

# 9<sup>th</sup> REDEALGAS WORKSHOP:

BIOTECHNOLOGY, SUSTAINABILITY AND  
OUTREACH ACTIVITIES ALIGNED TO SDGs-UN

BIODIVERSITY, FOOD, DRUGS, AGRICULTURE, EDUCATION, CULTIVATION, COSMETICS,  
BIOFOULING, VETERINARY, BIOECONOMY, ENVIRONMENTAL AND SUSTAINABLE BIOENERGY



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## The Sustainability of the Land-Based Farming of the Seaweed *Kappaphycus alvarezii* for Different Markets: An Emergy Approach

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Seaweed may play an important role in Integrated Multitrophic Aquaculture (IMTA). There is a lack of quantitative sustainability studies of land-based seaweed farming. Therefore, we evaluated *Kappaphycus alvarezii* land-based farming environmental accounting considering selling the products in these markets: carrageenan industry (C); human consumption (HC); liquid biostimulant for agroindustry (LB). In the LB market, biostimulant co-product is reused as biomass for the carrageenan industry and biocompound for ruminant feed. The emergy analysis was a viable tool for measuring seaweed farming sustainability and identifying the main sustainability aspects of the production system. Bleached and dried seaweed transformity were  $1.11\text{E}+05$  and  $3.53\text{E}+06$  sej/J to C and LB, respectively. The transformity for the dried seaweed as food was  $1.50\text{E}+06$  sej/J, for liquid biostimulant was  $1.94\text{E}+05$ , and for biocompound  $3.42$  sej/J. The system renewability for carrageenan, human consumption, and the liquid biostimulant were 18.3, 21.7, and 28.7%, respectively. The resources from the economy are most representative in the emergy flow ranging between 68 and 77%. Taxes were the most representative inputs for all the scenarios. The emergy sustainability index was 0.33 for carrageenan, 0.36 for human consumption, and 0.57 for the liquid biostimulant. The results suggest that land-based farming is unsustainable for all the market strategies scenarios. However, the present study indicates that the biorefinery strategy may be a sustainable option for seaweed farming aiming carrageenan industry.

**Keywords:** environmental accounting; bioeconomy; macroalgae; biorefinery.