



VALIDATING CARBON STOCK ESTIMATION USING PHOTOGRAMMETRY AND THE GLOBE TREE APPLICATION IN KRABI

Presented by

**Group 2, Grade 11
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Nattapach	Munjintaphan	Suchanard	Wangwongwatana
Pattarapol	Boonsala	Tanakorn	Tanyacharoenkit
Achira	Sivorarakkana	Anusaya	Kaewsuwasingh
Anan		Woraphol	Kornmatitsuk
Danupat	Chettong	Chayapol	Kongthavorn
Chayanis	Putthacharoenlap	Chanakarn	Charoenram
Chayodom	Runghirunruk	Panthuda	Panngam
Thanawich	Limsirisettakul	Kawkwan	Phetrin
Sabhuri	Sakul	Chawakorn	Junnu



Introduction

The total land area of Krabi is 4,709 sq.km. ,Divided into



*Fertile agricultural lands amount to **548,648.33** rai, accounting for 18.64 % of the overall area.*



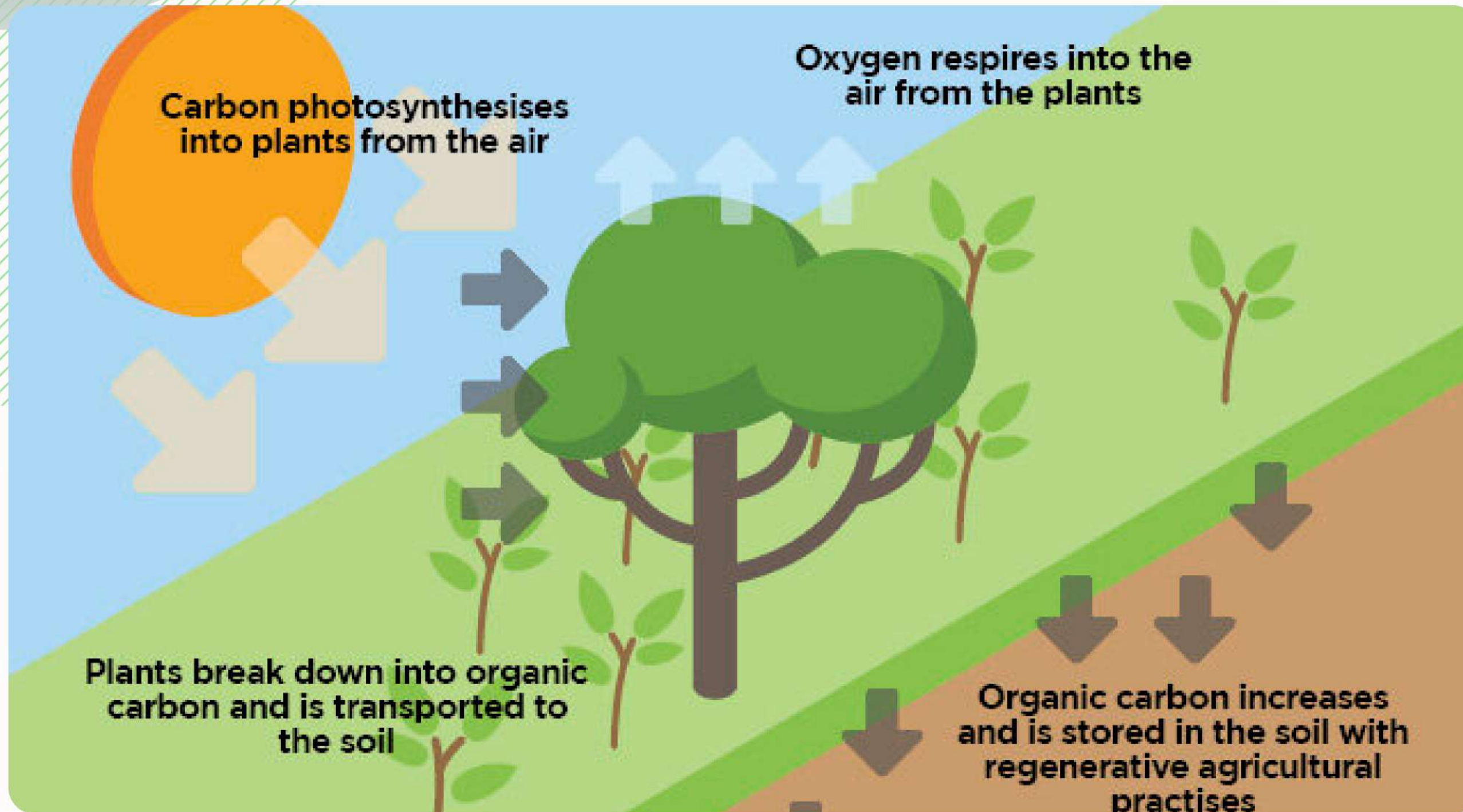
*The coastal areas of the province cover the area out of approximately **221,900** rai.*

Nevertheless, it has been disturbed by anthropogenic activities, such as deforestation. These might lead to CO₂ emissions. Data on biomass is necessary to assess the ability to store carbon in the forest ecosystem.



