



# **Gill Net Fishery Development Strategy in Cilacap Districk, Central Java Province, Indonesia**

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## **Authors' contributions**

*This reasearch was carried out in collaboration among all authors. Authors FH designing research, processing statistical analysis data, and first author of the manuscript. Authors NK and FAD managed literature and managed the analyses of the reasearch. All authors read and approved the final manuscript.*

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## **ABSTRACT**

Capture fisheries require resource management to optimize fishing activities, followed by efforts to maintain ecosystems and preserve fish resources as catch targets from the threats of degradation and extinction. For that a descriptive research was conducted from January-July 2021 on stakeholders, divided into two, namely the main and secondary groups and the data collected through questionnaire forms, interviews and Focus Group Discussions (FGD) in Cilacap districk. The collected data was analysed using scoring method with various respondents. Stakeholders give a rating or value of 1,2,3,4 on the strengths and opportunities factors, Giving a rating of 4,3,2,1 for the opposite of the level of importance of the weaknesses and threats factors. The strategy formulations used are SWOT analysis using the Strength, Weakness, Opportunity, Threats (SWOT) and Quantitative Strategic Planning Matrix (QSPM) analysis. The matching of the selected strategy is Strength Opportunity (SO) with the largest score: 1.34 and 1.06. The strategic

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priorities are area and fishing time with a Total Attractive Score (TAS) of 4.2439, increasing fishermen's human resources (4.0715), modernizing and modifying fleets and lay gill nets (3.6098), utilizing potential for export needs (3.317).

*Keywords: Decision making; stakeholder; SWOT analysis; QSPM analysis; governance policy.*

## 1. INTRODUCTION

In general, development is interpreted as an effort to change from something less to be good one. In particular, the development of fishery business is a form of process or human activity in increasing production in the fishery sectors and can indirectly increase fishermen's income through the application of better technology. Capture fisheries require resource management to optimize fishing activities, followed by efforts to maintain ecosystems and preserve fish resources as catch targets from the threats of degradation and extinction [1,2].

The carrying capacity of Cilacap district as a Minapolitan city [3] is that it has a type A fishing port, 20 fish auction places, a fish processing industry, and 17,500 fishermen [4]. However, from the latest empirical facts, there are factors that hinder this process, namely most fishing businesses have small capital, decreasing conditions in the aquatic environment [5-7], and changing fishing season patterns. According to [8] and [9], the characteristics of small fishermen are using simple technology, inadequate safety equipment, and limited fishing areas.

Gill net, long line and danish seine are the most common fishing gears found in Cilacap Regency. one of the most environmentally friendly fishing gear is gillnet fishery [2]. To realize prosperous fishermen, it is necessary to manage fisheries in a sustainable manner and be supported by good governance. A strategy is needed to manage all stakeholders from conflicts of interest. The results of the strategy formulation are prepared for the sustainability and welfare of fishermen as the first priority.

Fishery development models can be used in various ways, namely by regional characteristics [10,11], the potency of superior fish [12,13], collaboration of fishermen and tourist attraction bases, and the condition of fish resources [14], but the development research of fisheries based on the use of fishing gear has not been carried out.

Strategy is defined as a tool to achieve goals [15]. Implementation of the strategy must receive support from the government policies [16]. Strategy and policy are two important things in solving fishery problems, these steps are organized using internal and external factor approaches. The internal and external factors are two key factors in the success of a strategy [8,17]. According to [18] development planning needs to do strategic analysis in order to get maximum results.

This study aims to formulate, match strategies and make decisions on the development of gill nets in Cilacap Regency, Central Java.

## 2. METHODOLOGY

The research was conducted in January 2021 – July 2021. Specifically, this research uses combination on quantitative and qualitative data. The primary data in this study include the stakeholder perception through questionnaire forms, in-depth interviews and Focus Group Discussions (FGD) regarding the development of gill nets in Cilacap district. In-depth interviews are a process of obtaining information from informants in the context of participatory observation [14], and the application of expert judgment on weight assessment. Secondary data come from Cilacap Fisheries Service dan Fish Auction Place.

