



Qualitative Descriptive Data Analysis of the Competitiveness of Floating Cage Net Production in West Java Province

Fitri Andayani^{1*}, Asep Agus Handaka Suryana¹, Ayi Yustiati¹ and Atikah Nurhayati¹

¹*Department of Fisheries, Faculty of Fisheries and Marine Science, Padjadjaran University, West Java, Indonesia.*

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/AJFAR/2021/v13i630282

Editor(s):

(1) Dr. Pinar Oguzhan Yildiz, Ataturk University, Turkey.

Reviewers:

(1) Yasodha Thirumal, India.

(2) Benjamin U. Akpoiih, University of Port Harcourt, Nigeria.

Complete Peer review History: <https://www.sdiarticle4.com/review-history/72084>

Original Research Article

Received 21 July 2021
Accepted 06 August 2021
Published 14 August 2021

ABSTRACT

This study has the aim to analyze the competitiveness production of floating net cages aquaculture in West Java Province. The research was conducted from September 2020 – July 2021. The method used was a literature survey to determine the competitiveness of floating net cage aquaculture in 27 regencies/cities in West Java Province. Data collected was analysed descriptively. Primary data is in the form of expert judgment consisting of 20 people regarding the proportion of competitiveness of floating net cage aquaculture fisheries. Secondary data on Floating Net Cage Aquaculture Fisheries (2004 – 2019) was obtained from the office of Maritime Affairs and Fisheries of West Java Province. The results of this study indicates that the regencies with very high competitiveness are Purwakarta Regency and Cianjur Regency. While the regencies with low competitiveness are regencies/cities in the northern and southern regions.

Keywords: Floating cage net aquaculture; competitiveness; west java; production.

*Corresponding author: Email: andayanifitri82@gmail.com;

1. INTRODUCTION

Geographically, West Java Province is located between 5°50' - 7°20' South Latitude and 104°48' - 108°48' East Longitude. West Java Province has an area of 37,087.92 km² with a coastline of 832,69 km. Based on the marine management authority of 0-12 miles, the sea area of West Java Province is 15.528,90 ha and has 19 small islands [1].

Administratively, in 2019 the area of West Java Province is divided into 27 regencies / cities, covering 18 regencies and 9 cities, namely Bogor, Sukabumi, Cianjur, Bandung, West Bandung, Garut, Tasikmalaya, Ciamis, Kuningan, Cirebon, Majalengka, Sumedang, Indramayu, Subang, Purwakarta, Karawang, Bekasi, and Pangandaran as well as the City of Bogor, Sukabumi, Bandung, Cirebon, Bekasi, Depok, Cimahi, Tasikmalaya and the City of Banjar. Sukabumi Regency is the largest regency area in West Java Province with an area of 4.145,70 km² (11,72 percent of the area of West Java Province), while the smallest area is Cirebon City which is 37,36 km² (0,11 percent of the total area of the Province West Java). West Java Province consists of 627 regencies, 645 villages and 5.312 villages [1].

West Java Province is an area that has natural conditions suitable for the development of aquaculture, especially freshwater aquaculture. This is supported by a large number of freshwater resources in West Java because it is supported by high rainfall. Rainfall ranges from 2000-4000 mm/year, the amount of rain is estimated at 180 days/year. West Java has many rivers, lakes, swamps, lakes, and other puddles. West Java Province has large reservoirs, namely Jatiluhur Reservoir, Cirata Reservoir, Saguling Reservoir and Darma Reservoir with a wide range of each reservoir between 420 ha to 8,300 ha. The large potential of the reservoir used for the aquaculture of floating net cages in West Java Province is an opportunity to develop the region [1].

West Java is one of the provinces with the largest contribution to reservoir fisheries production. Many people in West Java use these public waters in their fishery activities, both cultivation and capture. Reservoir fisheries both in Indonesia in general and in West Java in particular are still dominated by aquaculture, capture fisheries, the contribution is still small. One of the activities that utilizes reservoir

resources for fish aquaculture activities is especially floating net aquaculture activities. This activity has contributed a lot to regional income and also the welfare of the people who do it [2].

