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Name of the Title: Assessment of Floating Wetland Technology as way to Improve Water Quality of River Buriganga.

Introduction

The discharge of various industrial and domestic effluents into surface waterways is severely damaging the aquatic environment in Bangladesh. Natural purification is a viable route for maintaining the ecological health of the waterways. However, in Bangladesh the strength of effluent discharge and pollutant load on the waterways are substantially higher than in many other countries. Considering that the natural self-purification capacity of a waterway is limited, excessive pollutant loadings can cause severe and prolonged degradation of water quality. To protect the waterways, new regulations on wastewater treatment and discharge have been introduced. However, illegal wastewater discharge to load open channels has limited the effect of the new regulations. In addition to law enforcement, artificial strengthening of the purification ability of the water bodies is necessary for protecting the water environment.

Constructed wetland, a low-cost green treatment technology is a viable option to enhance the pollutant removal abilities of open water channels. Several studies reported the potential application of subsurface flow wetlands, for improving the water quality of polluted rivers. However, the implementation of subsurface flow wetlands for polishing polluted surface waters in Bangladesh is difficult, due to the lack of available land areas on the banks of rivers, as they are often used for agricultural activities.

Under such circumstances, FCW can provide a balance between the necessity of treating polluted river waters and shortage of land areas for agricultural activities. FCW systems include emergent macrophytes, supported by water buoyant mat structures. The stems of the macrophytes remain above the water surface; their roots developing through water column beneath the floating mats. Microbiological population develops around the hanging roots, forming a complicated network of roots and bio films. Such complicated mesh produce net removal of pollutants as water passes through the networks.

Different types of wastewaters had been studied for potential treatment by the FCW systems. However, using FCW to treat polluted river water has not been thoroughly investigated. To date, only a limited number of studies have investigated the FCW stems for the treatment of polluted open water channels. Significant variations of pollutant concentrations in the polluted river during dry and wet periods are common, as observed in surface water channels. The influence of such variations on the effectiveness of FCW has not been critically examined. Shock loading pollutants is a common phenomenon in surface waters, caused by sudden increase of pollutant input by severe weather events in wet seasons, accidental pollutant spills or illegal discharges. Adverse impact of shock loading on the removal performances of subsurface flow wetlands had been reported but previous studies have not been carefully examined the effect of shock loading on FCW systems.

This study has been designed to assess the performance of a pilot-scale FCW, used for the treatment of polluted water collected from Buriganga River, which is one of the most polluted rivers in Bangladesh.

The objectives of the study were -

a) To investigate the effectiveness of floating treatment wetland in removing some major pollutants, such as: ammonia (NH3), nitrite (NO2), nitrate (NO3), total nitrogen (TN), suspended solids (SS) and phosphorus from river Buriganga.

b) To evaluate the efficiency of the system in removing coliform bacteria (from the water column of Buriganga river).

c) To observe pollutant removal pattern of the system when subjected under various loading conditions i.e. sudden increase (shock loading) and decrease of input loadings that are often observed across surface water channels.

Results and discussion: Table 1 summarizes overall pollutant removal performances of the pilot scale FCW during the experimental campaign. In addition, Bangladesh guidelines of some surface water quality parameters (i.e. pH, DO, NH4-N, BOD, P) have also been included in the Appendix. As observed in graphs, the concentration of these parameters in the collected river water was higher, when compared with Bangladesh guidelines. Mean pH and DO values increased in the effluents of the FCW. Mean removal percentages of NH4-N, NO2-N, P and E. coli were higher, compared with other parameters. Minor increase of NO3-N concentration was observed in the effluent. Mean influent organic concentrations were lower, associated with lower removal percentages in the FCW. The experimental wetland was not efficient in terms of removing suspended solids (from river water), as illustrated by very low removal performances.

For more information on this study, please contact the National Resource Centre, NGO Forum for Public Health, E-mail: nrc@ngof.org