Introduction

- Carbon capture and storage



Hypothesis

01

Accurate measurement of forest carbon stock is vital for addressing global warming challenges and implementing strategies to reduce CO₂ emissions.



The assessment of carbon stocks hold significant keys to address climate changes, advocating for sustainable land management, and preserving biodiversity.

02



Objective

1

Can aerial imagery (drone) be applied to measure the carbon stock in a mixed deciduous forest (MDF) compared with the conventional method .

2

To calculate above ground carbon stock of the tree using field measurement compared with drone base data.

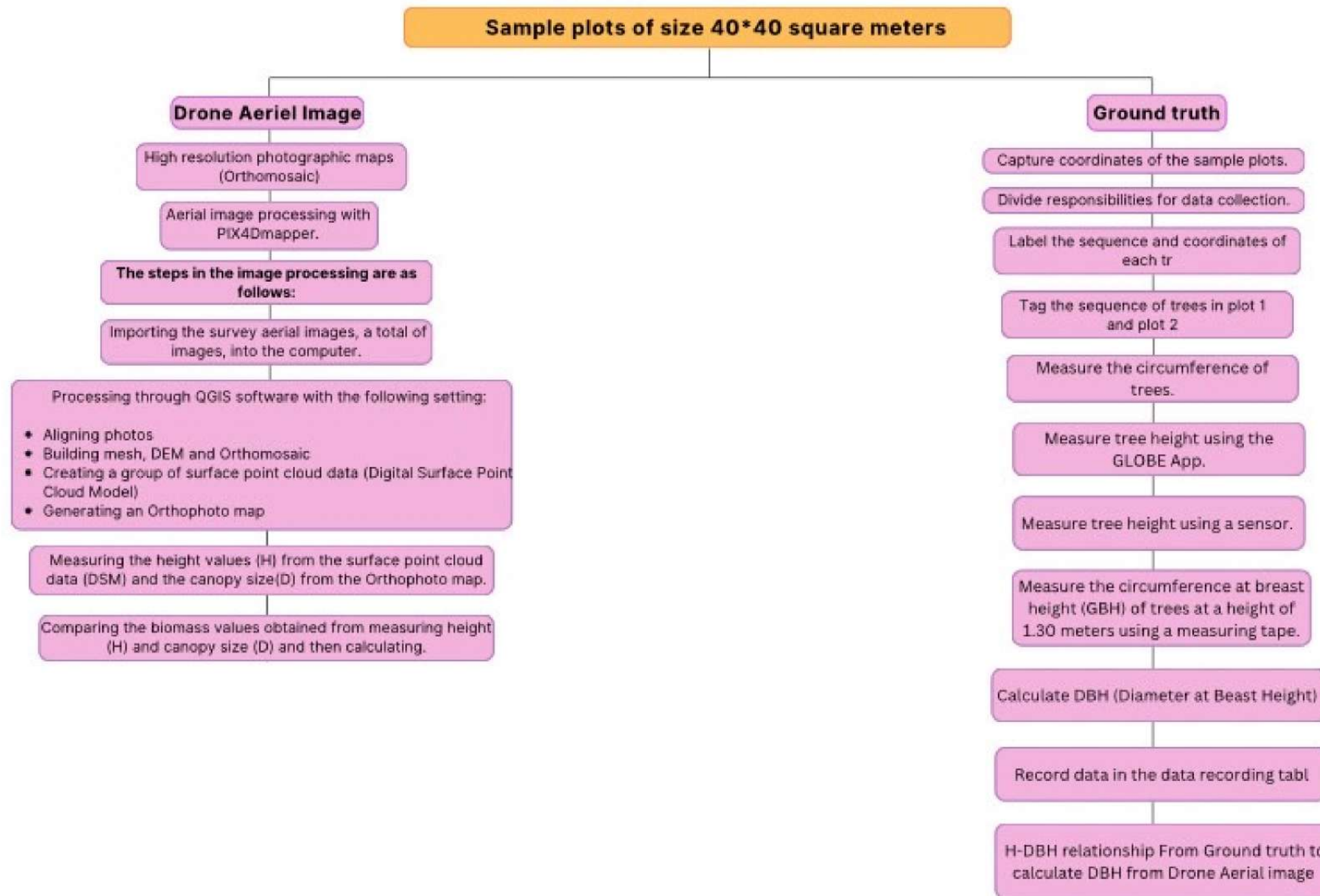
3

To evaluate whether the diversity of plant species and its abundance affects carbon credit or not.



