ABSTRACT

Infiltration plays a crucial role in the hydrological cycle by influencing soil water availability. Improper land use changes can expand critical land areas and reduce infiltration capacity. Critical land conditions in the Bawang Gajah Sub-watershed indicate potential infiltration issues. However, no study has been conducted to assess infiltration rates in this area. Therefore, this research aims to analyze the infiltration rate in the Bawang Gajah Sub-watershed, Central Aceh Regency. The study was conducted from December 2024 to January 2025. This study using a four-stage survey method: (1) preparation, (2) preliminary survey, (3) main survey, and (4) data processing and presentation. Infiltration measurements and soil sampling were based on eight land mapping units (LMU). Double ring infiltrometer was used for infiltration measurements, while undisturbed soil samples were collected using a ring sampler. Soil physical properties analyzed included bulk density (gravimetric water content method) and porosity (gravimetric method) and permeability (constant head permeameter method). Results showed infiltration rates varying from 2.28 to 13.2 cm/hour, categorized as moderate to rapid. The highest rate was found in LMU 5 (13.2 cm/hour) with mixed plantation land use. High rates were also recorded in LMU 2 (11.57 cm/hour) and LMU 10 (7.24 cm/hour). Moderate rates were observed in LMU 3, 4, 6, 7, and 14. Permeability ranged from 1.62 to 3.34 cm/hour, with the highest in LMU 14 and the lowest in LMU 3. Porosity ranged from 47.21% to 52.31%, while bulk density values ranged from 1.28 to 1.34 g/cm^3, all falling within the moderate category.

Keywords: Double ring infiltrometer, Land use, Soil physical properties, Land degradation.