## A Life Cycle Assessment of Greenhouse Gas Emissions from the Traditional and Climate-smart Farming: A Case of Dhanusha District, Nepal

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Abstract : This paper examines the emission potential of different farming practices that the farmers have adopted in Dhanusha District of Nepal and scope of these practices in climate change mitigation. Which practice is more climate-smarter is the question that this aims to address through a life cycle assessment (LCA) of greenhouse gas (GHG) emissions. The LCA was performed to assess if there is difference in emission potential of broadly two farming systems (agroforestry-based and traditional agriculture) but specifically four farming systems. The required data for this was collected through household survey of randomly selected households of 200. The sources of emissions across the farming systems were paddy cultivation, livestock, chemical fertilizer, fossil fuels and biomass (fuel-wood and crop residue) burning. However, the amount of emission from these sources varied with farming system adopted. Emissions from biomass burning appeared to be the highest while the source 'fossil fuel' caused the lowest emission in all systems. The emissions decreased gradually from agriculture towards the highly integrated agroforestry-based farming system (HIS), indicating that integrating trees into farming system not only sequester more carbon but also help in reducing emissions from the system. The annual emissions for HIS, Medium integrated agroforestry-based farming system (MIS), LIS (less integrated agroforestry-based farming system and subsistence agricultural system (SAS) were 6.67 t ha-1, 8.62 t ha-1, 10.75 t ha-1 and 17.85 t ha-1 respectively. In one agroforestry cycle, the HIS, MIS and LIS released 64%, 52% and 40% less GHG emission than that of SAS. Within agroforestry-based farming systems, the HIS produced 25% and 50% less emissions than those of MIS and LIS respectively. Our finding suggests that a tree-based farming system is more climate-smarter than a traditional farming. If other two benefits (carbon sequestered within the farm and in the natural forest because of agroforestry) are to be considered, a considerable amount of emissions is reduced from a climatesmart farming. Some policy intervention is required to motivate farmers towards adopting such climate-friendly farming practices in developing countries.

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