A floating net cage is a fish rearing container in the form of a net bag that is located floating on the surface of the water. Fish rearing in floating net cages is a community economic activity that utilizes available natural resources, labor, and technology. In addition, the business is expected to open up new job opportunities and business opportunities for the community [3].

Putri [4] reveal that the floating net cage business in Jatiluhur Reservoir can improve socioeconomic conditions in the community such as increasing income, increasing work networks, increasing community insight, and improving development conditions around the community.

Aquaculture activities with floating net cage systems have the aim of increasing production to get maximum profit. The aquaculture pattern used is intensive, where fish are kept in high density and using commercial feed [5]. With intensive aquaculture, farmers can harvest fish in a faster time and with good quality [6].

According to [7] for fish aquaculture in floating net cages, fish species should be selected with the following characteristics: have resistance to environmental changes and pest/disease disturbances, fast growth, fish can be kept in high density, fish seeds are easily obtained from hatcheries and fish to be aquacultured are in demand by the market both for domestic consumption and as export commodities. Carp and other types of fish, including catfish, tilapia, and pomfret are superior commodities and have been cultivated from the past until now [8].

The application of freshwater fish aquaculture in floating net cages will provide more benefits when compared to using land as a pond. These advantages are in the form of reduced production costs for providing land (to build ponds), which can overcome the decrease in fish aquaculture land due to being pressured by agricultural, industrial, and housing development activities. Technically, the benefits obtained include the intensification of fish production and optimization of feed use that can be applied, competitors and predators of fish are easy to control and management and harvesting are not too complicated [9].

The application of freshwater fish farming in floating net cages will provide more benefits

when compared to using the land as a pond. These advantages are in the form of reduced production costs for land provision, which can reduce fish cultivation land due to agricultural, industrial, and housing activities.

The magnitude of this potential is not followed by the optimal utilization of fishery resources. Over time the aquaculture of floating net cages has led to several issues, such as controlling floating net cages in the Jatiluhur Reservoir, Purwakarta Regency [10], sources of fishery problems by various parties [11], and other disturbing threats are the COVID-19 pandemic affecting the market share of the floating net cage industry. This will trigger a low level of competitiveness among the existing floating net cage industries [12].

In the current era of regional autonomy, each region has the freedom to determine the direction and policy of developing economic areas. To determine the direction and policy of economic development in an area, information about the economic potential of the region is needed. The level of competitiveness is one of the parameters in the concept of a sustainable city. The higher the level of competitiveness, the higher the level of community welfare [13].

To determine the competitiveness of floating net cage aquaculture production, production data consisting of several types of fish is needed. Types of fish are divided into several species including carp, tilapia, nilem, carp, tawes, catfish, catfish, fresh pomfret, milkfish, and other fish [14]. According to Rochdianto [15], the types of fish cultivated in floating net cages must have high economic value so that market absorption can be met. In addition, of course, the seeds of this type of fish are easy to find at any time around the business location. This is so that the continuity of cultivation can later be supported. The most important thing is the ability of the fish species themselves to be able to live and grow well in aquaculture waters that can be implemented. So it will be seen how the profile of competitiveness in each regency/city in West Java Province has high or low competitiveness. This is intended so that the data obtained can later be useful for decision-makers, especially local governments as a consideration in preparing plans and strategies for the development of the fishery sector in the field of floating net cage aquaculture and for other parties, as a reference to add insight, information, and knowledge.

