

ABSTRACT

The use of both fertilizers and pesticides in the Lake Naivasha Catchment, is associated with agricultural intensification and has resulted in enrichment of aquatic ecosystems with nutrients, coupled with exposure of aquatic biota to pesticide residues affecting aquatic ecosystem structure and function. This study explored the changes in land use and related it with the concentrations of nutrients and selected pesticides, to show the potential of combined (nutrients and pesticides) risks associated with agricultural intensification in Lake Naivasha catchment, a tropical catchment in Kenya. The results indicate that between 1989 and 2019 there was an increase of cropland by 623 km², a reduction of forest cover by 200 km², increase of grasslands by 534 km², a reduction in bare soils by 100 km², and an increase of 540 km² of built area. The land cover changes were correlated with increased concentrations of nutrients and pesticides in surface waters across sampling sites monitored in 2015. The results further indicated that while the concentrations of nitrogen and phosphorus indicated a potential stoichiometric nitrogen limitation, increase in forest cover resulted in decreased nutrient concentrations in the river water. Concentrations of DDT and technical HCH active ingredients indicated significant relationships between land use changes and intensification. Areas with extensive farming systems were associated with higher concentrations of TP and \sum DDT compared with areas of high intensification, which may reflect high connectivity between intensive agricultural systems and river ecosystems. When combined nutrients and pesticides were considered, most of the lower reaches of the rivers draining to L. Naivasha were of poor water quality status as defined by Kenyan water quality regulations. The changes in land cover and agricultural intensification in the Naivasha catchment needs management and policy frameworks that manage the combined contamination from nutrients and pesticide residues. Enhanced investment in institutional and policy reforms, and an integrated review of water quality standards and monitoring indicators that combine biological, physical, and chemical monitoring, is necessary for future management of the catchment.

Keywords

IHE Delft Institute for Water Education