

BLUE ECONOMY: ANALYZING AQUACULTURE FARMS ON THE EXAMPLE OF THE AUTONOMOUS REPUBLIC OF ADJARA (GEORGIA)

 **Nestan Varshanidze**¹, Mg.oec., PhD student;  **Dina Popluga**², Dr.oec., associate professor

¹Batumi Shota Rustaveli State University Georgia;

²Latvia University of Life Sciences and Technologies

Abstract. The Blue Economy is a relatively new concept that relies on sustainable use of ocean resources for economic growth, improved livelihoods and jobs while preserving health of ocean systems. This concept has lately been regarded as a very promising tool in achieving several Sustainable Development Goals set by the United Nations. Understanding and proper implementation of the Blue Economy principles in coastline territories have become urgent and topical issues. The purpose of this study is to analyse and assess the feasibility and potential of introducing a fish and seafood production sector in the Autonomous Republic of Adjara, which is located in Georgia. The current study explores the opportunities, challenges, and potential benefits associated with establishing such sector in this region, characterizes existing aquaculture farms and identifies reasons that hinder the increase of farms' productivity. In scope of this study, a survey of 70 fish farms was carried out, and the research results highlight possibilities to develop scenarios for further field development where collaboration between aquaculture farms and the government can be identified as crucial issues to stimulate the production of fish products. By summarizing the research results and analysing the data, the following conclusions can be drawn: Georgia faces a challenge in introducing the modern Blue Economy and its principles; the existing aquaculture farms in the Autonomous Republic of Adjara have low productivity; farmers lack the necessary knowledge for sector development; it is crucial to strengthen aquaculture farms with government support.

Key words: Blue Economy, aquaculture, Georgia, Adjara.

JEL code: Q22, Q50, R11

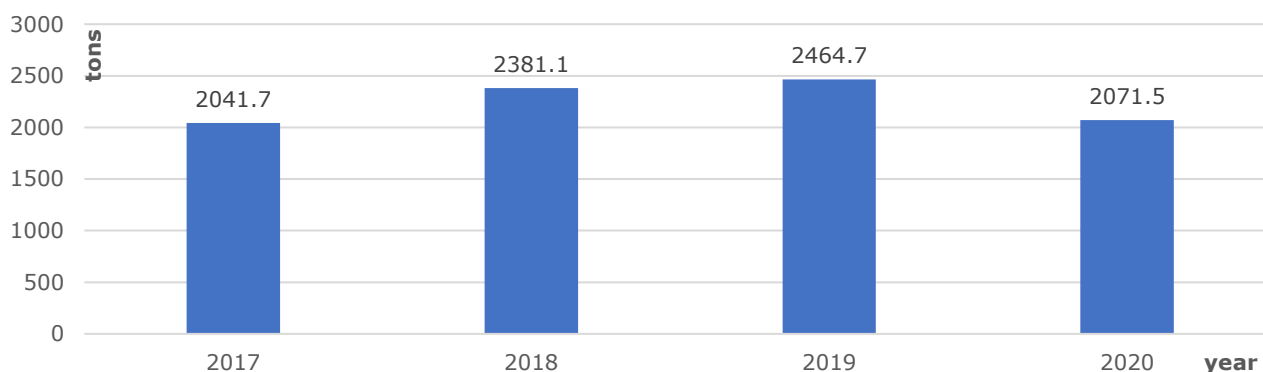
Introduction

The economy, based on its characteristics, can be compared to a living organism. At the global level, important economic, social, and environmental issues such as increasing consumption, unequal distribution of resources, socio-economic inequality, unemployment, and climate change are prevalent (BRIDGE-BS, 2022). This paper discusses the Blue Economy, which responds to the UN Sustainable Development Goals (Goals 1, 8, 14, 15 and 17). Most natural resources used daily for production and household purposes are non-renewable, including water, ocean, and sea resources (OECD, 2022). According to the World Bank, the Blue Economy refers to the "sustainable use of ocean resources for economic growth, improved livelihoods, and jobs while preserving the health of the ocean ecosystem" (The World Bank, 2017). The Blue Economy includes areas such as fisheries, maritime transport, waste management, marine renewable energy, tourism, and climate change.