2. METHODOLOGY

The method used in this study is a literature survey to determine the competitiveness of floating net cage aquaculture production in 27 regencies/cities in West Java Province. Literature survey is research related to library data collection or research whose research objects are explored through various library information (books and scientific journals) [16]. The data used are primary data and secondary data which is realized in the form of numbers and analyzed using descriptive statistics. The technique used to collect primary data in this study is expert judgment. While secondary data in the form of statistical data on Floating Cage Aquaculture Fisheries in 2004 – 2019 was obtained from the Department of Marine Affairs and Fisheries of West Java Province.

2.1 Research Location

The research took place at the Department of Marine Affairs and Fisheries, West Java Province, which is located at Jl. Wastukencana No. 17, Babakan Ciamis, Sumur Bandung Regencies, Bandung City, West Java 40117. This research was conducted in September 2020 – May 2021.

2.2 Data Analysis Method

Qualitative descriptive data analysis was used to describe or analyze the results of the research on the development profile of the competitiveness of the floating net cage aquaculture sector in the Regency/City of West Java Province. Data management and data analysis were carried out using Microsoft Office Excel 2013 software.

2.3 Competitiveness Profile Analysis

Analysis of the competitiveness profile of floating net cage aquaculture production in the Regency/City of West Java Province was carried out as follows:

1. Determine the main indicators and main variables of production.
2. Data was collected on floating net cage aquaculture fisheries in West Java Province from 2004 to 2019.
3. Identify priority weights or relative importance between indicators, variables, and sub-variables.

4. Collecting primary data in the form of expert judgment gives weight to the main indicators and variables. The respondents for this study were sampled from consisting of Socio-Economic Lecturers of FPIK Padjadjaran University and Aquaculture Lecturers FPIK Padjadjaran University, Head of Aquaculture Division of West Java Province, Head of Production and Business Section, Head of Facilities and Infrastructure Section, and Head of Section Fish Health and the Environment.
5. Calculating the weight of the expert judgment questionnaire results for each indicator, variable and sub-variable.
6. Processing the data that has been obtained during the research, using secondary data, namely statistical data on aquaculture in West Java Province in 2004, 2009, 2014, and 2019 to determine the competitiveness profile of each regency/city per 5 years.
7. Calculate the value based on the weight and score obtained.

$$\text{Score} = \frac{\text{Data each Regency or City}}{\text{Total Province Data}} \times 100$$

Value = Weight x Score

As for productivity is calculated back from fishery statistical data of West Java Provinces. Here's the formula productivity is calculated for the main indicators of competitiveness of fisheries [17]:

- a. Production Productivity per Area of Floating Cage Net

$$Ppt = \frac{Pik}{Tik}$$

Information :

- Ppt : Production productivity per floating cage net area (tonnes/m²)
- Q : Total Production (tonnes)
The type of fish Produced is in the hatchery and use stage
- T : Total area of floating cage net (m²)

- i : Regency i (i = 1, ... , 27)
- k : Period of Time (years)

- b. Production Productivity per Fish Farmer

$$Ppn = \frac{Pik}{Nik}$$

Information :

- Ppn : Production productivity per fish farmer (tonnes/person)
- P : Total Production (tonnes)
The type of fish produced is in the hatchery and rearing stages
- N : Total of fish farmers (person)
- i : Regency i (i = 1, ... , 27)
- k : Period of Time (years)

- c. Productivity Production Value per Floating Cage Area

$$Pnpt = \frac{NPik}{Tik}$$

Information :

- Pnpt : Productivity of production value per floating cage area (rupiah/m²)
- NP : Production Value (rupiah)
The type of fish produced is in the hatchery and rearing stages
- T : Total floating cage area (m²)
- i : Regency i (i = 1, ... , 27)
- k : Period of Time (years)

- d. Productivity of Production Value per Fish Farmer

$$Pnpn = \frac{NPik}{Nik}$$

Information :

- Pnpn : Productivity of production

value per fish farmer
(rupiah/person)
 NP : Production Value
(rupiah)
 The type of fish produced is in
 the hatchery and rearing
 stages
 T : Total of fish farmers
(person)
 i : Regency i ($i = 1, \dots, 27$)
 k : Period of Time (years)

8. Determine the criteria for the competitiveness of floating net cage aquaculture in all regencies/cities in West Java Province using quartiles. The competitiveness profile is divided into four competitiveness categories based on quartiles.
 Q1 = very high competitiveness
 Q2 = high competitiveness
 Q3 = enough competitiveness
 Q4 = low competitiveness.

