



Blue economy and food security the way forward: A systematic literature review analysis



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ABSTRACT

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Sustainable growth spotlights the significant challenges of the blue economy and food security. Escalating global attention has fueled fresh scientific inquiry into these areas, driven by their paramount importance in addressing pressing issues. This paper explores into the intersection of these concerns, which particularly emphasizing the supply chains of ocean resources, which have gained prominence due to the escalating effects of climate change. The changing climate exacerbates the vulnerabilities of oceanic food sources, compounding the urgency of understanding this nexus. To illuminate this complex landscape, the paper employs a comprehensive approach, encompassing a systematic literature review spanning seven years, 2017 and 2023. A dataset of 28 research papers sourced from the Scopus and WoS databases provides the foundation for this analysis. Through content analysis, thematic areas are identified, allowing for the identification of key trends and concerns within the literature. The results of this study extend beyond mere data trends; they encompass geographical distributions and reveal three overarching themes that encapsulate the study's focal areas: the blue economy, food security, and ocean governance. In essence, this research contributes to a deeper comprehension of the intricate interplay between the blue economy and food security, shedding light on the multifaceted challenges that must be tackled to achieve sustainable growth in the face of evolving climate dynamics and increasing global demands.

Contribution/Originality: Amid many separate studies on the blue economy and food security, a comprehensive review is lacking due to the wide range. This study aims to unite understanding of these themes, offering insights and new paths in sustainable development literature, while also contributing to scientific and social science domains, spanning varied disciplines.

1. INTRODUCTION

The concept of the blue economy has gained significant attention in recent years as a means to stimulate economic growth, improve livelihoods, and address global challenges such as food security. The blue economy focuses on the sustainable utilization of ocean resources while minimizing ecosystem degradation and enhancing social benefits (Farmery et al., 2021). It encompasses various sectors, including fisheries and mariculture, which are considered components of this concept (Farmery et al., 2021).

Food security is a critical aspect of blue economy. Blue foods, which include animals and plants produced for human consumption from oceans and coastal waters, play a vital role in ensuring food security (Farmery et al., 2021). Marine resources are essential for meeting the increasing demand for food, especially as the world's population continues to grow. The sustainable use of these resources can provide a source of nutritious and sustainable food for life (Olatidoye, 2022). With the significant interrelationship of both aspects, the blue economy and food security has created more opportunities in conjunction to socio-economic development. This will then contribute to poverty reduction, further enhancing supply of foods and long-term livelihoods.

The blue economy is closely linked to the United Nations Sustainable Development Goals (SDGs), especially Goal 14, addressing "Life below Water" challenges. Its influence also reaches various other SDGs such as poverty reduction, food security, clean energy, and climate action, as emphasized by Voyer et al. (2018). Utilizing the blue economy's potential can drive progress across multiple SDGs and foster sustainable development.

However, there are challenges in securing and managing the ocean and ensuring enough food and social needs for the future. Governance and policy frameworks need to be established to effectively manage and protect marine resources while maximizing their sustainable use. Additionally, the impact of climate change on the ocean ecosystem and the potential for environmental collapse pose significant risks to the blue economy and food security (Leandro et al., 2020). Therefore, it is crucial to address these challenges through cross-sectorial partnerships and collaborations between governments, civil society groups, and the blue economy (Akande, Asua, & Undiandeye, 2022).

The blue economy, which focuses on the sustainable utilization of marine resources has gained significant attention to stimulate economic growth which has potential contribution to food security. Blue foods produced from oceans and coastal waters has become global challenges for maintaining future global food for the people. Therefore, several challenges and gaps need to be addressed: (i) the disconnection between fishing activities that are the focus of many countries and the absence of food and nutrition security. This lack of attention can undermine efforts to address hunger and malnutrition; (ii) the future of ocean food supply chains and their role in global food security and nutrition is recognized as a challenge for the economy. There is a need to ensure that the fisheries and mariculture sector is optimized for sustainable use while minimizing ecosystem degradation and increasing social benefits; (iii) there is a need to ensure that the blue economy contributes effectively to the United Nations SDGs, including goals related to poverty eradication, food security, affordable and clean energy, and climate action. However, it is necessary that the blue economy can address the trade-off between conservation, economic returns, and social equity; (iv) there are challenges related to ocean governance, maritime security and regional/international cooperation that need to be addressed to fully harness the blue economy's potential for food security. Illegal and unregulated fishing, piracy, drug trafficking, and climate change pose major threats to food security and the sustainable development of the blue economy. Therefore, the highlighted issues need to be addressed to maximize the potential of these two key aspects for sustainable development. Hence, this paper is current and significant in contributing to further discussion.

