

ABSTRAK

Moh. Zandhio Fadly. 2025. “Kajian Beberapa Sifat Tanah pada Topografi yang Berbeda Serta Hubungan dengan Produksi Tanaman Kelapa Sawit (*Elaeis guineensis* Jacq)” dibimbing oleh Dr. Ir. Diapari Siregar, M.P. dan Prof, Dr. Ir, Yayuk Purwaningrum, S.P., M.P.

Penelitian ini bertujuan untuk mengkaji beberapa sifat fisik dan kimia tanah pada topografi yang berbeda serta hubungannya dengan produktivitas tanaman kelapa sawit (*Elaeis guineensis* Jacq.) di Kebun Air Tenang, PT. Perkebunan Nusantara II, Kabupaten Langkat. Penelitian ini dilaksanakan di PT. Perkebunan Nusantara II (PTPN II) Kebun Air Tenang, yang terletak di Kecamatan Batang Serangan, Kabupaten Langkat, Provinsi Sumatera Utara, pada koordinat 03°37'18.7" LU dan 98°10'31.9" BT. Kegiatan penelitian berlangsung selama tiga bulan, dimulai pada Agustus 2024 hingga Desember 2024. Penelitian menggunakan metode survei dengan pendekatan deskriptif kuantitatif dan kualitatif. Tahapan penelitian meliputi pengamatan dan pengambilan sampel tanah berdasarkan topografi di lapangan, serta analisis laboratorium di Pusat Penelitian Kelapa Sawit (PPKS) dan Laboratorium Universitas Islam Sumatera Utara (UISU).

Berdasarkan hasil penelitian menunjukkan bahwa sifat fisik dan kimia tanah memiliki pengaruh terhadap produktivitas tanaman kelapa sawit pada berbagai topografi. Pada topografi datar, tanah bertekstur lempung liat berpasir dengan pH 4,4, kandungan karbon organik 0,86%, nitrogen 0,13%, fosfor 3,47%, kalium 0,18%, serta KTK tertinggi sebesar 20,29 cmol/kg. Topografi bergelombang menunjukkan tekstur tanah serupa dengan pH 4,6, kandungan C (1,06%), N (0,13%), fosfor relatif tinggi sebesar (25,66%), kalium (2,8%), dan KTK (18,26 cmol/kg). Sedangkan pada topografi berbukit, meskipun kandungan C (1,51%) dan N (0,16%) lebih tinggi, kandungan fosfor sangat rendah (<0,01%) dan KTK paling rendah (11,08 cmol/kg). Topografi datar memiliki kondisi tanah paling optimal dengan KTK tertinggi (20,91 cmol/kg), dan struktur tanah yang lebih baik dibandingkan topografi bergelombang dan berbukit. Semua topografi diklasifikasikan sebagai kelas lahan N1 (Tidak Sesuai) untuk budidaya tanaman kelapa sawit. Curah hujan tinggi (4859 mm/tahun) menjadi indeks pembatas berat yang sulit diatasi. Produktivitas kelapa sawit tertinggi dicapai pada topografi datar dengan rata-rata produksi 14.541 kg/ha/tahun (42,1% standar PPKS), diikuti topografi bergelombang 12.868 kg/ha/tahun (37,3% standar PPKS), dan topografi berbukit 11.812 kg/ha/tahun (36,8% standar PPKS).

Kata Kunci: Kelapa Sawit, Sifat Tanah, Topografi, Produktivitas, PTPN II.

ABSTRACT

Moh. Zandhio Fadly. 2025. *“A Study of Several Soil Properties on Different Topographies and Their Relationship with Oil Palm (*Elaeis guineensis* Jacq) Production.”* Supervised by Dr. Ir. Diapari Siregar, M.P. and Prof. Dr. Ir. Yayuk Purwaningrum, S.P., M.P.

*This study aims to examine several physical and chemical soil properties across different topographies and their relationship with the productivity of oil palm (*Elaeis guineensis* Jacq.) at Kebun Air Tenang, PT Perkebunan Nusantara II, Langkat Regency. The research was conducted at PT Perkebunan Nusantara II (PTPN II) Kebun Air Tenang, located in Batang Serangan Subdistrict, Langkat Regency, North Sumatra Province, at coordinates 03°37'18.7" N and 98°10'31.9" E. The research activities were carried out over a period of three months, from August 2024 to December 2024. A survey method was employed using both quantitative and qualitative descriptive approaches. The research stages included field observations and soil sampling based on topography, followed by laboratory analyses conducted at the Palm Oil Research Center (PPKS) and the Laboratory of the Islamic University of North Sumatra (UISU).*

Based on the research findings, the physical and chemical properties of soil significantly influence oil palm productivity across different topographical conditions. On flat topography, the soil has a sandy clay loam texture with a pH of 4.4, organic carbon content of 0.86%, nitrogen 0.13%, phosphorus 3.47%, potassium 0.18%, and the highest cation exchange capacity (CEC) at 20.29 cmol/kg. Undulating topography also exhibits a similar soil texture, with a slightly higher pH of 4.6, organic carbon content of 1.06%, nitrogen 0.13%, relatively high phosphorus at 25.66%, potassium at 2.8%, and CEC of 18.26 cmol/kg. In contrast, hilly topography, although having higher organic carbon (1.51%) and nitrogen (0.16%) contents, shows extremely low phosphorus content (<0.01%) and the lowest CEC (11.08 cmol/kg). The flat area presents the most optimal soil condition with the highest CEC (20.91 cmol/kg) and better soil structure compared to the undulating and hilly areas. All topographies are classified under land suitability class N1 (Not Suitable) for oil palm cultivation. High annual rainfall (4,859 mm/year) serves as a major limiting factor that is difficult to overcome. The highest oil palm productivity was recorded on flat topography, with an average yield of 14,541 kg/ha/year (42.1% of the PPKS standard), followed by undulating terrain at 12,868 kg/ha/year (37.3% of the PPKS standard), and hilly terrain at 11,812 kg/ha/year (36.8% of the PPKS standard).

Keywords: *Oil Palm, Soil Properties, Topography, Productivity, PTPN II.*