A Novel Profitable Phytoremediation Process for Reducing Eutrophication at Zero Cost

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Pollution control is currently viewed as a cost, something to be avoided and ideally passed down to the next generations. This study focuses on converting nutrient pollution into a product of economic value. My research suggests that floating vetiver farms would be an effective and profitable solution for combatting eutrophication. For the purpose of this analysis, the efficacy of hydroponic vetiver (Chrysopogon zizanioides) was studied on water collected from Lake Wapalanne, New Jersey. The results show that vetiver grass can reduce total phosphate (TP) concentration by 48.25% over a 30 day period, and by 78.55% over a 60 day period. This clearly indicates vetiver's efficacy in reducing TP concentration. Phosphate concentration was measured using the Perkin Elmer Wallac 1420 Victor2 Microplate Reader. The change in TP level was modeled as a quasi-first order reaction, and the lognormal distribution of phytoremediation decay constant "k" was modeled using a spreadsheet-based (Excel) Monte Carlo simulation. A similar stochastic modeling was done for half life. The results of the simulation indicate the most likely decay constant is 0.02, and the most likely half life is between 30-43 days, thus floating vetiver islands would be an effective solution despite the climatic constraints of North America. My feasibility analysis suggests significant revenue potential from commercial cultivation of vetiver: it is used in moisturizers, mulch, bio fuel, and animal feed. Additionally, vetiver oil is used in 90% of western perfumes; the American perfume industry has an annual turnover of approximately six billion dollars. This study opens up numerous possibilities for economically profitable, self-sustainable, and green options for purification of eutrophied water bodies.

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