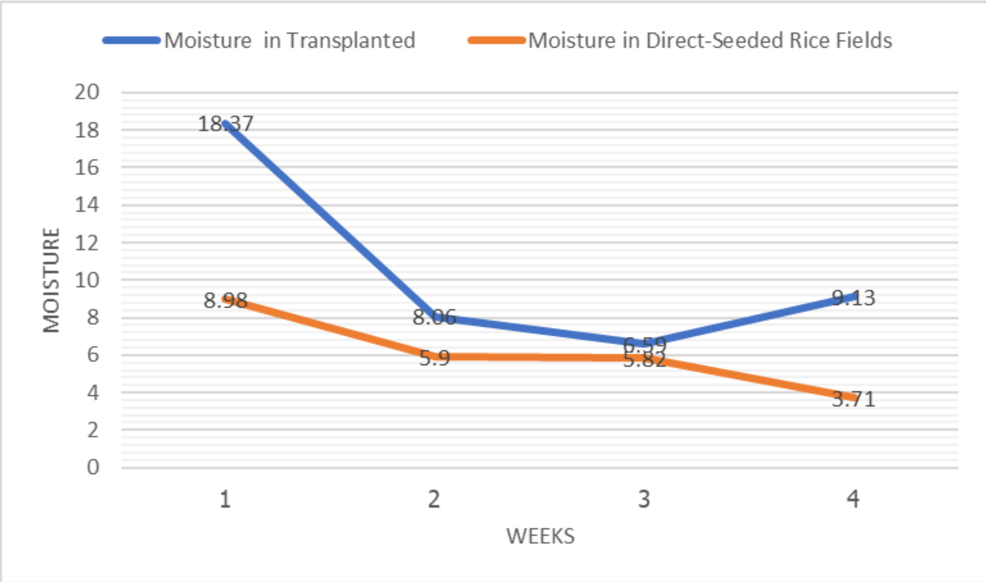
- Soil temperature measurement

2. Analyze the data to find the relationship between the Transplanted and Direct-Seeded Rice Fields.

3. Compare the temperature data of the Transplanted and Direct-Seeded Rice Fields.

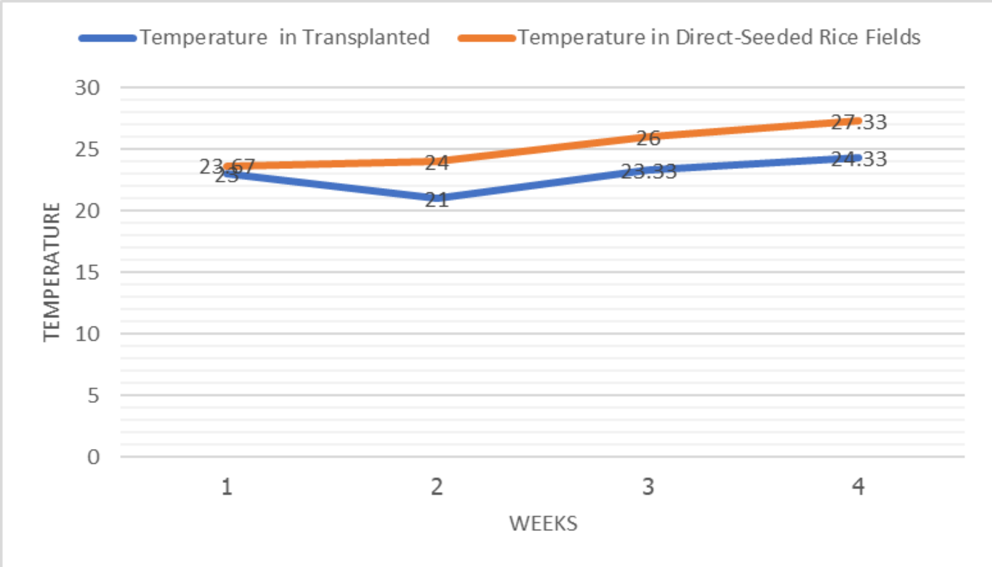
Results

4.1 Part 1 Determine study points and collect soil data at 3 points in in transplanted and 3 points in a broadcast rice field. Design and collect samples randomly to gather soil samples. Show the area of the transplanted rice field compared to the broadcast rice field.The soil moisture data indicate that moisture levels vary between different types of rice fields, particularly between transplanted rice fields (paddy fields) and broadcast-seeded rice fields. Therefore, an analysis and comparison are conducted based on the graph below.



