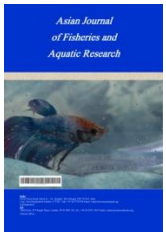

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Status of Capture Fisheries and Socio-Economic Analysis in Jatigede Reservoir, Sumedang Regency

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Authors' contributions

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

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ABSTRACT

The Jatigede Reservoir is the second largest reservoir in West Java after the Jatiluhur reservoir, which is located in Sumedang Regency, West Java. The purpose of the study was to analyze the socio-economic conditions and the value of the benefits of capture fisheries in Jatigede Reservoir, Sumedang Regency. This research was conducted by used data collection method (observation, questioner, literature study) and method of data analysis (feasibility business analysis). The data used are primary and secondary data. Primary data with judgment sampling 25 respondents. The results of the are income analysis (Total Revenue/TR), Break Even Point (BEP) analysis, Benefit Cost Ratio (BCR), and Payback Period. The results of the analysis of the feasibility of catching fish using several fishing tools are the Gill Net Profit Value IDR.72,150,000, Throwing Net (kecrik) IDR.343,450,000 and Bagan IDR.26,750,000. Break Event Point (BEP) production Gill net 2,573 kg, Throw net (kecrik) 1,816 kg, Bagan 1,290 kg in 1 year and Break Event Point (BEP) price for Gill net IDR. 5,437/kg, Throw Net (kecrik) IDR.6.810/kg and Bagan IDR.6.450/kg in 1 year. Benefit Cost Ratio (BCR) Gill net 2.75, Throw Net (kecrik) 2.20 and Bagan 2.32, Payback Period (PP) Gill net for 7 months, Throw net (kecrik) for 5 months, while Bagan for 4 months. This fishing activity has a positive value, meaning that the fishing effort in Jatigede Reservoir uses Gillnet, Throwing Net, Bagan and this is profitable and feasible to carry out.

Keywords: Capture fisheries; jatigede reservoir; social; economic; business feasibility analysis.

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1. INTRODUCTION

Jatigede Reservoir is a dam located in Sumedang Regency, West Java. This reservoir is the second largest reservoir in West Java after Jatiluhur reservoir. Jatigede Reservoir covers five areas, including Cisitu District, Jatigede District, Wado District, Jatinunggal District, and Darmaraja District. This reservoir has a puddle area of about 4,122 ha [1].

Jatigede Reservoir has excellent potential and value benefits for the economy and improving the welfare of the community. One form of utilization of reservoirs is for economic activity for local communities, and utilization of aquatic resources through capture fisheries [2]. The use of fisheries is the most widely carried out by the community in Jatigede Reservoir and becomes a livelihood for the surrounding community in the form of fishing using several fishing gear. Fishing gear used include throwing nets, fishing rods, charts, and gill nets [3]. Fish identified in Jatigede Reservoir are 9 families of 17 species of fish [4]. Small or traditional dominate this fishing activity [5].

The transfer of land fungi into Jatigede reservoirs in the community is an arena of integrated social conflicts that continue to occur. People who switch professions from farmers to fishermen face a number of political, social and economic problems. These problems include poverty, social inequality, low bargaining position in economic aspects [6].

The problems encountered in the management of Jatigede Reservoir are, among others, namely the optimal utilization of Jatigede Reservoir by communities affected by the construction of Jatigede reservoir. Social and economic analysis of capture fisheries is vital because it becomes a parameter that determines the extent of success rate of capture fisheries business both socially and economically. Research on the socio-economic capture fisheries in Jatigede Reservoir will be helpful information as a reference for fishing business activities and their impact on the economy.

2. METHODS

This research was carried out in the Jatigede Reservoir area of Sumedang Regency, West Java. The station points in this study are located in Darmaraja District, Sukamenak Village (Station I) and Cisurat Village (Station II). This research was conducted in July 2021 – February 2022 covering preparatory activities, field research, data retrieval, data processing and report preparation.

