POLICY BRIEF

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Towards a Robust and Resilient Seaweed Aquaculture in the Philippines

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Highlights

1. The seaweed carrageenan industry of the Philippines is the top producing national marine commodity with a total value of US$252M. It generates valuable economic income to more than 200,000 coastal families, uplifting their quality of life.

2. The absence of biosecurity measures in local movements of eucheumatoids exacerbates the transfer of diseases and pests.

3. Loss in biomass has been due to disease and pest outbreaks leading to unavailability of good quality seedlings.

4. Presence of potential wild populations of eucheumatoids in the country, which exhibit a significant genetic diversity, could be used as possible new sources of cultivars for future cultivation.

5. Social inequalities especially in the farm production sector were noted.

Introduction

In the last 10 years, seaweed biomass production has significantly declined, as a consequence of repeated vegetative propagation employed in farming for decades, which has led to increased susceptibility of the cultivated eucheumatoids to disease and pest infestations, lack of biosecurity measures, and poor farming practices.

The impact of climate change, especially the increasing sea surface water temperature in shallow areas where fixed-off bottom farms are located, has exacerbated the decline in production.

Despite five decades of success in the Philippine seaweed industry, lessons to improve the sector and to integrate stakeholders in the value chains of this globally competitive commodity, remain a work in progress.

The aim of this national policy brief is to highlight the current challenges facing the seaweed industry of the Philippines based on robust, scientifically proven results from the UK Research and Innovation funded GlobalSeaweedSTAR project. The brief provides policy recommendations to support sustainable growth of the national industry and ensure its long-term resilience. The synthesis also highlights the role of seaweed aquaculture in the country as a potential nature-based solution within the 'Blue' or Sustainable Ocean Economy agenda.

Several works done by the four work packages of the GlobalSeaweedSTAR Project in the Philippines. (Photos: AQ Hurtado, JP Mateo, RC Sibonga)

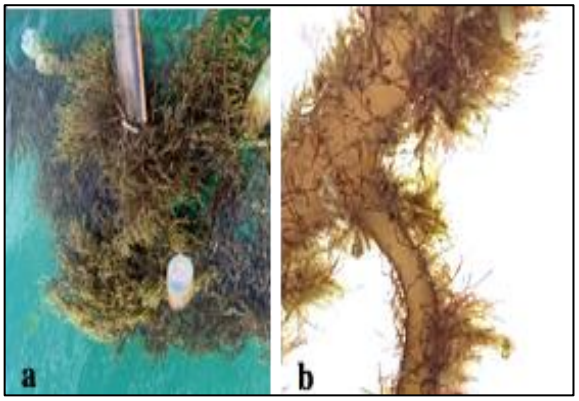
Key challenges facing seaweed farmers and potential recommendations to bridge the gap between the farm and the industry as whole are presented below:

Loss of biomass

'Ice-ice' disease (IID) is a major yield-limiting problem in seaweed farming. IID-affected seaweed displays a gradual loss of color, softening of the infected tissues, and detachment of the diseased seaweed from the cultivation lines resulting in biomass loss. Outbreaks of IID were reportedly related to abrupt fluctuations in the environmental parameters compromising seaweed health, thereby resulted in disease occurrence. IID are reportedly observed on farms in highly productive major seaweed-producing areas of the country, affecting biomass yields and compromising job security. There is a widespread prevalence in farming areas encompassing the seaweed cultivars used and farming techniques employed. This indicates a widespread occurrence of the disease at the farm level, with potential perennial disease outbreaks, if not given due attention.

Epiphytic filamentous algae (EFA) are another problem of the industry. The prevalence of EFA is aggravated by rising surface seawater temperatures and their improper disposal during line and equipment cleaning in the farm areas. These filamentous algae penetrate the outer and inner cell layers of the host seaweed, resulting in mechanical damage and exposing the thallus tissues to secondary microbial infections resulting in disease. EFA-affected seaweeds have lower carrageenan content, thereby affecting the price, and consequently, compromising farmers' income.

