



An analysis of the current status and future of biosecurity frameworks for the Indonesian seaweed industry

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Abstract

Indonesia is the world largest producer of the red seaweeds *Kappaphycus* and *Eucheuma*; however, this country is facing significant challenges such as disease outbreaks, epiphyte infestations and a loss in seedling quality. Biosecurity practices have been widely adopted in other aquaculture sectors and when enforced can help to limit the introduction and spread of diseases and pests. To assess current capacity for biosecurity in seaweed aquaculture in Indonesia, a systematic analysis of policy frameworks including legislation, regulatory tools, and national standards was conducted. Biosecurity themes and risks were used to evaluate current national biosecurity content. The results identified major challenges faced by the industry in order to implement biosecurity policies in practice. Barriers to implementation included unspecific reference to the seaweed aquaculture sector, limited variety of approaches to biosecurity, limited use of up-to-date scientific evidence, insufficient guidance for the use of precaution and insufficient inclusion of specific biosecurity hazards. In general, although national regulations are currently under revision, current policies indicate a lack of clarity where biosecurity is included. Six recommendations are suggested to incorporate proactive biosecurity actions into current frameworks, with the aim of improving the health and sustainability of the seaweed aquaculture sector in Indonesia.

Keywords Biosecurity · Indonesia · Seaweed aquaculture · *Kappaphycus* · *Eucheuma* · Legislation · Policy

Introduction

Seaweed aquaculture has been practiced for over five decades in Indonesia following the introduction of the red

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carrageenan-producing species *Eucheuma* sp. and *Kappaphycus* spp. in the late 1960s and 1980s, respectively (Hurtado et al. 2016; Neish et al. 2017). Production of this crop increased exponentially and Indonesia is currently the largest global producer of these species, with a total production of 10.11 million tonnes fresh weight (FW) and a value of 755 million US\$ in 2015 (Food Agriculture Organization Fisheries and Aquaculture Information and Statistics Branch FAO-FIGIS 2019). This industry directly supports approximately one million farmers and indirectly supports their households, who are often not reported in statistics as workers (Food Agriculture Organization 2016; Badan Pusat Statistik 2017a, b). As the global market demand for this crop increases (Campbell and Hotchkiss 2017), the Indonesian government is active in promoting the sustainable growth of the industry through supportive legislation and policies. Recent additions to legislation include protection and empowerment of farmers (National Legislation Law No. 7/2016), tax-free importation of cultivation equipment (Government Regulation PPRI No.81/2015), provision of a national competency qualification in seaweed processing from the Ministry of Labor (Ministerial Regulation No.107/2016) and new regulations