

Assessing the potential of deep-water seaweed cultivation along the Kenyan coast

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To satisfy the global demand for carrageenans across the food, cosmetic, and pharmaceutical industries, two carrageenophytes (i.e. red algae *Kappaphycus alvarezii* and *Eucheuma denticulatum*) are commercially cultivated in tropical coastal regions, with Asian countries such as Indonesia being the leading producers. Nevertheless, seaweed aquaculture is a growing industry along Kenya's coastline, providing economic opportunities to the local communities. Yet, seaweed cultivation in Kenya shares similar challenges experienced in other West Indian Ocean countries. The widespread use of the off-bottom culture technique and the restriction of farms to shallow sub-littoral zones (≤ 0.5 m depth at low tide) limit seaweed farming. Consequently, some farms are exposed to high air and water temperatures during low tide, potentially affecting seaweed growth. Additional challenges can be associated with the perennial use of the plots, such as increased herbivory and *K. alvarezii* die-offs due to the occurrence of ice-ice disease, especially in hot months like January and February. Relocating seaweed farms from shallow areas to deeper sites with more stable water quality has been suggested as a solution to mitigate these challenges. Therefore, in this study, we evaluated the effectiveness of deep-water seaweed cultivation along the Kenyan coast using biomass, relative growth rate (RGR), and survival rate as key indicators. Three seaweed species (i.e. *K. alvarezii*, *E. denticulatum*, and *Gracilaria salicornia*) were cultivated at three different depths of 0.5m, 2m, and 4m at four different locations in the south Kenyan coast: Kibuyuni, Kijiweni, Mwazaro and Tumbe. Additionally, we investigated how environmental factors such as temperature, turbidity and nutrient availability affect seaweed growth and survival. The obtained insights will provide valuable information to guide decision-making and the development of effective policies aimed at enhancing Kenyan seaweed production. This, in turn, is vital for safeguarding a more sustainable livelihood that contributes to food security for marginalized coastal communities in this region.

Keywords

Deep-water Cultivation, Seaweed Aquaculture, Carrageenophytes, *Kappaphycus Alvarezii*, *Eucheuma Denticulatum*, *Gracilaria Salicornia*, Sustainable Livelihoods