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Ecological factors shaping agroforestry practices among smallholder farmers in gorkha district, nepal

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Abstract

Agroforestry systems, a combination of trees and crops, are centrally linked to the livelihoods of Gorkha people, and they are presented as an alternative to conventional agriculture due to their potential to mitigate climate change without decreasing food production and biodiversity. This study delves into the interplay of biological and environmental factors shaping AF systems in Nepal's mid-hills. Our objective is to assess the influence of environmental factors on tree species richness, diversity, and vegetation structure. The study examines two different types of AF systems (crop terraces and multipurpose woodlots) that vary in vegetation and land use. Data collected on tree species richness and diversity, vegetation complexity, and soil structure, along with other environmental variables such as slope, orientation, and elevation of every plot. Alpha diversity, species richness, tree abundance, tree density, average height, basal area, and soil structure were estimated and compared between the terrace and multipurpose plots. A non-metric multidimensional scaling (NMDS) was also executed, implementing environmental variables (slope, orientation, and elevation), to determine the links between biological and environmental factors. While tree abundance, density, average height, and basal area exhibited higher values in multipurpose woodlots, no significant differences in tree species diversity and richness were observed between system types. Slope and elevation had an inverse relationship with biodiversity indices, indicating a lower biodiversity at higher altitudes and steeper terrains. Slope orientation was associated with a smaller number of trees, a lower quality of soil structure, and the presence of terraces. This result stems from reduced sunlight exposure on north-facing terraces, leading farmers to maintain fewer trees to minimise light competition for cropping. Overall, with the information gathered, a clearer understanding of the complex relationships of biological and environmental factors within AF systems can be obtained and used for applying optimal management practices and recommending farmers with the most sustainable and productive opportunities.

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