3. RESULTS AND DISCUSSION

The results of this study are in the form of ranking the competitiveness of production between regencies/cities in West Java. This overall competitiveness ranking shows the relative position of a region against other regions by taking into account all the variables it has and the extent to which the region can realize the potential of these variables. The competitiveness ranking of each district can be divided into rankings based on the main indicators of production. The production capacity of floating net cages in 27 regencies/cities can be determined through quartile calculations, and the values of Q1, Q2, Q3, and Q4 can be obtained. The value of each regencies/city in the province of West Java represents a high or low level of competitiveness. Q1 is a very highly competitive area, Q2 is a highly competitive area, Q3 is a fairly competitive area, and Q4 is a low competition area.

The scores obtained based on the main indicators of production from each regency/city produce a final score that shows the ranking and category of competitiveness of the regency/city. The ranking of regencies/cities in West Java Province in floating net cage aquaculture activities can be seen in Fig. 1.

Fig. 1 is the result of data processing per 5 years from production indicators which are calculated

based on the results of fish aquaculture production in floating net cages per regency /city in West Java Province from several types of fish. Types of fish are divided into several species including carp, tilapia, Nilem, carp, tawes, catfish, catfish, fresh pomfret, milkfish, and other fish [14]. The results of the trend of the production competitiveness profile show that there was an increase in production output experienced by Cianjur Regency from 2009, 2014, and 2019 with consecutive values (22,8), (27,3), and (32,3). Based on the data that has been processed, from this value Cianjur Regency is very consistently ranked 2nd in the Q1 category of very high competitiveness. Cianjur Regency has experienced good production development from year to year. Recently, fish cultivation in the floating cage net has developed very rapidly, including in Cirata Reservoir where fish aquaculture activities in the floating cage net are mostly carried out. Cianjur Regency is a regency that contributes 39.5% to the production of floating net cage fisheries in West Java Province [18].

Cirata is one of the largest reservoirs in West Java, located in Cianjur Regency which is used as a supplier of electricity needs for the Java and Bali regions. In addition to hydroelectric power (PLTA), the Cirata Reservoir is used as a location for fish aquaculture using a floating net cage system with a production yield 69.684,27 tons [19].

Cirata Reservoir gets its water source from the Citarum River watershed. This reservoir is the third reservoir after Jatiluhur and Saguling which were built by damming the flow of the Citarum River. The Cirata Reservoir, which was built in 1982-1987, is located at an altitude of 221 m above sea level. The area is 6.200 ha with a catchment area of 603.200 ha, an average depth of 34,9 m and a volume of 230 thousand m^3 . The inundation area covers Cianjur, Purwakarta, and Bandung Regencies. However, the largest areas of inundation are in Cianjur (60%), West Bandung (25%) and Purwakarta (15%) [18].

In 2009 the production of Cianjur Regency reached 33.005,84 tons with the highest production of fish species, namely carp and tilapia. Then it increased in 2014 to reach 48.181,18 tons with the highest production of fish species, namely carp and tilapia. In 2019, Cianjur Regency's production reached 69.684,27 tons, this is the highest production of Cianjur Regency for 15 years. Of the total production, Cianjur