Thus, the motivation of this paper is to provide understanding of the blue economy, food security and ocean governance integration. Therefore, the significant contribution of this paper will benefit researchers and propose new directions on sustainable development literature. Secondly, it will give a significant theoretical contribution

among academics, since the publications on blue economy and food security have been covered in many areas of studies, which include science and social science.

Despite numerous studies on the blue economy and food security, none comprehensively review the topic. Connections between studies are challenging due to the broad scope. This study conducts a comprehensive review to address: (i) the extent of the blue economy and food security; and (ii) consistently highlighted areas. The objectives are to: (i) extract relevant studies; (ii) analyze common areas of interest; and (iii) identify focal points for future research.

Therefore, to achieve the research objectives, the study conducts a systematic literature review (SLR) in relation to the field of blue economy and food security. However, only studies from the Scopus and Web of Science (WoS) databases have been retrieved due to the fact that research under these databases were peer-reviewed by experts and reliable for the literature.

2. METHODOLOGY AND SAMPLE IDENTIFICATION

The SLR employs the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework for transparent reporting. It utilizes Scopus and the Web of Science databases to gather pertinent literature on the blue economy and food security scope, with the search executed on April 13, 2023.

2.1. Systematic Searching Strategies

There are three main processes in the systematic searching process for selecting the articles namely identification, screening, and eligibility which can be referred to [Figure 1](#).

2.1.1. Identification

A thorough identification was done to find key terms including 'blue economy' and 'food security', which using 'Title-abs-key' for the Scopus articles and search using 'Topic' for the WoS articles. Nevertheless, only 68 related articles were found indicating a very limited topic area. Of this, the articles which use English language are considered after one manuscript in a Russian language had been ignored. All manuscripts are published from the year 2017 to 2023.

2.1.2. Screening

For the screening process, it was done by excluding all 22 duplicate articles. The data then were screened accordingly for eligibility and have excluded 2 sources from book series, 5 chapters in book, 9 review papers, and 2 conference papers, leaving 28 publications for the SLR review process.

2.1.3. Eligibility

The eligibility process will retrieve articles manually to ensure all articles that have previously gone through the screening process meet the study criteria. At this stage, the content of the article will be scrutinized and the title, the abstract as well as other important criteria of the article were thoroughly read.

2.1.4. Data Abstraction and Analysis

Thematic analysis is useful in identifying, analyzing, organizing, describing, and reporting themes. In the process of thematic analysis, data compilation is carried out. In this phase, the researchers read 28 articles carefully and analyzed all keywords used in the research papers. At this stage, the content analysis has been involved in identifying the main themes or patterns of these 28 articles. This process is interesting to ensure that it is in line with the topic applied.

3. FINDINGS AND ANALYSIS

3.1. General Findings and Background of the Studies Included in the Review

Table 1 presents the peer review articles covers author(s), year, geographical areas, and other features. Starting with the publication years, about 79% of studies have been published in 2020 onwards (Aanesen, Czajkowski, Lindhjem, & Navrud, 2023; AftabUddin, Hussain, Abdullah Al, Failler, & Drakeford, 2021; Allegretti & Hicks, 2022; Andriamahefazafy, Bailey, Sinan, & Kull, 2020; Avtar et al., 2021; Baker, Constant, & Nicol, 2023; Belton et al., 2020; Bennett, Blythe, White, & Campero, 2021; Bogadóttir, 2020; Booth, Arlidge, Squires, & Milner-Gulland, 2021; Cheng, Tseng, Iwaki, & Huang, 2021; Christ, White, Hood, Vianna, & Zeller, 2020; Clayton et al., 2022; Fong et al., 2022; Hossain et al., 2021; Karani, Failler, Gilau, Ndende, & Diop, 2022; Krause et al., 2022; Nash et al., 2020; Queirós et al., 2021; Satizábal, Dressler, Fabinyi, & Pido, 2020; Spillias et al., 2022; Voyer, Benzaken, & Rambourg, 2022) resulting from increasing interest in worldwide blue economy and food security. The remaining studies were published in 2017 (Grafeld, Oleson, Teneva, & Kittinger, 2017) 2018 (Harris et al., 2018; Islam & Shamsuddoha, 2018; Techera, 2018) and 2019 (Cohen et al., 2019; Soininen, Belinskij, Similä, & Kortet, 2019). Closed to 50% of the studies conducted in the Indian Ocean, followed by the Atlantic Ocean, the Pacific Ocean, and the Arctic Ocean.