The method used in this study is the quantitative descriptive method. An illustrative method takes data directly in the field to get a trough picture due to data collection in a particular area. [6].

2.1 Data Types and Sources

The data used is primary and secondary data. Primary data is obtained from respondents, while secondary data is data obtained from relevant agencies and library sources related to this research.

The technique of taking respondents was carried out by *judgment sampling* as many as 25 respondents. The research parameters used include social and economic parameters. Social aspects include parameters of social conflict, social capital and community empowerment. Economic aspects include the feasibility of tangka fisheries business in Jatigede reservoir. The analysis tool used is a test of the validity and reliability of data.

2.1.1 Validity test

Data validity test data is a test of data about its trueness in accordance with the circumstances in the field. The criteria in this test are if cholera between items with a total score of more than 0.35, then the instrument is declared valid and vice versa; if cholera between things with a total score of less than 0.35 then the tool is declared invalid [6].

2.1.2 Reliability test

Data Reliability test reveals specific symptoms [6]. This rehabilitation test determines whether the data collection tool shows the level of accuracy, accuracy, stability, or consistency. This rehabilitation test uses *Cronbach's Alpa,* coefficient method, which is as follows:

$$\mathrm{r11} = \frac{k}{(k-1)}\left(1 - \frac{\Sigma\sigma b^2}{\sigma 1^2}\right)$$

Where :

r_{11} = Instrument Rehabilitation
k = Number of Questions
$\Sigma\sigma b^2$ = Number of Item Variances

The criteria for the rehabilitation test decision are as follows:

r_{11} > 0.60, then the instrument is reliable
r_{11} < 0.60, then the instrument is not reliable.

2.2 Analysis of Feasibility of Capture Business

Analysis of the feasibility of capture fisheries business is carried out using income analysis (*Total Revenue* / TR*), Break Even Point* Analysis (BEP), *Benefit Cost Ratio* (BCR), and *Payback Period* [7].

2.2.1 Revenue analysis

This business income analysis aims to find out the benefits obtained in fishing efforts [8] as systematic analysis of business income can be formulated as follows:

$$\pi = TR - TC$$

Where:

π = Profit
TR = Total Acceptance
TC = Total Expenditure

Business Criteria:

TR > TC then decent effort
TR < TC then the effort is not worth it
TR = TC then the business is in a break-even state

2.2.2 Analysis *Break Event Point* (BEP)

Break Event Point analysis aims to find out is a break-even point where the total revenue (*revenue)* equals the total cost *(cost).* The formula can be express the calculation of the BEP:

$$\text{Production BEP} = \frac{\text{Total Production Cost}}{\text{Sales Price}}$$

$$\text{and BEP Price} = \frac{\text{Total Cost of Production}}{\text{Production Price}}$$

2.2.3 Analysis *Benefit Cost Ratio* (BCR)

Benefit Cost Ratio (BCR), is a way to compare the present value of all results obtained by a business with current value of all business costs.

$$BCR = \frac{TR}{TC}$$

Information:

The criteria are as follows: BCR > 1, then the business is worth carrying out.
BCR < 1, then the business is in a state of unfit to be implemented.
BCR = 1, then the business is in a state of not breaking even.

2.2.4 *Payback Period* (PP)

The payback period (PP) is used to measure the length of return on investment from the profits received by the owner [9].

$$PP = \frac{I}{\pi}$$

Information:

I = Investment
p = Advantage

3. RESULTS AND DISCUSSION

3.1 General State of the Research Site

Jatigede Reservoir is a dam located in Sumedang Regency, West Java, this reservoir is the second largest reservoir in West Java after Jatiluhur reservoir. Jatigede Reservoir covers five areas, including Cisitu District, Jatigede District, Wado District, Jatinunggal District, and Darmaraja District. This reservoir has a puddle area of about 4,122 ha [1].

