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Abstract: Most of the wastewater treatment systems in small rural communities of the Cova da Beira region (Portugal) consist of constructed wetlands (CW) with horizontal subsurface flow (HSSF). It is believed that those systems allow the compliance of discharge standards as well as the production of final effluents with suitability for reuse. Results obtained in a nine-month campaign in an HSSF bed pointed out that COD and TSS removal were lower than expected. A discrete sampling also showed that removal of TC, FC and HE was not enough to fulfill international irrigation goals. However, the bed had a very good response to variation of incoming nitrogen loads presenting high removal of nitrogen forms. A good correlation between mass load and mass removal rate was observed for BOD5, COD, TN, NH4-N, TP and TSS, which shows a satisfactory response of the bed to the variable incoming loads. The entrance of excessive loads of organic matter and solids contributed for the decrease of the effective volume for pollutant uptake and therefore, may have negatively influenced the treatment capability. Primary treatment should be improved in order to decrease the variation of incoming organic and solid loads and to improve the removal of COD, solids and pathogenic. The final effluent presented good physical-chemical quality to be reused for irrigation, which is the most likely application in the area.

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