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## Assessment of Soil Nutrient Depletion Levels in Different Land Use Types and its Economic Implication in Gelda Watershed, Ethiopia

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### Abstract

Due to improper land management practices such as crop residue harvesting and erosion, soil nutrient depletion has become a major agricultural problem in central highlands of Ethiopia. As a result, it is impossible to achieve food security in the region. To counteract the problem, it is necessary to implement proper land use systems and to identify the impacts of these systems on soil nutrient depletion. Hence, the objectives of this paper were to assess the level of nutrient depletion in five adjacent land use types (grazing land, natural forest land, old farm land with scattered trees, new bare farm land and old bare farm land) and to evaluate its economic implication in Gelda watershed, South Gondar Zone, north-west Ethiopia. Soil samples were collected from 0–15 and 15–30 cm depth and analysed for physical and chemical properties using standard laboratory procedures. Some of the parameters analysed were texture, bulk density, organic matter content, moisture content, active and exchangeable acidity, total macro nutrients (N, P and K), exchangeable cations ( $\text{Ca}^{2+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Na}^+$ , and  $\text{K}^+$ ) and CEC. The results indicated that clay content, organic matter content, pH and CEC were higher in the forest lands than in the farm and grazing lands. Depletion level of the total macro nutrients and exchangeable cations were positively correlated to organic matter. Of all the land use types considered, the grazing land had higher degradation index (-140%) and among the three farm land use types, the old farm land with scattered trees had a lower degradation index (-78%). The annual nutrient loss from the old bare farm land through rill and interrill erosion was estimated at 1560 birr  $\text{ha}^{-1} \text{yr}^{-1}$  in monetary terms. In general, the current land management system can't sustain the nutrient level required for common food crops production. And hence, we recommend the expansion of scattered tree based agroforestry system in order to sustain the soil nutrient level.

**Keywords:** Degradation index, land use, nutrient depletion, scattered trees