PhD Dissertation Defense

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ABSTRACT

Forest plays an important role in global carbon cycle, so a REDD+ (Reducing Emission from Deforestation and Degradation) mechanism is proposed as an effective policy in addressing climate change concerns. However, the effective and efficient REDD+ implementation depends on better estimation of carbon emission and its impact on livelihood benefits and biodiversity conservation. This study focuses on four key areas: first determine the spatial distribution pattern of forest carbon stock and identify the most accurate method for predicting the spatial surface of carbon stock; second analyze the association among carbon stock, forest contribution to livelihood and biodiversity; third locate regions with overlapping biodiversity and carbon accumulation hotspots and any trade-offs, and fourth make appropriate recommendations based on the findings. This study examined several interpolation methods to estimate forest carbon distribution in Kayarkhola and Ludhikhola watersheds of Nepal and geostatistical technique, cokriging provided better result compared to Inverse Distance Weighting (IDW), ordinary kriging and regression kriging for estimating carbon stock in both areas. Cokriging with elevation, vegetation, and tree crown as secondary variables showed relatively low root mean square error (RMSE) value, about 40.9% in Kayarkhola and 28.9% for Ludhikhola watersheds. The Spearman rank correlation was calculated to examine the association among carbon stock, livelihood improvement, and biodiversity. The results indicate there is positive but minimal association between carbon stock and livelihood benefit and the

degree of association varied among regions. Similarly, the association between species richness and livelihood index shows positive correlation in Kayarkhola (rS=0.44) and negative in Ludhikhola (rS= -0.007), suggesting both trade-off and synergies are possible outcomes. Further, there is positive but moderate significant association between carbon and biodiversity at watershed level, but at local level, the spatial distribution indicates carbon hotspot areas do not always overlap with biodiversity rich areas. The analysis showed that REDD+ that is primarily focused on carbon stock may pose undesirable risk to other benefits, as the association is not always the outcome, so livelihood benefits and biodiversity conservation should be incorporated in a decision making process.