



Study and Analysis of the Correlation
between Soil Properties and the Quality
of Red Sago Palm Starch
(Metroxylon sagu)
in Na Yong District, Trang Province,
Thailand



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Introduction

The Red Sago Palm (*Metroxylon sagu*) is a significant indigenous plant, deeply rooted in both the cultural heritage and the ecological landscape of Na Yong District, Trang Province. The physical environment of sago forests—characterized by wetlands and peatlands—combined with a tropical monsoon climate and consistent rainfall, both of which are critical for shows that the production demands of local farmers.

Therefore the research team, focuses on the study and analysis of the physical and chemical characteristics of the soil, including soil temperature, macronutrient content (Nitrogen, Phosphorus, and Potassium), and soil pH levels, conducted between October and January.

This study aims to analyze the relationship between soil property factors and the quality of sago starch. It is hypothesized that optimal macronutrient levels and appropriate pH values within the watershed areas are directly linked to the quality and efficiency of starch accumulation within the trunk of the Red Sago Palm.





Research Question

"How do the soil properties in the Sago forest areas of Nayong District, Trang Province, correlate with and impact the quality of Sagu starch?"



Research Hypothesis

Optimal concentrations of primary soil macronutrients (Nitrogen, Phosphorus, and Potassium) and soil pH levels within the watershed ecosystem are directly correlated with the starch accumulation mechanisms and quality within the trunk of the Red Sagu Palm (*Metroxylon sagu*).





Research Materials and Equipment

1. Beakers
2. Thermometer
3. Richmoto analog soil meter
4. HANNA Soil Test Kit (for pH and NPK analysis)
5. Test tubes
6. Glass stirring rods
7. Measuring cylinder (100 mL)
8. No. 40 sieve (0.425 mm mesh size)
9. High-precision digital balance



Research Methodology

Study Site Selection

This research was conducted in the Sagu forest of Ban Sai Khan, Nayong District, Trang Province, situated at coordinates 7.4912881° N latitude and 99.71247061° E longitude. The geographical characteristics of the study area are defined as wetlands or peat swamp forests.

