



Policy Influence Citarum Harum against Aquaculturist on Floating Cage in Saguling Reservoir, West Bandung District

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Authors' contributions

This work was carried out in collaboration among all authors. Author FA designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors AR and LPD managed the analyses of the study. Author AAH managed the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

This research aims to analyze the policy about Citarum Harum and analyze social economy condition fisheries resource from freshwater on floating cage Saguling Reservoir, West Bandung District. This research was conducted in Saguling Reservoir, West Bandung District, starting in August until November 2019. The method of data collection was carried out by survey methods, the technique of taking respondents using a purposive sampling technique. This research data consists of two types of data, namely primary data and secondary data. Analysis of the data used in this research includes the Likert Scale and business analysis. The result of the analysis policy influence use Likert Scale has an average index value at 8562%. This average index means the influence of policy citarum harum is considered very well by related stakeholders. Analysis of social-economic conditions The aquaculturist has good economic potential. Seen from the result of income and business analysis on each cultivator showing value Rp.17.125.000/3month and RCR value as big as 1,922.

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1. INTRODUCTION

West Bandung District has two large reservoirs in West Java that have the potential as a place for fish farming in the floating net cages. West Bandung Regency fish potential is 23,337 tons per year. Cirata Reservoir fish production was 15,829 tons (67.82%) and Saguling Reservoir 7.508 tons (32.18%) [1].

Saguling Reservoir is located in the Citarum watershed, which flows into several sub-districts, namely the Districts of Cililin, Batujajar, and Cipongkor, with a Saguling Reservoir capacity of +1,000 million m³ [2]. Citarum River, one of the largest rivers in West Java as well as a river which is very important to meet water needs, especially for the people of West Java and DKI Jakarta and also as a source of national electricity generation. The high level of community dependence on the Citarum River can be seen with the construction of a cascade of three reservoirs namely the Saguling, Cirata and Juanda Reservoirs with multipurpose electricity patterns [3].

Problems in the Citarum watershed are caused by population growth which results in the increased exploitation of space and water resources [4]. High population and industrial growth on the outskirts of the Citarum watershed that is not accompanied by appropriate waste management also results in high pollution of the Citarum watershed [5].

Citarum Harum is a movement/program carried out by the government that only started in February 2018 to overcome the waste problem in the Citarum watershed. The purpose of the Citarum Harum movement is to improve the quality of the Citarum river and prevent flooding. This movement was carried out in several areas, one of which was in the Citarum Dayeuh Kolot watershed [6].

The government has issued a public policy to address the Citarum River problem through Presidential Regulation No. 15 of 2018 concerning the Acceleration of Pollution and Damage Control of the Citarum watershed. Ministry of Maritime and Fisheries Affairs also supported the sustainable fisheries activities in the Citarum watershed and assisted affected communities to switch professions [7].

The policy which will be the focus of the author to study further, especially in the fisheries sector because sooner or later the pollution of the Citarum watershed that flows through the Saguling and Cirata Reservoirs, will have an impact on the decline in freshwater fish aquaculture production and threaten the decline in employment and food supply from the center floating cage freshwater cultivation in West Bandung District.

This research aims to analyze government policies regarding the Citarum Harum program and analyze the socio-economic conditions of fisheries resources from freshwater fish cultivators in floating cage Saguling Reservoir, West Bandung District.

2. MATERIALS AND METHODS

The research site was conducted in Saguling Reservoir, West Bandung District. The time of the research is August - November 2019. The research method was carried out by the survey method. The survey method is one part of the descriptive type of research method to make a situation description or event [8]. This method will explain the results of quantitative and qualitative data processing.

This sampling method uses a purposive sampling technique which is aimed at respondents who are considered to have the ability to answer questions posed well and can understand the existing problems [9]. The number of samples used as respondents was 31 aquaculturists in Saguling Reservoir, 5 related stakeholders, calculations from respondents involved using questionnaires and interviews.

