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POLICY NOTE

STRENGTHENING ENVIRONMENTAL AND CLIMATE CHANGE CONSIDERATION ON MITIGATION EFFORTS IN SEAWEED FARMING TOWARDS AQUATIC BIODIVERSITY CONSERVATION:

A CASE STUDY OF ZANZIBAR

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Introduction

The Africa Blue Economy Strategy outlines key drivers of change that are shaping Africa's Blue Economy development and identified priority areas of intervention for sustainable Blue Economy development for the Continent. The strategy identified issues of climate change mitigation, environmental sustainability, aquatic biodiversity and ecosystems conservation as some of the key drivers of the Africa Blue Economy. The strategy therefore presents blue economy as a key goal in AU Agenda 2063 for sustainable development in African Union Member States (AU-MS). In addition, the Policy Framework and Reform Strategy for fisheries and aquaculture in Africa identified conservation and sustainable use of aquatic resources as well as strengthening resilience and reducing vulnerabilities to Climate Change in African Fisheries and Aquaculture as policy arenas.

Climate change poses a significant threat to African aquatic biodiversity and ecosystems, leading to rising Ocean temperatures, increased salinization, and Ocean acidification. These changes adversely affect coastal communities that depend on these ecosystems for their well-being and livelihoods.

In light of the above context, the African Union – Inter African Bureau for Animal Resources (AU-IBAR), with support from the Swedish International Development Cooperation Agency (SIDA) is implementing a project "Conserving Aquatic Biodiversity in African Blue Economy". The project has identified activities towards strengthening climate change mitigation efforts in aquatic biodiversity and ecosystems conservation and supports initiatives to restore degraded aquatic ecosystems, including support for sustainable seaweed farming.

Through a study commissioned by AU-IBAR through the project "Conserving Aquatic Biodiversity in the Africa Blue Economy", a climate change mitigating strategy on the impact aquatic biodiversity was developed which underscored seaweed farming as a promising Nature-Based Solution (NbS) to mitigate the negative impacts of climate change (Brandollini, 2022). Seaweed absorbs carbon dioxide from the atmosphere, therefore reducing Ocean acidification Furthermore, it provides an alternative source of food and income for coastal communities, potentially reducing pressure on the already overexploited fisheries. Consequently, AU-IBAR collaborated with the Zanzibar Seaweed Cluster Initiative (ZaSCI) to provide support to strengthen ongoing initiatives on blue ecosystems restoration to mitigate the negative impacts of climate change in local coastal communities in the East African Region through a Regional Seaweed Farming initiative. AU-IBAR and ZaSCI organised a field study to identify Seaweed Farms and sensitize local communities/ farmers on climate change mitigation; conducted field surveys to identify tree species mostly used as pegs in Unguja and Pemba islands of Zanzibar and to identify practices that contribute to coastal pollution and environmental degradation in seaweed farming areas.

Seaweed Farming in Africa, a case study of East Africa

East Africa, with its extensive coastline, growing aquaculture industry and favorable climate conditions, is well-positioned to support the growth of seaweed cultivation. However, not much has been done in integrating climate and environmental considerations into seaweed farming practices; which is crucial in ensuring sustainability of the seaweed industry (FAO, 2022).

This policy brief explores the current state, impact, and prospects for mainstreaming environmentally sustainable seaweed farming in Africa, mainly East Africa.

Current Status and Production

Seaweed farming along the East African coast varies across Countries, with Tanzania (Zanzibar) contributing over 80% of the total seaweed production (Msuya, Bolton, Pascal, et al., 2022). Other Countries such as Kenya, Namibia, and Mozambique are in the early stages of cultivation (FAO, 2022).