According to the literature, in the 18th century, the English scientist Thomas Robert Malthus spoke about limited resources and unsustainable consumption. Other classical scientists, such as David Ricardo, John Stuart Mill, and William Stanley Jevons, predicted that the scarcity of natural resources would lead to economic decline, and therefore described economics as a "dismal science" (Toman, 1997). The problem is particularly acute in developing countries. The term "Blue Economy" was first used in 1994 by Gunther Pauli in his book "Blue Economy 3.0", where he highlights that economic processes are rapidly developing in maritime regions (Pauli, 2011).

Nowadays, approximately half of the world's population, which is around 3 billion people, lives within 200 kilometres of a coastline. According to anthropologists, this figure is likely to double by 2025 (Creel, 2020). In recent years, awareness of the concept of the Blue Economy has been growing, although it is still not a widespread policy with formulated goals (EUMOFA, 2022). The Autonomous Republic of Adjara is located on the coast of the Black Sea. Hence, it is urgent to develop and implement the appropriate

Blue Economy policies, including those related to fish and seafood production (BSEC, 2019). In order to plan the right policy, it is necessary to study the current situation, the status quo. The contribution to Georgia's gross domestic product of agriculture, hunting and forestry, fishing, fishing sector from 2015 to 2020 was in the range of 7.9-8.2%. Fish products foreign trade balance has always been negative and in 2020 amounted to 17-22 thousand tons. The share of imported products in the Georgian fish market is high, namely, 85-90% of fish products on the market are imported (Geostat, 2021). According to the data of the National Statistics Agency of Georgia, in recent years, the number of fish produced in aquaculture farms has decreased. The produced amount of aquaculture products in 2020 equalled 2.0-2.5 thousand tons (Fig. 1).



Source: author's calculations based on GEOSTAT data

Fig. 1. Volume of fish produced in aquaculture farms in Georgia

The mentioned fact is important and needs to be studied at a scientific level. Water resources are not used commercially, which is a loss for the real economy (AGENDA, 2021). Considering the given facts, it is necessary to study the challenges faced by aquaculture farms. The development of the fisheries sector is of special importance to the coastal regions of Georgia, where most of the fishing companies are located. Companies in the fisheries sector are not able to work with traditional and obsolete technology, equipment and complexity (BRIDGEBS, 2020).

It should be noted that positive changes in the aquaculture sector can be observed in Georgia starting from 2021. This is primarily due to the adoption of the draft Law on aquaculture. With the mentioned change, from 2024, permits for aquaculture activities will be issued taking into account permit conditions. According to the explanation of the Environmental Protection and Natural Resources Committee of the Parliament of Georgia, aquaculture, extensive aquaculture and mariculture are distinguished in the sector (at this stage it was not represented in Georgia at all). This process will lead to the utilization of water resources through environmentally friendly activities. Additionally, it will facilitate the commercialization of these resources, the protection of aquatic species, and most importantly, establish a legal framework for the sector. To complement these efforts, it is imperative to gather statistical data that will accurately describe the current state of the sector and provide a clear overview of potential development opportunities. Since 2017, the National Statistics Agency of Georgia has been publishing statistics on aquaculture farms every year. However, this study alone is not sufficient, as the data and indicators presented in it do not allow for detailed analysis, particularly on a regional level (including the Adjara region). Therefore, the research conducted by us, which identifies the challenges faced by aquaculture farms in the Adjara region, is crucial. There is a lack of such research in this sector, which adds significant practical value to this research paper. Based on the findings of this research, it will be possible to develop state policies that consider the needs of the farmers.