Analysis of the data used in this research is quantitative descriptive, while the type of data using the Likert Scale method in data processing techniques. The author uses a measurement scale obtained from the answers of respondents in this research that is a Likert scale with the formula% index and uses score interpretation based on intervals according to Table 3 [10].

$$\text{Formula Index\%} = (\text{Total Score} / Y) \times 100$$

The income calculation is used by calculating the amount of freshwater fish sold by the farmer [11].

$$TR = P \times Q$$

Information:

TR = Total Revenue = total revenue in the field of fisheries (Rp)

P = Price = cost of fish per kg

Q = Quantity = number of fish products produced (kg) a fish in the Saguling Reservoir at a selling price per kilogram. The formula used is as follows

Net income is obtained by the following formula [11]:

$$\pi = TR - TC$$

Information:

π = Floating Cage net business income (Rp)

TR = Total Revenue

TC = Total Cost = TFC + TVC

TFC = Total Fixed Cost, i.e. the cost of depreciation of equipment and others (Rp)

TVC = Total Variable Cost, i.e. the cost of feed and capital to buy fish (Rp)

To find out if the KJA business in the Saguling Reservoir is profitable or not, the Revenue Cost Ratio formula is used as follows [11]:

$$R / C = PT / BT$$

Information:

R / C = Ratio of receipts and fees

PT = Total Revenue (Rp)

BT = Total Cost (Rp)

The decision-making criteria are as follows:

- If $R / C > 1$, then the business experiences profits because the revenue is greater than the cost.
- If $R / C < 1$, then the business suffers a loss because the revenue is smaller than the cost.
- If $R / C = 1$, then the business gets even because the revenue is equal to the cost.

Tabel 1. Likert scale format

Interpretation of score based on intervals
Figures 0%– 33,33% = Not Good
Figures 34% – 66,66% = Good
Figures 67% – 100% = Very Good

3. RESULTS AND DISCUSSION

West Bandung District is part of the West Java Province which definitively becomes a Level II Region based on Law Number 12 of 2007 concerning the Establishment of West Bandung District in West Java Province [12]. Based on Geographically West Bandung District is located at 06° 41 ' - 07° 19' South Latitude and 107° 22 ' - 108° 05' East Longitude. The whole area of West Bandung District has an area of 1,305.77 Km² or 130,577.40 Ha which is divided into 16 subdistrict administration areas, namely Lembang, Parongpong, Cisarua, Cikalongwetan, Cipeundeuy, Ngamprah, Cipatat, Padalarang, Batujajar, Cihampelas, Cililin, Cipongkor, Rongga, Sindangkerta, Gununghalu, and Saguling. West Bandung District covers 165 villages [13].

3.1 Characteristics of Respondents

In this study, the main respondents were fish farmers with floating cage status. Farmers provide information about fish farming businesses and their perceptions of policies issued by the central government regarding Citarum Harum. Each respondent from the government who has a position in the relevant stakeholder defines the implementation of the policy. The characteristics of the respondents especially the fish farmers observed in this study were broken down into three categories: age, last education and cultivation experience.

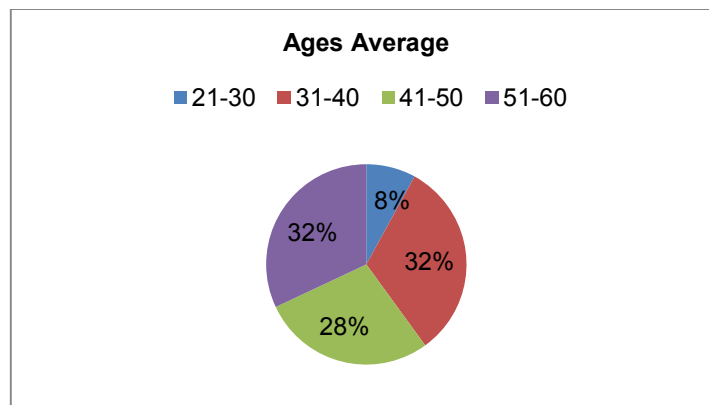


Fig. 1. Ages average of aquaculturist

Tohir [14] states that the labor force is classified into a productive age of 18 to 50 years. Means someone who has an age above 50 years is an unproductive age. So it can be seen that farmers who have the highest percentage of age are in the range of 31-40 years with a percentage of 32%. Where it is classified as someone's productive age in carrying out work activities looks like in Fig. 1.

