

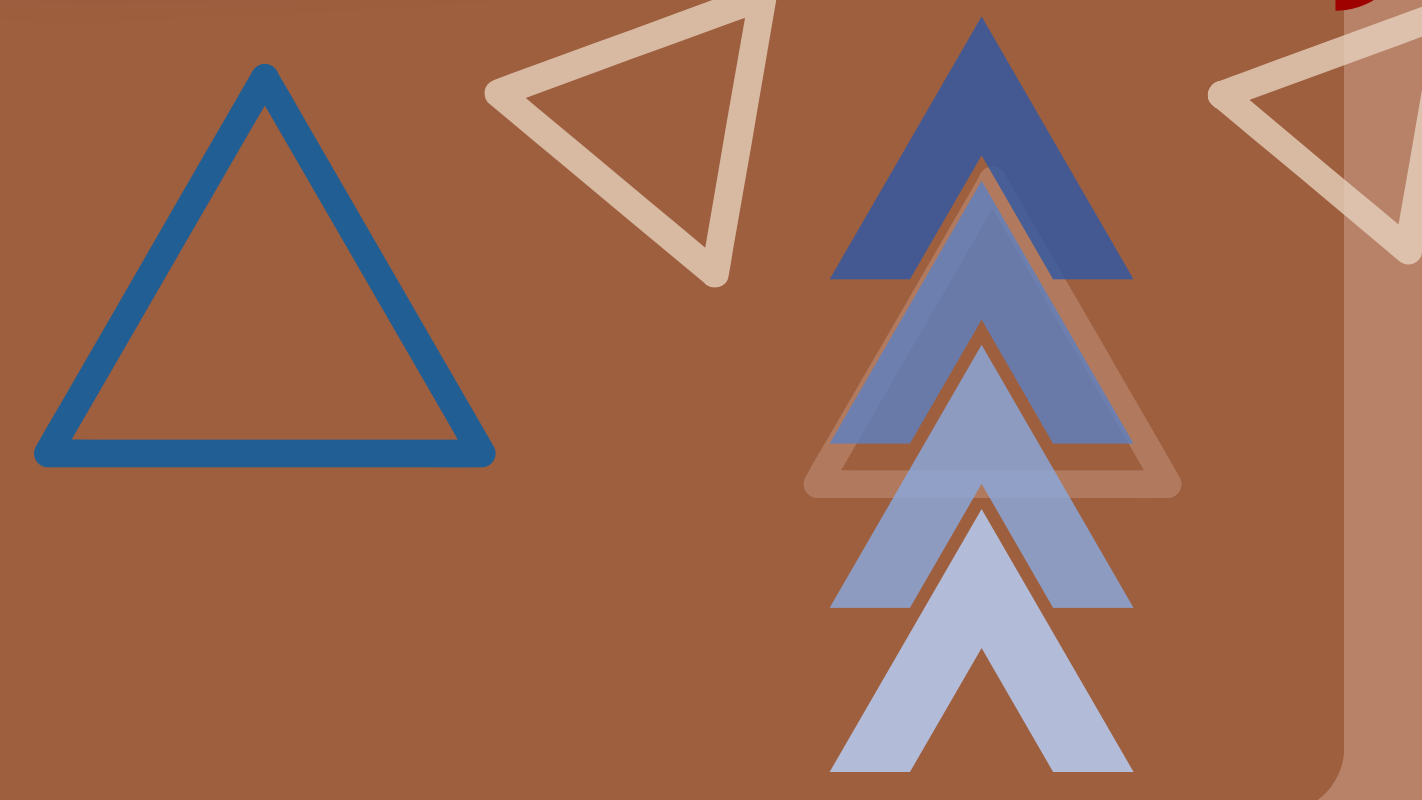
A Study of Carbon Dioxide (CO₂) Emissions from Food Waste and Carbon Sequestration of Trees



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Abstract

This research studied carbon dioxide emissions from students' leftover food and compared them with the carbon sequestration capacity of trees around the school canteen at Phak Mai Wittayanukul School. The study found that students generated an average of 2 kg of leftover food per day, producing 5 kg CO₂e per day, or 880 kg CO₂e per academic year. A survey of 42 trees around the canteen showed a total carbon sequestration capacity of 32,886.59 kg CO₂e, with Bullet Wood, Pine, and Ironwood being the most common species. The results indicated that the trees were able to sequester significantly more carbon dioxide than that emitted from leftover food.