Farmed *Kappaphycus alvarezii* affected by ice-ice disease. (Photo: JP Faisan Jr.)



(a) Healthy and robust *Kappahycus alvarezii*, and (b) Epiphytic filamentous algae infected *Kappaphycus alvarezii*. (Photos: AQ Hurtado)

Grazing by herbivores such as fish (siganids, parrot fish, and puffers) can also result in the loss of biomass in cultured seaweeds, especially during the nursery phase of seaweed farming. This compromises the volume of seaweed for seedling production. Damaged or exposed grazed tissues may result in secondary infection due to opportunistic microbes present in the water and can lead to disease occurrence.

Grazed tips on the soft parts of the seaweed plant. (Photo: AQ Hurtado)

Shortage of good quality eucheumatoid cultivated varieties or strains brought about by repeated vegetative propagation of the same plant has led to low genetic diversity**.** As a consequence, the seaweeds are susceptible to opportunistic pathogens. To date, only a few farmed populations of eucheumatoids like *Kappaphycus alvarezii, K. striatus* and *Eucheuma denticulatum* have been selected and domesticated for commercial cultivation. However, the presence of genetically diverse wild populations in the country reveals more varieties or strains are yet to be explored and selected as possible new sources of varieties or strains for commercial cultivation.

Wild populations of eucheumatoids which are possible sources of new variety or strain for commercial cultivations. (Photos: RC Sibonga)

Shallow water farming using hanging long-line technique in Ajuy, Iloilo, Philippines. (Photo: JP Mateo)

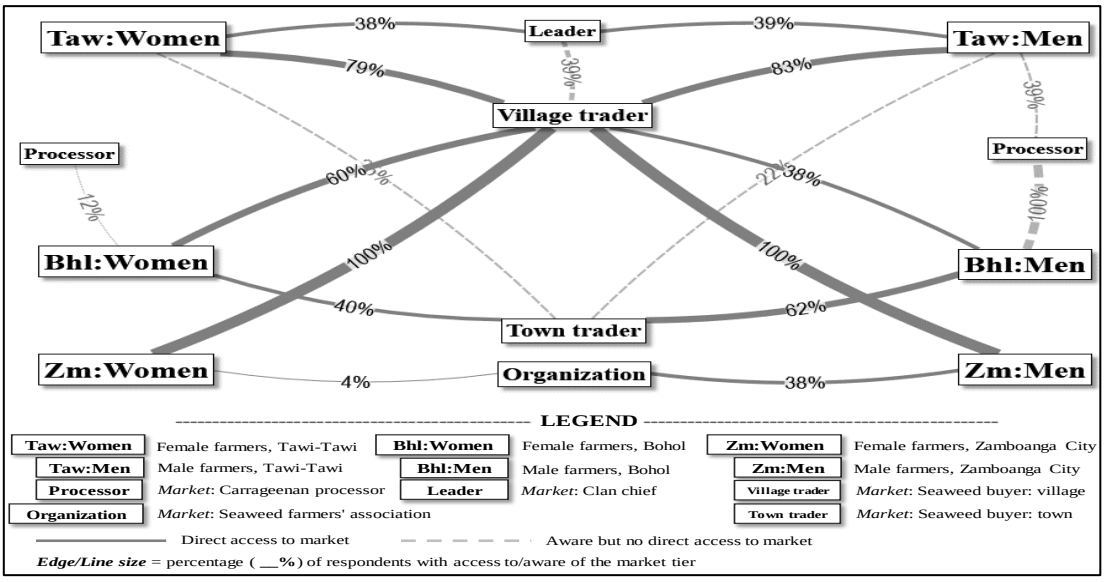
Lack of regulatory mechanisms

Incoherent biosecurity legislation and policy. The only existing policies explicitly for seaweeds are the Good Aquaculture Practices for Seaweeds (GAqP for seaweeds, PNS/BAFS 208:2021 and Dried Raw Seaweed (RDS, PNS/BAFS 85:2021) by the government, and manuals for farming by government and non-government agencies. These standards lack biosecurity measures especially in the transfer of new seedlings from one farm to another. These documents, however, must be harmonized with international standards to enable the industry to be globally competitive.