Regency contributed to fisheries in West Java Province by 33% in 2004, increased in 2009 to 48% and increased again by 66% in 2019. This increase can be a boost for other regencies/cities in developing the aquaculture of floating net cages so that it becomes an important economy in the Regency / City of West Java Province. Type of fish that are aquaculture are carp (*Cyprinus carpio*) and tilapia (*Oreochromis niloticus*). Carp and tilapia are widely aquaculture due to consumer demand and are easier to care for [18]. Based on observations and information from residents around the Cirata Reservoir, there are various types of fish in the Cirata Reservoir such as tilapia (*Oreochromis* sp), Nilem (*Osteichthilus hasselty*), tawes (*Puntius* sp), corm (*Pangasius* sp), and trout (*Hampala macrolepidota*). The following is a graph of the trend of the competitiveness of floating net cage aquaculture based on production indicators:

According to the results of data processing above, Purwakarta Regency experienced a decrease in production in 2014 and 2019. This decline was evidenced by its highest value of 55,4 in 2009, then decreased to 48 in 2014 and decreased again in 2019 with a value of 43,3. Despite the decline, Purwakarta Regency has consistently been ranked 1 in 3 consecutive periods and consistently inhabited the Q1 area, so it is still categorized as very high. According to Pradita and Sidik [12], the decline in production output experienced by Purwakarta Regency in 2019 was caused by the COVID-19 pandemic. At present, there are other threats that disrupt this industry, namely the Covid-19 pandemic. With its unusually fast spread and difficult for anyone to detect, this industry has also been affected. When the Large-Scale Social Restriction policy was implemented in several regions, this policy indirectly affects the market share of the marine cage industry. Therefore, with the COVID-19 pandemic, the income earned has decreased compared to the usual day, although not too significant. Because it has been overcome by various strategies by the workers and business owners of these floating net cages, for example, by marketing the harvest in the form of carp according to the time of harvest.

According to the research results of Astuti [20], The decrease in the production of floating net cage aquaculture was also due to an increase in plots in 2016 which reached 48.989 plots. The input load of phosphorus from floating net cage cultivation reaches 12.000 tons per year. This condition has given negative feedback to the

decline in fish farming productivity in floating cage net from 2,11 tons/floating cage net plot/year in 2004 to 1,6 tons/ floating cage net plot/year in 2015. In addition, in 2014 – 2015 production of the yield of fish farming in floating net cages has decreased. This is due to the frequent occurrence of mass fish deaths in floating cage net so that many fish aquaculture are out of business. Mass mortality of fish is suspected due to several things as follows:

- Decrease in water quality which causes stunted growth and development of cultured fish
- Outbreaks of fish disease (Koi Harves Virus/KHV) which causes slowing of growth and death of fish
- Feeds that lift the bottom water mass with low oxygen content and toxic materials causing mass fish deaths.

The above factors have had an impact on decreasing the productivity of floating net cage aquaculture. The types of fish that are widely cultivated in the Jatiluhur Reservoir are carp (*Cyprinus carpio*) and tilapia (*Oreochromis niloticus*) [20]. According to Fitri [21] Types of fish cultivated in Jatiluhur Reservoir mostly carp, tilapia, and catfish.

The results of the quartile in 2019 are illustrated in Table 1. The results of the production competitiveness category in 27 regencies/cities in West Java Province can be seen in Fig. 2.

The third-largest ranking of floating net cage aquaculture in West Java Province is influenced by three large reservoirs in West Java Province, namely Saguling Reservoir (5.600 ha), Cirata Reservoir (6.200 ha), and Jatiluhur Reservoir (8.300 ha) with catchment areas coming from the river. The vast Citarum covers the areas of West Bandung Regency, Cianjur Regency, and Purwakarta Regency. The catchment areas that enter the three reservoirs mark the division of the Citarum watershed into 3 parts, namely the upstream Citarum watershed, the middle Citarum watershed, and the downstream Citarum watershed [22].

