

# Ecological assessment based on soil animal communities and thermal environment in roof garden soil of Tokyo in Japan

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## Abstract:

The purpose of this study was to evaluate the thermal environment, cultivation management and soil biodiversity of roof gardens. Planting roof gardens not only creates places to relax, but also conserves energy in buildings by insulating roofs and mitigating the urban heat island effect. Therefore, local district governments undergoing urbanization require planting of gardens on roofs of buildings that exceed prescribed dimensions. Restoration of soil biodiversity in cities is also highly anticipated. Not only parks but also roofs of buildings are effective as new biological habitat areas. However, roof gardens often use artificial lightweight soil. Furthermore, roofs tend to become arid due to the effects of solar radiation and wind and thus differ from natural forests as habitat environments for soil animals with low mobility.

In this study, we examined animal communities and physical and chemical properties of soil from natural forests and natural and artificial lightweight soils from eight locations in roof gardens of different ages on office, commercial and apartment buildings in the centre of Tokyo. This study showed that population and species richness of soil animals are lower in roof gardens than in natural forests. Furthermore, natural soil in roof gardens increases population and species richness of soil animals over the years. In contrast, artificial lightweight soil increases population but decreases species richness. In other words, this study showed that soil biodiversity in roof gardens is increased by natural soil instead of artificial lightweight soil and by avoiding excessive management of cultivation. An examination of soil surface temperatures revealed a difference between natural and artificial lightweight soil. A more effective way to create ecological cities is to plan rooftops based on the ecological evaluations of this study.

**Keywords:** urban ecology, soil animal communities, soil biodiversity, thermal environment, roof garden

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