Movement of harvested seaweed from farm to work area in Sipangkot, Tawi-Tawi, Philippines. (Photo: JP Mateo)

Promoting equity in the seaweed industry

In this context, the social inequalities are noted in the sector. The existing socio-economic structure tends to be biased towards men, as such, women tend to be underrepresented in statistics and reports. The lack of "formal" accounting for women's involvement across the seaweed value chain affects [women's] access to resources, services, and information. Informal networks (i.e., patron-client relations) are adopted to supplement weak governance practices (i.e., lack of government support), but this contributes to poor standards control for raw dried seaweeds, lack of access to markets and limited opportunities for stakeholders (e.g., farmers, traders, processors) to undertake higher-income market activities.



Access to local seaweed trading network between women and men seaweed farmers at the three sampling sites (Suyo et al., 2020). (Figure: JGB Suyo)


Women seaweed farmers tying seedlings in Sipangkot, Tawi-Tawi, Philippines. (Photo: JP Mateo)

Policy Recommendations

The GlobalSeaweedSTAR project implementation in the Philippines brought together national and international experts and community leaders to map risks and discuss solutions for sustainability of the seaweed aquaculture sector. Five key policy recommendations explain what measures can be enhanced to ensure long term sustainable growth of the sector and emphasizes the need to act before risk becomes reality.

1. **Promoting conservation of wild populations to preserve genetic diversity.** This approach could facilitate a rich source of future sources of new cultivars. From appropriately conserved wild stocks, new seaweed strains that are resistant to IID, exhibit faster growth, or possess other favorable characteristics can be further identified and domesticated. The preservation of the genetic diversity of wild populations can also serve as a source for future initiatives for selective breeding to further improve cultured stocks.

2. **Strengthening infrastructure for the consistent supply of robust and biosecured seedlings.** A dedicated laboratory for bio-banking, production of new plants through spores and tissue culture techniques must be established, spearheaded by the University of the Philippines Visayas (UPV), Southeast Asian Fisheries Development Center Aquaculture Department (SEAFDEC/AQD), University of the Philippines Marine Science Institute (UP-MSI), in collaboration with the Bureau of Fisheries and Aquatic Resources - National Seaweed Technology and Development Center - National Fisheries Research and Development Institute (BFAR-NSTDC-NFRDI). Further capacity building of staff and upgrading of laboratory facilities throughout the country are also needed. This will enable farmers to have an easy access to good quality, disease and pest-free seaweed cultivars, that are genetically curated within their respective regions.

3. **Enhancing Biosecurity Measures.** Implementing biosecurity measures, such as screening and proper quarantine of seedlings prior to planting to prevent the transfer of diseased plants to new farming areas. This will require strict monitoring of movement of seaweed between farms by the local government units. Thus, other essential measures are written in the GAqP for Seaweeds, which should be properly disseminated for wider access.

4. **Integration of seaweed sector into climate change adaptation planning.** Shift of cultivation sites from nearshore (shallow water) to offshore (deeper water) areas, where more moderate and stable environmental conditions are favorable to meet the challenges of climate change effects. Allocation of areas for fallowing through proper zonation, which can be controlled by the local government units. Also, crop rotation will be supported by seedling provision.

5. **Steering multi-stakeholders' partnerships.** All stakeholder groups should be equally represented in government reports and statistics by requiring government agencies to collect gender disaggregated data (i.e., roles/involvement, experiences and perceptions, needs). The government needs to direct more support towards farmers because they face greater risks in the supply chain. These interventions should include, but are not limited to (a) provision of financial (i.e., credit, loans, insurance) and technical support services (i.e., trainings, capacity-building activities) to enhance stakeholders' capability and confidence in engaging in entrepreneurial activities; (b) increased monitoring for compliance to required standards, providing incentives to those who conform to required standards; and (c) provision of policies for increased market protection, particularly concerning price control, tariffs/quotas, and access to research/educational services.

Further Reading

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