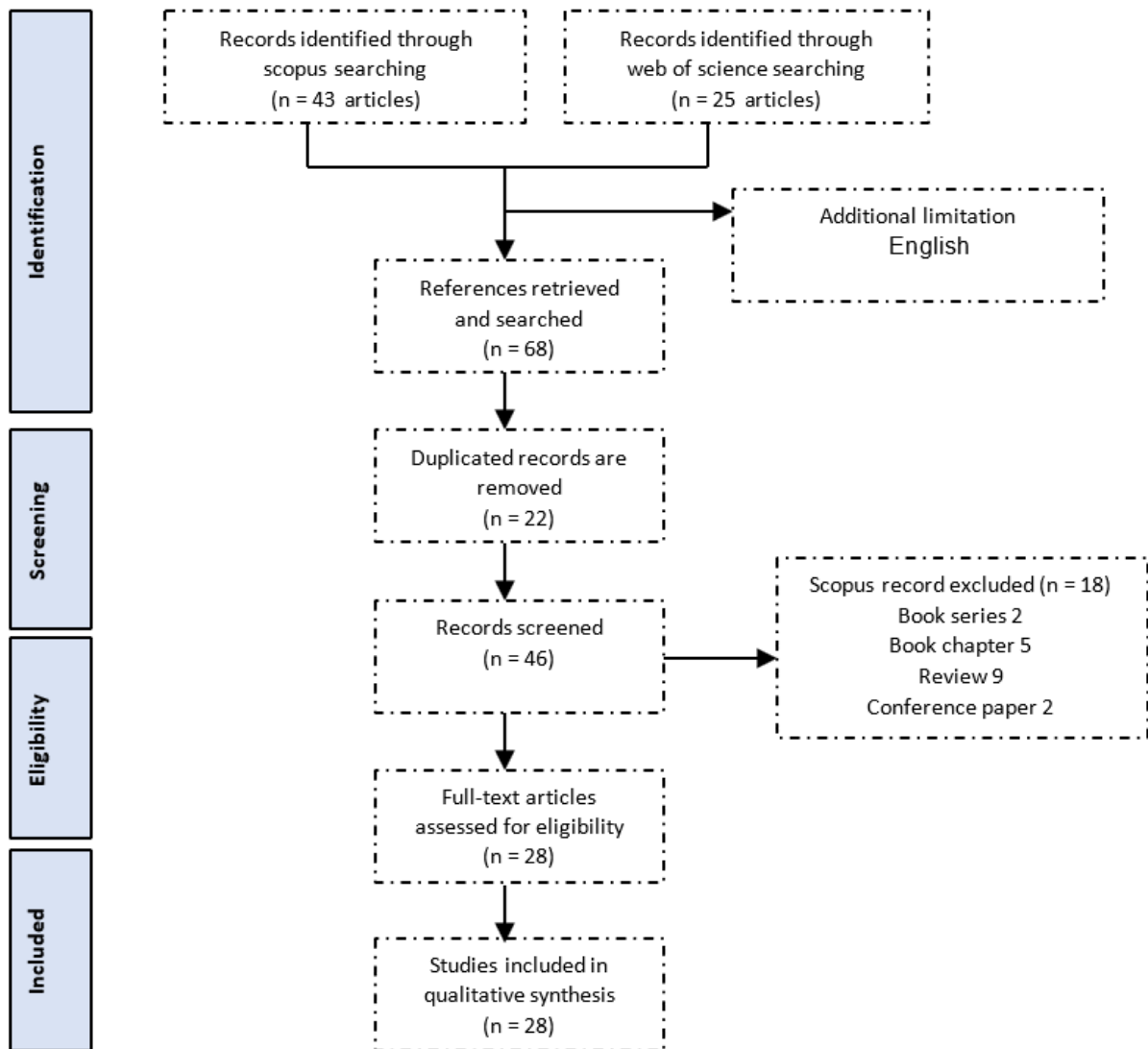


Figure 1. Flow diagram of the research

Source: Moher, Liberati, Tetzlaff, Altman, and PRISMA Group (2009).

