

ABSTRACT

Soil organic carbon stocks play a vital role in maintaining soil quality and mitigating global climate change. Carbon stored in soil as organic matter improves physical, chemical, and biological soil properties, while carbon loss, especially as carbon dioxide, contributes to global warming. Peudada District consists of various land use types including rice fields, plantations, dryland forests, mixed dryland, settlements, and open land, which are expected to have differing soil carbon stocks. This study aimed to quantify the soil carbon stock across these different land use types in Peudada District, Bireuen Regency. The research was conducted from September to November 2025 using a descriptive survey method with stages comprising preparation, preliminary survey, main survey, data analysis, and result presentation. Soil samples were collected by digging minipits at depths of 0-20 cm and 20-40 cm in each land use type. Intact samples were used for bulk density analysis, and non-intact samples for soil organic carbon analysis. A total of 12 soil samples, results showed that the highest soil bulk density 1.55 g/cm^3 occurred in the dryland forest type at 20-40 cm depth, whereas the lowest 1.10 g/cm^3 was found in the rice field at the same depth. The highest soil organic carbon content was found in settlements at 20-40 cm depth 4,43%, and the lowest also in settlements but at 0-20 cm depth 0,99%. The highest soil carbon stock was observed in dryland forest land use at 20-40 cm depth 136.09 MgC/ha, while the lowest was at 0-20 cm depth 23.95 MgC/ha. These findings demonstrate significant variability in soil carbon stocks depending on land use and soil depth.

Keywords: Carbon Organic, bulk density, vegetation, and lowlands