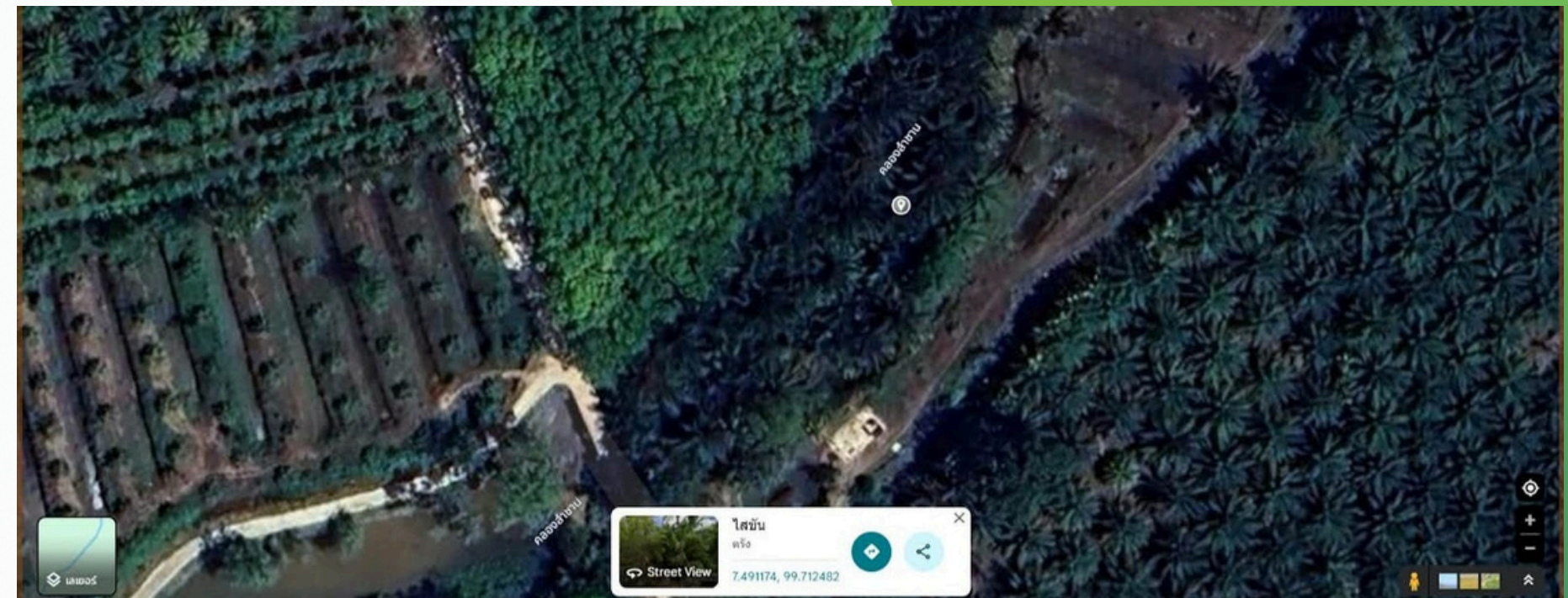
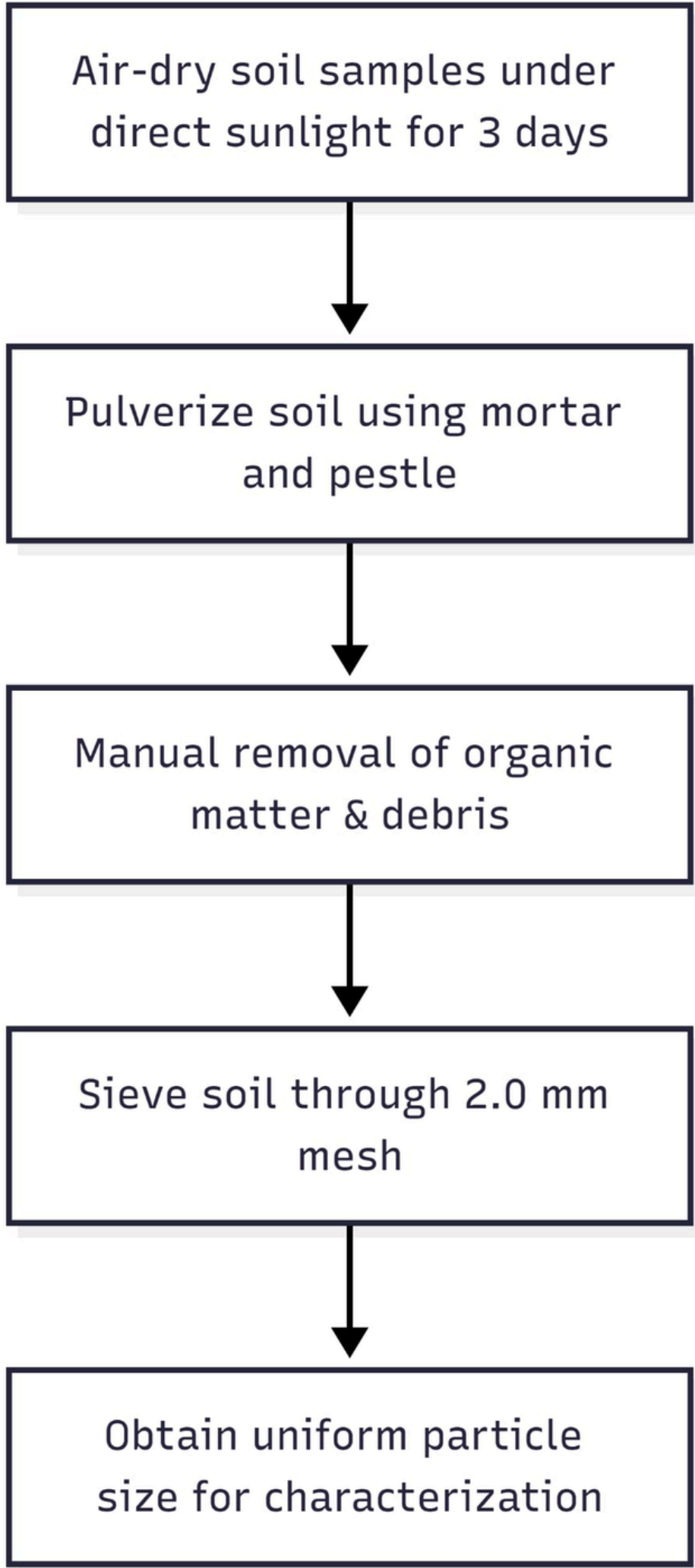