The Citarum River is the longest and largest river in West Java Province, which has great potential for the community. Both the potential for profit and loss. One of the activities that have these two potentials is a fishing activity using a floating net cage system. The high profits obtained from the floating cage net fishery

business are an attraction for investors to enter the floating cage net business and create many business opportunities that are directly or indirectly related to the floating cage net business. Directly related businesses include feed providers, suppliers of materials for making floating net cages, marketing of fish produced by

floating net cages, as well as those engaged in services, namely the manufacture of floating net cages, harvesting services, transportation services, and others. While those that are not directly related, such as food vendors, boat rentals as a means of transportation, and others [10].

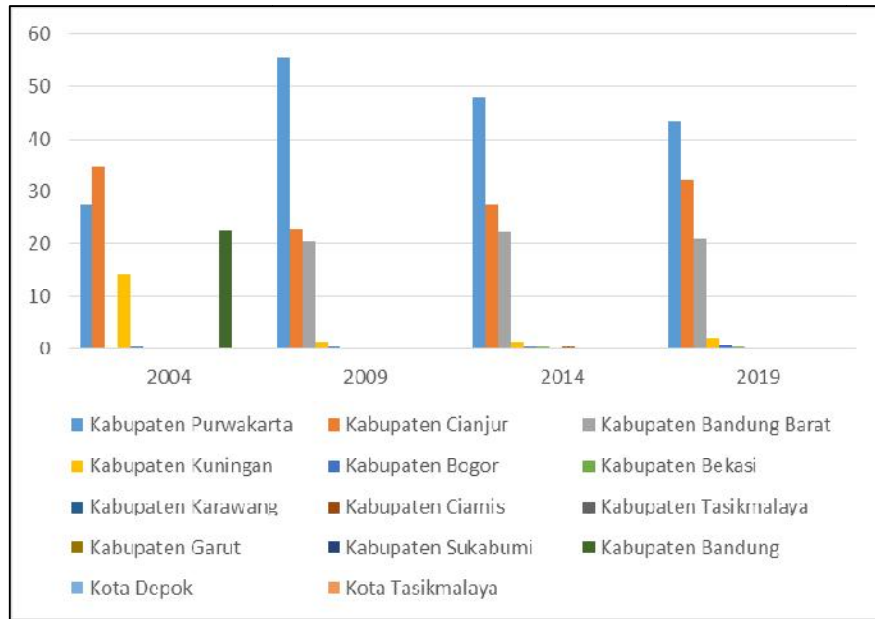


Fig. 1. Trends in the competitiveness profile of floating cage aquaculture based on production indicators

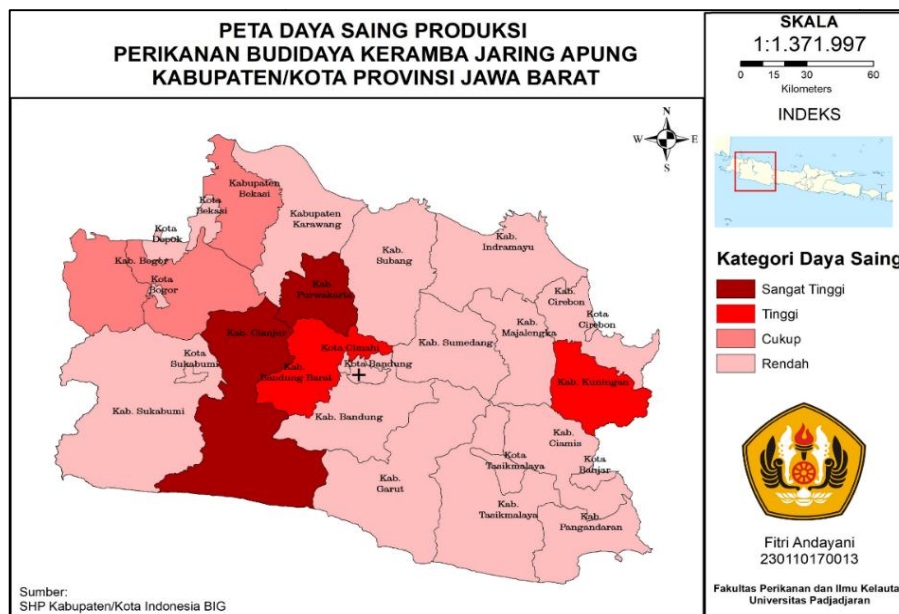


Fig. 2. Competitiveness profile of aquaculture production in floating net cages

Table 1. Competitiveness ranking of floating net cage aquaculture production in west Java province

