Research name: Study on Soil Quality in an Oil Palm Plantation in Areas with Accumulated Palm Leaves and Palm Fronds, Thung Khai Subdistrict, Yantakhao District, Trang Province

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Abstract

The purpose of this study is to study the quality of soil with palm leaf and palm frond deposition, Thung Khai Subdistrict, Yan Ta Khao District, Trang Province, by using soil samples to analyze the mean to find fertility, soil structure, soil temperature, humidity, acidity-base (pH), nitrogen (N), phosphorus (P), potassium (K) content.

The results of the soil quality study found that the soil texture (surface) of the soil structure in all 3 points has loose adhesion. The structure is sandy soil mixed with loam. Results of the soil study (depth 15 cm.)

The soil structure under the palm frond has an average of being loose and sandy. There is a loose adhesion. The soil structure in the area 30 cm. from under the palm frond has an average of sandy powder, and the soil structure in the area 60 cm. from under the palm trees.

Results of the study of soil temperature (surface)

The soil temperature in the area under the palm frond averaged 22.1 the soil temperature 30 cm. from under the palm frond has an average of 22.93 and a soil temperature of 60 cm. from under the palm frond has an average of 23.33

Results of the soil temperature study (15 cm. deep) Soil temperatures in the area below the palm frond averaged 21.67 the soil temperature 30 cm. from under the palm frond has an average of 21.67 and a soil temperature of 60 cm. from under the palm frond has an average of 23.33

Results of the study of soil moisture (surface) The soil moisture value under the palm frond has an average of 1.33 the soil moisture value in the area 30 cm. from under the palm frond has an average of 0.33 and a soil moisture value of 60 cm. from under the palm frond has an average of 0

Results of the study of soil moisture value (depth 15 cm.) The soil moisture value under the palm frond has an average of 2.17 the soil moisture value in the area 30 cm. from under the palm frond has an average of 1.67 and a soil moisture value of 60. cm from under the palm frond has an average of 1.17

(surface) N,P,K Soil in the area under the palm frond has an average of 4. N,P,K soil in the area 30 cm. from under the palm frond has an average of 0.89 and a value of N,P,K soil at a distance of 60 cm. from under the palm frond has a mean value of 0.22

Results of the study of soil N,P,K values (15 cm. deep) The N,P,K values of the soil under the palm frond had an average of 0.67 soil in the area 30 cm. from under the palm frond has an average of 0.67 and a value of N,P,K soil at a distance of 60 cm. from under the palm frond has an average of 1.11

Keywords: Soil quality, soil with palm frond accumulation, soil without palm frond accumulation.

Introduction

The palm plantation is located in Moo 9, Thung Khae Subdistrict, Yan Ta Khao District, Trang Province. Currently, the weather in Thailand is becoming increasingly hot, dry, and stifling, posing a significant challenge to agriculture across all regions. As all types of plants require water and nutrients to thrive, many new-generation farmers are turning to methods that maintain soil moisture to prevent the soil from drying out. One popular approach is soil mulching, which involves using agricultural waste materials such as grass, straw, leaves, coconut fronds, or palm fronds to keep the soil moist for an extended period until they decompose into organic matter.

From February to April each year, oil palm farmers in many areas face prolonged dry spells during the dry season, lasting more than three months. Oil palms exposed to prolonged drought can suffer damage, including a decrease in female flower clusters and an increase in male flowers, or the development of flower clusters that are already affected by drought, leading to sterility and reduced yield. To ensure the palms remain healthy and are minimally affected by the drought, it is essential to implement methods that support their growth during these challenging conditions.When palm fronds are cut, they are placed in rows between the palm trees, serving as ground cover. This practice influences the soil quality in the surrounding area.

Therefore, the researcher has proposed studying soil quality in areas covered by palm fronds in a palm plantation located in Thung Khae Subdistrict, Yan Ta Khao District, Trang Province. The study will inspect the physical characteristics of the soil, including the levels of nitrogen (N), phosphorus (P), and potassium (K), soil acidity-alkalinity, pH value, soil moisture, and soil structure. This data will provide valuable insights into the soil quality of the palm plantation, which can ultimately benefit palm farming practices.

Research ฎQuestion: Does the accumulation of palm fronds affect soil quality?
Research Hypothesis : The accumulation of palm fronds affects soil quality.
Independent Variable: Soil in areas with accumulated palm fronds and areas without accumulation.
Dependent Variables: Soil quality in the oil palm plantation, including,
Nutrient content, Soil moisture, Soil temperature and pH level
Controlled Variables: Sampling period (time frame for soil collection) Soil sample quantity

Materials and Equipment

1. Beaker
2. Chemical balance
3. Measuring spoon
4. Field guide for soil texture classification by hand feel method
5. Soil thermometer
6. Soil moisture and pH meter
7. Measuring tape
8. Soil fertility test kit
9. Tissue paper
10. Soil aggregation comparison chart
11. NPK soil test meter

Research Methodolog

Part 1: Defining the Study Area

Designate study points in the palm garden area, Thung Khai Subdistrict, Yan Ta Khao District, Trang Province.
Coordinates are 7.483109°N, 99.645900°E.







