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“Management of land use systems for enhanced food security:
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Meet the Balance of Carbon Emission and Land Use Productivity - Case Study from Naban National Nature Reserve, Xishuangbanna

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Abstract

Land use planning for Low Emission Development Strategy (LUWES) is a crucial platform for sustainable land use management, which aims to decrease carbon emissions while maintains land use productivity/ economic growth in landscape. In Naban National Nature Reserve (NNNR), Rapid Carbon Stock Appraisal (RaCSA) approach was applied to evaluate time-averaged carbon stock of dominate land use types, namely upland forest, lowland forest, upland rubber plantation, lowland rubber plantation, bush and grassland, and agricultural crops. These values were used for upscaling and C stock estimate in landscape. Historical and current land use change patterns was assessed by creating transition matrix from 1989, 2007 and 2012 land use land cover maps. The top four land use changes were from bush and grassland to upland forest, from bush and grassland to agricultural crops, from agricultural crops to upland forest and from upland forest to upland rubber plantation, which had a percentage change of total area value of 39.45 %, 16.25 %, 8.38 % and 7.39 % respectively. From 1989 to 2012, the land use change induced 0.18 Mt carbon emissions and 0.73 Mt carbon sequestrations. The net carbon sequestration was 0.55 Mt with a sequestration rate of 20.62 Mg C ha⁻¹. In next step, the REDD Abacus (Reducing Emissions from Deforestation and Forest degradation Abatement Cost Curves and Simulator for Scenarios of Policies) software will be used to simulate business as usual scenarios and other emission-reduction scenarios within landscape. Opportunity cost will serve as a good indicator for providing reference benefit of various land use types within specific rotation life, it refers to the potential economic gains if certain types of land use change not happening. The analysis can provide a simple first approximation of potential avoidable emissions which driven from incentive mechanisms in the past. Results of this study can provide an entry point for the discussion on the feasibility of compensation-based mechanism of climate change mitigation actions, moreover, it can also serve as the foundation for more complicated process-based modelling for providing reference for local decision makers.

Keywords: Carbon emission, land use productivity, low emission land use planning strategy, RaCSA, REDD Abacus