FRN application and conventional methods for soil redistribution analysis in the la Zanguenga micro-basin (Panama Canal)

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Soil erosion is a key process in the degradation of terrestrial ecosystems, affecting agricultural productivity and environmental sustainability. This study evaluates soil redistribution in the La Zanguenga Creek micro-basin (a high pineapple production area). This micro-basin is part of the Panama Canal's hydrographic basin, which feeds the Gatun Lake, an artificial reservoir essential for the canal's operation. For its analysis, three methods were applied: Fallout Radionuclides (FRN), erosion pins, and the Universal Soil Loss Equation (USLE) model. The FRN method allows for the analysis of soil dynamics at different spatial and temporal scales, making it an effective tool for quantifying erosion and sedimentation rates. Erosion pins provide direct measurements, though they may present a degree of subjectivity depending on the accuracy of the reader. In contrast, mathematical models, while useful, have limitations due to specific parameters and require a considerable number of additional readings.

The integration of multiple methods enables a more comprehensive assessment of soil redistribution in the La Zanguenga Creek micro-basin. In this region, soil losses due to erosion reach 200,08 t/ha in bare soils and 13,72 t/ha under conventional planting, exceeding the soil loss tolerance threshold of 11 t/ha/year (Mejia, 2018). These figures are largely attributed to human activities and the rainfall patterns characteristics of the area, which are further altered by the effects of climate change, leading to more frequent heavy rains. The impact of runoff varies depending on its speed and the vegetation cover present during rainfall events. In the case of the La Zanguenga micro-basin, the extensive pineapple cultivation areas lack sufficiently dense foliage to reduce aggressive soil displacement. However, different production systems are employed in the region, which may either increase or decrease soil erosion.

This study aims to identify which of these methodologies is most suitable for local farmers, helping them understand soil redistribution processes through these techniques and providing tools to optimize agricultural practices and mitigate erosion effects.

Mejia, J. (2018). *EVALUACIÓN DE LA PÉRDIDA DE SUELO Y NUTRIENTES POR EROSIÓN*.