ASSESSMENT OF ABOVEGROUND CARBON STOCK OF SAGO PALM (METROXYLON SAGU ROTTB.) UNDER NATURAL GROWTH CONDITIONS IN AREAS WITH DIFFERENT SOIL QUALITY: A CASE STUDY OF KHOK SABA AND NA KHAO SIA SUBDISTRICTS,NAYONG DISTRICT, TRANG PROVINCE, THAILAND

Authors Mr.Nattakit Rittima ,Mr.Kittikawin Deebao ,Mr.Apiwit SanKong

Advisors Miss Kanjana Kong-ied ,Mr.Noppanan Thongchit

Affiliaation SawatRattanaphimuk School, Nayong district, Trang Province

Introduction

Climate change is driven largely by rising CO_2 from human activities, making carbon storage in natural ecosystems a key mitigation strategy. Plants absorb and store carbon through photosynthesis, so carbon stock assessment is widely used to evaluate ecosystem mitigation potential. Tropical wetlands, including sago palm (Metroxylon sagu Rottb.), have high carbon sequestration capacity, but this can be affected by soil conditions and land-use change.

Introduction

This study examines the relationship between aboveground carbon storage of naturally growing sago palms and soil quality in two wetland areas to support sustainable wetland management and climate change mitigation.

Research Question

1.) Is carbon sequestration in the biomass of naturally growing sago palms related to soil quality in wetland areas?

Research Hypothesis

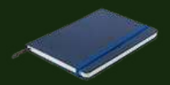
1. Differences in soil quality among the study sites result in differences in above-ground biomass carbon sequestration of sago palms.

Materials and Methods

Carbon Stock Assessment in Sago Palm

1.1 Materials

Tree circumference measuring tape



Recording equipment

Global Positioning System (GPS)

Clinometer

Measuring tape

Materials and Methods

Carbon Stock Assessment in Sago Palm

1.2 Methods

1. Study sites were established in Khok Saba and Na Khao Sia subdistricts, with 20 plots per subdistrict (5 × 20 m each).

2. Sago palms with woody trunks and heights ≥ 1.5 m were selected. Stem circumference was measured at 1.3 m above ground, and tree height was measured using a clinometer and trigonometric principles.

Materials and Methods

Carbon Stock Assessment in Sago Palm

1.2 Methods

3. Biomass and carbon stock were calculated as follows:

3.1 Aboveground biomass calculation

ABOVEGROUND BIOMASS (BAP)

$$B_{ap} = V \times B_J \times BEF$$

3.2 Carbon stock calculation

CARBON STOCK (CB)

$$C_b = B \times \%C_{organic}$$

Materials and Methods

Soil Property Analysis

2.1 Materials

Test tubes

Beakers

Glass stirring rods

Soil test kit for NPK and pH (HI3895 Quick Soil Test Kit)

Materials and Methods

Soil Property Analysis

2.2 Methods

Soil pH, nitrogen, phosphorus, and potassium were analyzed following the procedures specified in the HI3895 soil test kit manual.

Results

Carbon Stock in Sago Palm

Khok Saba subdistrict had a higher number of sago palms than Na Khao Sia. Although average tree height and stem circumference were similar, Khok Saba exhibited greater aboveground biomass and carbon stock, indicating that tree density strongly influences ecosystem carbon storage.

Parameter	Khok Saba	Na Khao Sia
Number of Sago Palms (Trees)	89	61
Average Tree Height (m)	12.47	13.70
Average Stem Circumference (m)	1.44	1.48
Total Aboveground Biomass (tons)	1024.84	799.62
Total Carbon Stock (tons)	481.68	375.72

Results

Soil Properties

Soils in Khok Saba were acidic, whereas soils in Na Khao Sia were alkaline. Nitrogen and phosphorus levels were very low in both areas, while potassium was high in Khok Saba and low in Na Khao Sia.

Study Area	pH Level	Nitrogen (N)	Phosphorus (P)	Potassium (K)
Khok Saba	4 (Acidic)	Trace	Trace	High
Na Khao Sia	8 (Alkaline)	Trace	Trace	Low

Discussion

The results show that higher sago palm density leads to greater aboveground biomass and carbon storage, even though tree height and stem circumference do not differ significantly between sites, indicating that carbon sequestration is driven mainly by biomass per unit area.

Conclusion

Variations in soil properties, particularly pH and nutrient availability (N, P, and K), likely influenced biomass accumulation by affecting plant growth and photosynthetic efficiency. Overall, sago palm density together with key soil properties plays a crucial role in determining carbon storage, highlighting the potential of sago palm wetlands as effective carbon sinks for climate change mitigation.

THANK YOU!