

## **Summary for Public Release**

Umaro Foods Inc., in collaboration with Sway Innovation Co., plans to conduct the project "Improvement of Drop-In Bioplastic Films with Alginate-Rich Process Streams," led by Dr. Amanda Stiles. This initiative aims to enhance the performance, production, and impact of bioplastics by repurposing surplus seaweed hydrocolloids. The primary objective is to optimize Umaro Foods' excess alginate output for integration with Sway's bioplastic formulation process.

Umaro Foods, a company producing protein from ocean-harvested seaweed, will partner with Sway, a startup creating and commercializing home compostable, seaweed-based bioplastics. This strategic collaboration will focus on refining the mechanical and thermal characteristics of Umaro's alginate waste stream through various fractionation techniques to maximize hydrocolloid efficacy for upcycled use into Sway's portfolio of products. The methods employed will include integrating hydrocolloid side streams into bioplastic formulations, assessing mechanical and thermal properties such as tensile strength, elasticity, and degradation rates to identify superior formulations. Additionally, different fractionation methodologies will be evaluated to determine their impact on the physicochemical properties of hydrocolloid extracts, including molecular weight distribution, viscosity, and gel strength, and how these properties affect bioplastic quality.

Furthermore, a techno-economic analysis (TEA) and life cycle assessment (LCA) will be conducted to estimate the unit economics and environmental impacts of combining protein extraction with bioplastics production, compared to existing technologies. This project has the potential to significantly impact the bioplastics industry and the environment by valorizing a waste product as the hero ingredient of an array of bioplastics that displace petroleum-based plastics. The expected outcomes include enhanced bioplastic formulations with improved mechanical and thermal properties, a scalable process for utilizing surplus alginate from seaweed protein production, reduced environmental impact through the use of renewable resources and home compostable materials, increased accessibility to bioplastics through a lowered product price point, and economic benefits for increased economic opportunity and job stability for seaweed-supplying coastal communities most vulnerable to climate change.

By optimizing the use of excess seaweed hydrocolloids in bioplastic production, this project aims to advance sustainable materials technology, reduce reliance on petroleum-based plastics, and increase adoption of regenerative materials. This collaborative effort between Umaro Foods Inc. and Sway Innovation Co. leverages their respective expertise in seaweed protein production and bioplastic formulation, promising a significant contribution to both industry and society.