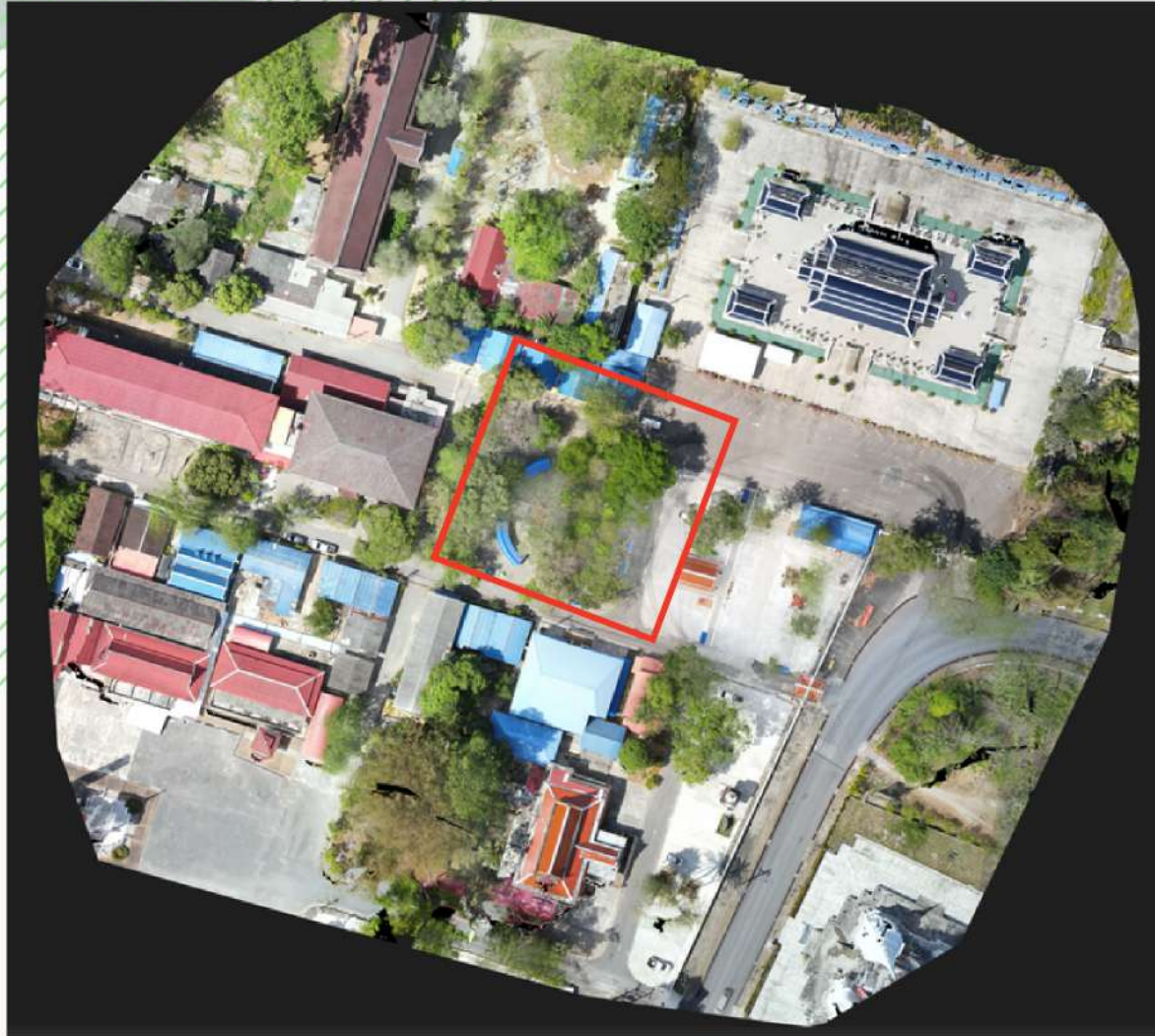
Materials and Methods

• Data collection



Materials and Methods

- Data collection



Wat Kaew Korawararam



Thara Park

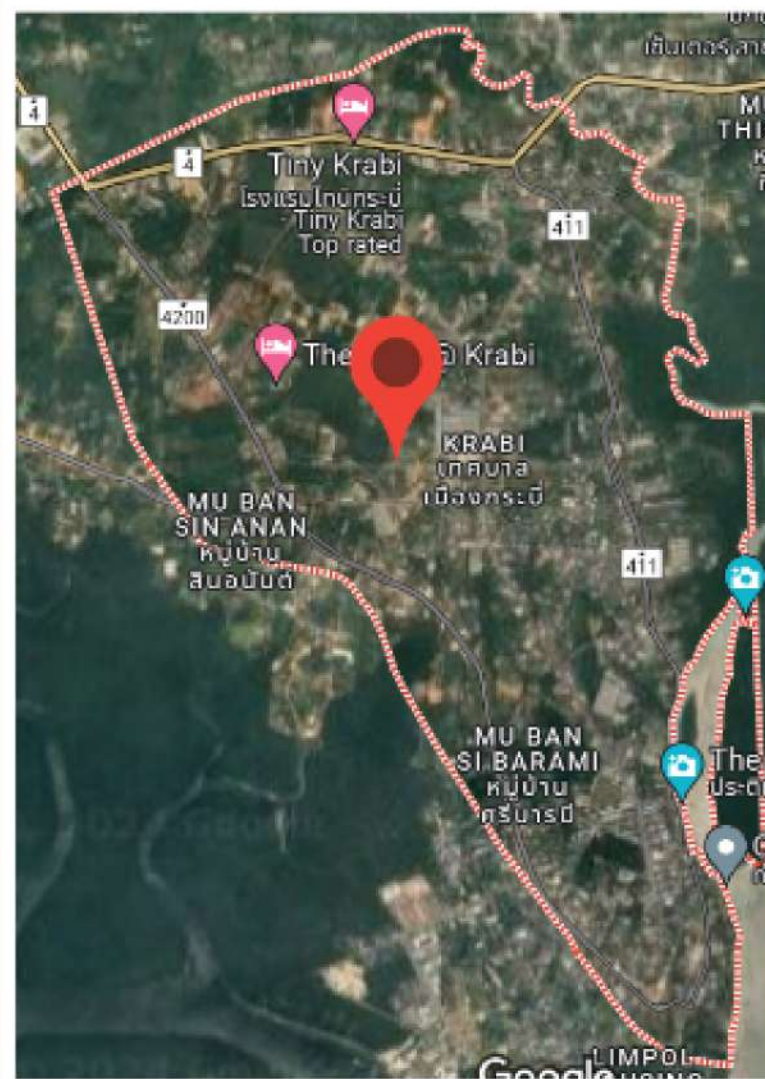


Materials and Methods

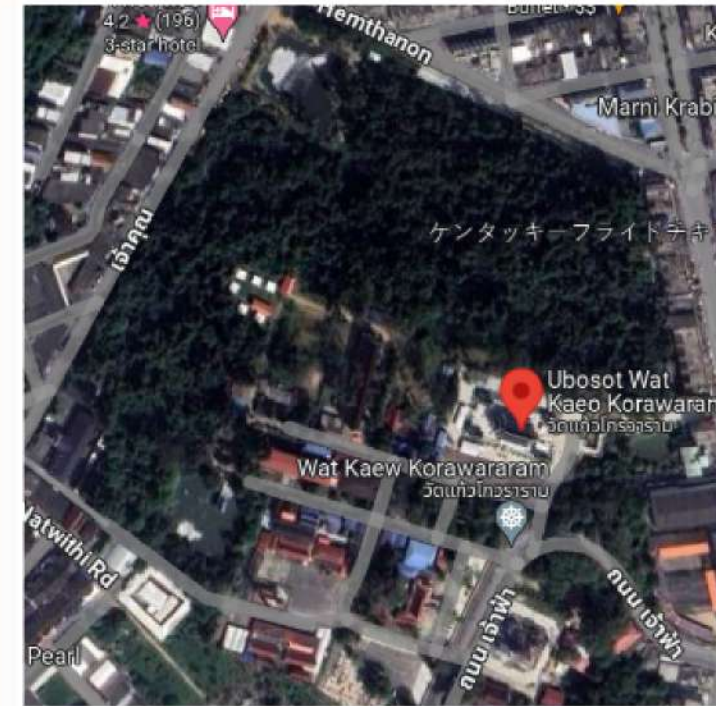