Research methodology

The paper aims to clearly reflect the peculiarities of the Blue Economy and problematic issues in Georgia, especially in the direction of fishing and aquaculture. Also, determining the condition and challenges of aquaculture farms in Adjara within the framework of the Blue Economy. To achieve the aim, two specific research tasks were set: 1) to conduct a review of theoretical literature on the role of the fish products industry in Adjara; 2) to analyse problems faced by aquaculture farms.

The research employed general and structural sociological research methods (interviews and questionnaires). The descriptive, analysis and synthesis methods were used to formulate the research results. The analysis conducted on the subject matter utilized a variety of sources to gather specific information. These sources include both international and local literature, which may consist of academic publications, research studies, and other written material that pertains to the topic under consideration. Additionally, practical studies were examined to provide real-world insights into the matter. Furthermore, the sources of analysis also included governmental and non-governmental organizations. These organizations may have provided statistical data, reports, and case studies on the subject matter, which were analysed to gain a comprehensive understanding of the topic at hand. Overall, the analysis utilized a diverse range of sources to ensure a thorough and well-rounded understanding of the subject matter. Experience shows that due to the nature of the problem, complex and multifaceted research is needed.

The research process involved the use of statistical data analysis methods and surveys. A quantitative method was employed to obtain data from representative surveys containing questions developed by the author. The surveys were designed to resemble in-depth qualitative research interviews, with open-ended and closed-ended questions to allow respondents to provide detailed feedback. In some cases, mobile phones were used for conducting interviews.

The questionnaires were thoroughly reviewed for inconsistencies and technical errors. If any issues were found, the questionnaires were edited. A pilot survey was conducted to identify any missing or incorrect information and make necessary modifications. This approach helped to ensure the quality of the questionnaires. This approach allowed for the efficient and effective collection of data.

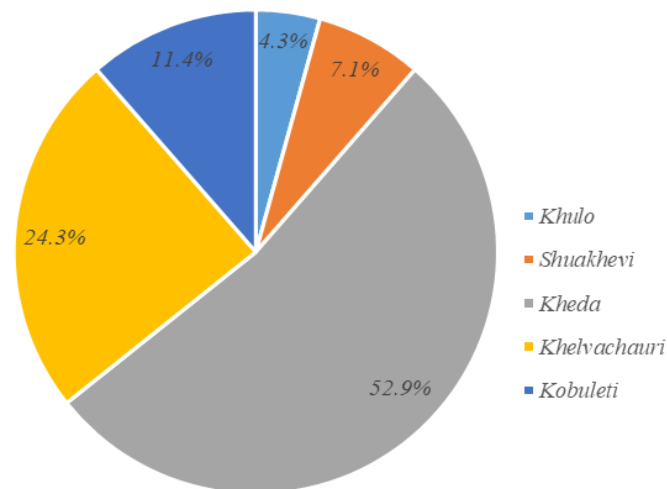
The object of the research is fish and seafood farms, specifically aquacultures located in the Autonomous Republic of Adjara. The subject of the research is to investigate the factors that affect the functioning of these aquaculture farms in the Adjara region. To obtain data, surveyed and interviewed farms were selected based on their business activities and experience. The main selection criterion was that the respondent must be the owner of a farm located in the Adjara region that has been in operation for at least the last 10 years. As a result of these selection criteria, the presented research report is reliable and relevant because the survey respondents have considerable experience in the aquaculture industry. This ensures that the data obtained is based on the practical experiences of established aquaculture farmers in the region.

The survey results were processed by means of the data processing program SPSS (Statistical Package for the Social Sciences). Microsoft Excel for Windows was used for a graphical analysis of the data.