A total of 31 respondents including fish farmers and 5 respondents related stakeholders have been interviewed in this survey. The proportion of all respondents can be viewed from the level of education, so most fish farmers are elementary school (ES), junior high school (JHS), senior high school (SHS), and stakeholders are diploma (D3), bachelor (S1) and master (S2).

The skills of fish farmers can be seen from how long they carry out aquaculture activities. As many as 31 fish farmers in the Saguling Reservoir have different lengths of experience. It can be dominated by the long experience of cultivation in Saguling Reservoir 6-10 years with a percentage of 45%.

3.2 Effect of Citarum Harum Policy

3.2.1 Stakeholder perception on the effects of fragrant citarum in the saguling reservoir

The policy in the fishery sector analyzed in this study is the policy of the Citarum Harum Program, which is quoted from Presidential Regulation No. 15 of 2018 concerning the Acceleration of Pollution and Damage Control in the Citarum River Basin. There are 7 aspects analyzed, namely, socialization and education by providing information warning about the impact of pollution and damage to the Citarum watershed to the community, handling waste and restoring ecosystems, coordinating the relocation of data and information updating needed as an effort to prevent pollution and damage to the Citarum watershed with related institutions, conducting innovation in overcoming pollution and damage to the Citarum watershed by the development of science and technology, community empowerment, prevention, and law enforcement.

In Fig. 2, the graph above shows policy aspect number three, which is coordinating the relocation of people affected by the Citarum watershed, which has the lowest index value of 74.07%, which means that even though

conditions are very good, it shows the lowest index compared to other variables. This is because the coordination of relocation in the Saguling Reservoir affected by the arrangement of KJA, namely the community, still wants to do cultivation business in KJA rather than conducting business in the cultivation of calm water ponds with the land that has been given by the government. This compensation report was rejected by the cultivation practitioners because the cultivation business in the KJA was more efficient, and therefore not many people affected by the arrangement of the KJA were relocated to other places.

Handoyo [15] According to Handoyo Research the problem of relocation is a problem that still arises, one of which is because the community is still working on agricultural activities that do not support the sustainability of the reservoir. In addition, in the study of the structuring of residential areas, especially on the banks of the Citarum river, must be planned in such a way as to produce policies that benefit both the community and the government. Options such as relocation (resettlement), revitalization (rejuvenation), reconstruction (rebuilding houses into vertical flats), and other options must be reviewed and discussed together between the community and the government to get a win-win solution [16].

3.3 Aquaculturist Business Performance at KJA in Saguling Reservoir

3.3.1 Operating costs

Production operational costs are all costs incurred to run the production process [17]. Costs incurred by aquaculturists consist of fixed costs and variable costs.

Table 2. Shows that the fixed costs of all farmers used for conducting fish farming are Rp. 2,500,000. the amount of variable costs used in each harvest varies as much as Rp. 7,900,000 - Rp. 28,900,000, with an average of Rp. 16,475,000 and the total cost for farmers incurred in the amount of Rp. 10,400,000 - Rp. 31,400,000, with an average of Rp. 18,975,000.

According to the research the fixed costs used to carry out fish farming for tilapia in the KJA business are Rp. 691,333 - Rp. 1,365,733, a variable fee of Rp. 8,360,000 - Rp. 16,710,000 and the average total cost of Rp. 13,563,533 [17].