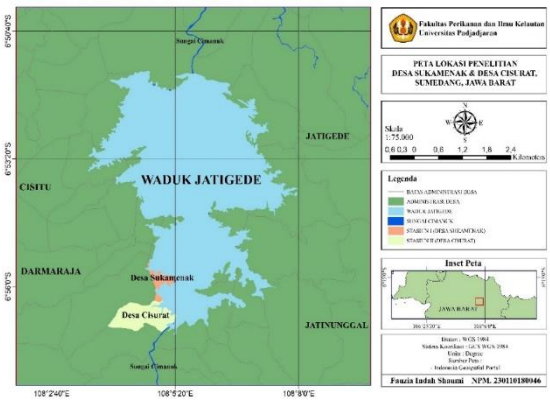

Fig. 1. Research Location

With the area of inundation, Jatigede reservoir provides tremendous potential and value benefits for the economy and improves the welfare of the community in the fisheries sector. The form of utilization of pools is for economic activity for local communities, and the utilization of aquatic resources through capture fisheries [2]. This research point is located in Darmaraja District, Sukamenak Village (Station I) and Cisurat Village (Station II).

3.2 Characteristics of Respondents

Based on the results in the field, the age characteristics of respondents were grouped into 3, namely: (1) the age of 27-29 years as much as 20%, (2) the age of 40-50 years as much as 72% and (3) the age of >52 years as much as 8%. Based on the results of interviews in the field, it is known that respondents who have an elementary school education level (SD) as much as 20%, Junior High School (SMP) as much as 32% and High School (SMA) as much as 48%.

3.3 Validity and Reliability Test Result

3.3.1 Validity test

Based on the results of the data validity test using social and economic aspect parameters, it has a value of > 0.35 which means that this jatigede reservoir benefits to the community, especially fishing communities. Because in this test criteria, if cholera between items with a total score of more than 0.35 then the instrument is declared valid, and vice versa, if cholera between things with a total score of less than 0.35, then the instrument is declared invalid [6].

3.3.2 Reliability test

Based on the reliability value of the question items in the quarter of each variable studied, namely > 0.60, the research instruments used in this study are reliable.

3.4 Capture Fisheries Social Conflict in Jatigede Reservoir

Reservoirs have economic and social value from aspects of land transfer that often cause conflicts in communities affected by reservoir construction. Based on the results of research in the field found, social conflicts in capture fisheries in jatigede reservoir.

The social conflicts that occur in jatigede reservoir are:

Social conflict regarding Floating Net Cage (FNC) in Jatigede Reservoir. According to The Regional Regulation (Perda) of Sumedang Regency Number 2 of 2012, the operation of Floating Net Cages (FNC) is not allowed to be used in the waters of Jatigede Reservoir. The reason is that the tool can damage the water order and water quality in Jatigede Reservoir, but the reality in the field is still found in floating net cages (FNC). The use of floating net cages causes conflict between fishing fisher and aquaculture fisheries (Floating Net Cages) and the government is considered weak in enforcing the rule. With the current conditions, some fishermen want the use of floating net cages to be allowed to operate in the waters of Jatigede Reservoir.

3.5 Social Capital of Society

Social capital is a value shared between members of a group. There is a cooperation between formal and non-formal groups to achieve a common goal, namely welfare [2].

Based on the results in the field regarding social capital that applies in the jatigede reservoir fishing community, namely the absence of restrictions on operational areas, the intention of the lack of restrictions on functional areas, namely, every fishing community is allowed to make operational arrests in other villages, this is because the fishing community has the view that the resources in the waters of Jatigede Reservoir are *(Open Acess)* or joint property.The fishery area in the Jatigede Reservoir is regulated in the Sumedang Regency Regional Regulation Number 2 of 2012 concerning the Sumedang Regency Regional Spatial Plan listed in Chapter VIII article 49, namely as a fishing ground, and it is prohibited to carry out fishing activities of the Floating Net Cage (FNC)., and until the current RT RW there is still no permit for the use of reservoirs for fish farming with Floating Net Cage (FNC). By looking at these various problems in the Jatigede Reservoir, it is necessary to carry out counseling activities on how to manage the reservoir, by optimizing the land around the reservoir for cultivation activities, including several locations of receding land (drawdown) around Jatigede [10].

