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# Monitoring and Assessment of Watershed Management Practices on Sedimentation Rate of Inle Lake, Myanmar

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Unstainable agricultural practices and deforestation around the Inle Lake in Myanmar have accelerated not only soil erosion and land degradation, but also the sediments delivery into the lake, leading to the deterioration of water quality. These problems are compounded by climate change impacts resulting in fluctuating water level between dry and wet seasons, and reduction of water volume especially in the dry season. There is an urgent need to understand how land use and management changes affect water quality and quantity, sedimentation rate and sediment transport processes, for sustainable integrated watershed management of Inle Lake. Here, we used the fallout radionuclides (FRNs) i.e. Caesium-137 (137Cs) to assess soil erosion and sedimentation processes, and compound specific stable isotope (CSSI) technique to identify the origins of erosion by land use type. CSSI is based on the measurement of carbon-13 isotopes of specific organic compounds such as the fatty acids of plants in the soil. As the makeup of carbon-13 is unique for each compound, measuring its carbon-13 signature ($\delta$13C) can reveal the origin of the eroded soil. By linking carbon-13 fingerprints of land use to the sediment in deposition zones, this technique is useful in determining the sources of eroded soil and in identifying areas prone to soil degradation.

The Kalaw watershed, one of the major streams flowing into the Inle Lake was selected for this study, because of the serious erosion and the major contribution of sediments to Inle Lake. Forty-five CSSI samples across the entire Kalaw watershed of 480 km2 and 135 137Cs samples from the sloping land with different cultivation years (5, 15, 20, 30 and 40-50 years) were collected. The FRN samples were measured using Gamma Spectrometry, while the CSSI analysis was based on Isotope Ratio Mass Spectrometry.

The results showed that soil loss rates increased with cultivation time converted from forests, at an increasing rate of 26 t ha-1 yr-1. After 40 years of cultivation, soil erosion rates reach 120 t ha-1 yr-1. The results also showed significant soil losses occurred in the upper slopes and soil accumulation at lower locations. Preliminary CSSI results determining contribution of different land use types to sediment sources in Inle Lake showed that almost 45% of the total sediment contribution from Kalaw watershed came from degraded or bare land as a result of deforestation. Our results suggested that a combinative use of 137Cs and CSSI techniques has great potential in quantitative assessment of the watershed management practices on sedimentation budgeting.