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Ecological Trade-offs between Plant Biodiversity, Land-use and Management Intensification in Agroforestry Systems of Bangladesh

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Agroforestry, because of its diverse options and structures is sometimes believed to be most suitable for conserving biodiversity, particularly in tropical landscapes where rural people depend heavily on nature for sustaining their livelihoods. However, since agroforestry systems are subjected to some level of cultural management it is also critical to understand how cultural management and different levels of intensification affect biodiversity in agroforestry landscapes. We conducted an exploratory survey on four contrasting agroforestry systems; *viz*., betel-vine (*Piper betle*) based agroforestry, lemon (*Citrus limon*) based agroforestry, pineapple (*Ananas comosus*) based agroforestry, and short-rotation shifting cultivation in a tropical forest patch of Bangladesh, to assess the response of plant community to different levels of management intensification.

A unique management intensification gradient was developed identifying a total of 11 local cultural practices spread across the studied agroforestry systems. We recorded 173 plant species (61 trees, 42 shrubs, 47 herbs, 18 climbers and 5 orchids) from forty 100 m^2 plots established in the four agroforestry systems. The Shannon-Weiner biodiversity index calculated was higher for betel-vine agroforestry (3.3), followed by 2.9 for lemon/horticulture agroforestry, 2.2 for pineapple agroforestry and 1.9 in short-rotation shifting cultivation system (comparable to 2.7 for forest). Species evenness index for tree was also higher in betel-vine agroforestry system (0.79). A simple linear regression was performed for each of the studied agroforestry systems to realise the response of different plant functional groups to a weighted management intensification value. It was observed that plant biodiversity is highly sensitive to management intensification, and the response of different plant functional groups to different management regimes varies greatly on the type of agroforestry systems and the kind of expected products. The study also suggested that some practice (for example here betel-vine agroforestry system) that evolved through indigenous innovation is suitable for conservation of plant biodiversity and could offer a basis for sustainable forest management.

Keywords: Agroforestry, Bangladesh, land-use, Lawachara National Park, management intensification

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