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High rate transpiration system: A phyto-technology for land treatment and disposal of pulp and paper mill wastewater

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Abstract

Pulp and paper mill wastewater is characterized by high BOD, COD, TDS and color that pose disposal problems into water bodies and on land. High Rate Transpiration System (HRTS) is a well designed phyto-land treatment system with well controlled hydraulic loading in furrows with filter bed media and plants were grown on ridges which transpire the wastewater. In this study plants such as Bambusa arundinacea, Acacia mangium, Azadirachta indica, Dalbergia sissoo and Eucalyptus hybrid serve as a biopump. We sought to investigate the effects of long-term operation of HRTS to treated pulp and paper mill wastewater (250 m^3/ha/day), by comparing the physicochemical and microbiological properties of soil and groundwater. Long-term application (20 years) of HRTS was found to have significant impacts on soil nutrient and microbial community as well as on many physico-chemical properties including pH, EC, and cation concentrations. The quality of groundwater was monitored within and outside of HRTS through piezometer and open dug well.

The results show that under scientific design and standardized management, pulp and paper mill wastewater could be used in HRTS. The irrigation is safe and reliable with a certain pre-treatment process, which has no adverse impact on the soil and ground water. The HRTS is a cost-effective and alternative to conventional treatment processes. Biomass from HRTS has the potential to be used as raw material in paper industries. HRTS will have an ancillary benefits like carbon sequestration and ecosystem services.