A Study of Soil Quality in Abandoned Paddy Fields

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THE GLOBE PROGRAM
Global Learning and Observations to Benefit the Environment

Abstract

- This study investigated the soil quality of abandoned rice fields in Yan Ta Khao District, Trang Province, Thailand. The objectives of the research were to examine soil structure, soil pH, soil moisture, and light intensity in order to evaluate the potential for future agricultural reuse. The research questions focused on identifying the physical and environmental characteristics of soil in long-abandoned rice fields. Soil samples were collected from selected sites, and data were obtained using a pH meter and multipurpose measuring devices. The results indicated that the soil had a granular structure and a neutral pH value of 7, which is suitable for plant growth. The average soil moisture was 93 percent, while the average light intensity was 983.33 lux, indicating high light availability. These findings suggest that the abandoned rice fields have generally favorable soil conditions; however, improvements in soil moisture management are recommended before agricultural utilization. In conclusion, with appropriate soil improvement, abandoned rice fields in this area can be restored and reused effectively for agricultural purposes.
- Keywords: soil quality, abandoned rice fields, soil pH, soil moisture, light intensity

Research Question

What is the soil structure in abandoned rice fields?
- What is the soil pH in abandoned rice fields?
- What is the soil moisture level in abandoned rice fields?
- What is the light intensity in abandoned rice fields?

Introduction

Content Knowledge

Rice fields play a vital role in Thailand's environment, economy, and society. They are not only a primary source of food but also support rural livelihoods, local ecosystems, and traditional ways of life. In recent years, however, many rice fields have been abandoned due to economic challenges, labor shortages, and changing agricultural practices. As a result, abandoned rice fields have become an increasing environmental and societal concern, particularly in rural communities. Without proper management, these areas may experience soil degradation, weed invasion, and changes in soil properties that reduce their potential for future agricultural use.

Soil quality is a key factor influencing the sustainability and productivity of agricultural land. Important soil characteristics include soil structure, soil pH, soil moisture, and light intensity, all of which directly affect plant growth and nutrient availability. Soil structure influences water infiltration and root development, while soil pH controls nutrient solubility and microbial activity. Soil moisture is essential for plant survival, and light intensity affects photosynthesis and crop productivity. According to basic soil science principles and GLOBE environmental monitoring protocols, measuring these factors provides reliable indicators of land suitability for agriculture and ecosystem health.

Previous studies have shown that abandoned agricultural land often undergoes changes in physical and chemical soil properties over time. Kamrara, Tekas, and Ishikawa (2012) explained that soil conditions in paddy fields are strongly influenced by water management and microbial processes, which can change significantly when cultivation stops. Other studies have reported that abandoned rice fields may retain suitable pH levels but suffer from imbalanced soil moisture and reduced soil management, limiting their reuse potential (Montop Gratcharoen, 2005). Additionally, Kaewkan (1995) emphasized that changes in agricultural practices can impact both soil quality and local communities.

Despite existing research, many investigations focus mainly on active rice fields or economic aspects of agriculture, while fewer studies examine the environmental characteristics of abandoned rice fields at the local community level. This research addresses this gap by studying soil structure, soil pH, soil moisture, and light intensity in abandoned rice fields in Yan Ta Khao District, Trang Province. Understanding these factors is important for local communities and policymakers because it provides scientific information needed for land restoration and sustainable land-use planning.

In conclusion, this research is significant because it connects environmental science with real-world social issues. By applying scientific measurement methods aligned with GLOBE protocols, the study contributes to a better understanding of how abandoned rice fields can be improved and reused for future agricultural and environmental benefits.

Research Methods

Planning Investigations Describes the planning process

This research was carefully planned to investigate soil quality in abandoned rice fields using systematic scientific methods. The planning process began with defining the research questions and identifying key environmental variables related to soil quality, including soil structure, soil pH, soil moisture, and light intensity. These variables were selected based on their importance to plant growth and land restoration. The study design followed basic environmental science principles and aligned with relevant GLOBE (Global Learning and Observation to Benefit the Environment) protocols to ensure reliable and comparable data collection.

Study Site Description

The study was conducted in abandoned rice fields located in Yan Ta Khao District, Trang Province, southern Thailand (latitude 7.395931, longitude 99.662005). The study area consists of former agricultural land that has not been cultivated for an extended period. The region has a tropical monsoon climate, characterized by high temperatures, high humidity, and seasonal rainfall, which strongly influence soil moisture and vegetation growth. Land cover in the study area is primarily grass, weeds, and scattered shrubs, with no active farming activities. A map of the study site was prepared to show the location, boundaries, and sampling points within the abandoned rice fields.

GLOBE Protocols and NASA Assets

This investigation applied relevant GLOBE protocols, particularly those related to soil characterization and environmental measurements. Soil structure was identified using standard soil texture charts, while soil pH and soil moisture were measured using calibrated field instruments following GLOBE guidelines. Light intensity measurements were conducted to support environmental analysis related to plant growth. Although no direct NASA satellite data were analyzed, the study was conceptually connected to NASA Earth observation goals by contributing ground-based environmental data that support understanding of land use and ecosystem conditions.

Data Collection Organization and Instruments

Before data collection, all tools and equipment were prepared and checked for accuracy. Instruments included a pH meter, a multipurpose measuring device for soil moisture and light intensity, and soil charts for soil structure classification. Instrument calibration was conducted according to manufacturer instructions to ensure measurement reliability. Data recording sheets were prepared in advance to organize observations and measurements systematically.