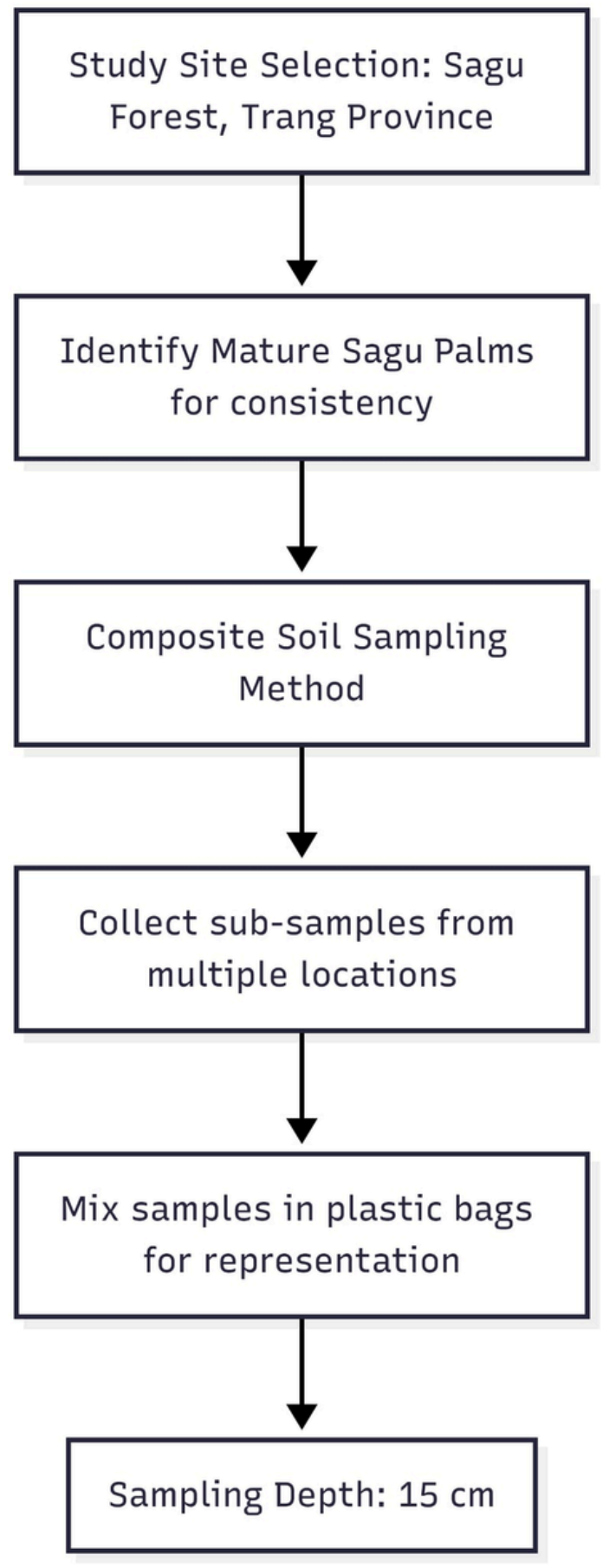


