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**Title:** Unveiling the research trajectory and key barriers in seaweed commercialization using bibliometric and fuzzy ISM-MICMAC methods (2000-2025)

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**Abstract:** Introduction: Seaweed research has witnessed substantial traction in recent years, stimulating interest among researchers, academic bodies, industry players, policymakers, and philanthropic bodies to explore its potential applications for commercialization.. Methods: For addressing this gap, the current study has conducted a dual approach, integrating comprehensive bibliometric analysis (2000-2025) with Fuzzy Interpretive Structural Modelling (ISM) MICMAC methodology, using VOSViewer, Biblioshiny and RStudio to examine the global seaweed commercialization research. 331 documents were extracted from Scopus (n=230) and Web of Science (n=101) database which summed up to be 258 documents after removing 73 duplicates. Results: Further, after identifying conceptual patterns and thematic trends related to seaweed commercialization and blue tourism governance under bibliometric analysis, the Fuzzy ISM-MICMAC analysis was conducted through a combination of 23 academic and industry expert interviews and extensive literature review. Consequently, 7 validated key barriers were identified that are restricting the commercialization of seaweed and water hyacinth across food, biofuel, pharmaceutical, and fertilizer sectors. These key barriers are further segregated into four-levels and four-quadrants based on their dependence and driving power. Discussion: The novelty of the study lies in it being the first to apply both bibliometric and Fuzzy ISM-MICAMAC analysis on seaweed commercialization, suggesting a potential sequential policy framework to address the barriers hindering commercialization and emphasizing the need for sustained knowledge exchange in this promising domain.



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