3.2. Main Findings

Three key research themes have been identified from the review process namely blue economy, food security, and governance between 2017 and 2023. Research on blue economy (BE) has generally focused on blue economy, blue economy development, blue growth, and ocean economy. Second research theme is mainly on food security (FS), including nutrition, fishing activities, and fishing products. Lastly, it is the research on ocean governance (OG) in the field of blue economy, connecting to SDGs, coastal and marine conservation, fisheries governance, marine governance, ocean governance, adaptive law, and fisheries law.

Blue economy refers to the sustainable use and conservation of oceans, seas, coasts, including banks and shorelines, lakes, rivers, and groundwater (Karani et al., 2022). About 20 percent of the studies are largely focused on the three key research themes (blue economy, food security, and governance) whereas more than one-third of the studies are associated with the research themes of blue economy and food security. While the blue economy or ocean economic activities benefits society in terms of income and food security, it also threatens marine biodiversity (Booth et al., 2021). Blue growth can also interfere with social relationships and cohesion (Bennett et al., 2021). In light of this, conservation management and ocean management are necessary for a sustainable marine economy. From the review, the study found that 18 studies, or about 64.3% focused on the blue economy, while 85.7% of the studies concentrated on food security. For governance, there were 57.1% studies discussed on this issue. Surprisingly, only five, or 17.9% studies discussed the three issues of blue economy, food security and governance.

Table 1. Peer review articles

No	Author(s)	Geographical areas	BE	FS	OG
1	Grafeld et al. (2017)	Hawaii, pacific ocean		/	
2	Harris et al. (2018)	Southern and Eastern Africa		/	/
3	Islam and Shamsuddoha (2018)	Bangladesh, Indian Ocean	/		/
4	Techera (2018)	Indian Ocean	/	/	/
5	Cohen et al. (2019)	Countries dependent on fisheries or developing their blue economy	/	/	/
6	Soininen et al. (2019)	EU-Finland, Atlantic Ocean	/	/	/
7	Andriamahefazafy et al. (2020)	Western Indian Ocean - Madagascar, Mauritius, and Seychelles		/	/
8	Belton et al. (2020)	Countries dependent on fisheries or developing their blue economy	/	/	
9	Bogadóttir (2020)	Faroe Islands, Denmark, North Atlantic Island	/	/	
10	Christ et al. (2020)	Seychelles, Indian Ocean		/	
11	Nash et al. (2020)	Countries dependent on fisheries or developing their blue economy	/	/	
12	Satizábal et al. (2020)	Southeast Asia and Philippines	/		/
13	AftabUddin et al. (2021)	Bangladesh	/	/	
14	Avtar et al. (2021)	North-Western coast of India	/	/	
15	Bennett et al. (2021)	Countries dependent on fisheries or developing their blue economy	/		/
16	Booth et al. (2021)	New Zealand, Namibia, the US California	/	/	
17	Cheng et al. (2021)	Marshall Island, Taiwan/ SIDS	/	/	
18	Hossain et al. (2021)	The Southern coast of Bangladesh	/	/	/
19	Queirós et al. (2021)	Ireland		/	/
20	Allegretti and Hicks (2022)	Global South -refer article for details		/	/
21	Clayton et al. (2022)	Countries dependent on fisheries or developing their blue economy		/	/
22	Fong et al. (2022)	The US California	/	/	
23	Karani et al. (2022)	African Union Member Countries	/	/	/
24	Krause et al. (2022)	Countries dependent on fisheries or developing their blue economy		/	/
25	Spillias et al. (2022)	Countries dependent on fisheries or developing their blue economy	/	/	
26	Voyer et al. (2022)	Commonwealth countries, Indian Ocean	/		/
27	Aanesen et al. (2023)	Norway, Arctic Island		/	
28	Baker et al. (2023)	Seychelles, Indian Ocean		/	/

Note: BE - Blue economy/ Blue growth; FS - Food security/ Nutrition/ Fishing activities/ Fishing products; OG - SDGs/ Conservation/ governance.

Consequently, the process has resulted in three main themes as can be described in Figure 2. These three differences themes highlight the role of the blue economy, food security and ocean governance.

