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## **Application of disruptive technologies for biorefinery of seaweeds for value chains**

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Seaweeds has been explored for a range of high value ingredients however key sustainability challenges include valorisation of processing waste streams & develop energy efficient processing and extraction techniques. The objective was to set up a novel integrated biorefinery model of seaweed production with the valorisation of this biomass to high-value products. This study investigated and developed an energy efficient zero-waste production system for creation of value chains from sustainably produced aquaculture seaweeds. Application of disruptive technologies i.e. use of energy efficient drying system (e.g. Microwave drying), application of cavitation technologies (e.g. ultrasound and hydrodynamic cavitation) for bio-transformation and membrane technologies for fractionation of high value ingredients. This study developed 4 value chains i.e. soluble fibres (laminarin), biopolymer (alginates), bioactives (phenolics and amino acids) and proteins. The study demonstrates the application of innovative approaches to valorise side streams and processing waste for creation of eco-friendly zero waste value chains; optimize and implement innovative processing approaches across the value chain to obtain ingredients, biopolymers and bioactives. Extracted bioactives and high value ingredients demonstrated comparable properties with those extracted using conventional techniques. Life cycle impact assessment of complete seaweed value chain was developed to identify the energy demand and key environmental hotspots. Drying step in the processing chain was the most energy intensive process for the creation of value chains. This study demonstrates that the overall biorefinery process can be used by industries to improve their processes and develop zero-waste strategy for renewable biomasses.