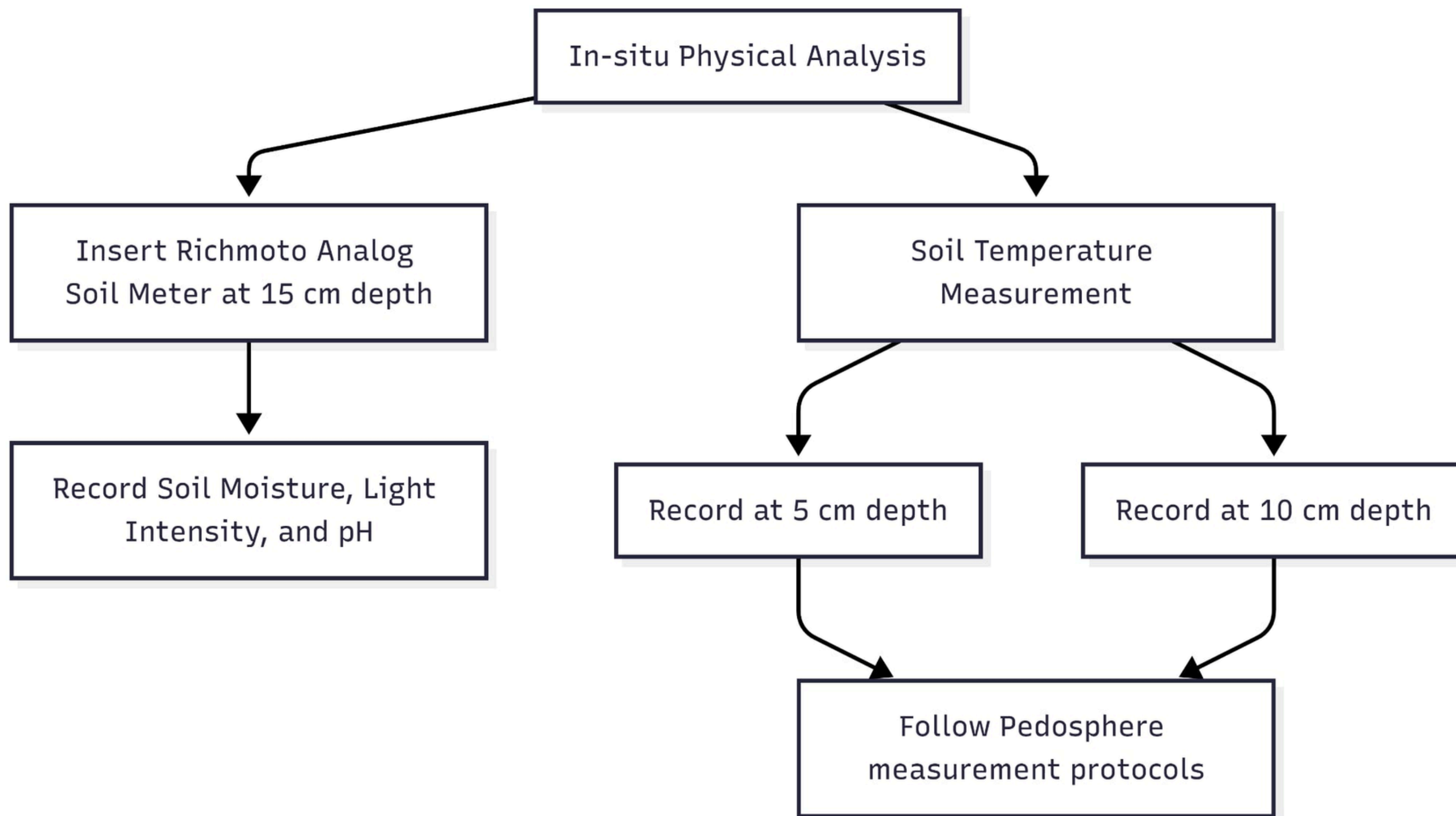
Figure 1: Geographical location of the study site within the Sagu palm forest, Lamo Sub-district, Nayong District, Trang Province (Source: Google Maps).

