



Land Degrdatation, Causes, Implications, and Sustainable Management in Arid and Semi-Arid Regions: A Case Study of Egypt



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THIS REVIEW focuses on the main causes, effects and governmental management practices of soils in Egypt subjected to degradation threats. Land degradation became a global concern threatening food security and the ecosystem since it has a significant impact on the environment and agriculture. The major causes of degradation are alteration in climatic conditions, overgrazing, salinization, deforestation, depletion of soil organic matter content, desertification, waterlogging, inappropriate agronomic practices and erosion. It is paramount to reduce these causative factors in order to adequately manage the situation. The effects of these factors may lead to loss of ecosystem, biodiversity and agricultural yield/output. We can manage and improve the well-being of our soils in Egypt through afforestation, managing vegetation cover, soil reclamation, optimizing agricultural practices (e.g. tillage, irrigation and fertilization), avoidance of crop residues removal and application of organic matter to the farmland. Additionally, organic farming can be a substitute in keeping our land safe from degradation. The outstanding features of GIS and remote sensing, which include: field wide view, inexpensive costs, instantaneous data capturing, and sporadic imagery is now widely applied in the studies of land degradation due to its timeliness, coverage and efficiency. Future research in this area of study should empjasis on developing modern soil sensors, which will be connected with sattalite data, to predict the futute alterations in soil ecosystems and potetials of land degradation.

Keywords: Sustainable Management; Land Degradation; Agriculture; Environment; GIS and Remote sensing

1. Introduction

Land degradation (LD) is an environmental process associated with the decline in productive capacity of soils as a result of soil erosion and/or any other alterations in the hydrological, biological, physical and chemical properties of the soil. Land use alterations by anthropogenic activities have had inconsistent impacts on the Earth's surface taking into consideration that soil is a non-renewable natural resource (Haregeweyn *et al.*, 2023). Many locations throughout the world are currently losing their fertile topsoil due to several natural causes (wind, water, and climate influences) and anthropogenic activities (e.g. unsustainable agricultural practises and intensive tillage that induced erosion) (Heffer and Prud'homme, 2014; Ferreira *et al.*, 2022). More than 90% of the world's topsoil is threatened by land degradation, potentially exacerbating negative consequences such as reduced crop production and a

negative impact on food security as the world's population grows (Beillouin *et al.*, 2022; Wang, 2022). Negative impacts of land degradation are numerous, these may include; loss in soil organic matter content, soil erosion, soil compaction, desertification, salinization, deforestation (Turner *et al.*, 2016). Land degradation are associated with tremendous impacts on land productivity, biodiversity, soils flora/fauna that affects human livelihood (Mohamed *et al.*, 2019; AbdelRahman and Arafat, 2020; El-Rawy *et al.*, 2020; AbdelRahman *et al.*, 2022; AbdelRahman, 2023). Land degradation due to accelerated and combined effects of urbanisation (deforestation), inappropriate agricultural activities (e.g. intensification of land management practises and overgrazing) has exacerbated the negative impacts on severe weather warnings (e.g. high temperature, heat islands and

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