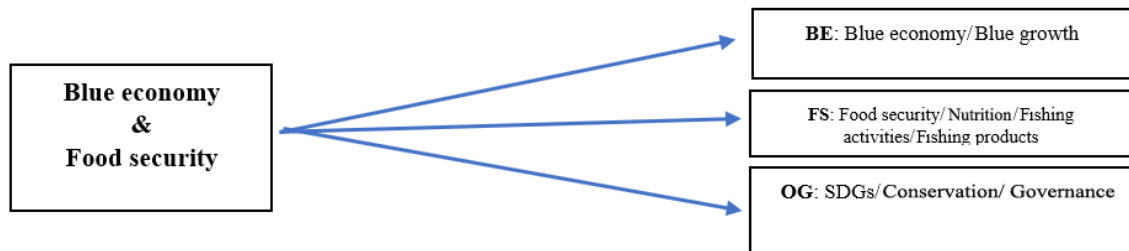


Figure 2. Conceptual framework

Besides the conceptual framework illustrated in Figure 2, the combination of these three themes can be delineated by the Theory of Sustainability. The principles of sustainability have been interpreted as an integration of social responses to cultural and environmental issues (Anderson, 2010). Moreover, according to the Asche et al. (2018) concept of sustainability in fisheries emphasizes three main pillars which are economic development, environmental protection and social development. The blue ocean economy literature reveals that these sustainable pillars involve three major tradeoffs, first blue economy activities benefit society in terms of food security and income generation, which in turn poses a threat to marine biodiversity, second, blue growth also impedes social relationships and cohesion and third, conservation and management which refer to the governance, are necessary for a sustainable marine economy. Thus, sustainable blue economy becomes more important in the new era of economy to fulfill needs for current generation without compromising the needs of future generations purposely when it comes to food security and governance.

4. DISCUSSION

From the review, surprisingly, the study found that only five, or 17.9% of the studies discussed the three issues of blue economy, food security and ocean governance. On the geographical coverage, we found that the majority of studies focused on regional, which is very wide. We also discovered that only 13 studies focused on country or state level. The issue that may arise is that different countries may have different policies regarding the blue economy, thus, combining a few countries as a region in one study may give inappropriate policy recommendations. The policy may differ due to types of animal that can be found in any particular country.

As mentioned in the early section, the problem with the blue economy and food security is that there is a lack of proper governance to govern the activities. Without proper governance, the sustainability of the blue economy and food security may not be achieved. For example, illegal fishing activities like using unallowed tools, may happen due to lack of governance and proper policy. This kind of activity may cause the extinction of certain kinds of marine life. We reviewed three themes that were identified throughout the process, and these are discussed below.

4.1. Blue Economy (BE)

The concept of the blue economy draws its inspiration from the principles of the green economy, focusing on strategies for harmonizing nature and sustainability. Variations in approaches to the blue economy exist across different nations. While the blue economy holds the potential to enhance food security and generate income for society, it also carries the risk of overexploiting marine ecosystems, leading to environmental degradation and social inequities. Activities such as large-scale ocean ventures and pollutants can disproportionately affect small-scale fishers and create imbalances in resource distribution, resulting in a delicate balance between economic expansion and biodiversity preservation.

Integrating measures like bycatch levies into the blue economy framework can offer a balanced solution, benefiting both economic prosperity and biodiversity conservation. Beyond its role in food security, the blue economy extends its socio-economic significance to economic stability, empowerment, public health, and cultural services, as emphasized by Hasan, Lima, and Shaha (2021). Recognizing the intricate socio-economic facets of the blue economy is essential for shaping policies and actions that foster sustainable economic progress while enhancing community well-being.

4.2. Food Security (FS)

As global consumption continues to rise and the projected global population approaches 10.9 billion by 2100, the imperative to enhance future food production becomes evident. The ocean economy emerges as a potential solution for addressing this challenge. Seaweed farming, as highlighted by Hossain et al. (2021) offers a transformative approach to various critical aspects such as food security, gender equality, economic growth, nutrient management, carbon sequestration, employment generation, and aquatic environmental health. While the blue economy concept holds promise in bolstering society's food security, it's important to acknowledge that not all ocean economy activities seamlessly align with food and nutrition security goals.

Marine finfish farming, for instance, faces significant hurdles in realizing the expected gains in food security and environmental sustainability due to complex biological, technical, and economic constraints, as identified by (Belton et al., 2020). In summary, the increasing consumption patterns and projected population growth underscore the need for innovative strategies in food production. Seaweed farming stands out as a multifaceted solution, but careful evaluation is essential to ensure that diverse ocean economy activities contribute effectively to sustainable food and nutrition security.

