


Study the amount of carbon sequestration in trees aroundthe parking lot and the auditorium Phakmai Wittayanukul School.

Research Team

Mr.Kriangkrai Srisongkram

Ms.Waranya Wisetchat

Mr.Kittiwat Naknaul

Mr.Jedsadapong Budda

Research Advisors

Mrs.Darunee Samerpak

Mr.Samraun Samerpak

Ms.Sasiwimon Paengma

Sciencetific Advisor

Dr. Amorn Thedsakulwong

Lecturer, Department of Physics Faculty of Science,

Ubon Ratchathani University

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Research team Mr.Kriangkrai Srisongkram
Ms.Waranya Wisetchat
Mr.Kittiwat Naknaul
Mr.Jedsadapong Budda

Grade level Grade 12

Research Advisors Mrs.Darunee Samerpak
Mr.Samraun Samerpak
Ms.Sasiwimon Paengma

School Phakmai Wittayanukul School

Abstract

This research aimed to study the amount of carbon sequestration by trees planted within the area of Phak Mai Wittayanukul School, as trees play an important role in absorbing carbon dioxide (CO_2),one of the greenhouse gases that contributes to global warming. The study involved surveying tree species and measuring trunk circumference in order to calculate the amount of carbon that each tree could store. The results showed that a total of 15 trees from 7 species were able to sequester5,919kilograms of carbon. These findings indicate that trees within the school play a significant role in reducing greenhouse gas levels in the atmosphere. The data obtained can be used to plan additional tree planting or to develop environmental promotion activities within the school in the future.

Keywords : Carbon dioxide levels ,tree

Introduction of Literature

1. Background and Significance

Greenhouse gas emissions and global warming are primarily driven by human activities, including waste burning, transportation, and industrial processes. Among these, waste burning in schools and local communities is often underestimated, despite its significant negative impacts on air quality and the environment. The release of greenhouse gases from such activities contributes to the accumulation of carbon dioxide and other pollutants in the atmosphere, accelerating global warming and climate variability. These changes increase the likelihood of extreme weather events and natural disasters, which directly affect ecosystems, human health, and overall quality of life. Addressing these issues at the local level, particularly within educational institutions and communities, is therefore an important step toward mitigating broader environmental problems.

Trees play a vital role in reducing greenhouse gas concentrations by absorbing carbon dioxide through the process of photosynthesis and storing carbon within their biomass. In addition to carbon sequestration, trees help maintain ecological balance, improve air quality, increase humidity, and create green spaces that enhance physical and mental well-being. This study focuses on examining the carbon sequestration capacity of trees located around the school parking area and auditorium, with a comparison of different tree species based on factors such as tree size, height, and species characteristics. The data obtained from this study can serve as a guideline for promoting tree planting in schools, communities, and at both local and national levels. Furthermore, the findings can support environmental policy planning, encourage the development of green spaces, and contribute to the sustainable conservation of natural resources. The results may also be used as educational materials to raise environmental awareness among students, youth, and community members, highlighting the importance of trees in mitigating global warming and fostering collective efforts toward a sustainable environment for future generations (Thailand Greenhouse Gas Management Organization, 2020).

2. Research Question

- How does carbon fixation efficiency vary among different tree species?
- Based on the research findings, which tree species should be recommended for widespread planting due to their high carbon fixation efficiency?

3. Research Hypothesis

- Trees can store different amounts of carbon depending on the type of tree, trunk sizeze and age. Larger and older trees tend to store more carbon than smaller and youngertrees.

4. Research Objectives

4.1 This study aimed to investigate the carbon storage capacity of various tree species in the auditorium area of Phak Mai Wittayanukul School. Data on the physical characteristics of the trees, such as species and height, were collected and then analyzed for comparative analysis.

4.2 To explain the differences in carbon storage capacity based on various factors.

5. Expected Outcomes of the research

5.1 It helps us understand the role of trees in absorbing and storing carbon from the atmosphere, which is important in reducing greenhouse gases that cause global warming.

5.2 The results of this study can be applied to forest conservation planning, reforestation, and forest management to increase carbon sequestration.

5.3 Assist in assessing the impacts of land-use change and develop tools for monitoring natural carbon levels, which is beneficial for environmental conservation.

6. Variables Involved

6.1 Independent Variables : Tree species and tree size .

6.2 Dependent Variable : Amount of carbon stored in each tree.

6.3 Controlled Variables : Study location (the area between the parking area and the auditorium of Phak Mai Witthayanukul School), data collection period, and measurement procedures and calculation methods used throughout the study.

