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.

Article Information

DOI: 10.9734/AJFAR/2020/v6i230092
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(2) Forcep Rio Indaryanto, University of Sultan Ageng Tirtayasa, Indonesia.
(3) Mohamed EL. Sayed Megahed, National Institute of Oceanography and Fisheries, Egypt.
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Complete Peer review History: http://www.sdiarticle4.com/review-history/55720

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.
Keywords: Citarum Harum; floating cage; saguling reservoir; social economy conditions.

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 aquaculturist 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].

Formula Index% = (Total Score / Y) x 100

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

TR = P x 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:
\( \pi = \) Floating Cage net business income (Rp)
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:

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

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 06º 41 ' - 07º 19' South Latitude and 107º 22 ' - 108º 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, Parongpon, 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](image-url)
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 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 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. Table 4. Shows that the average net income received by aquaculturists in the Saguling 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 3. Price and quantity from aquaculturist in saguling reservoirs

| No | Nama          | Price | Quantity |
|----|---------------|-------|----------|
| 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 | Lalal         | 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 | Ujang Gunawan | 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 | 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. Ujang Gunawan  | 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| 342,500,000|
| **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.

ACKNOWLEDGEMENT

The main author thanks all those involved in making this journal because the farmers are willing to be respondents and related stakeholders involved in West Bandung District.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
http://www.sdiarticle4.com/review-history/55720