4.3. Ocean Governance (OG)

Presently, a specific governance framework for the blue economy is absent, although notable organizations like the World Wildlife Fund and the United Nations Environment Programme (UNEP) have formulated overarching guiding principles for its development. Approaches to shaping the blue economy encompass a spectrum of strategies, ranging from international guidelines to regional strategies tailored to specific contexts. The United Nations Sustainable Development Goals (SDGs) consist of 17 overarching objectives, supported by 169 targets and 231 distinct indicators. Seaweed farming, a component of the blue economy, aligns with 26 of these SDG targets aimed at eradicating food insecurity while also contributing to other SDG targets.

However, it's important to acknowledge that many studies highlight the potential conflicts between blue economy pursuits and other SDG objectives. The intricate interplay between blue economies and broader SDG aspirations necessitates a nuanced analysis. To establish comprehensive legal and policy frameworks that promote resilience and address both environmental and human security concerns, a sophisticated assessment becomes crucial. The complexity of coastal challenges demands an integrated approach that combines critical socio-economic and scientific data. This data-driven approach is pivotal for formulating effective strategies to address the intricacies of coastal regions, ensuring the well-being of both the environment and the human population they support.

5. CONCLUSION AND RECOMMENDATION

The blue economy, with its focus on the sustainable utilization of marine resources, has emerged as a promising approach to address global challenges and promote economic growth. One of the key aspects of the blue economy is its potential contribution to food security - blue foods. The sustainable use of marine resources can help meet the increasing demand for food as the global population continues to grow. By optimizing the utilization of these resources, countries can enhance the availability and accessibility of nutritious food, particularly in coastal communities that heavily rely on marine resources for their livelihoods. This can contribute to improved food

security and long-term livelihoods. Furthermore, the blue economy offers opportunities for economic growth and job creation. By harnessing the potential of marine resources, countries can diversify their economies and create new employment opportunities, particularly in sectors such as fisheries and mariculture. This can contribute to poverty reduction and economic security, further enhancing food security and the well-being of communities.

However, the successful implementation of the blue economy and its contribution to food security require effective governance and policy frameworks. Clear and consistent governance mechanisms are needed to ensure the sustainable development of the blue economy while minimizing ecosystem degradation and enhancing social benefits - poverty alleviation, sustainable livelihoods, and the protection of the ocean.

To maximize the blue economy's potential for food security, tackling ocean governance, maritime security, and regional/international cooperation challenges is crucial. Threats like illegal fishing, piracy, and climate change endanger both food security and sustainable blue economy growth. Addressing these via cross-sector partnerships can safeguard marine resources and coastal communities' livelihoods.

In conclusion, the blue economy holds great promise to address global challenges and promote economic growth. Its potential contribution to food security through the sustainable utilization of marine resources is significant. By optimizing the utilization of blue foods, countries can enhance food availability and accessibility, create employment opportunities, and improve the well-being of communities. However, effective governance which can address the challenges related to ocean governance and security are crucial for the successful implementation of the blue economy and the achievement of food security goals. By addressing these aspects, we can maximize the potential of blue economy and sustainable development, ensuring a brighter future for generations to come.

After all, the study of blue economy and food security is important for several reasons: (i) policymakers and stakeholders can develop strategies and policies that contribute to the achievement of SDGs goals (Voyer et al., 2018); (ii) researchers can identify ways to optimize the use of marine resources and increase the availability and accessibility of nutritious food to meet the growing food demand as the global population continues to increase (Farmery et al., 2021); (iii) researchers can identify opportunities for economic growth and job creation, particularly in coastal communities that rely heavily on marine resources for their livelihoods; (iv) researchers can develop strategies to reduce potential negative impacts that could threaten the food security and livelihoods of vulnerable populations, especially in developing countries and Small Island Developing States (Farmery et al., 2021).

Therefore, the study found that there is a lack of research focusing on this area. The study recommends researchers to look into this area and come out with outcomes that are useful for academics as well as for policy makers. The integration of the blue economy, food security and good governance should be emphasized to have a dynamic and sustainable blue economy. Apart from that, research also must focus on the specific countries or states level to cater for the micro parts of the blue economy. Micro studies might help policy makers to design a better policy that suits a specific need of the area.

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