3.6 Economic Value of Capture Fisheries Business in Jatigede Reservoir

The economic value of capture fisheries business is an effort to provide quantitative value to goods or services produced from natural resources and the environment. Jatigede reservoir management based on economic value refers to the utilization of reservoirs by local communities. Community activities are utilizing the public waters of Jatigede reservoir land for capture fisheries.

3.6.1 Types of fishing boats in Jatigede Resevoir

Jatigede Reservoir has a function in capture fisheries. This capture activity as a business activity or source of livelihood for the surrounding community to meet the needs of their lives. Small or traditional fisher dominate fishing activities in Jatigede Reservoir.

Based on the research result in the field of fishing boat types in Jatigede Reservoir presented in the table 1.

The types of boats that fishers in Jatigede Reservoir are motorized canoe boats with a percentage of 76%, transport rental (general) of 16% and rafts by 8%. Differences in the types of vessels used by fishers in Jatigede Reservoir based on the fishing gear used. Fishers widely used motorized canoes with Gill Ner fishing gerar (*Gill Net*) and Throwing Nets (Kecrik), while anglers use transport rentals (everyday) for fishing in the middle of reservoirs. At the same time, rafts are used by chart fishers.

3.6.2 Types of fishing gear In Jatigede Reservoir

The types of fishing gear used in Jatigede Reservoir are presented in the Table 2.

From Table 3. It can be seen that the fishing gear that is widely used in the waters of Jatigede Reservoir is Gill *Net with* a percentage of 80%, the second most is The Throwing Net (Kecrik) with a ratio of 16%, Bagan with a ratio of 4%. According to Martasuganda [11] a gill net is a type of fishing equipment made of nets that have a rectangular shape, this (*Gill* Net) at the top is equipped with a buoy and the bottom is equipped with several ballasts.

The Throwing Net (Kecrik) is a simple fishing gear operated on the shallow shores [12]. Bagan is one of the lift nets operated in the waters at night by using light as a factor to pull fish to approach the net (Takril 2008). Bagan is divided into three types: sedentary step charts, raft charts that are sedentary, and commonly used in rivers or river estuaries, and sedentary boat charts (Sudirman and Mallawa 2004).

3.6.3 Total admissions

Acceptance in one cycle (one year) on the catch consists of two seasons, namely the dry and rainy seasons. The total revenue obtained in fishing efforts using fishing gear in Jatigede Reservoir is as follows in the Table 3.

Based on the results in the field of total fishing receipts using fishing gear in Jatigede reservoir with the type of Gill Net fishing gear (*Gill net)* total receipts per year, namely IDR.105,000,000 / year, the full receipt of Gill Net fishing gear (Kecrik) is IDR.60,000,000 / year, and the total receipt of Bagan fishing gear per year is IDR.45,000,000 / year.

3.6.4 Production costs

Production costs are all costs incurred to produce a production, according to (Sugiarto *et al* 2002) production costs consist of two namely fixed costs and variable costs. Fixed costs on the fishing business are the cost of maintaining ships, machinery and shrinkage of fishing gear. The details of fixed costs are as follows in the Table 4.

