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Impacts of agricultural practices on water quality in Uma Oya catchment area in Sri Lanka

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Abstract

Sustainability of global food production is highly depending on the quality of the environment. In many parts of the world increase of agricultural production heavily depend on intensive agricultural practices which are having negative impact on the environment. The impacts of agricultural practices on surface water quality is given special attention currently since the safe and ample supply of freshwater is fundamental to humans and for the sustainability of ecosystem function. Intensive agricultural practices in river catchments often pose threat to the ecological integrity of river ecosystems. Uma Oya watershed in the upper Mahaweli watershed in Sri Lanka is an intensively cultivated landscape. In most parts of the catchment previously forested lands have been cleared and converted to agricultural lands. However, the empirical evidence on quantitative assessment of such land use conversion impacts on stream ecological health is lacking in the context of river catchments in Sri Lanka. Therefore the present study was aimed at evaluating the agricultural land use impacts on stream physical habitat quality, water quality and macroinvertebrate indices in the Uma Oya catchment at different spatial scales. The relationship between catchment and site scale % agricultural lands, water quality and macroinvertebrate indices were evaluated using univariate and multivariate approaches. The results indicated that stream physical habitat quality, water quality parameters and macroinvertebrate indices are significantly ($p < 0.05$) affected by catchment scale % agricultural land cover. Among the water quality variables that were tested $\text{NO}_2\text{-N}$, $\text{NH}_3\text{-N}$, $\text{PO}_4\text{-P}$ and BOD_5 level in sites with higher percentage of agricultural land cover exceeded the drinking water quality standards during dry season. $\text{PO}_4\text{-P}$ and BOD_5 level in those sites exceeded the proposed ambient water quality standards for inland waters in Sri Lanka for aquatic life and for irrigation purposes. Findings of the present study suggest that catchment scale interventions are crucial for the management of Uma Oya watershed and for the improvement of water quality and sustainable agricultural production.

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Keywords: Agricultural practices; water quality; physical habitat quality; macroinvertebrate indices

1. Introduction

Sustainability of global food production is highly depending on the quality of the environment. The need for increased food production to cater to increasing human population is challenged by issues related to sustainability of the world's ecosystems on which food production depends on. In many parts of the world increase of agricultural production heavily depend on intensive agricultural practices which are having negative impact on the environment. The impacts of agricultural practices on surface water quality is given worldwide attention currently since the safe and ample supply of freshwater is fundamental to humans and for the sustainability of ecosystem function.

The Upper Mahaweli watershed area in Sri Lanka has undergone considerable land cover changes during the last few decades due to the anthropogenic influences. In most parts of the previously forested catchment, areas have been continuously cleared and converted into agricultural lands. Intensive agricultural practices in steep slopes in the catchment have used extremely high levels of pesticides (insecticides and fungicides) and fertilizers in order to maintain high yields and profits¹. Evaluation of such land conversion impacts on stream ecological integrity is important for taking decisions in catchment management and for the adoption of sustainable agricultural practices. The present study was conducted in Uma Oya (fig. 1) catchment in upper Mahaweli watershed in Sri Lanka with the aim of testing the agricultural land use impacts under different spatial scales on river health in terms of physical, chemical and biological quality.

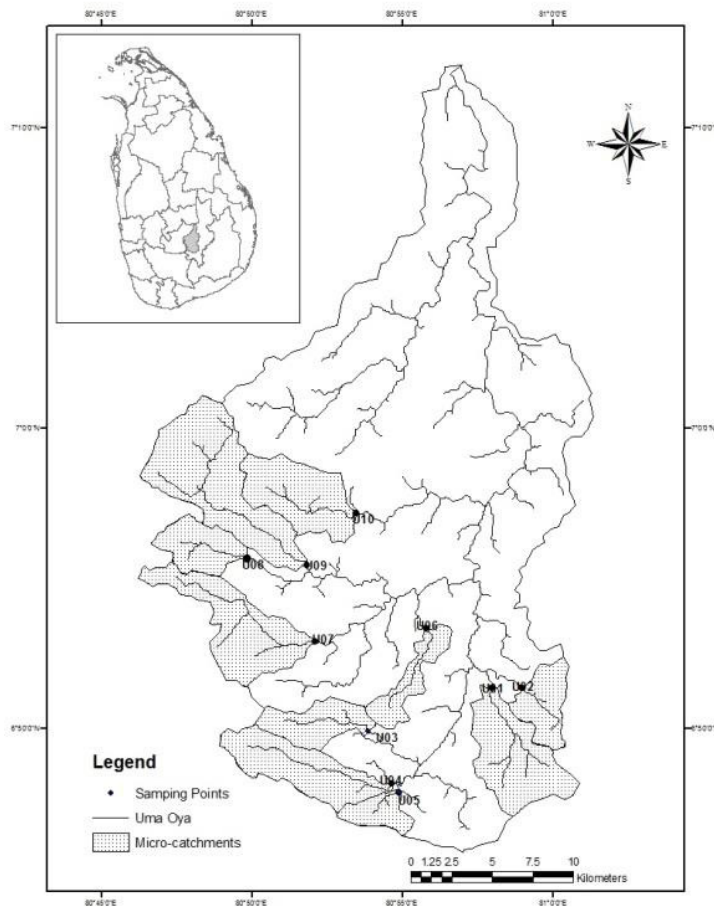


Fig.1. Sampling locations in the Uma Oya catchment

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