- Study Area Description



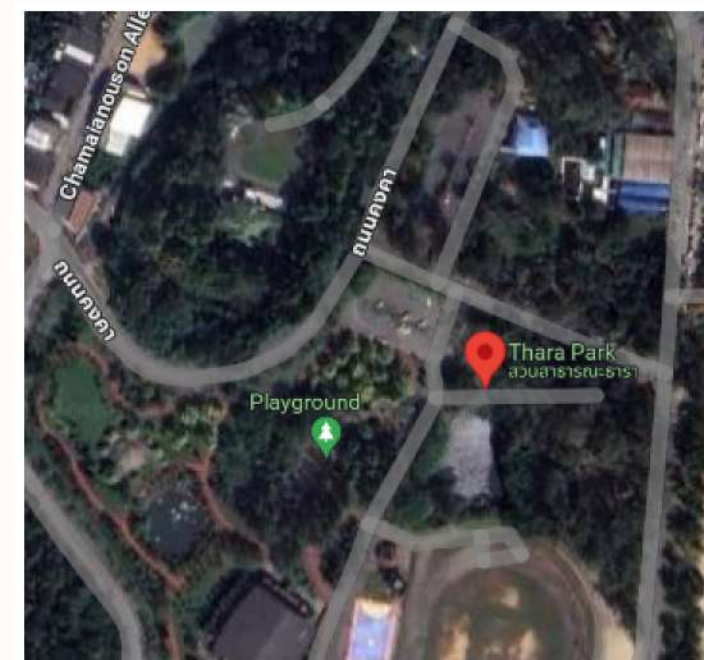
Map of Thailand



Krabi Province, Southern Thailand



Wat Kaew Korawararam



Thara Park



Materials and Methods

- **Area Setup**

Two study sites are located in mixed deciduous forest (MDF), for 40 m × 40 m each.



