

ABSTRAK

Tanah longsor akibat hujan merupakan salah satu bencana geoteknik yang sering terjadi di Indonesia, terutama di wilayah dengan curah hujan tinggi seperti Kabupaten Purbalingga. Upaya mitigasi non-struktural melalui vegetasi, khususnya vetiver (*Chrysopogon zizanioides*), dinilai efektif karena mampu memperkuat lereng secara hidrologis dan mekanis. Penelitian ini bertujuan menganalisis pengaruh penanaman vetiver terhadap perubahan tekanan air pori dan faktor keamanan lereng selama hujan ekstrem dengan kala ulang 200 tahun. Metode yang digunakan adalah pemodelan numerik berbasis *GeoStudio* melalui tahapan *SEEP/W* dan *SLOPE/W*. Data curah hujan diperoleh dari hidrologi.net dan diolah menjadi kurva IDF, sedangkan parameter tanah dan tambahan kohesi akar (C_r) dihitung dari nilai *Root Area Ratio* (RAR) hasil studi terdahulu. Hasil simulasi menunjukkan bahwa vetiver menurunkan peningkatan tekanan air pori sebesar 1–11% dibandingkan tanah tanpa vegetasi, serta meningkatkan *safety factor* dari 0,98 menjadi 4,1 pada umur 6 bulan, atau naik sekitar 419,7%. Hubungan tekanan air pori dan *safety factor* bersifat berbanding terbalik, di mana sistem perakaran vetiver mampu menahan penurunan kestabilan lereng. Dengan demikian, vegetasi vetiver terbukti efektif sebagai solusi mitigasi non-struktural ramah lingkungan terhadap longsor akibat hujan.

Kata kunci: Vetiver, Stabilitas Lereng, Tekanan Air Pori, *Safety Factor*, *GeoStudio*

ABSTRACT

*Rainfall-induced landslides are among the most frequent geotechnical disasters in Indonesia, particularly in regions with high rainfall such as Purbalingga Regency. Non-structural mitigation using vegetation, especially vetiver (*Chrysopogon zizanioides*), is considered effective due to its hydrological and mechanical reinforcement mechanisms. This study aims to analyze the effect of vetiver planting on changes in pore-water pressure and slope safety factor during extreme rainfall with a 200-year return period. Numerical modeling was conducted using GeoStudio through SEEP/W and SLOPE/W analyses. Rainfall data were obtained from hydrologi.net and processed into Intensity–Duration–Frequency (IDF) curves, while soil parameters and root cohesion (C_r) were derived from Root Area Ratio (RAR) values reported in previous studies. The simulation results show that vetiver reduced the increase in pore-water pressure by 1–11% compared to bare soil and enhanced the slope safety factor from 0.98 to 4.1 at six months of growth, indicating an improvement of approximately 419.7%. A negative correlation was observed between pore-water pressure and the safety factor, confirming that the vetiver root system effectively limits slope instability. Thus, vetiver vegetation is proven to be an environmentally friendly and reliable non-structural mitigation strategy against rainfall-induced landslides.*

Keywords: Vetiver, Slope Stability, Pore-Water Pressure, Safety Factor, GeoStudio