Soil Sampling and Preparation



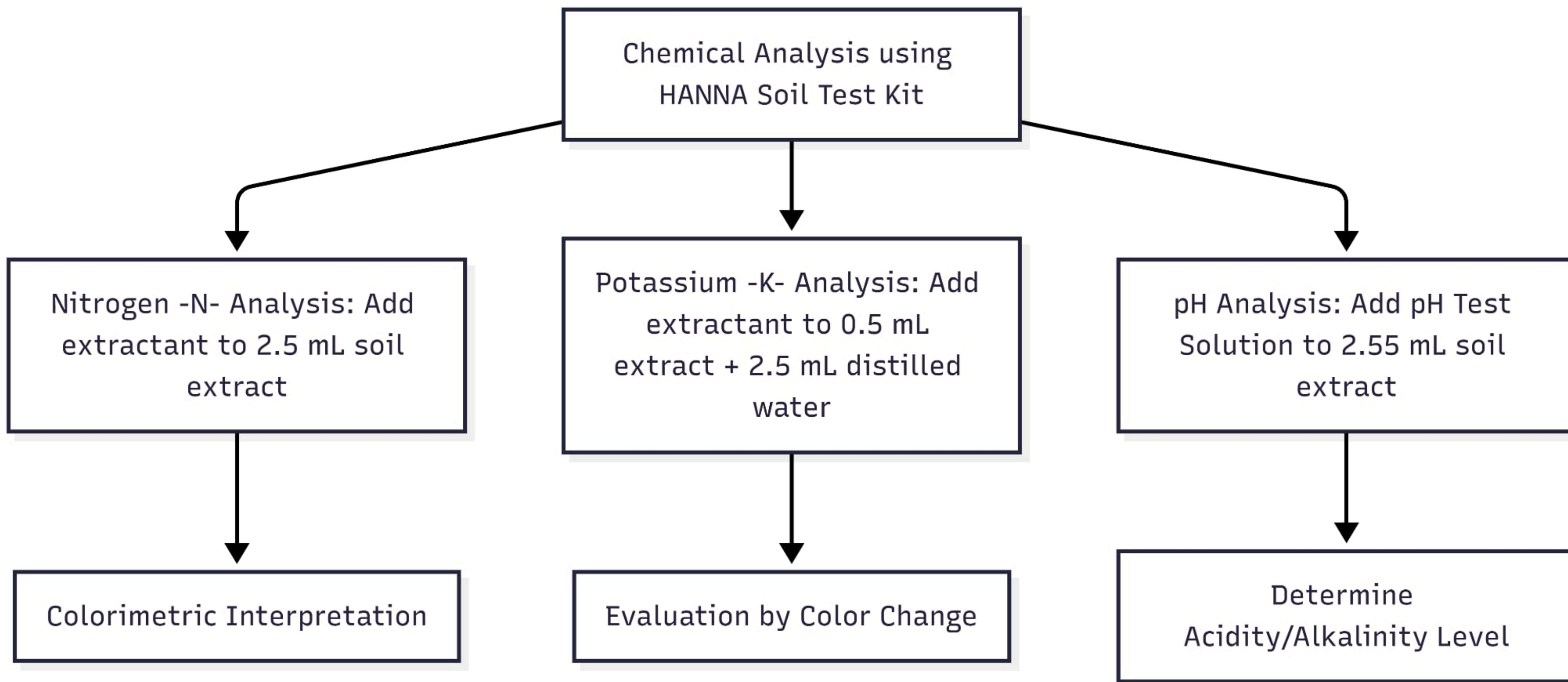


Soil Physical Property Analysis





Soil Chemical Property Analysis





Analysis of Soil Physical Properties

Table 1 : Analysis of Physical Characteristics of Soil in Sago Palm Forests, Na Yong District, Trang Province (October – January)

Date of Observation	Soil Moisture (level)	Light Intensity (LM)	Temperature (°C)	pH (1-14)
October 20, 2025	10	200	31	8
November 10, 2025	10	300	30	8
December 5, 2025	10	450	30	8
January 20, 2026	7	100	31	8



Chemical Property Analysis

According to the chemical property analysis of the soil in Sago palm forests from October to January, conducted in Na Yong District, Trang Province

Table 2 : Chemical Properties of Soil in Sago Palm Forests, Na Yong District, Trang Province, Analyzed Using Hanna Soil Test Kits for pH and NPK Levels.

Sampling Date	Soil-to-Water Ratio	Nitrogen (N) Content	Phosphorus (P) Content	Potassium (K) Content	pH (1-14)
October 20, 2025	1:2	Trace	Medium	Low	9
November 10, 2025	1:2	Trace	Medium	Low	9
December 5, 2025	1:2	Trace	Medium	Low	9
January 20, 2026	1:2	Trace	Low	Low	9



Analysis of Starch Quality

Based on the quality analysis of sago starch samples collected from Na Yong District, Trang Province

Table 3 : Analysis of Physical Dimensions and Starch Yield of Sago Palms (*Metroxylon sagu*) Derived from Randomly Sampled Trunks (n=3) Following the Removal of External Bark.

Segment No.	Diameter (cm)	Height (cm)	Pre-extraction Mass (kg)	Extracted Starch Mass (kg)	Starch Yield (%)
1	45	65	81.00	14.18	17.50
2	36	80	87.22	17.44	20.01
3	42	65	90.00	16.69	18.52



table 4 : Physical properties and characteristics of Sago starch.

Segment No.	Color	Moisture Characteristics	Texture / Form
1	Brown	Dry appearance	Fine powder
2	Brown	Dry appearance	Fine powder
3	Brown	Dry appearance	Fine powder



Conclusion

1. Effects of Soil Physical and chemical Properties on Plant Growth

- **Soil Properties:** The soil in the study area is characterized as **alkaline**, with pH levels ranging from **8.0 to 9.0**. Environmental conditions remained relatively stable, with temperatures between **30–31°C** and moisture levels at **7–10%**. Regarding nutrient content, primary macronutrients (**N-P-K**) were generally low; notably, Nitrogen was found only in **trace** amounts.
- **Plant Dimensions:** Despite high alkalinity and low nutrient availability, the Sago palms exhibited robust growth, with trunk diameters ranging from **36–45 cm** and heights between **65–80 cm**.