Research results and Discussion

The main data set that was analysed in this study was obtained from 70 questionnaires. These questionnaires were distributed and interviews were conducted by using the cluster analysis method. The clusters were represented by municipalities in the Autonomous Republic of Adjara (Khulo, Shuakhevi, Keda, Khelvachauri, Kobuleti). The surveys were conducted from May to July 2022. There were 3 datasets from

Khulo municipality, 5 from Shuakhevi, 37 from Keda, 17 from Khelvachauri, and 8 from Kobuleti. Distribution of fishing farms by municipalities (clusters) are summarized in Figure 2.

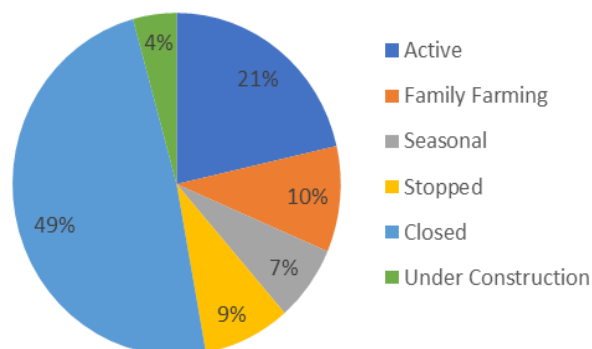


Source: author's calculations based on survey (n=70) results

Fig. 2. Distribution of fish farms by municipalities

Based on the research findings and secondary data, the following conclusion can be drawn: the surveyed aquaculture farms and their production rates differ from each other. 37% of the surveyed fish farms are in operation (active all year - 20%, family farming (family consumption) - 10%, seasonal - 7%). Most of the farms are registered as individual entrepreneurs, and some don't own real estate (mainly fish farms on the river) due to legal regulations. Family members, on average 2-3 people, are employed in these farms. The research showed that one of the obstacles to the development of the fishing industry in the Adjara region is the age of the employees. The people employed in the sector are old, which indicates that young people are less interested. Also, the majority of owners of surveyed farms are men. 22% of the surveyed employees of fisheries farms are in the age group of 60+ years. Most of the employed are in the 45-60 age group (48%). As well as a large proportion of employees are in the age group of 30-45 years (21%). The number of young people employed is relatively small, the lowest number of employees is in the age group under 30 - only 9%. This fact is related to such factors as the location of farms in rural areas, lack of qualifications for working in the fisheries sector, low profit margins, and others. All this makes it difficult to introduce innovations in the sector and increase its efficiency and productivity.

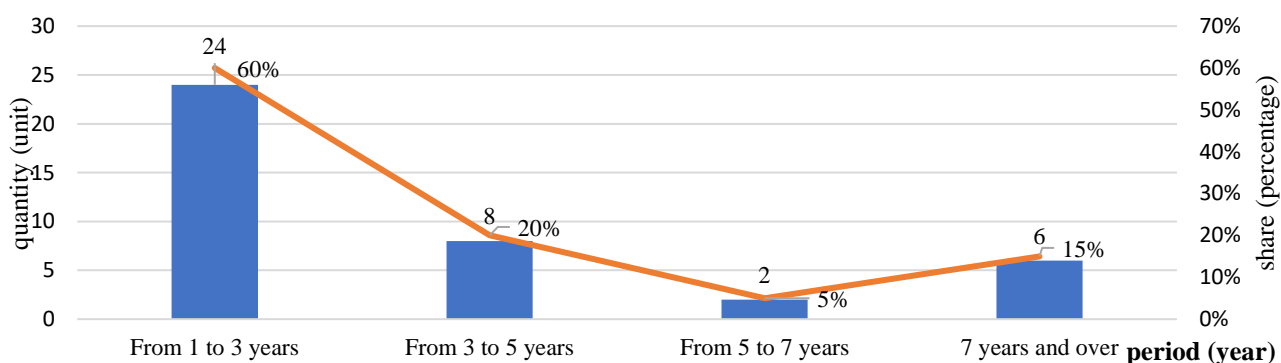
Mostly these farms were built in the 1990s and 2007-2010. During the last 5 years, about 2 new enterprises have been added, although it is worth noting that these enterprises are provided with much higher performance and better infrastructure.