Research Methodology

1. Scope of Research

1.1 Scope of Content

1.1.1 Covers content about the importance of carbon in nature.

1.1.2 The processes that trees use to store carbon.

1.1.3 Factors affecting carbon storage.

1.2 Scope of Work: The area around the parking lot and auditorium of Phak Mai Wittayanukul School, Phak Mai Subdistrict, Huai Thap Than District, Si Sa Ket Province.

1.3 Time Scope: June 17 - June 19,

2. Material and Equipment

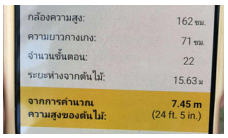
2.1 Measuring tape – used for measuring the circumference of tree trunks.

[Figure 1. Measuring tape]

[Figure 2. Measuring tape]

2.2 Mobile phone – used for photographing trees, estimating tree height, and calculating carbon storage.

[Figure 3. Mobile phone]



[Figure 4. Results from tree height calculation]

[Figure 5. GLOBE Observer application]

2.3 Notebook – used to record measured data such as tree size.

[Figure 7. Notebook]

[Figure 8. Notebook]

2.4 Pen or pencil – used for writing down data.

[Figure 9. Pen]

[Figure 10. Pen]

3. Research Methodology

3.1 Determination of the Study Area

The study was conducted within the area of Phak Mai Witthayanukul School, Phak Mai Subdistrict, Huai Thap Than District, Sisaket Province.

[Figure 10. Parking area of Phak Mai Witthayanukul School]

[Figure 11. Auditorium area of Phak Mai Witthayanukul School]

3.2 Survey of Tree Quantity and Species

The surveyed tree species included Terminalia catappa, blue fan palm, golden shower tree, queen's flower tree, eucalyptus, foxtail palm, and devil tree.

[Figure 12. Survey of tree species]

[Figure 13. Survey of tree species]

[Figure 14. Survey of tree species]

3.3 Measurement of Tree Dimensions

A measuring tape was used to measure the circumference of the tree trunk, and a mobile phone was used to measure tree height through the GLOBE Observer application.

[Figure 15. Measurement of tree dimensions]

[Figure 16. Measurement of tree dimensions]

[Figure 17. Measurement of tree dimensions]

3.4 Measured Carbon Stock

- The carbon content of trees was calculated by selecting groups of trees with high density and greater height.
- The calculation was conducted using the LESS-FOR-01 website, which is a web-based tool for estimating carbon stock. The results were obtained as the amount of carbon stored in the trees.

3.5 Comparison of Tree Quantity and Carbon Storage

A comparison was made between large, tall trees and smaller trees with lower height. The results showed that larger and taller trees are generally able to store more carbon than smaller trees. However, in some cases, fast-growing species such as eucalyptus have high biomass and density, enabling them to store carbon efficiently as well.

3.6 Summary of Results and Data Entry

[Figure 18. GLOBE Observer application]

[Figure 19. Data Entry application]

The process of summarizing results and entering data into the Data Entry system is an important step in ensuring accurate and well-organized data management. The process begins with summarizing the collected data completely and correctly before submitting it to the Data Entry system. Once the data are prepared, the first step is to verify their accuracy, such as checking whether the entered values are correct and whether the data are complete. Subsequently, the data may need to be organized into appropriate categories or converted into formats supported by the system, for example, transforming data from Excel files into CSV or other compatible formats.

The next step involves entering the data into the system, either by filling out electronic forms or uploading data files into the program. After the data have been entered, it is necessary to conduct another verification to ensure that the information is accurate and free from errors. If any errors are detected, corrections must be made and the data saved again to ensure completeness and accuracy. Once finalized, the data are stored in the system and can be used for further purposes, such as calculations, report generation, or data analysis in subsequent stages.

Furthermore, even after the data have been successfully submitted to the system, continuous verification remains essential. Rechecking the data helps ensure that no errors remain and that the data are reliable and ready for use in decision-making or further data processing.