Table 1. Types of Fishing Boats in Jatigede Reservoir

No.	Ship Type	Size (m)	Motor Capacity (Hp)	Sum	Presented
1.	Motorized Canoe	5-6 m	5,5 HP	19	76%
2.	Transport Rental (general)	7 m	5,5 HP	4	16%
3.	Raft	3 m	-	2	8%
Total				25	100%

Source: *Primary Data Processed, 2022*

Table 2. Types of fishing gear in Jatigede Reservoir

Types of Fishing Gear	Sum	Presented
Gill Net *(Gill Net)*	20	80%
Throwing Net (Kecrik)	4	16%
Bagan	1	4%
Total	25	100%

The fixed cost of the results of this study found that the treatment of boats on Gill *Nets and* Throwing Nets (Kecrik) fishing gear has an economic life of 5 years in general, and in Bagan fishing gear has an economical lifespan of 1 year. The total cost of maintaining the type of gill net fishing gear includes the cost of boat maintenance, engine maintenance, and shrinkage of fishing gear, which is IDR.5,210,000/year, gill nets are IDR.1,740,000/year, and for chart fishing gear type equipment IDRp.1,100,000/year.

Variable costs or operational costs in this fishing business include consumption costs and fuel costs (BBM). Details can be found in the following table in the Table 5.

Based on the results of the field on fishing activities on gill net fishing equipment *(Gill Net)* in one day fishing spent 4liters of fuel, Net Throwing (Kecrik) in one day fishing spent 2liters of fuel. The total variable cost incurred to conduct fishing activities per year for Gill Net fishing equipment is IDR.32,850,000 /year, Throwing Nets (Kecrik) is IDR. 25,550,000/year, and Bagan is IDR. 18,250,000 per year.

3.7 Benefit

The profit value represents the total revenue minus the total cost of production. The results of the integrity of fishing activities in Jatigede Reservoir are presented in the following Table 6.

Based on the results in the field, the total profit of fishing business using Gill Net fishing gear (*gill net)* per year is IDR.72,150,000 / year. The profit obtained from the Throwing Net fishing gear (kecrik) per year is IDR.343,450,000 / year. The profit from chart fishing gear per year is IDR.26,750,000 /year. This shows that the advantages in fishing business activities in

Table 3. Total Admission of Arrests in Jatigede Reservoir

No.	Types of Fishing Gear	Catch (Kg)	Total Admission (IDR/Year)
1.	Gill Net	7.000	105.000.000
2.	Throwing Net (Kecrik)	4.000	60.000.000
3.	Bagan	3.000	45.000.000

Table 4. Fixed cost of fishing in Jatigede Reservoir

No.	Types of Fishing Gear	Cost Types	Cost (IDR/Year)	Maintenance Fee (IDR)
1.	Gill Net *(Gill Net)*	Boat Maintenance	250,000/year	5.210.000
		Machine Maintenance	4,000,000/5 years	
		Shrinkage of Fishing Gear	80,000/week	
2.	Throwing Net (Kecrik)	Boat Maintenance	100,000/year	1.740.000
		Machine Maintenance	4,000,000/5 years	
		Shrinkage of Fishing Gear	70,000/week	
3.	Bagan	Boat Maintenance	500,000/year	1.100.000
		Machine Maintenance	-	
		Shrinkage of Fishing Gear	600,000/year	

Table 5. Variable cost of fishing business in Jatigede Reservoir

Types of Fishing Gear	Cost Types	Average Price/Day (IDR)	Average Price/year (IDR)	Total/year (IDR)
Gill Net *(Gill Net)*	BBM	40.000	14.600.000	32.850.000
	Consumption (Food & Cigarettes)	50.000	18.250.000	
Throwing Net (Kecrik)	BBM	20.000	7.300.000	25.550.000
	Consumption (Food & Cigarettes)	50.000	18.850.000	
Bagan	BBM	-	-	18.250.000
	Consumption (Food & Cigarettes)	50.000	18.850.000	

Table 6. Advantages of Fish Fishing Business in Jatigede Reservoir

Types of Fishing Gear	Total Admission (IDR/Year)	Fixed Fee (IDR/Year)	Variable Fee (IDR/Year)	Advantages (IDR/Year)
Gill Net *(Gill Net)*	105.000.000	5.210.000	32.850.000	72.150.000
Throwing Net (Kecrik)	60.000.000	1.740.000	25.550.000	34.450.000
Bagan	45.000.000	1.100.000	18.250.000	26.750.000