Source: author's calculations based on the survey (n=70) results

Fig. 3. Distribution of fish farms by status

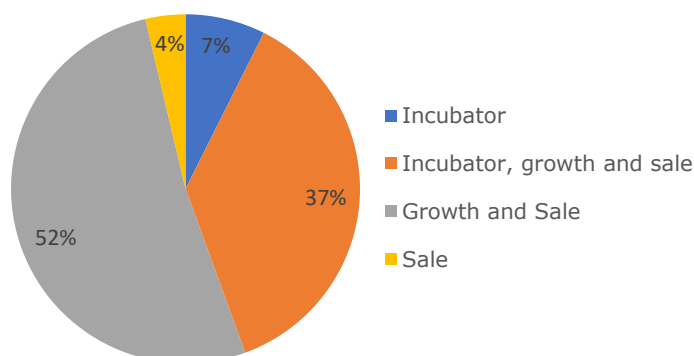
According to analysis of distribution of surveyed fish farms by status (Figure 3), the majority (58%) are closed (49%) or their operation is suspended (9%). According to the obtained data, the authors can say that most of them (60%) were closed in 2019-2021. The respondents evaluated the reasons for the production of aquaculture farms with a 5-point Likert scale, where 1-point means "very bad" and 5 points means "very good". The list of the main reasons contain the following arguments: expensive raw materials (food, drugs) and lack of access to them (restricted imports), problems related to sales (restriction of movement, lack of transport), financial problems, spread of diseases and others (Figure 4). The main reasons for farm closures in 2016-2018 were financial problems, poor food quality and widespread diseases.



Source: author's calculations based on the survey (n=70) results

Fig. 4. Distribution of suspended and stopped farms by years

According to survey results, the production cycle of 53% includes the purchase, growth and sale of spawn, 37% have a fully realized production cycle, 7% are limited to the shares of incubators and 4% of sellers (Figure 5). This indicates that every stage of the entire production cycle is quite well developed in the Adjara region. Farmers often cooperate and form a value chain. An example of this is the organic aquaculture development association "Foreji", which was established in Keda municipality with the financing of the European Union. "Foreji" is an association that develops organic aquaculture, facilitates the project to ensure that healthy fry is hatched from quality-bred roe, guaranteeing an uninterrupted supply for fisheries throughout the business year. In addition, the main task "Foreji" sees for itself is changing the minds of fish farmers. Currently, the general mindset both hinders development of the field and distorts the income of the farmers.



Source: author's calculations based on the survey (n=70) results

Fig. 5. Distribution of active fish farms according to production cycles

Due to difficult environmental conditions and deficiencies in the incubation cycle (water quality, common viral and bacterial diseases, lack of ichthyologists), hatcheries and fish farms operate at high losses. The challenging environmental conditions and inadequacies in the incubation cycle, such as poor water quality, frequent viral and bacterial diseases, and a shortage of ichthyologists, result in significant losses for hatcheries. Small fish don't have high immunity, which affects the growth rate and duration of the

production period. This will ultimately affect the increase in the cost of products. The commercial weight of rainbow trout (*Oncorhynchus mykiss*), a common fish species in Adjara, is 200-250 grams, which takes 8-9 months to 13-18 months to grow (depending on water quality, temperature and amount of food).

During the survey, it was revealed that farmers often bring small fish and fish feed from the neighbouring country Turkey. There are also imported Polish, Italian, Danish products, the price of which depends on the exchange rate of the euro. In ichthyology, it is accepted that to grow 1 kilogram of trout, about 1-1.2 kilograms of fish food is needed. Due to the increased production period, the local fish farm has to supply about 1.5 – 2 kilograms, which increases the prime cost of the products.