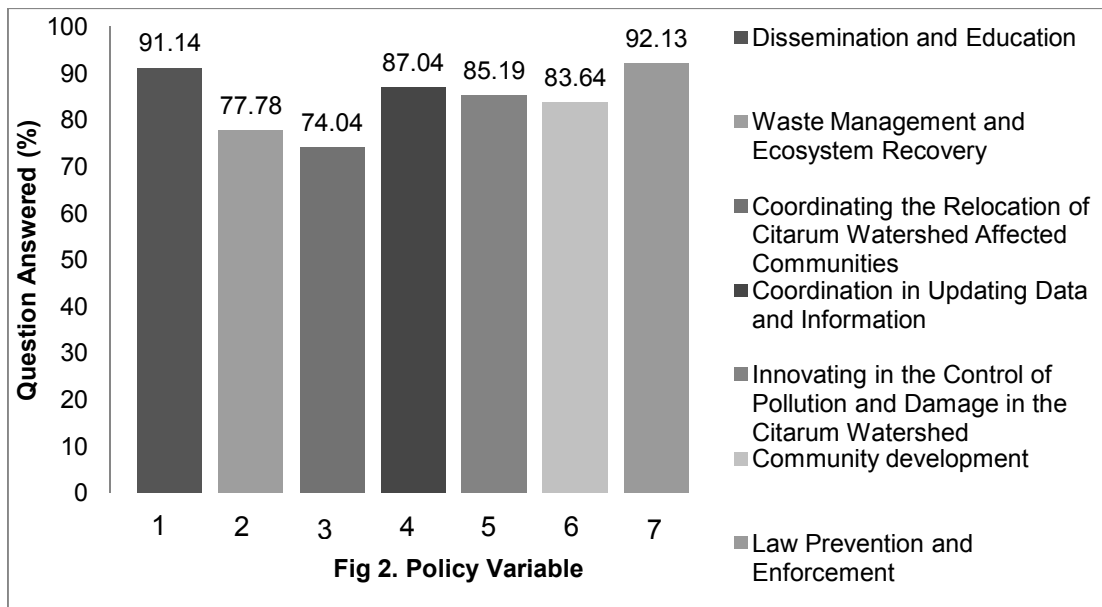


Fig. 2. Analysis of Citarum Harum's likert scale in the Saguling Reservoir

Tabel 2. Operational costs of fish culture business in floating cage in saguling reservoir

Aquaculturist name	Fixed cost	Variable cost	Total cost (Rp)
1. Abit	2.500.000	7.900.000	10.400.000
2. Acung	2.500.000	13.400.000	15.900.000
3. Ade	2.500.000	21.900.000	24.400.000
4. Ade Junaedi	2.500.000	25.400.000	27.900.000
5. Apih	2.500.000	25.400.000	27.900.000
6. Asep	2.500.000	25.400.000	27.900.000
7. Bu Iyam	2.500.000	25.400.000	27.900.000
8. Dani	2.500.000	7.900.000	10.400.000
9. Deden	2.500.000	13.400.000	15.900.000
10. Heri	2.500.000	25.400.000	27.900.000
11. Hiban	2.500.000	8.400.000	10.900.000
12. Jaka	2.500.000	8.400.000	10.900.000
13. Karman	2.500.000	28.900.000	31.400.000
14. Lalah	2.500.000	8.400.000	10.900.000
15. Muhammad Ridwan	2.500.000	8.400.000	10.900.000
16. Sumpena	2.500.000	13.400.000	15.900.000
17. Syarifudin	2.500.000	21.900.000	24.400.000
18. UjangGunawan	2.500.000	13.400.000	15.900.000
19. Unang	2.500.000	13.400.000	15.900.000
20. Yadi	2.500.000	13.400.000	15.900.000
Total	50.000.000	329.500.000	379.500.000
Average	2.500.000	16.475.000	18.975.000

According to research the fixed costs used for conducting aquaculturists in the KJA are Rp. 4,365,000, variable costs incurred in the amount of Rp. 21,500,000 and the total cost of fish cultivation incurred is Rp. 25. 865,000 [18].

3.3.2 Total revenue and income

To find the total revenue can be searched by adding the price and quantity of each value. if calculated from the largest total revenue that is from aquaculturist Karman with the price the carp

and tilapia amounting to Rp. 22,000 and Rp. 18,000, with a quantity of 1,600.

Reservoir is Rp. 17,125,000 of total net income that varies from the smallest to the largest net income obtained by farmers of Rp. 7,100,000- Rp. 32,600,000.