Table 7. Results of the Feasibility Analysis of Fishing Business in Jatigede Reservoir

Component	Types of Fishing Gear	Value	Indicator	Information
BCR	Gill Net (gill net)	2,75	>1	**Proper**
	Throwing Net (rattle)	2,20		
	Bagan	2,32		
PP	Gill Net (gill net)	0,7	< 3 Years	**Proper**
	Throwing Net (rattle)	0,5		
	Bagan	0,4		

Jatigede Reservoir are positive, which means that fishing efforts in Jatigede Reservoir use Gill Net fishing gear, Throwing Nets, Bagan and this is profitable.

3.8 Analysis of Feasibility of Capture Fisheries Business in Jatigede Reservoir

The results of the analysis of fishing efforts using fishing gear in Jatigede Reservoir were carried out using income analysis (*Total Revenue /* TR*), Break Even Point* Analysis (BEP), *Benefit Cost Ratio* (BCR), and *Payback Period* [2]. The results are presented in the table 7.

Table 7 shows that the capture effort in Jatigede Reservoir, Sumedang Regency is in a state worthy to be carried out. Based on the BCR value of each fishing gear >1 with a value of 2.75 for the type of Gill Net fishing gear, 2.20 for the Throwing Net fishing gear (rattle), and 2.32 for the Bagan fishing gear type. With a pp value of < 3 years with a value of 0.7 (7 months) for gill net fishing gear, 0.5 (5 months) for fishing nets, and 0.4 (4 months) for Bagan fishing gear.

3.9 Catch of Capture Fisheries in Jatigede Reservoir

Fish that live in Jatigede Reservoir is a fish that comes from the Cimanuk river, the fish is deliberately inserted so that the fish grows and breeds. According to Andani (2016) the fish identified in Jatigede Reservoir are 9 families of 17 species of fish including Lalawak (*Barbodes balleroides*), Sapu (*Liposarcus pardalis*), Hampal (*Hampala macrolepidota*), Bandeng (*Chanos chanos*), Seren (*Cyclocheilichthys repasson*), Patin (*Pangasius hypophythalamus*), Genggehek (*Mystacolecus marganitus*), Cork (*Channa striata*), Hike (*Osteochilus microcephalus*), Sepat (*Trichogaster pectoralis*), Berod (*Mastacembulus erythrotaenia*), Mujair (*Oreochromis masombis*), Paray (*Rasbora argyrotaenia*), Nila (*Oreochromis niloticus*), Senggal (*Mystus nemurus*), Tawes (*Barbodes gonionotus*), and Nilem (*Osteochilus hasselti*).

4. CONCLUSION

Based on the results of the research that has been carried out, it can be concluded that:

1. Social conflicts in capture fisheries in Jatigede reservoirs are not allowed the operation of Floating Net Cages (FNC) in the waters of Jatigede Reservoir, but the reality in the field is still found floating net cages (FNC).
2. Social capital that applies in the fishing community of Jatigede Reservoir, namely the absence of restrictions on operational areas or (*open acess*).
3. The total acceptance of fishing using fishing gear in Jatigede reservoir with the type of Gill Net fishing gear (*Gill net)* total receipts per year is IDR.105,000,000 / year, Gill Nets (Kecrik) per year is IDR.60,000,000 / year, and Bagan per year is IDR.45,000,000 / year.
4. The total profit of fishing business in Jatigede Reservoir in this fishing activity is positive, meaning that the fishing business in Jatigede Reservoir uses Gill Net fishing gear, Throwing Nets, Bagan and this is profitable.
5. The value of BCR > 1, then the capture fishery business in jatigede Reservoir is feasible to be implemented economically.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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