Most of the respondents have not created their brand name for better marketing. Only 26% of respondents have their trade mark. They mainly use traditional ways for sales and they do not use online sales and other digital platforms. Only 15% of fish farms operating in Adjara have a webpage on social media. Only two of the surveyed farms indicated participation in the local exhibition. The lack of direct contact with the customer, the absence of websites and catalogues reduces the number of sales as they do not feel the need for them at the moment. However, as practice shows, it is possible to introduce new products to customers faster through social networks and online sales. Aquaculture farms with production volume of more than 1 ton implement wholesale trade (selling to resellers), delivering to "Melkimoria", rural market and supply catering facilities (mainly seasonal cafes and restaurants, in some cases their own).

As mentioned in the interviews, local aquaculture farmers are also exposed to problems related to various aquaculture diseases. An alternative is to move to a neighbouring country Turkey, where aquaculture is much more developed and they can accurately diagnose such diseases. It is difficult to find an ichthyologist who can accurately diagnose and treat fish diseases throughout the Adjara region and not only Adjara, but the whole of Georgia. Firstly, there are no qualified personnel, secondly, there is no special laboratory where it will be possible to conduct the research.

From the survey results the authors can conclude that vast majority of people (85%) working in this sector are less interested in acquiring theoretical knowledge and sharing practice. Knowledge gap is one of the issues that is highlighted also in other studies in the field of aquaculture. For example, A. Sapkota and co-authors (2008) summarize that one of the urgent issues in aquaculture farms is knowledge concerning major chemical, biological and emerging agents that are employed in modern aquaculture facilities and their potential impacts on public health. Situation analysis and survey results in Georgia highlights that aquaculture farmers think that they don't need additional training. The main part of existing knowledge in aquaculture farms is based on practical experience and traditional knowledge, which is not sufficient to introduce new sustainable production methods. The mentioned fact is related to the demographic indicators of the employees in the sector (age, gender).

The research focused on analysing the essential resources needed to develop business models for aquaculture farms. The study highlighted those physical resources, such as tanks, equipment, support buildings, laboratories, and food, intellectual resources like brand and customer database, human resources in terms of employee competencies, knowledge, and creativity, along with financial resources are the most crucial resources for the development of aquaculture farms' business models. Similar findings can be found in other studies that also explore challenges and opportunities for aquaculture development (Ugalde et al., 2023). Furthermore, the study found that family farms are the most prevalent type of farm, but they are less likely to receive information on financial performance compared to other farm types.

One of the significant drawbacks of the existing aquaculture farms in Adjara is the limited modernization of their production processes. This ultimately leads to low productivity, causing a decrease in production levels (FAO, 2022). One of the contributing factors to this issue is the lack of knowledge regarding advanced

aquaculture production practices. As a result, only a small quantity of fish products is released into the market, which is not sufficient to meet local demand. Moreover, this situation fails to generate the expected total added value in the economy, thereby adversely impacting economic growth.

Conclusions

The review of scientific literature and discussions dedicated to the Blue Economy concept has confirmed that the development prospects for aquaculture farms in Georgia, particularly in the Autonomous Republic of Adjara, are promising. The growth of this industry will undoubtedly contribute to improving the socio-economic conditions of the local population, specifically among those living in rural areas, by increasing local employment opportunities.

The development of aquaculture farms will ultimately lead to a rise in fish and sea product production, which will be crucial in reducing and possibly substituting imports in the medium-term. This, in turn, will have a positive impact on the overall economy, benefiting both producers and consumers. At this stage, based on the research, the authors have made several conclusions.