Wat Kaew Korawararam

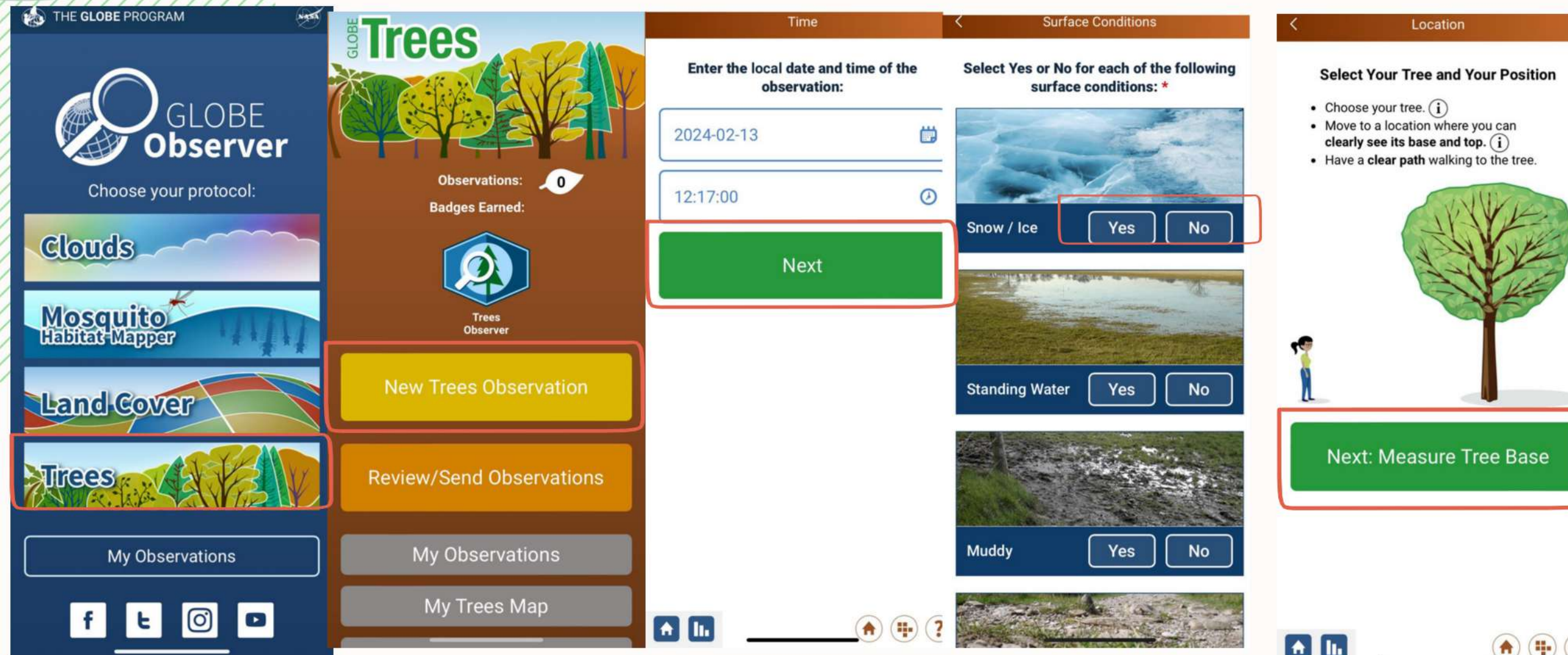


Thara Park



Materials and Methods

- GLOBE Observer : Trees



Choose Protocol : Trees >> New Trees Observation >> Choose the current date, time, the latitude and longitude, and select the following surface conditions.



Materials and Methods

- GLOBE Observer : Trees

The screenshot shows the GLOBE Observer app interface for tree measurement, divided into three main sections:

- Measure the Tree's Top:** This section shows a tree with a dashed line indicating the top. It includes instructions: "1. Bring your device to eye level." and "2. Align the dashed line with the top of the tree." Below the image, it asks "Do you like this alignment?" with two green buttons: "No, Try Again" and "Yes, Continue to Measure Tree Top" (the latter is highlighted with a red border). A "Color" button is also visible.
- Staying Where You Are, Photograph the Tree:** This section shows the same tree from a different angle. It includes instructions: "Walk to the base of the tree **while counting your steps**." and "If a steep slope or anything else prevents you from walking with a natural stride, please measure the distance and/or make a note in the comments. Enter your estimated steps here, then enter the true measured distance on the final review screen." Below this, there is a diagram of a person walking towards a tree with a green arrow. A text input field contains the number "12". Below the input field, it says "(Use decimals if you walked a portion of a step.)" and a green "Next" button.

At the bottom of the app interface, there are zoom controls labeled "ZOOM: NORMAL" with minus and plus buttons, and a "Skip" button.

Take photos: select your tree and your position, as same as counting your steps.



Materials and Methods

- GLOBE Observer : Trees

The screenshots illustrate the following steps in the GLOBE Observer app:

- Location:** Shows a map with latitude (8.6423) and longitude (99.8920). A green "Set Position" button is highlighted. A "RESET" button is also visible.
- Circumference Option:** Asks "Would you like to measure your tree's circumference?". A tree trunk with a green double-headed arrow indicates measurement. A yellow "Optional: Enter Circumference" button and a green "Finish" button are highlighted.
- Tree Circumference:** Instructs to measure at a height of 135 cm. An illustration shows a person measuring a tree trunk. A text input field contains "20". A green "Finish" button is highlighted.
- Review:** Displays "Your Measurements" (Camera Height: 160 cm, Stride Length: 70.2 m, Number of Steps: 12, Distance to Tree: 8.43 m) and "Calculated Tree Height: 6.4 m (21 ft. in.)". A "Circumference: 20 cm (ft. 8 in.)" is also shown. A "Comments" section is present. A green "Finish" button is highlighted.
- Complete:** Displays a thank-you message: "Thank you, your data has been stored successfully on your device and is ready to send to GLOBE." A green "Send All Trees Data Now" button is highlighted. Other buttons include "Review/Edit Observations", "Share", "New Trees Observation", "My Observations", and "My Trees Map".