Regency/City	Production Value	Rating	Competitiveness Category
Purwakarta Regency	43.3	1	Very high
Cianjur Regency	32.3	2	Very high
Bandung Barat Regency	21	3	High
Kuningan Regency	2.1	4	High
Bogor Regency	0.55	5	Enough
Bekasi Regency	0.30	6	Enough
Karawang Regency	0.18	7	Low
Ciamis Regency	0.11	8	Low

Regencies/cities that rank the lowest production competitiveness with a value of 0 are 19 regencies/cities. Thus, the regency/city is in the four quartiles which means low product competitiveness. The regencies/cities that have the lowest rank are mostly occupied by regencies/cities that do not have large reservoirs located in the northern and southern parts of West Java Province. West Java consists of a steep mountainous area in the south, a gently sloping hillside area in the middle, and a large land area in the north. The southern part consists of a steep mountain watershed (9,5%) with an elevation of more than 1.500 m above sea level. The middle part consists of a gently sloping hillside area (36,48%) with an altitude of 10-1.500 meters above sea level. The northern part consists of a gently sloping land area (54,02%) with an altitude of 0 – 10 meters above sea level. According to [23], the aquaculture of floating net cages is suitable in reservoirs located in the lowlands so that the chance of upwelling is very small compared to reservoirs located in the highlands. Up welling is a natural phenomenon that causes a backflow from the bottom of the reservoir which can float mud to the surface of the water, usually occurs at the turn of the dry season to the rainy season. According to [21], the backflow of reservoir water caused by bad weather can reduce the production of floating net cage aquaculture because it triggers the mass death of fish.

4. CONCLUSION

The category of very high production competitiveness of floating net cage aquaculture in West Java Province was obtained by Purwakarta Regency and Cianjur Regency. Purwakarta Regency was ranked first with a final score of (43,3), which means that it contributed 43,3% of the total production of floating net cage aquaculture in the province of West Java. Cianjur

Regency was ranked second with a final score of (32,3), which means that it contributed 32,3% of the total production of floating net cage aquaculture in the province of West Java. West Bandung Regency is in third place with a final score of (21), which means that it contributed 21% of the total production of floating net cage aquaculture in the province of West Java. The results of this study can be useful for decision makers, especially the West Java Provincial Government as consideration in preparing planning and development strategies for the fishery sector in the field of floating net cage cultivation and as a reference to add insight and knowledge. Based on the results of the research that has been carried out, the expected suggestion is to conduct further research on the competitiveness and policy strategies of floating net cage aquaculture in all provinces of Indonesia.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Regional Development Planning Agency for Research and Development of West Java Province. The Regional Government Work Plan of West Java Province in 2020; 2019.
2. Anna Z. Sustainable Capture Fisheries Management of Cirata Reservoir: A Logistics Bio-Economic Model Approach. *Journal of Socio-Economic Marine Fisheries*. 2016;(11)2.
3. Sitompul F, Ramli M, Bathara L. Analysis of the State of Fish Cultivation Business with Floating Net Cages in Lake Toba (Case of Untemungkur Village, Muara