Part 2: To study soil sample collection in order to study soil quality

1. Check the soil structure By collecting soil samples as desired and examining them with a soil structure sample diagram, recording the results
2. Measure the temperature of the soil. By using a soil thermometer Embroidered to the surface of the soil and depth 15 cm. Read the values and save the results
3. Measure soil moisture by using a soil moisture meter. Embroidered to the soil surface and depth 15 cm. Read the values and save the results
4. Measure acidity-base (pH) using a pH meter in the soil. Embroidered on the soil area to be tested. Read the values and record the results
5. Measure the N,P and K elements of the soil by taking the NPK detectors and placing them in the collected soil sample and reading the values and recording the results

Table 1: Soil Texture (Surface Soil)

Soil texture (surface)				
Soil collection point	1	2	3	Average value
Under the palm	Sand mixed with water	Sandblasted	Sand mixed with water	Sand mixed with water
Tail 30 cm	Sand mixed with water	Sand mixed with water	Sand mixed with water	Sand mixed with water
Tail 60 cm	Sand mixed with water	Sand mixed with water	Sand mixed with water	Sand mixed with water

Results of the study of soil texture (surface)
All 3 land structures are reclaimed. The structure is sandy and mixed with loose soil

Table 2 shows the soil structure (15 cm deep)

Soil texture (15 cm)				
Soil collection point	1	2	3	Average value
Under the palm	Gummy and sandy	Gummy and sandy	Gummy and sandy	Gummy and sandy
Tail 30 cm	Sand mixed with water	Sand mixed with water	Gummy and sandy	Sand mixed with water
Tail 60 cm	Sand soil	Sand mixed with water	Sand mixed with water	Sand mixed with water

Soil Composition Study Results (15 cm. Depth)
The soil structure beneath the palm path has an average composition of loamy clay mixed with sand, with a crumbly texture. The soil structure in the area 30 cm away from the palm path has an average composition of sandy loam. In the area 60 cm away from the palm path, the soil structure continues to change, with a mix of sandy loam and sandy soil.

Table 3 shows soil temperature values (surface)

Soil temperature (soil surface)					
Soil collection point	1	2	3	Average value	SD
Under the palm	22	22.3	22	22.1	0.17321
Tail 30 cm	23	23	22.8	22.93	0.11547
Tail 60 cm	23	24	23	23.33	0.57735

Results of the study of soil temperature (surface)
The soil temperature under the palm has an average value of 22.1 The soil temperature from under the palm is 30 cm. It has an average value of 22.93 and a soil temperature from under the palm of 60 cm. It has an average value of 23.33

Table 4 shows soil temperature values (15 cm deep)

Soil temperature (15 cm deep)					
Soil collection point	1	2	3	Average value	SD
Under the palm	22	22	21	21.67	0.57735
Tail 30 cm	21	22	22	21.67	0.57735
Tail 60 cm	24	23	23	23.33	0.57735

Results of the soil temperature study (15 cm deep)
The soil temperature under the palm has an average value of 21.67 The soil temperature from under the palm is 30 cm. It has an average value of 21.67 and a soil temperature from under the palm of 60 cm. It has an average value of 23.33

Table 5 shows the soil moisture value (surface)

Moisture value (surface)					
Soil collection point	1	2	3	Average value	SD
Under the palm	1	1	2	1.33	0.57735
Tail 30 cm	0	0	1	0.33	0.57735
Tail 60 cm	0	0	0	0	0

Results of the study of soil moisture (surface)
The soil moisture value under the palm has an average value of 1.33 The soil moisture value under the palm is 30 cm. It has an average value of 0.33 and a soil moisture value in the area from under the palm of 60 cm. Has an average value of 0

Table 6 shows soil moisture values (15 cm deep)

Moisture value (15 cm deep)					
Soil collection point	1	2	3	Average value	SD
Under the palm	2	1.5	3	2.17	0.76376
Tail 30 cm	1.5	2	1.5	1.67	0.28868
Tail 60 cm	1	1.5	1	1.17	0.28868

Results of the soil moisture study (depth 15 cm)

The soil moisture value under the palm has an average value of 2.17 The soil moisture value under the palm is 30 cm. There is an average value of 1.67 and the soil moisture value in the area from under the palm is 60 cm. It has an average value of 1.17