In the first week, the graph indicates that the moisture content in transplanted rice fields reached its peak at 18.37%, whereas the moisture content in broadcast rice fields was 8.98%, which is significantly lower. This demonstrates that transplanted rice fields retain more water during the initial stage. In the second week, the moisture content in transplanted rice fields dropped sharply to 8.06%, while that in broadcast rice fields also decreased to 5.9%, indicating water loss in the soil for both systems. By the third week, the moisture content in transplanted rice fields continued to decline to 6.59%, whereas that in broadcast rice fields was 5.82%, showing similar moisture levels. In the fourth week, the moisture content in transplanted rice fields increased to 9.13%, while that in broadcast rice fields decreased to 3.71%, the lowest recorded value throughout the study.

4.2 Part 2 Determine study points and collect soil data at 3 points in in transplanted and 3 points in a broadcast rice field. Design and collect data, showing the areas by Transplanted and Direct-Seeded Rice Fields.The soil temperature measurements indicate that the temperature varies between different types of rice fields, particularly between transplanted rice fields and broadcast-seeded rice fields. Therefore, an analysis and comparison are conducted based on the graph below.



In the first week, the temperature of the transplanted rice field was 23.67°C, which was lower than that of the direct-seeded rice field, recorded at 25°C. In the second week, the temperature of the transplanted rice field decreased to 21°C, while the temperature of the direct-seeded rice field increased to 24°C. This indicates that, during the initial stage of cultivation, the transplanted rice field exhibited lower temperatures than the direct-seeded rice field. This may be due to the high soil moisture content and standing water, which help reduce soil temperature.By the third week, the temperature of the transplanted rice field increased to 23.33°C, while the direct-seeded rice field maintained a higher temperature of 26°C. In the fourth week, the temperature of the transplanted rice field slightly increased to 24.33°C, whereas the temperature of the direct-seeded rice field rose to 27.33°C, remaining consistently higher than that of the transplanted rice field.

Summary and Discussion

This study compared soil water drainage and temperature between transplanted rice fields and direct-seeded rice fields to assess their effects on soil moisture retention and temperature regulation. The results indicate that transplanted rice fields retain moisture more effectively than direct-seeded rice fields, particularly during the later stages of rice growth. In the first week, the soil moisture content in transplanted rice fields was 18.37%, significantly higher than the 8.98% observed in direct-seeded rice fields. Although the moisture content in transplanted fields decreased initially, they consistently maintained higher moisture levels than direct-seeded fields throughout the study period. By the fourth week, soil moisture in transplanted fields increased to 9.13%, while that in direct-seeded fields decreased to a minimum of 3.71%. This finding suggests that transplanted rice fields provide better long-term moisture retention due to differences in soil structure and water management.

Regarding soil temperature, direct-seeded rice fields consistently exhibited higher temperatures than transplanted fields throughout the four-week study period. In the first week, the soil temperature in transplanted fields was 23.67°C, whereas in direct-seeded fields, it was 25°C. The temperature difference continued to increase over time, reaching 27.33°C in direct-seeded fields and 24.33°C in transplanted fields by the fourth week. These results indicate that water retention in transplanted fields helps lower soil temperature during the early growth stages. However, this effect diminishes over time due to water loss, leading to greater temperature fluctuations in transplanted fields. In contrast, the soil temperature in direct-seeded fields continued to rise steadily, likely due to lower moisture levels and increased heat absorption

Discuss the results of the experiment

The findings of this study suggest that the transplanted rice cultivation method offers advantages in terms of soil moisture retention and temperature regulation compared to the direct-seeding method. The superior water retention capacity of transplanted rice fields may help mitigate drought risks and support better plant growth. Additionally, the lower soil temperature in transplanted fields during the early growth stages may create a more favorable environment for root development. However, the higher soil temperature in direct-seeded fields may lead to increased evaporation rates, potentially raising the demand for irrigation.These results can be applied to strategic water management planning in rice cultivation, enabling farmers to select cultivation methods that best suit their environmental conditions. Implementing efficient irrigation techniques and soil conservation measures can enhance water use efficiency, improve rice yields, and promote sustainable agriculture. Furthermore, future research should investigate the long-term effects of different rice cultivation methods on soil quality, nutrient retention, and overall productivity to support the sustainable development of rice farming in Thailand

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