Along the coastlines of Tanzania, Madagascar and Kenya, red seaweed (Rhodophyta) dominates seaweed cultivation, with Eucheumma spp. and Kappaphycus spp. being the main cultivated species. These red algal species currently record an annual production of approximately 110,000 - 130,000t (FW) being exploited especially for their high carrageenan content (Msuya, Bolton, Pascal, et al., 2022). Carrageenan is sold to international markets and once processed is used as a gelling and thickening agent in the cosmetic, pharmaceutical, and food industries (World Bank, 2020). Other species cultivated, but in smaller quantities are Gracilaria spp. and Ulva spp.

The major cultivation method involves the use of (nylon) ropes and pegs, referred to as "off-bottom method" where seaweed seedlings are suspended in the Ocean water with the support of wooden) pegs. This method has been defined as a low-cost and low maintenance method of cultivating seaweed in the Ocean (Jaubert et al., 2017). Other farms use bottom rafts made of nets and ropes for cultivation.

Climate Change and Environmental significance in Africa

Seaweed aquaculture is a vital channel for Blue Carbon, an emergent concept referring to the role of marine plants in carbon dioxide (CO2) sequestration. Research indicates that autotrophic seaweed varieties can capture up to 1.5 peta-grams of carbon annually through net production, which accounts for the carbon remaining after subtracting respiratory losses. In terms of gross production, which includes total carbon fixed before respiration, this value would be even higher (Krause-Jensen & Duarte, 2016; Duarte et al., 2017; Moreira & Pires, 2016).

Consequently, many developing Nations in Africa are exploiting seaweed farming as a fairly inexpensive solution to mitigating climate change while producing valuable human food, animal feed, biofuel, biomolecules, and energy (Duarte et al., 2017). Namibia is, for instance, developing a large-scale cultivation of a giant kelp Macrocystis pyrifera with a target of producing over 70,000 tonnes annually by 2030 (Chen et al., 2015; Kelp Blue, 2020 - unpublished). This is one way of capturing large volumes of CO2 in Africa for the benefit of the environment.

Furthermore, seaweed farming is preferred as a vital tool for climate change mitigation and adaptation for its role in protecting vulnerable coastal ecosystems by providing coastal habitats with important ecosystem functions. For example, seaweed canopies act as coastal protection structures buffering against coastal erosion from strong waves (Duarte et al., 2017). Besides, seaweed farming has minimal to no requirements for land use changes, freshwater resources, or any kind of feed.

Considering the role that seaweed farmers play in farming seaweed, there is a need therefore, to adequately compensate farmers for the benefits of seaweed production in mitigating against the (negative) impacts and adapting to climate change. This incentive is crucial especially since further production may push market prices down and discourage farmers from the practice. This economic incentivization for climate change services will also help to create a new market for the industry.

Socioeconomic Impacts and Prospects for Seaweed Farming

Seaweed farming has significantly boosted local economies with its entire value chain from planting, harvesting, processing, and marketing being a major source of income, and employment, especially for women and people living in rural coastal areas (FAO, 2020). In Zanzibar, for example, households engaged in seaweed farming record up to 30% higher incomes than non-farming households (Mshigeni et al., 2014). Efforts are also underway in most East African Countries to strengthen seaweed farming recognizing the equal role of men and women as key agents of change.

Value Addition: Currently, seaweed is mainly exported as a raw material, fetching lower prices than processed seaweed which is of significantly higher value (FAO, 2022). In that regard, diversification and innovation are vital to make the industry more resilient to economic downturns (Mazarrasa et al., 2014). Fortunately, products like agar-agar and carrageenan are already being used in food sources, biofuels, and cosmetic products (Marinho-Soriano et al., 2020) and the demand has increasing over time. To meet this growing demand for its diverse applications, research suggests the need to scale up seaweed production throughout the entire chain from farming to processing (Callaway 2015; Mazarrasa et al. 2014).

