

Abstract

Earthworms which inhabit soils and litter layers in agro-ecosystems play significant roles that regulate soil ecosystem services supporting agriculture. Through their feeding, burrowing and casting activities, earthworms redistribute organic material within the soil, increase soil penetrability, and influence soil organic matter decomposition and nutrient cycling. These activities modify plant root distribution, increase soil microbial activity and influence the supply of plant nutrients. Because earthworms respond quickly to land use changes, farm management practices affect their diversity, abundance and biomasses. While cultivation and use of acidic fertilizers and chemicals reduce earthworm numbers, management practices that enhance the supply of earthworm food such as fertilization and manure application increase their numbers. This article reviews the beneficial earthworm facilitated biotic interactions that enhance nutrient use efficiency in agro-ecosystems. First, earthworm identification, distribution, and ecology together with factors that determine their populations in agro-ecosystems are discussed. It shows that agricultural practices affect earthworms directly and that farm management can be manipulated to encourage practices that favour earthworms. Secondly, beneficial biotic initiated ecosystem services resulting from earthworm activities are presented highlighting the significant roles they play in influencing soil processes. Finally, the review ends with recommendations for future research. Overall, this review shows that earthworms are an important resource to be managed for nutrient use efficiency in agro-ecosystems. It also demonstrates the need for further research that links the physical, chemical and biological effects of earthworm activities to plant nutrient supply. It is necessary to develop suitable farm management practices that optimise these beneficial roles.