

## Assessment of Greenhouse Gas Absorption and Sustainable Land Use in Agricultural Areas and Mangrove Forest, Tha sak, Mueang, Nakhon Si Thammarat

Agricultural activities are significant sources of greenhouse gas emissions that impact the climate, such as livestock farming, manure management, chemical fertilizer use, and land-use changes. However, agricultural lands and forest areas also play a crucial role in absorbing and sequestering greenhouse gases. Forest areas are particularly efficient carbon sinks. Trees and vegetation in forests absorb carbon dioxide from the atmosphere through photosynthesis and store carbon in the form of biomass. Forest soil plays a role in storing carbon that is decomposed from organic matter falling to the ground. Although agricultural areas have less potential to absorb greenhouse gases than forest areas, as the land-use change from forests to agricultural lands reduces carbon sequestration, agricultural areas can still play a role in greenhouse gas sequestration if sustainable agricultural practices are implemented. These practices include crop rotation, cover cropping, proper soil management, and planting perennial trees in integrated farming systems. The objectives of this research are: 1) To assess the greenhouse gas absorption capacity of agricultural areas and mangrove forests, which is a crucial factor in maintaining climate balance. 2) To raise awareness in communities about resources and environmental management.

This research collected data, including both agricultural areas and mangrove forests, as follows:

- Tree measurements (diameter and height), including parameters necessary for calculating tree biomass using allometric equations.
- Soil sampling to determine soil organic matter content and soil density.
- Assessment of carbon sequestration in trees within the study area, evaluated using allometric equations, adapted from the carbon sequestration calculation methods for trees (T-VER-TOOL-FOR/AGR-01 Version 4) and the Greenhouse Gas Emission Reduction Support Project (LESS-FOR-01 Version 6).
- Calculation of soil carbon accumulation in this research, adapted from the method for calculating the amount of carbon accumulated in soil before project initiation, from T-VER-S-TOOL-01-02 Version 01.
- Organizing mangrove plantation activities and providing education on resources management.

Evaluating the ability of agricultural plants and mangrove forests to absorb greenhouse gases not only helps us understand the role of natural resources in reducing greenhouse gas levels but also provides a foundation for planning and implementing effective policies to balance

economic development and environmental conservation. Furthermore, it helps maintain the sustainability of ecosystems and protect natural resources for the future.

This study assessed carbon sequestration in agricultural areas and planted mangrove forests in Tha Sak Subdistrict, Mueang Nakhon Si Thammarat District, Nakhon Si Thammarat Province in 2023. Using data from the District Agricultural Office and the Provincial Mangrove Resource Management Center, the total agricultural area was 3,319.75 rai, with 96% being rice fields, oil palm, and coconut plantations. The planted mangrove forest area from 2008-2016 was 1,751.45 rai. The total carbon sequestration in 2023 was 186,322 tons CO<sub>2</sub> equivalent, divided into 31% in plants and 69% in soil. Agricultural areas sequestered 90,968 tons, while planted mangrove forests sequestered 95,354 tons CO<sub>2</sub> equivalent. In the case of rice paddies, there is a greenhouse gas emission of 539 tons. Rice cultivation involves flooding the fields, which creates conditions where methanogens bacteria thrive. These bacteria decompose organic matter (such as plant debris and rice straw) under anaerobic conditions (without oxygen), resulting in the production of methane gas.

**Keywords:** Carbon sequestration, Agricultural areas, Planted mangrove forests