Synthesis: The findings suggest that stable soil temperature, consistent moisture, and adequate light intensity (**100–450 lm**) provided by the canopy density are key factors. These environmental conditions enable Sago palms to achieve sufficient maturity for starch accumulation despite the nutrient-limited and alkaline soil profile.



Conclusion

2. Quality and Characteristics of Sago Starch

- Physical Characteristics: The extracted and processed Sago starch presented as a fine powder with a distinct brown coloration. Post-drying analysis indicated a moisture content of 0%.
- Starch Yield and Accumulation:
 - Laboratory analysis of three random samples showed a starch yield (by mass) ranging from 17.50% to 20.01%. The data indicates a positive correlation between height and yield, as the tallest segment (80 cm) produced the highest yield.
 - Furthermore, the research identified starch accumulation levels between 28% and 35%. Segment 3 demonstrated the highest efficiency, reaching a peak accumulation of 35%.



Botanical Characteristics and Starch Physical Quality

The analysis of Sago palm trunk samples for yield quality can be summarized as follows:

Trunk Physical Dimensions: The analyzed trunk sections had diameters ranging from 36 to 45 cm and heights between 65 and 80 cm.

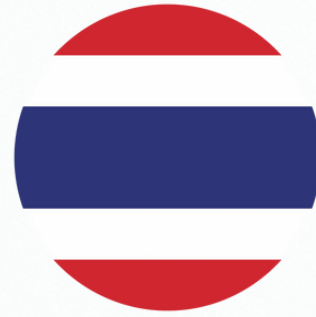
Starch Production Efficiency: Starch extraction yields ranged from 28% to 35%. The highest yield was observed in the third section, which reached a maximum starch accumulation of 35%.

Organoleptic and Physical Characteristics: The resulting Sago starch was a fine powder with a distinct brown color. The moisture content of the processed and dried starch samples was recorded at 0%.



Reference

- Flach, M. (1997). Sago palm: *Metroxylon sagu* Rottb. Promoting the conservation and use of underutilized and neglected crops. International Plant Genetic Resources Institute (IPGRI).
- Kakuda, K., & Yamaguchi, T. (2018). Nitrogen and potassium dynamics in peat soils and their effect on sago palm (*Metroxylon sagu* Rottb.) starch productivity. *Journal of Tropical Agriculture*.
- Katasila, K. (2013). Carbon sequestration in the biomass of Sago (*Metroxylon sagu* Rottb.) in peat swamp forests. *Journal of Science and Technology*.
- Pornmas, P. (2018). Influence of age and trunk position on physical and chemical properties of sago starch. *Journal of Applied Science Research*.
- Pratiwi, E., & Santoso, D. (2020). Chemical properties of peat swamp soil and its impact on the growth of indigenous palms. *Indonesian Journal of Agricultural Science*.
- Wetland Research and Development Center. (2019). Wisdom of sago starch production and local resource management in Palean and Trang basins. Department of Marine and Coastal Resources.



The submission of environmental monitoring data to the GLOBE project database

Soil Temperature

Measured Date:	2025-12-05
Organization Name:	Sawat Rattanaipimuk
Site ID:	408799
Site Name:	Sagu Forest Bann Saikhan
Country Name:	Thailand
Country Code:	THA
Latitude:	7.49389
Longitude:	99.71295
Elevation:	27m
Measured At:	2025-12-05T07:30:00
Solar Measured At:	2025-12-05T14:18:00
Depth Level:	5 cm
Soil Current Temperature:	32 °C

 [Show on Map](#)

Soil pH

Measured Date:	2025-12-05
Organization Name:	Sawat Rattanaipimuk
Site ID:	408799
Site Name:	Sagu Forest Bann Saikhan
Country Name:	Thailand
Country Code:	THA
Latitude:	7.49389
Longitude:	99.71295
Elevation:	27m
Collected On:	2025-12-05T00:00:00
pH:	8
Horizon Top Depth:	0 cm
Horizon Bottom Depth:	10 cm
Horizon Number:	1
Reference Depth Level5cm:	true
Reference Depth Level10cm:	true
Ph Method:	meter
Comments:	

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