Set position >> measure your tree's circumference >>
Proofread and submit your tree data



RESULTS AND DISCUSSION

A. Above Ground Biomass of Tree Stand

- The AGB of site 1 (Wat Kaew Korawararam) was measured at 2618.44 kg (Unknown species 1), 8307.07 kg (Unknown species 2), and 1437.26 kg. (Black Afara)
- The AGB of site 1 (Wat Kaew Korawararam) was measured at 14399.29 kg (Northern Black Wattle), and 6284.8 kg (Unknown species 3).



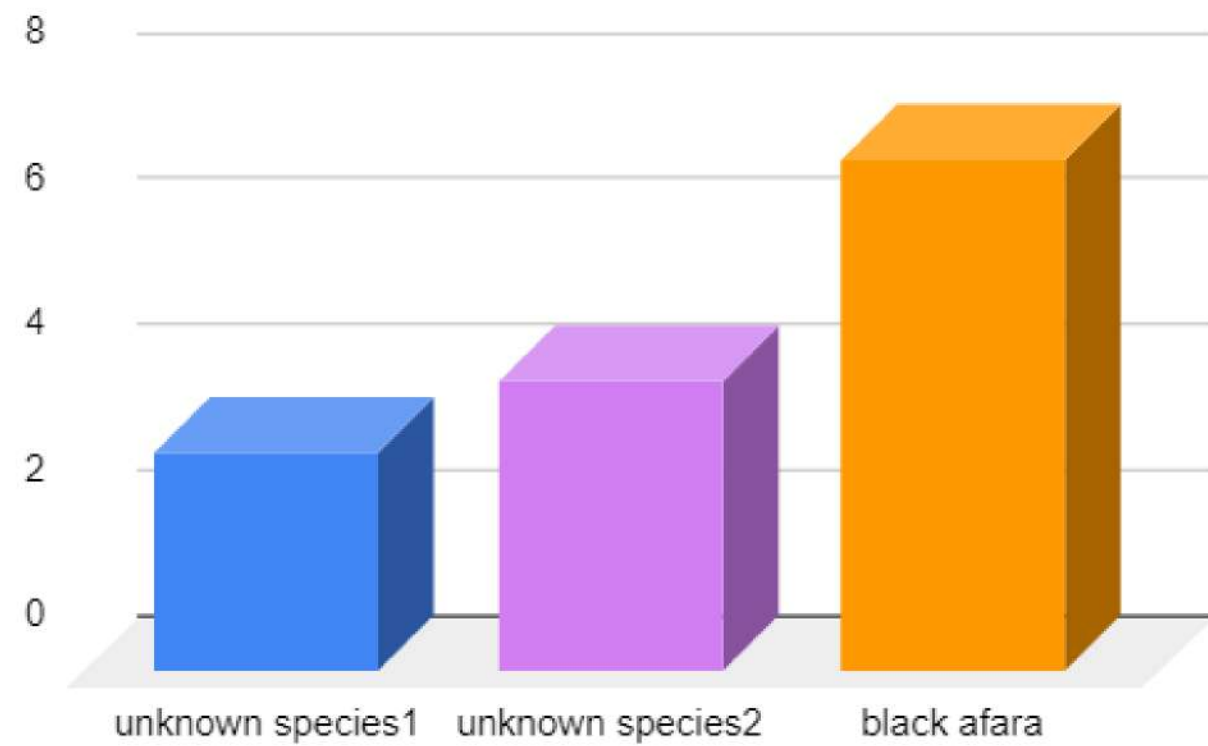
RESULTS AND DISCUSSION

B. Carbon Stock of Above-Ground Biomass

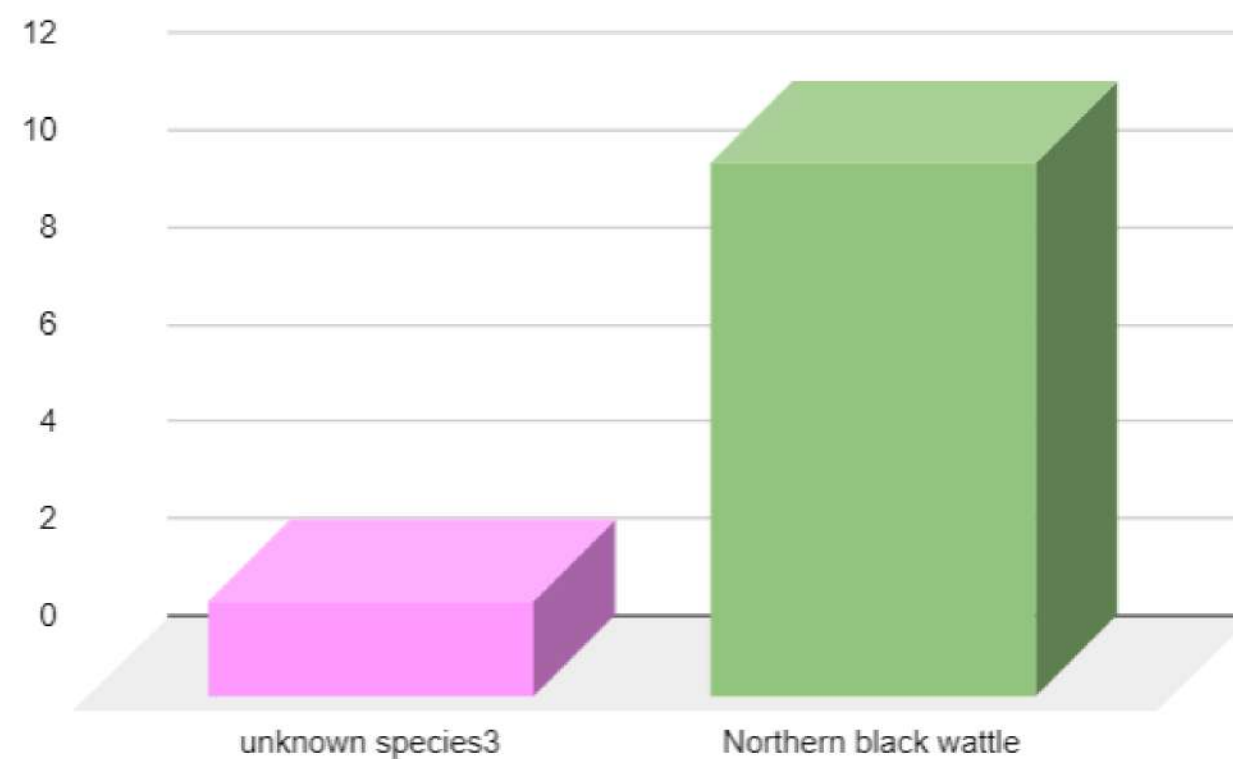
- The computed carbon stock within the first study plot amounted to 4,159.520 tons/ha (ground truth) and 19,986.840 tons/ha (drone-based techniques).
- The computed carbon stock within the second study plot amounted to 992.510 tons/h (ground truth) and 39,099.14 tons/ha (drone-based techniques).



