A Systematic Review of the Influence of Urban Soil Management on Tree Growth and Long-term Ecosystem Services

Abstract

Typical urban development usually results in soil degradation that can impair urban tree establishment and growth and related long-term ecosystem services (e.g., stormwater runoff mitigation and carbon sequestration). There are increasing body of knowledge on soil rehabilitation strategies for degraded urban soil. However, a comprehensive analysis of how urban soil management affects tree growth and long-term ecosystem services is still lacking. To address the research gap, we conducted a systematic literature review in the Web of Science using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) method. A total of 36 keywords were used to retrieve the existing literature, for example, “urban forest and soil rehabilitation” and “urban and compost amendments and soil compaction”. Following the application of search parameters, 5,913 articles were retrieved. After screening, a total of 57 peer-reviewed articles were included in our study. With a focus on the most effective urban soil rehabilitation strategies, this study will comprehensively examine and synthesize existing literature to better assess potential strategies/solutions/techniques to address soil compaction, facilitate urban tree growth, and enhance long-term ecosystem services. In general, we found that soil management practices like amendment addition enhanced the soil properties like increased soil organic matter, reduced soil bulk density, and increased tree growth rates compared to unamended soils. Likewise, the amendment that had the highest and most lasting effect on the soil properties in this study was the application of biochar along with compost. Deep incorporation of compost such as Soil Profile Rebuilding is a viable means to improve establishment and increase growth rates of planted trees in disturbed, urbanized soils. The result of these studies concludes that the application of compost can improve numerous soil properties (e.g. soil porosity, soil microbial properties, soil bulk density and infiltration rate) in degraded soils within.These findings will help guide urban planners, decision-makers, and scholars who are interested in sustainable urban development. It will also provide applicable knowledge to diverse stakeholders towards a greener, healthier, and more sustainable future.