Research Results

1. Table of Experimental Results

Soil samples were collected and analyzed to determine the amount of carbon sequestration in the study area. Measurements of carbon sequestration were conducted from 17–19 June 2025, and the collected data were subsequently analyzed and compared. The results are as follows:

Period for Requesting Certification of Greenhouse Gas Sequestration From 17 June 2025 to 19 June 2025					
Order	Plant species name	Plant species category	Height (m)	Tree circumference (cm)	Greenhouse gas sequestration ($kgCO_2eq$))
1	Blue palm	Palm group	7	129	164.35
2	Blue palm	Palm group	7	144	161.73
3	Blue palm	Palm group	7	118	155.23
4	Blue palm	Palm group	8	119	183.16
5	Indian almond tree	General plant species	5	29	31.28
6	Indian almond tree	General plant species	7	66	192.36
7	Red olive tree	General plant species	12	149	1,477.25
8	Foxtail palm	General plant species	7	62	181.27
9	Eucalyptus tree	General plant species	20	91	952.87
10	Queen’s crape myrtle	General plant species	8	49	123.91
11	Golden shower tree	General plant species	10	32	70.55
12	Golden shower tree	General plant species	15	60	332.86
13	Golden shower tree	General plant species	12	72	381.84
14	Devil tree	General plant species	11	77	411.22
15	Devil tree	General plant species	11	130	1,099.13

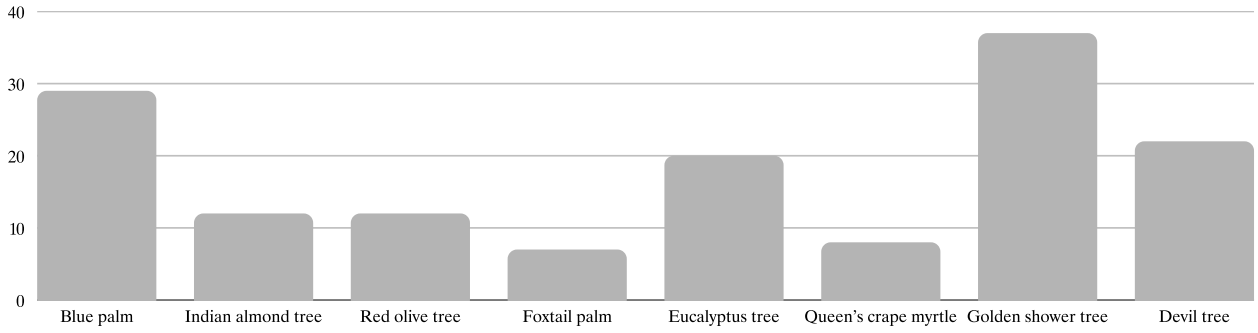
[Table 1. shows the amount of carbon sequestered by trees in the Phak Mai Witthayanukul School area.]

Large trees store greater amounts of carbon. Trees with larger sizes, such as the Red olive tree (Elaeocarpus hygrophilus) with a circumference of 149 cm and the Eucalyptus tree (Eucalyptus spp.) with a circumference of 91 cm, exhibited the highest levels of greenhouse gas sequestration in this table, at 1,477.25 kg CO_2eq and 952.87 kg CO_2eq, respectively.

The relationship between tree size and the amount of carbon sequestration presented in the table clearly indicates that trees with greater height and larger circumference have a higher capacity to sequester greenhouse gases.

Furthermore, the study encompasses a wide variety of plant species in order to obtain comprehensive data that can be applied to assessing carbon sequestration potential in different areas.

2. Summary of Experimental Results



[Figure 1. shows the amount of carbon sequestered by trees in the Phak Mai Witthayanukul School area.]

The Golden shower tree exhibited the highest value in the graph, indicating the greatest amount of carbon sequestration among all tree species studied, which is consistent with the results shown in the previous table. The Blue palm showed the second-highest value, demonstrating relatively high carbon sequestration efficiency compared to most other species.

The Devil tree and the Eucalyptus tree displayed similar and moderately high values, while the Indian almond tree and the Red olive tree showed comparable values at a moderate level. In contrast, the Foxtail palm and the Queen's crape myrtle exhibited the lowest values, indicating significantly lower carbon sequestration compared to other tree species.

Summary of surveyed trees		
Tree species group	Number of trees (trees)	Greenhouse gas sequestration ($kgCO_2eq$)
General plant species	11	5,245.56
Palm group	4	664.46
Overall	15	5,919.00

[Table 2. summarizes the number of trees surveyed.]

The results of the study indicate that different tree species have varying capacities for carbon sequestration, depending on several factors such as size, height, trunk circumference, wood density, and species characteristics. Mature trees that have reached full growth generally exhibit a higher potential for carbon sequestration than smaller or younger trees that are still in the growth stage.

The findings further demonstrate that tree planting can significantly contribute to reducing atmospheric carbon dioxide levels, which is one of the major greenhouse gases responsible for global warming. Trees absorb CO_2 through the process of photosynthesis and store it as biomass both aboveground and belowground, thereby enabling ecosystems to function as important carbon sinks.