Table 7 shows the acid base (pH) values

pH value					
Soil collection point	1	2	3	Average value	SD
Under the palm	7.6	7.5	7.3	7.46	0.15275
Tail 30 cm	7.6	7.4	7.3	7.43	0.15275
Tail 60 cm	7.5	7.4	7.2	7.36	0.15275

Results of acid-base (pH) studies (15 cm deep)

Acid-base (pH) The soil under the palm has an average value of 0.12 Acid-base (pH) Soil under the palm 30 cm. It has an average value of 0.12 and a base acidity (pH) The soil in the tail area from under the palm is 60 cm. Average value 0.12

Table 8 shows N,P,K (surface) values

N,P,K (surface)											
Soil collection point	N			P			K			Average	SD
	Point			Point			Point				
	1	2	3	1	2	3	1	2	3		
Under the palm	1	2	3	0	3	5	2	7	13	4	3.96863
Tail 30 cm	0	0	1	0	0	1	0	1	5	0.89	1.61589
Tail 60 cm	0	0	0	0	0	0	0	0	2	0.22	0.66667

Results of the study of N,P,K soil (surface)

N,P,K The soil in the area under the palm has an average value of 4 N,P,K. The soil in the area under the palm is 30 cm. It has an average value of 0.89 and a value of N,P,K soil in the tail area from under the roof of the pipe of 60 cm. It has a value of 0.22

Table 9 shows the values N, P, K (15 cm deep)

N,P,K value (15cm depth)											
Soil collection point	N			P			K			Average	SD
	Point			Point			Point				
	1	2	3	1	2	3	1	2	3		
Under the palm	1	0	0	1	0	0	2	1	1	0.67	0.70711
Tail 30 cm	1	0	0	1	0	0	2	1	1	0.67	0.70711
Tail 60 cm	2	1	0	0	0	0	4	2	1	1.11	1.36423

Results of the study of N,P,K soil (15 cm deep)

N,P,K The soil under the palm has an average value of 0.67 N,P,K. The soil around the tail from under the palm is 30 cm. It has an average value of 0.67 and a value of N,P,K soil in the tail area from under the roof of the pipe of 60 cm. It has a value of 1.11

Summary and discussion of research results

The results of the soil quality study are within normal ranges as follows.

Study results on soil texture (surface soil) at three points showed a loose structure, classified as sandy loam. Study results on soil texture (15 cm deep) indicated that the soil structure under the palm fronds had an average classification of clayey loam mixed with sand, with a loose structure. The soil structure 30 cm away from the palm fronds had an average classification of sandy loam, and the soil structure 60 cm away from the palm fronds had an average classification of sandy loam. Study results on soil temperature (surface soil) showed that the soil temperature under the palm fronds had an average of 22.1℃, the soil temperature 30 cm away from the palm fronds had an average of 22.93℃, and the soil temperature 60 cm away from the palm fronds had an average of 23.33℃. Study results on soil temperature (15 cm deep) showed that the soil temperature under the palm fronds had an average of 21.67℃, the soil temperature 30 cm away from the palm fronds had an average of 21.67℃, and the soil temperature 60 cm away from the palm fronds had an average of 23.33℃. Study results on soil moisture (surface soil) showed that the soil moisture under the palm fronds had an average of 1.33, the soil moisture 30 cm away from the palm fronds had an average of 0.33, and the soil moisture 60 cm away from the palm fronds had an average of 0.

The study results on soil moisture (at a depth of 15 cm) show that the average soil moisture under the palm fronds is 2.17. The average soil moisture 30 cm away from the palm fronds is 1.67, and the average soil moisture 60 cm away from the palm fronds is 1.17.

Results of the study on soil N, P, K values (surface soil) showed that the average N, P, K values of the soil under the palm fronds are 4. The N, P, K values of the soil located 30 cm away from the palm fronds have an average of 0.89, and the N, P, K values of the soil located 60 cm away from the palm fronds have an average of 0.22.

The study results of N, P, K soil values (at a depth of 15 cm) show that the average N, P, K values of the soil under the palm fronds are 0.67. The N, P, K values of the soil 30 cm away from the palm fronds have an average of 0.67, and the N, P, K values of the soil 60 cm away from the palm fronds have an average of 1.11 and the soil quality at different distances from the accumulation of palm fronds varies, with areas where palm fronds accumulate having better soil quality.

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Reference documents

- Sources of information on soil quality studies

Department of Land Development (2007) Final Research Report: The Effect of Ground Cover on the Chemical and Physical Properties of Soil in Oil Palm Plantations

Searched from : https://e-library.ldd.go.th/library/Research/Fulltext/bib10504.pdf

Appendix