Assessing the Seaweed *Ulva's* Carbon, Nutrient, and Contaminant Profiles as a Potential Agricultural Soil Amendment

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Seaweed, often considered a nuisance in shellfish farming operations due to excessive growth and encroachment, holds untapped potential for improving agricultural soil quality as a possible valuable source of carbon and nutrients. The systematic quantification of carbon content, nutrient profiles, and the presence of contaminants in seaweed biomass necessitates further research and analysis. This study proposes a comprehensive monitoring framework aimed at assessing the seaweed genus *Ulva*'s carbon and nutrient uptake capacity, with the assumption that this knowledge can provide valuable insights into its potential as a soil amendment for enhanced agricultural productivity. Moreover, we seek to evaluate how *Ulva* removal from aquatic ecosystems affects water quality. *Ulva* biomass from partner shellfish farms are harvested and processed for contaminant analysis, ensuring its suitability for soil application at each *Ulva* application rate. Further laboratory techniques and quantitative models are employed to quantify carbon and nutrient removal by *Ulva* from marine ecosystems and to assess the extent to which these removed elements are effectively incorporated into agricultural soils, accounting for other sources of inorganic matter such as sand. Time series analyses are then conducted to identify trends, seasonal patterns, and other spatiotemporal dynamics in nutrient concentrations. This analysis aims to deepen our understanding of the carbon and nutrient sequestration potential of *Ulva* species, with the ultimate goal of developing efficient, climate-smart strategies and long-term frameworks for its large-scale integration into agricultural systems to improve soil health and crop productivity. Findings are to be disseminated to farming operations and meant to provide valuable insights into the benefits of seaweed as a regional approach that can feasibly offer sustainable solutions using resources available within the local context.