RESULTS AND DISCUSSION



At Wat Kaew Korawararam

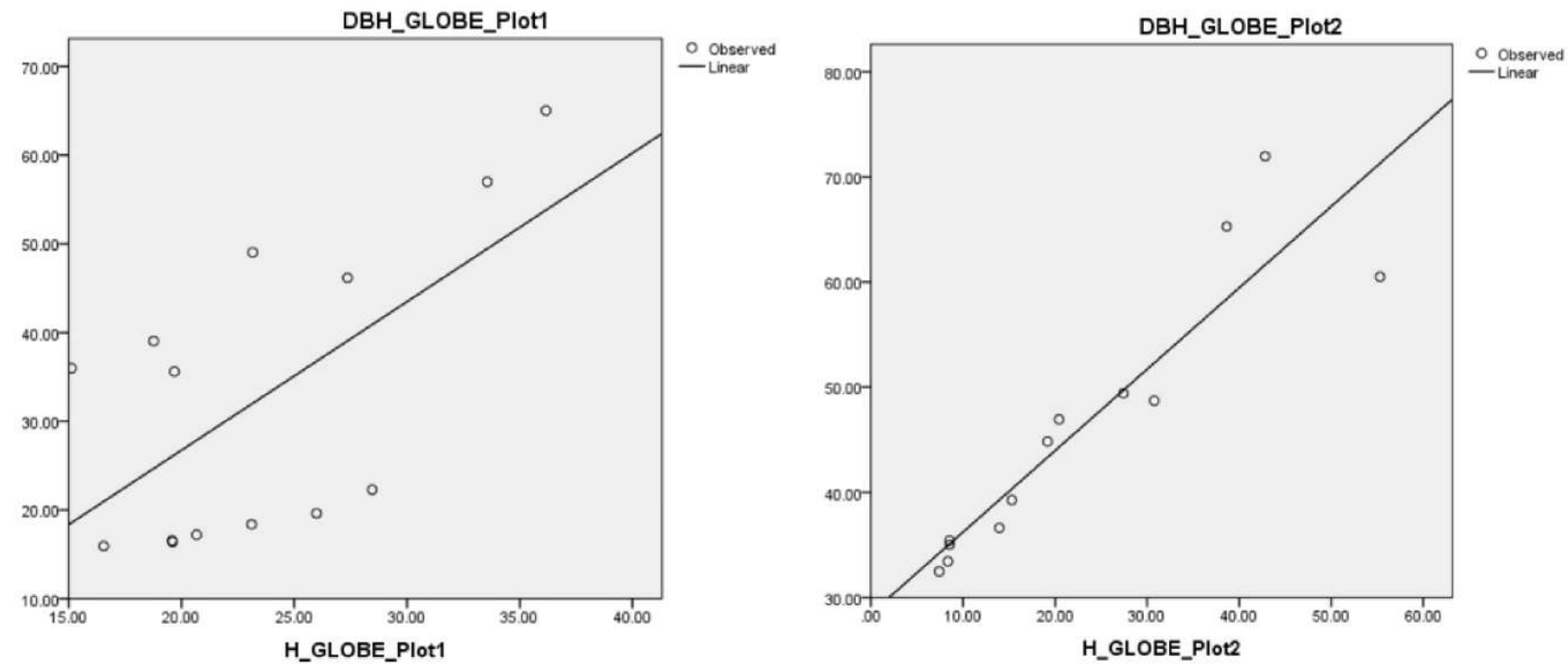


At Thara Park

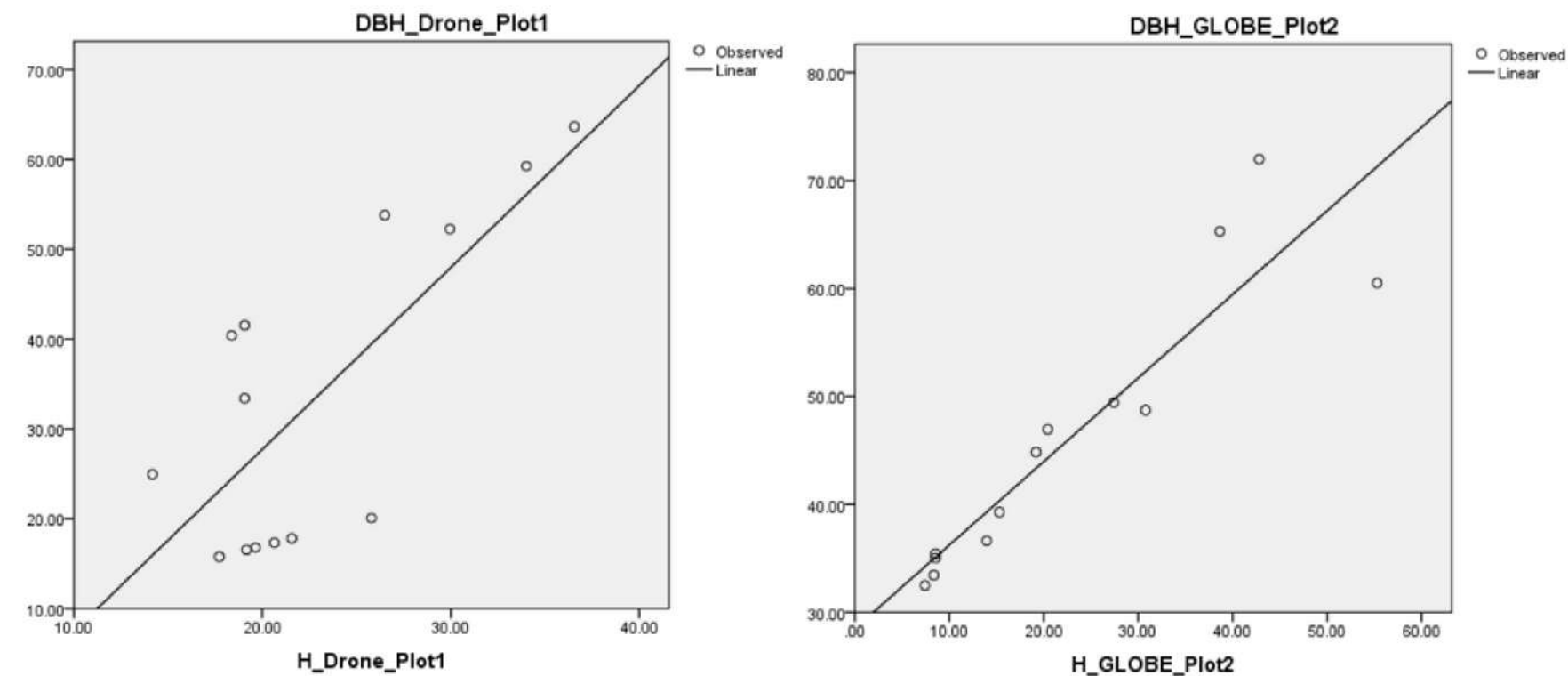
Graphs illustrate the number of various species of trees in the work fields.



RESULTS AND DISCUSSION



Graphs illustrate the correlation between DBH and height from GLOBE APP



Graphs illustrate the correlation between DBH and height from drone



CONCLUSION

- ✓ Drone ortho-mosaic imaging can directly measure a tree's height, except for DBH.
- ✓ To estimate biomass from drones, we employed second-order estimations of DBH based on regression analysis.
- ✓ The total AGB value of the second study site is significantly more than the first site.
- ✓ With the second platform, which is the Globe Observer App, an error occurred when collecting the tree height data in the fieldwork.



CONCLUSION



Carbon storage of the second area also notably higher than the first one.



The Carbon storage is directly varied to the AGB value.



There is a limitation using the drone and it stems from insufficient research on plant factors.



According to *carbon credit*, or an action when exchanging functional trees with currencies for the purpose of carbon-dioxide stocking, trees have an ability to stock carbon-dioxide, so that it is one of the important factors when taking it into account.



Reference

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Thank You