Foreseeable Threats and Challenges in Seaweed Farming

Despite the huge prospects in seaweed farming, a number of shortfalls are witnessed across the region affecting seaweed production. Among notable issues in seaweed farming include but are not limited to;

a. ***Climate Change -*** Including rising sea level and temperatures, ocean acidification, and stronger storms and winds. These factors have serious implications on growth and quality of seaweed crops hence may lead to failures in such ventures.
b. ***Invasive Species -*** invasive species e.g sargassum seaweed, or any other that is not native to the region, if it happens to thrive may cause harm or cause competition with native seaweed species for (scarce) resources, consequently creative opportunities for diseases and pests.
c. ***Regulatory frameworks -*** Local and regional governments may not be willing to create a conducive environment for the development of seaweed industries. This makes it difficult for seaweed farmers to access credit.
d. ***Infrastructure -*** Lack of infrastructure including stable electricity; transportation routes; processing and storage facilities; research centers; water quality monitoring infrastructure; waste management infrastructure; and freshwater availability.
e. ***Commercialization -*** Marketing of seaweed products has been a challenge to many small-scale farmers. This denies them good prices for their products. This coupled with many other challenges that affect seaweed production affects marketing.

Policy Recommendations

Based on work by AU-IBAR on aquatic biodiversity and ecosystems conservation, and the potential role of seaweed cultivation in climate change adaptation and mitigation, the following are some of the best practices, recommendations, and lessons learned from Seaweed Farming that could be replicated in other AU Member States for relevant projects.

1. Assess regional value chain for seaweed for enhance women and youth effective participation as well mainstream environmental and climate change consideration.
2. Develop and implement eco-friendly and environmentally sustainable best practices in Seaweed Nature-based Solutions (NbS) such as the use of native seaweed species to reduce the introduction of invasive species, responsible sitings to prevent ecological disruptions, sustainable harvesting to reduce damage to the marine ecosystem and ensure the long-term viability, and minimization of pollution i.e. from the use of harmful chemicals and nutrient runoff.
3. Encourage research and development in seaweed aquaculture to optimize seaweed cultivation techniques, explore the integration of seaweed farming with other aquaculture activities (i.e., poly-culture), and develop new seaweed varieties that are resistant to climate change stressors.
4. Invest in Capacity Building i.e., by investing in community-based training to expose farmers to vital knowledge and skills on sustainable seaweed cultivation techniques, environmental monitoring protocols, business management, and market access strategies.
5. Strengthen Knowledge Management: subregional organizations in charge of the Large Marine Ecosystems (LME) and Inland Aquatic Ecosystems (IAE) can promote interdisciplinary collaboration and innovation among policymakers, researchers, businesses, and farmers civil societies to support decision-making and advocacy on climate change concerns affecting aquatic ecosystems and local livelihoods.
6. Awareness Enhancement and Creation for Local Coastal Communities Engaged in Seaweed Farming on the environmental benefits of seaweed farming to generate greater support for the industry and promote sustainable consumer choices.
7. Foster Women's Empowerment and Gender Equity: Seaweed cultivation presents a vital opportunity to promote women's economic participation and agency in East Africa. Measures should be taken to ensure equitable access to resources, training, and leadership roles for women within the sector to improve the success and sustainability of seaweed farming initiatives.
8. Policy and Strategy Integration: Effective policies, strategies, and regulations are important to ensure environmental sustainability in the sector. This includes; monitoring environmental effects, establishing clear licensing processes, and promoting responsible waste management practices.
9. Regular Monitoring and compliance check protocol for Best Farming Practices (BFP): For the longer-term benefit of the community and the Nations at large, BFP that avoid or mitigate climate change impacts must be checked, verified and corrected where farmers do not adequately comply. Establishment of a National Climate Change Task Force team composed of government staff and stakeholder experts could support this check at quarterly bases in short-term, followed by an annual check in

longer-term.

10. Encourage value addition of seaweed products and coordinate the development and harmonization of standard certification procedures for seaweeds products: This will enhance value addition of seaweeds and help farmers access regional and international markets.
11. Infrastructure: Support seaweed farmers on infrastructure development including provision for stable electricity; transportation routes; processing and storage facilities; research centers; water quality monitoring infrastructure; waste management infrastructure; and freshwater availability.

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