- 1) The paper describes the results of the research conducted in the aquaculture farms in the Autonomous Republic of Adjara. The research revealed the main problems faced by farmers. Among them, the following should be highlighted: lack of availability of fish food (it is imported and has high and unstable prices); lack of ichthyologists and laboratories; outdated knowledge among farmers and lack of innovation in the field; low access to finance.
- 2) Based on the findings, the local and central governments should support aquaculture farm owners to maintain production and overcome the existing challenges. At the same time, it is necessary to maintain the necessary infrastructure for farmers, share new knowledge, practices and provide financial support.
- 3) A limitation of this research is its relatively small sample size. Therefore, future studies should aim to expand the sample size and cover a wider range of regions in Georgia to provide more comprehensive insights into the aquaculture industry. Additionally, conducting further practical studies would be beneficial in providing practical solutions to the challenges faced by farmers in this sector.

Acknowledgment

This work was supported by Shota Rustaveli National Foundation of Georgia (SRNSFG) [grant number MR-21-1059].

I want to express my heartfelt gratitude for my supervisor, professor Natela Tsiklashvili, for her exceptional guidance and support throughout the research process. Her insightful feedback and unwavering encouragement played an integral role in the successful completion of our scientific paper.

Bibliography

1. AGENDA (2021). World Bank: Georgia's 'blue economy' can be vehicle for accelerating climate change adaptation. Retrieved from: <https://agenda.ge/en/news/2021/536>
2. BRIDGE-BS (2020). Programme H2020-BG-2018-2020 (Blue Growth). Retrieved from: <https://bit.ly/3NJz2t1>
3. BRIDGE-BS (2022). Online Directory of Black Sea Ocean Literacy Initiatives. Retrieved from: <https://bit.ly/3mErNGW>
4. BSEC. (2019). Blueing the Black. Retrieved from: <https://bit.ly/3mzW3TB>
5. Creel, L. (2020). Ripple Effects: Population and Coastal Regions. Retrieved from: www.prb.org: <https://www.prb.org/resources/ripple-effects-population-and-coastal-regions/>
6. EUMOFA (2022). EUMOFA Monthly Highlights. Retrieved from: <https://bit.ly/3mEpgMW>
7. FAO (2022). Aquaculture market in the Black Sea: country profiles. Retrieved from: <https://www.fao.org/3/cb8551en/cb8551en.pdf>

8. Geostat (2021). SURVEY OF AQUACULTURE HOLDINGS 2020. Retrieved from: www.geostat.ge:
<https://www.geostat.ge/media/39347/Survey-of-Aquaculture-Holdings---2020.pdf>
9. OECD. Stat (2022). Agriculture and Fisheries. Retrieved from: <https://stats.oecd.org/#>
10. Pauli, G. (2011). The Blue Economy. Retrieved from: https://www.jef.or.jp/journal/pdf/175th_cover04.pdf
11. Sapkota, A., Sapkota, A.R., Kucharski, M., Burke, J., McKenzie, S., Walker, P., Lawrence, R. (2008) Aquaculture practices and potential human health risks: Current knowledge and future priorities. *Environment International*, Volume 34, Issue 8, pp. 1215-1226. ISSN 0160-4120, <https://doi.org/10.1016/j.envint.2008.04.009>
12. The High Level Panel (2020). National Accounting for the Ocean and Ocean Economy. Retrieved from:
<https://bit.ly/3mAqu74>
13. The United Nations (2021). world water development report 2021. Retrieved from: <https://bit.ly/3aTgV5G>
14. The World Bank (2017). THE POTENTIAL OF THE BLUE ECONOMY. Retrieved from: <https://bit.ly/3ttb6SN>
15. Toman, M. (1997). Why not to calculate the value of the world's ecosystem services. Retrieved from:
<https://bit.ly/3NJSV3d>
16. Ugalde, S.C., Vu, S.V., Giang, C.T., Ngoc, N.T.H., Tran, T.K.A., Mullen, J.D., In, V.V., O'Connor, W. (2023). Status, supply chain, challenges, and opportunities to advance oyster aquaculture in northern Vietnam, *Aquaculture*, Volume 572, 739548, ISSN 0044-8486, <https://doi.org/10.1016/j.aquaculture.2023.739548>