**HUNGARIAN UNIVERSITY OF AGRICULTURE AND LIFE SCIENCE (MATE)**

**Szent Istvan Campus**

# Spatiotemporal Dynamics of Soil Erosion Response to Land Use Land Cover Dynamics and Climate Variability in Maybar Watershed, Awash Basin, Ethiopia


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## SUMMARY

Soil erosion is a significant threat to land and water resources in Ethiopia's highlands, resulting in a loss of fertile soil and declining crop yields. The study's objective was to determine how changes in land use and cover impact soil erosion dynamics and prioritize soil and water conservation interventions. The study utilized GIS and remote sensing techniques to assess the impact of land use and land cover changes on soil erosion from 2004 to 2020. The RUSLE model was used to map soil erosion risk and estimate soil erosion rates. The study identifies six land use and cover types and shows significant changes in bare land and shrubland, decreasing by 25.48% and 6.17%, respectively, over 24 years. Meanwhile, forest land increased by 20.19%, and cultivated land increased by 3.52%. The study found that bare land, cultivated land, and grazing land have the highest annual loss, while forest land, shrubland, and water bodies have the lowest. The mean annual soil loss rate at the watershed level decreased from 12.8t $ha^{-1}$ $yr^{-1}$ in 2004 to 3.21t $ha^{-1}$ yr-1 in 2020, and the expansion of forest land in marginal areas is strongly related to the soil and water conservation program, contributing to the decrease in soil loss rate. The RUSLE model utilized rainfall data, soil data, DEM data, and satellite images to estimate RUSLE parameters and prepare RUSLE factors map in a 2 m x 2 m pixel size raster data layer. The soil erosion risk map, expressed in tons per hectare per year, was generated through the combination of the RUSLE model's five factors for three study periods. The study also mapped the spatial distribution of the soil erosion risk using the RUSLE model, which was verified through different scholars' findings. The study classified the watershed into five classes based on the severity of soil erosion, with 88.5% of the watershed falling under the low soil erosion-prone class. The study emphasized the importance of prioritizing interventions for watershed types with high erosion risks to reduce soil loss and conserve water resources. The findings support the importance of long-term watershed management to reduce soil erosion, and the study recommends encouraging afforestation and reforestation, developing sustainable land use policies, strengthening soil conservation measures, and improving monitoring and evaluation of land use changes to reduce soil erosion effectively and improve environmental quality.



**Keywords:** Soil erosion, Land use dynamics, Climate Variability, Maybar Watershed, Spatiotemporal dynamics