- District, North Tapanuli Regency, North Sumatra Province). Online Journal of the Faculty of Fisheries and Marine Sciences Students. Riau. 2014;(2)1.
4. Putri ADR. Community Economic Empowerment Through Fish Karamba Business in Jatiluhur Reservoir, Purwakarta Regency. Thesis; 2017.
 5. Ardi I. Floating Net Cage Fish Aquaculture System to Maintain the Sustainability of the Cirata Reservoir Aquatic Environment. Aquaculture Media. 2013;8(1):23-29.
 6. Gandhi, A. Analysis of Increasing Income of Floating Cage Farmers With Diversification of Aquacultured Fish Species in Cirata Reservoir. Journal of Economics and Development Studies. 2017;18(1):25-23.
 7. Samadi, B. Enlargement Of Fish In Public Waters In Floating Net Cages. Science Titian Publisher. Bandung; 2009.
 8. Apriliani T, Huda HM, Nasution Z. Business Profile, Income, and Household Consumption of Fish Cultivators in Cikidang Bayabang Village, Cianjur, West Java. J. Wisdom and Social Research KP. Jakarta; 2010;5(2).
 9. Rochdianto. Fish Cultivation in Floating Nets. Self-Help Spreader. Jakarta; 2002.
 10. Kurniasari N, Apriliani T, Koeshendrajana S, Wijaya RA. Social Risks of Controlling Floating Cages in Jatiluhur Reservoir. 2020;15(1):107-119.
 11. Hermawaty AI. Institutional Problems in Utilizing Darma Reservoir for Floating Cage Aquaculture Activities in Kuningan Regency, West Java. Regional and Environmental Journal. 2015;3(2):95-104.
 12. Pradita SM, Sidik H. Socio-Economic Changes in the Floating Net Cage Industry at Curug Apu Jatiluhur during the Covid-19 Pandemic. Gulawentah: Journal of Social Studies. 2020;5(2):77-86.
 13. Irawati I, Urufi Z, Resobeoen REIR, Setiawan A, Aryanto. Measurement of Regional Competitiveness Levels Based on Regional Economic Variables, Infrastructure Variables, Natural Resources and Human Resources Variables in the Region of Southeast Sulawesi Province. J@TI Undip. 2012;8(1).
 14. Department of Marine Affairs and Fisheries of West Java Province. The Cultivation Fisheries Database of West Java Province. Bandung; 2019.
 15. Rochdianto. Budidaya Ikan Jaring Terapung. Penebar Swadaya. Jakarta; 2002.
 16. Syaodih N. Educational Research Methods. PT. Rosdakarya Youth: Bandung; 2009.
 17. Yulistyo. Marine and Fisheries in Figures. Ministry of Maritime Affairs and Fisheries. Jakarta; 2011.
 18. Jubaedah I, Sudinno D, Anas P. Analysis of water quality conditions and productivity of floating net cage cultivation in Cirata Reservoir, Cianjur Regency, West Java Province. Journal of Fisheries and Marine Extension. 2014; 8(1):9-22.
 19. Hidayat A, Annisa Z, Gandhi P. Policies for Ecological, Social, Economic Sustainability of Reservoirs and Cultivation of Floating Net Cages in Cirata Reservoir. Minutes of Agricultural and Environmental Policy Formulation of Strategic Studies in Agriculture and Environment. 2016;3(3): 175-187.
 20. Astuti LP, Nurfiarini, Sugianti, Warsa A, Rahman, Hendrawan LS. Sustainable Fisheries Governance in Jatiluhur Reservoir. Yogyakarta; 2016.
 21. Fitri N, Hidayat AH, Gandhi P. Environmental and Institutional Supporting Capacity of Floating Net Cages in Jatiluhur Reservoir. Minutes of Agricultural and Environmental Policy Formulation of Strategic Studies in Agriculture and Environment. 2016;3(3):248-261.
 22. Citarum-Ciliwung Watershed Management Agency. Integrated Citarum Watershed Management Plan. Bogor; 2009.
 23. Rachmawati, A. Economic Value of Floating Cage Fishery Business in Sutami Reservoir, Karangates Village, Sumberpucung District, Malang Regency, East Java. Thesis; 2017.

© 2021 Andayani et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<https://www.sdiarticle4.com/review-history/72084>