Therefore, it is recommended to promote tree planting in public spaces, urban areas, and degraded lands, along with the development of sustainable green space master plans at both local and national levels. This should be accompanied by continuous research to assess the carbon sequestration potential of different tree species in relation to local topography, climate conditions, and ecosystem characteristics.

Such policy implementation not only helps mitigate the impacts of climate change but also enhances long-term quality of life by improving air quality, promoting biodiversity, and maintaining balanced ecosystems.

Discussion

The findings of this study indicate that different tree species possess varying capacities for carbon dioxide sequestration. This capacity is influenced by several factors, including tree size, height, trunk circumference, and species characteristics. Large, mature, and long-lived trees generally demonstrate a significantly greater ability to absorb and store carbon from the atmosphere than smaller or immature trees. This is because trees absorb atmospheric carbon dioxide through the process of photosynthesis and store the carbon in the form of biomass, such as trunks, branches, leaves, and roots. Over time, the amount of carbon accumulated within a tree increases in proportion to its size and age.

Accordingly, the results clearly suggest that tree planting—particularly the promotion of large-scale planting or reforestation in areas affected by deforestation, such as degraded forest lands—represents an effective approach to reducing atmospheric carbon dioxide concentrations. This, in turn, contributes directly to mitigating the impacts of global warming, which is currently intensifying worldwide.

The results of this study are consistent with the concept that “trees are a vital natural mechanism in combating global warming.” Trees play a crucial role in the absorption of carbon dioxide, one of the primary greenhouse gases responsible for global climate change. In particular, large and long-lived trees are capable of accumulating substantial amounts of carbon over periods spanning several decades to centuries, thereby functioning as highly effective natural carbon sinks.

Therefore, promoting tree planting in public spaces such as parks, schools, and community areas, as well as restoring degraded forest ecosystems, should be regarded as a priority in long-term natural resource and environmental management planning. This is especially important in an era when global populations are increasingly confronted with the consequences of climate change, including more severe natural disasters, shifts in seasonal patterns, and heightened risks to ecological balance.

Furthermore, additional research should be encouraged to further investigate the carbon sequestration potential of different tree species at both local and global scales. Such research would support the selection of appropriate tree species based on site-specific conditions and carbon reduction objectives, while also enhancing the effectiveness and sustainability of green space planning and management. The outcomes of these studies can also inform environmental policy development and raise public awareness of the critical role of trees as valuable natural resources and essential tools in addressing the ongoing global climate crisis.

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Optional Badges

1) I Am a Collaborator

This research project was successfully completed through the collaboration of all four team members. We worked together to study the amount of carbon sequestration in trees around the parking lot and the auditorium at Phakmai Wittayanukul School. Each member was assigned clear responsibilities, including area surveys, measuring tree height and trunk circumference, data collection, data analysis, and report preparation. Throughout the project, we communicated regularly, supported one another, and made joint decisions to ensure accurate data and meaningful results. Our teamwork and shared responsibility enabled the project to be completed successfully. Therefore, we believe that our team is well qualified to receive the Collaborator badge.

2) I Make an Impact

Our research makes a positive impact by addressing climate change through the study of carbon sequestration in trees around the parking lot and the auditorium at Phakmai Wittayanukul School. By identifying tree species with high carbon storage potential, our findings provide practical guidance for selecting and planting trees that can effectively reduce carbon dioxide in the atmosphere, especially in urban and school environments.By sharing our results and raising awareness about the importance of tree conservation and proper tree selection, this project encourages our school and community to take action toward environmental sustainability. Through this work, we not only deepened our understanding of environmental science but also contributed to real-world solutions that support a healthier and more sustainable future. Therefore, we believe our project meets the criteria for the “I Make an Impact” badge.

3) I Am a Problem Solver

This project demonstrates our problem-solving skills by addressing the environmental challenge of carbon dioxide accumulation through the study of carbon sequestration in trees around the parking lot and the auditorium at Phakmai Wittayanukul School. We identified the problem of increasing greenhouse gas emissions and designed a systematic approach to investigate how different tree species contribute to carbon storage.By collecting field data, measuring tree height and trunk circumference, analyzing the results, and comparing carbon sequestration among species, we developed evidence-based solutions that can help guide tree selection and planting strategies in school and urban areas. This project shows our ability to identify real-world problems, apply scientific methods, and propose practical solutions, which qualifies us for the “I Am a Problem Solver” badge.