Evaluation of Rubber Seed Production Capacity and the Impact of Seed Harvesting on Greenhouse Gas (GHG) Fluxes in Para Rubber Plantations

Yoshiaki Kitaya[1]

e-mail: kitaya@omu.ac.jp

[1]*Organization for Research Promotion, Osaka Metropolitan University*

Abstract

Para rubber (Hevea brasiliensis) seeds are a highly promising, underutilized biomass resource. Establishing sustainable pathways for their industrial utilization (biochemicals, bioplastics, bioenergy) is vital for the SATREPS circular economy framework. In addition, large-scale harvesting may alter nutrient cycling and soil carbon input, shifting greenhouse gas (GHG) dynamics. This research aims to evaluate regional seed production across Thailand and assess the effect of seed removal from the soil surface on soil-surface GHG fluxes.

This research mainly consists of two phases.

1. Potential seed production: Field investigations at model farms in Chonburi and Nakhon Si Thammarat will quantify annual seed yields across various tree ages and varieties. Simultaneously, canopy phenology will be analyzed using UAV and satellite remote sensing to develop a nationwide yield estimation model.

2. GHG fluxes: In-situ soil GHG (CO_2, CH_4) emissions will be measured at a model site in Chachoengsao, comparing experimental plots with natural seed and litter retention (control) to those with systematic seed removal (simulating harvesting).

Based on empirical data, we will estimate the potential availability of rubber seeds in Thailand, accounting for seasonal variations, tree ages, and varieties. Additionally, we will construct a predictive model to simulate soil GHG dynamics in response to changes in seed-harvesting intensity. This research provides a critical scientific baseline for SATREPS, helping stakeholders optimize the utilization of rubber seeds for green energy and materials while minimizing the carbon footprint of natural rubber production.