

## ABSTRACT

Dryland areas in Bener Meriah Regency have considerable potential for agricultural development; however, variations in soil quality caused by differences in soil type, land use, and slope gradient remain a major constraint to sustainable land management. This study aimed to analyze the physicochemical properties of dryland soils in Bener Meriah Regency, Aceh Province, Indonesia. Observation sites were determined through the overlay of soil type, land use, and slope gradient maps, resulting in ten Land Mapping Units (LMUs). The analyzed parameters included soil texture, bulk density, soil moisture content, permeability, soil pH (H<sub>2</sub>O), pH (KCl),  $\Delta$ pH, cation exchange capacity (CEC), and organic carbon. The results showed that soil texture ranged from sandy clay loam to clay. Bulk density varied from 0.59 to 1.58 g/cm<sup>3</sup>, soil moisture content ranged from 2.82 to 10.71%, and soil permeability ranged from 0.02 to 6.54 cm/s, classified as very slow to rapid. Soil chemical properties indicated that soil pH (H<sub>2</sub>O) ranged from very strongly acidic to moderately acidic, while all LMUs exhibited negative  $\Delta$ pH values. Cation exchange capacity was classified as high to very high, whereas soil organic carbon ranged from low to very high. Based on the overall physicochemical characteristics, LMU 8 exhibited the most favorable soil conditions, whereas LMU 16 showed the poorest chemical properties and LMU 4 had the least favorable physical properties.

**Keywords:** bulk density, cation exchange capacity, permeability, soil organic carbon, water content.