



Evaluating biosecurity policy implementation in the seaweed aquaculture industry of Malaysia, using the quantitative knowledge, attitude, and practices (KAP) survey technique

Cicilia S.B. Kambey^a, Iona Campbell^b, Elizabeth J. Cottier-Cook^b, Adibi R.M. Nor^c, Azhar Kassim^d, Ahemad Sade^d, Phaik-Eem Lim^{a,*}

^a Institute of Ocean and Earth Sciences, University of Malaya, Kuala Lumpur 50603, Malaysia

^b Scottish Association for Marine Science, Oban, Argyll PA37 1QA, United Kingdom

^c Institute for Advanced Studies, University of Malaya, Kuala Lumpur 50603, Malaysia

^d Department of Fisheries Sabah, Kota Kinabalu 88624, Malaysia

ARTICLE INFO

Keywords:

Biosecurity
Eucheumatoid
Knowledge-Attitude-Practices survey
Seaweed policy
Policy implementation
Malaysia

ABSTRACT

This study evaluated on-farm implementation and effectiveness of Malaysian seaweed aquaculture policies and regulations that applied the biosecurity concept. The knowledge-attitude-practice (KAP) survey tool was utilised to assess the effectiveness of the biosecurity measures adopted by seaweed stakeholders, including 67 seaweed farmers and ten government extension officers, who were located in the three most productive seaweed producing regions. The KAP results indicated a disconnection between the implementation of biosecurity measures in national policy and uptake by practising farmers. Although farmer's biosecurity knowledge and attitude scores were fair (55.7–64.1%), implementation of practices was poor (36.1–40.6%). The survey data highlighted that a low educational level, combined with the temporary nature of employment in the seaweed sector, contributes to the lower KAP scores. Extension officers are also limited in their ability to support farmers in implementing good biosecurity practices due to their moderate knowledge (57.9%), despite having a good attitude towards biosecurity (76.9%). The implementation of national seaweed policies including biosecurity prevention, and mitigation measures, remains weak due to the limited understanding and ability of the stakeholders to carry out farm risks. By identifying some forthwith gaps, this work highlights where short-term improvements and longer-term goals could be introduced. This study also highlights the importance of translating biosecurity policy into on-the-ground knowledge and stresses the need for economic support to enable a more significant impact in the upstream level of the seaweed aquaculture industry.

1. Introduction

Applying the biosecurity concept in aquaculture has become crucial in the management of pathogens, including diseases and pests, which can negatively impact farm productivity and production. The biosecurity concept can also positively affect the industry by improving the health and quality of the cultivated animals or plants [1–3]. Incorporating the biosecurity concept into a national aquaculture policy requires a clear regulatory and legal framework to limit the impacts of new and emerging diseases, rationalise controls, introduce an integrated surveillance and traceability system, and facilitate product acceptability at both the national and international levels of trade [4]. In the aquatic

animal aquaculture and agricultural development system, the biosecurity concept has been widely adopted as an essential standard practice [5,6]. By contrast, the seaweed aquaculture industry lacks the integration of activities specific to biosecurity [3], particularly in the eucheumatoid industry, where most production occurs in low to middle-income countries [7].

Global seaweed production is dominated by Southeast Asia (29–42%), of which the red seaweeds *Kappaphycus/Eucheuma* spp. were the main products from 2010 to 2018 [4]. Despite increasing eucheumatoid production, several challenges play a crucial role in reducing production capacity, including the continuing occurrence of the ice-ice disease or syndrome and the epiphytic pests that are persistent in

* Corresponding author.

E-mail address: phaikeem@um.edu.my (P.-E. Lim).

<https://doi.org/10.1016/j.marpol.2021.104800>

Received 6 June 2021; Received in revised form 25 August 2021; Accepted 10 September 2021

Available online 25 September 2021

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