Introduction

Climate change is a global problem mainly caused by greenhouse gas emissions, especially carbon dioxide from human activities. One often overlooked source of carbon dioxide emissions is leftover food, particularly in school cafeterias where food waste occurs daily. If not properly managed, leftover food can contribute to long-term environmental impacts.

At the same time, trees help reduce carbon dioxide levels by absorbing and storing carbon. The areas around the cafeteria and buildings of Pak Mai Wittayanukul School contain various tree species that may help offset carbon dioxide emissions within the school. Therefore, this study aims to compare carbon dioxide emissions from students' leftover food with the carbon sequestration capacity of trees around the school cafeteria, in order to promote environmental awareness, reduce food waste, and encourage sustainable use of green spaces in schools.

Research Question

Is carbon dioxide emitted from leftover food greater than the carbon sequestered by trees in the school?

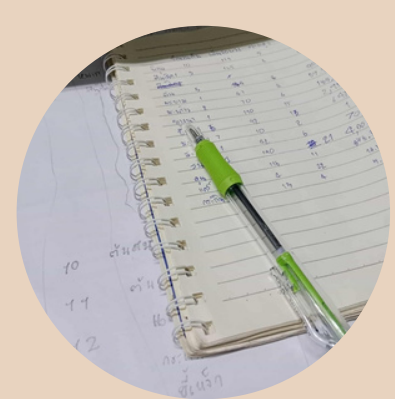
Conclusion

The study found that students generated an average of 2 kg of leftover food per day, producing 5 kg CO₂e per day, or 880 kg CO₂e during the 2569 academic year. A survey of 42 trees around the school cafeteria showed a total carbon sequestration capacity of 32,886.59 kg CO₂e. The tree species with the highest carbon sequestration were large pine, Yang Na, and small pine trees. Overall, the carbon sequestration capacity of the trees was significantly greater than the carbon dioxide emissions from leftover food waste.

Research Methods and Materials

Part 1: Assessment of CO₂e Emissions from Food Waste
1.1 Data Collection: The data collection period was set for one academic year.
1.2 Waste Separation: Food waste left after lunch was collected. Contaminants such as spoons and plastic bags were completely separated and removed.
1.3 Weighing: The total food waste was weighed daily, and the results were recorded.
1.4 Calculation: The total weight of food waste was used to calculate the average daily amount. Formula: Food waste weight (kg) × 2.5 = Amount of carbon dioxide gas

Part 2: Assessment of Carbon Sequestration by Trees (GLOBE Biometry Protocol)
2.1 Study Area: The boundaries of the green areas surrounding the cafeteria and school buildings were identified.
2.2 Species Survey: Tree species in the study area were identified (common tree species).
2.3 Tree Measurement: Tree circumference was measured at 1.50 meters above ground level (breast height). Tree height was calculated using the GLOBE Observer application. The Low Emission Support Scheme (LESS) website was used to calculate the carbon sequestration of trees in the areas surrounding the cafeteria and school buildings.