Table 4. Shows that the average net income received by aquaculturists in the Saguling

Tabel 3. Price and quantity from aquaculturist in saguling reservoirs

No	Nama	Price		Quantity
		Mas	Nila	
1	Abit	25.000	20.000	500
2	Acung	25.000	20.000	700
3	Ade	25.000	20.000	900
4	Ade Junaedi	24.000	20.000	1.200
5	apin	25.000	20.000	1.100
6	Asep	22.000	18.000	1.300
7	Bu Iyam	25.000	20.000	1.200
8	Dani	25.000	20.000	400
9	Deden	25.000	18.000	650
10	Heri	25.000	20.000	1.300
11	Hiban	25.000	20.000	600
12	Jaka	25.000	20.000	500
13	Karman	22.000	18.000	1.600
14	Lalah	25.000	20.000	400
15	Muhammad Ridwan	25.000	20.000	550
16	Sumpena	25.000	20.000	700
17	Syarifudin	25.000	20.000	900
18	UjangGunawan	25.000	20.000	600
19	Unang	24.000	18.000	700
20	Yadi	23.000	20.000	700

Tabel 4. Income and total revenue from aquaculturist in saguling reservoirs

Aquaculturist name	Type of income		
	Total revenue	Total cost	Net income
1. Abit	22.500.000	10.400.000	12.100.000
2. Acung	31.500.000	15.900.000	15.600.000
3. Ade	40.500.000	24.400.000	16.100.000
4. Ade Junaedi	52.800.000	27.900.000	24.900.000
5. Apin	49.500.000	27.900.000	21.600.000
6. Asep	52.000.000	27.900.000	24.100.000
7. Bu Iyam	54.000.000	27.900.000	26.100.000
8. Dani	18.000.000	10.400.000	7.600.000
9. Deden	27.950.000	15.900.000	12.050.000
10. Heri	58.500.000	27.900.000	30.600.000
11. Hiban	27.000.000	10.900.000	16.100.000
12. Jaka	22.500.000	10.900.000	11.600.000
13. Karman	64.000.000	31.400.000	32.600.000
14. Lalah	18.000.000	10.900.000	7.100.000
15. Muhammad Ridwan	24.750.000	10.900.000	13.850.000
16. Sumpena	31.500.000	15.900.000	15.600.000
17. Syarifudin	40.500.000	24.400.000	16.100.000
18. UjangGunawan	27.000.000	15.900.000	11.100.000
19. Unang	29.400.000	15.900.000	13.500.000
20. Yadi	30.100.000	15.900.000	14.200.000
Total	722.000.000	379.500.000	345.500.000
Average	36.100.000	18.975.000	17.125.000

Tabel 5. The average RCR value obtained by the Floating Cage system aquaculturist from the carp and tilapia businesses

Aquaculturist name	Value RCR
1. Abit	2,163
2. Acung	1,981
3. Ade	1,660
4. Ade Junaedi	1,892
5. Apin	1,774
6. Asep	1,864
7. Bu Iyam	1,935
8. Dani	1,731
9. Deden	1,758
10. Heri	2,097
11. Hiban	2,477
12. Jaka	2,064
13. Karman	2,038
14. Lalah	1,651
15. Muhammad Ridwan	2,271
16. Sumpena	1,981
17. Syarifudin	1,660
18. UjangGunawan	1,698
19. Unang	1,849
20. Yadi	1,893
Average	1,922

According to the research with the same study but in different places that the average net income received by Tilapia aquaculturist is Rp. 926,467 and according to a net income of Rp. 6,435,000 [17].

3.3.3 Revenue Cost Ratio (RCR)

1,922 is the average fish business in the floating cage system in the Saguling Reservoir. This shows that the decision making criteria is if $R / C > 1$, then the business experiences profits because the revenue is greater than the cost. So that the fish farming system of the floating cage system is profitable and feasible to continue.

4. CONCLUSION

Based on research conducted on the Effect of Fragrant Citarum Policy for aquaculturist on the floating cage in Saguling Reservoir, West Bandung District, it can be concluded as follows:

1. The Fragrant Citarum Policy implemented in Saguling Reservoir, West Bandung District is considered good by the community. Based on 7 aspects that are assessed by the user community shows a value of 85.62%
2. Socio-economic conditions in the Saguling Reservoir have good economic potential. Judging from the results of the analysis of

income and business in each farmer shows the value of Rp. 17,125,000 / 3 months and RCR of 1,922.

CONSENT

As per international standard informed and written participant consent has been collected and preserved by the authors.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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