Data Collection Strategy

Data were collected at selected sampling points within the study area to represent overall soil conditions. Measurements were taken during consistent times of the day, primarily in the morning, to reduce the effects of temperature and light variation. Soil samples and environmental measurements were collected once during the study period, with multiple readings taken at each location to improve accuracy. The timing and location of sample collection were carefully planned to ensure that data were scientifically workable and appropriate to the scope of this research.

Carrying Out Investigations

The investigation was conducted in abandoned rice fields located in Yan Ta Khao District, Trang Province. Following the completion of the planning stage, the research team carried out fieldwork at the study site to collect environmental data. All data collection activities were performed under appropriate weather conditions to ensure accuracy and consistency of the measurements.

The study was conducted in accordance with relevant GLOBE protocols related to soil and environmental observations. Soil characterization protocols were applied to observe and classify soil structure. Soil pH and soil moisture were measured using handheld field instruments following standard GLOBE measurement procedures. Light intensity was measured to assess environmental conditions influencing plant growth. Although NASA satellite imagery was not directly analyzed, the data collected served as ground-based observations that support NASA Earth science objectives by contributing local soil environmental information.

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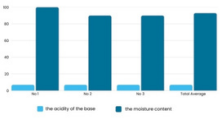
This research was conducted in a deserted rice field in Yan Ta Khao Subdistrict, Yan Ta Khao District, Trang Province, located at latitude 7.395931 degrees North, longitude 99.662005.

Results

Analyzing Data

The soil in the abandoned rice fields had a granular structure. The soil pH was 7, indicating neutral soil conditions suitable for plant growth. The average soil moisture was 93 percent, which was relatively low. The average light intensity was 983.33 lux, which was considered high. Overall, the area has potential for agricultural use; however, soil moisture improvement is recommended before utilization.



Plan 1 shows the acidity of the base and the moisture content of the soil in the abandoned fields.

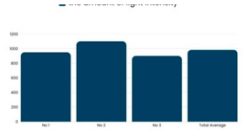


Chart 2 shows the amount of light intensity in an abandoned field.

GLOBE Badges

Be a Collaborator

This research was conducted through effective collaboration among team members from the same school. Each student was assigned a clearly defined role to ensure efficient data collection and analysis. One student was responsible for measuring soil pH and soil moisture, another measured light intensity, and another observed soil structure and recorded all data. These roles supported one another by ensuring that all environmental variables were measured at the same locations and times. Collaboration allowed the team to collect accurate data more efficiently and reduce individual error. Working together also enabled students to discuss observations, compare measurements, and improve the reliability of the results.

Be a Data Scientist

Students analysed their own field data, including soil pH, soil moisture, light intensity, and soil structure observations. The data were averaged and interpreted to evaluate the suitability of abandoned rice fields for agricultural reuse. Limitations of the data were considered, such as the small number of sampling locations and the single sampling period, which may not reflect seasonal variations. Students used the data to make inferences about future land use and recommended soil moisture improvement before reuse. Additional data from previous studies and published research were used to compare findings and strengthen interpretations. This analysis helped answer the research questions and supported evidence-based conclusions.

Be an Engineer

The research identified an engineering problem related to soil moisture management in abandoned rice fields. Based on student-generated data, the team explored possible engineering solutions, such as improving drainage systems, adding organic matter, or redesigning water retention structures to optimise soil moisture levels. These solutions were evaluated for their potential effectiveness and environmental impact. Applying engineering principles to real-world land management problems demonstrates how scientific data can be used to design practical and sustainable solutions that benefit both agriculture and the environment.

Make an Impact

This research was inspired by a local environmental issue: the increasing number of abandoned rice fields in the community. The findings provide valuable scientific information that can support local decision-making and land restoration planning. By identifying soil conditions and limitations, the study offers recommendations for improving soil quality before reuse. These results can help farmers, schools, and local authorities make informed decisions, contributing to sustainable land use and food security. The research also connects local issues to global challenges related to land degradation and sustainable agriculture.

Be a STEM Professional

The research was conducted with guidance from a STEM professional, including a teacher advisor with expertise in environmental science. This collaboration improved research design, ensured proper use of scientific instruments, and increased the precision of data collection. Professional guidance also supported more accurate data analysis and interpretation, helping students apply scientific standards and think critically about their results.

Be a STEM Storyteller

Students shared the story of their research through presentations and written reports that explained the research process, findings, and real-world significance. Visual materials such as photographs of the study site, data tables, and charts were used to communicate results clearly. By sharing their research with classmates and the school community, students increased awareness of environmental issues related to abandoned rice fields and demonstrated how scientific research can be used to understand and improve local environments.

Discussion

Interpreting Data

The soil properties in abandoned rice fields reflect environmental conditions. The soil pH was neutral at 7, the average soil moisture was 93 percent, and the light intensity was high at 983.33 lux. These factors significantly affect soil quality. The results support the concept that soil properties influence agricultural land use. With appropriate soil improvement, abandoned rice fields can be restored and reused effectively

Conclusions

The soil properties in abandoned rice fields reflect environmental conditions. The soil pH was neutral at 7, the average soil moisture was 93 percent, and the light intensity was high at 983.33 lux. These factors significantly affect soil quality. The results support the concept that soil properties influence agricultural land use. With appropriate soil improvement, abandoned rice fields can be restored and reused effectively.

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