Logbook



Lette of Recognition: LOR



Plastic bucket



Scale



Tape measure



Mobile phone



Pen



Plastic bag

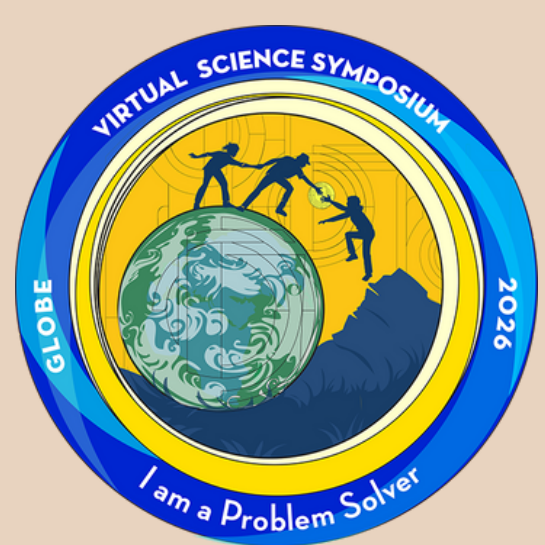


GLOBE Observer

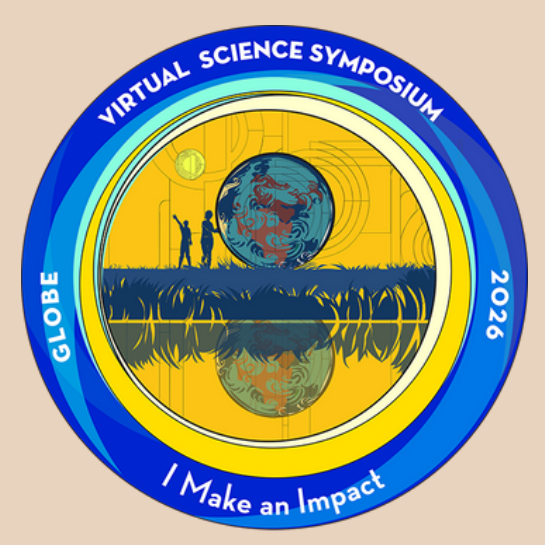
Optional Badges



I AM AN EARTH SYSTEM SCIENTIST



I AM A PROBLEM SOLVER



I MAKE AN IMPACT

Illustration



Results

Table: Tree Data of Pak Mai Wittayanukul School, Huai Thap Than District, Sisaket Province

Local name	Number of trees	Circumference (Cm)	Height (M)	Carbon sequestration
Pine tree	3	144(Cm)	8(M)	954.33 CO ₂ e(kg)
Golden shower tree	1	116(Cm)	11(M)	856.39 CO ₂ e(kg)
Siamese cassia	6	92(Cm)	13(M)	647.55 CO ₂ e(kg)
Devil tree	3	165(Cm)	4(M)	641.25 CO ₂ e(kg)
Spanish cherry	10	133(Cm)	5(M)	387.07 CO ₂ e(kg)
Coconut tree	2	70(Cm)	6(M)	185.83 CO ₂ e(kg)
Neem tree	1	42(Cm)	6(M)	70.65 CO ₂ e(kg)
Tamarind tree	1	47(Cm)	4(M)	59.56 CO ₂ e(kg)
Agati tree	2	4(Cm)	4(M)	14.17 CO ₂ e(kg)
Leucaena tree	1	13(Cm)	4(M)	5.24 CO ₂ e(kg)
Large pine tree	4	190(Cm)	21(M)	4,006.30 CO ₂ e(kg)
Yang na tree	1	190(Cm)	15(M)	2,915.34 CO ₂ e(kg)
Papaya tree	7	10(Cm)	2(M)	1.66 CO ₂ e(kg)
all	42	-	-	32886.59 CO ₂ e(kg)

Table: Carbon emission values from leftover food waste of Pak Mai Wittayanukul School, Huai Thap Than District, Sisaket Province.

Mount	Leftover food (kg) x 2.5	Carbon footprint CO ₂ e(kg)
May 2568	26(kg)	65CO ₂ e
June 2568	40(kg)	100CO ₂ e
July 2568	46(kg)	115CO ₂ e
August 2568	44(kg)	110CO ₂ e
September 2568	42(kg)	105CO ₂ e
November 2568	42(kg)	105CO ₂ e
December 2568	40(kg)	100CO ₂ e
January 2569	36(kg)	90CO ₂ e
February 2569	36(kg)	90CO ₂ e
all	352(kg)	80CO ₂ e

Illustration



Research Question and Hypothesis

Research Question:

How does the amount of carbon dioxide emissions from leftover food in the school canteen compare with the carbon sequestration capacity of trees in the canteen area?

Research Hypothesis:

The amount of carbon dioxide emitted from leftover food is greater than the carbon sequestration capacity of trees in the canteen area of Phak Mai Wittayanukul School.

Discussion

The study found that carbon dioxide emissions from leftover food during the 2567 academic year (880 kg CO₂e) were far lower than the carbon sequestration capacity of the 42 trees surrounding the cafeteria (32,886.59 kg CO₂e). This indicates that the trees around the cafeteria function as an effective carbon sink and that the school maintains a positive balance between carbon emissions and carbon absorption. Overall, the cafeteria area of Phak Mai Wittayanukul School demonstrates greater carbon sequestration capacity than carbon emissions.

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