

## ***Analysis of Short-Term Fluctuations in Soil Moisture during the Dry Season in Gampaha District in Sri Lanka using Satellite Remote Sensing***

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Soil moisture, a critical factor for plant growth, denotes the water content within the soil. Its significance in agriculture cannot be overstated, as it directly influences plant development and overall health. According to the Land Use Policy Planning Department, in 2008, the Gampaha District dedicated 86.06% of its land to agriculture. Home gardens made up 55.56%, paddy lands occupied 13.47%, coconut plantations covered 13.44%, and rubber cultivation constituted 3.08%. This study focuses on estimating Near-Surface Soil Moisture (NSSM), specifically within the uppermost 5cm or less of the soil layer. The investigation emphasizes the temporal fluctuations of soil moisture during the dry season in this region, intricately linked to variations in climatic conditions, especially rainfall and temperature. After analyzing monthly average rainfall data, which were obtained from the CHRS website from 2003 to 2023, it was noted that the month of February recorded the driest period in the Gampaha District. Subsequently, the research focused on short-term temporal variations in soil moisture during February in 2018, 2021, and 2024 by analyzing Landsat 8 satellite images with the help of ArcGIS Pro software. The analysis incorporated multiple variables, including the Normalized Difference Vegetation Index (NDVI) and Land Surface Temperature (LST), crucial parameters in optical and thermal infrared remote sensing. The study unveiled that the maximum and minimum land surface temperatures during the study period were 35°C and 16°C, respectively. In 2018 and 2021, the Western part of the district recorded drier characteristics compared to the Eastern part. Conversely, in 2024, this dryness shifted towards the Northeast part of the district. During 2018 and 2021, the Eastern part exhibited wet soil conditions. The Southern part maintained wet soil moisture levels, while the Western part, especially Ja-Ela, Katana, and Wattala near the coast, was drier. By 2024, the driest areas were predominantly in the Northeast of the study area. Hence, these findings will be useful for agricultural practitioners and land managers to efficient water utilization and maintain the health of crops.

**Keywords:** Soil Moisture, Gampaha District, Dry Season, NDVI, LST