Determination of respondents is done to prevent generalizations and contradictory main goals [19]. In this study, stakeholders are divided into 2 parts, namely the main and secondary stakeholders. Identification of stakeholders is made using the process approach and strategic issues. According to [19] stakeholders have the main meaning in a unified system, namely predictability, use of power and level of interest.

SWOT analysis and QSPM analysis are combined to make a desired sequential strategy formulation [20,21]. Analysis of Strengths Weaknesses Opportunities Threats in this paper will be further abbreviated as SWOT analysis, Quantitative Strategic Planning Matrix Analysis will be further abbreviated as QSPM Analysis.

Table headings should be placed above the table. Footnotes should be placed below the table with superscript lowercase letters.

## 2.1 Swot Analysis

SWOT analysis is a situation analysis by identifying various factors systematically to formulate a development strategy [22,23]. The SWOT approach is widely used in the regions to plan a mature strategy in the development and management of a complex problem. SWOT analysis is based on logic that maximizes strengths and opportunities, but simultaneously minimizes weaknesses and threats. The SWOT matrix can describe the results of the identification and calculation of the IFE (Internal Factor Evaluation) matrix and the EFE (External Factor Evaluation) matrix. The SWOT analysis can not only make an analysis of current conditions, but can be used for the future, this is because this analysis is used to construct consensus based on needs and desires.

The steps in determining the SWOT analysis are as follows [22] : Identification of data and information materials as material for evaluating internal and external factors, and stages of decision making. Stakeholders give a rating or value of 1,2,3,4 on the strengths and opportunities factors, Giving a rating of 4,3,2,1 for the opposite of the level of importance of the weaknesses and threats factors.

## 2.2 Quantitative Strategic Planing Matrix Analysis

According to David et al 2009; Rachman et al 2013 Quantitative Strategic Planning Matrix (QSPM) analysis is an analytical technique designed to determine the relative attractiveness and the best alternative action. Conceptually, this method determines the relative attractiveness of the various strategies chosen to be implemented. QSPM analysis is part of the decision stage after going through the grand strategy matrix and SWOT analysis. The selected strategy in the QSPM matrix is the result of the priority sequence of the first choice strategy.

QSPM Analysis steps are retrieving data from the Internal Factor Evaluation matrix and External Factor Evaluation, determining an Attractive Score (AS) with a scale of 1 to 4, Value 1= no attractiveness, value 2 = low

attractiveness, value 3 = moderate attractiveness, value 4 = high danceability and calculating and adding up all the Total Attractive Scores (TAS)

## 3. RESULTS AND DISCUSSION

According to [24] strategy formulation has 3 stages, namely input stage, matching stage and decision stages. In general, the development direction for gill net fisheries is built using a bottom-up planning system. This process starts from collecting information, observing existing conditions, interviews and Discussing with Focus Group Discussions (FGD) method. From the results of research, identification of gill net stakeholders is described in the identification of gill net stakeholders is described in the following Table 1.

**The first stage (input stage):** Stakeholders fill out a questionnaire form according to their level of importance in determining the strategy. Each stakeholder gives a rating on the key success factor in the swot analysis. The key success factor is from stakeholder focus group discussion (fgd). The results of the summary have been calculated into the input stages, namely: the matrix internal factor evaluation (ifa) and external factor evaluation (efa) matrix in the Table 2.

**Stage 2 Matching Stage:** Internal Evaluation Matrix Value: strength weight total – weakness weight Total :  $2.16 - 0.80 = 1.36$ .

Internal Evaluation Matrix Value : Opportunity weight total – Treats weight Total :  $2.06 - 1.02 = 1.04$ .

The next step is determining the SWOT analysis quadrant. The results of the calculation can be seen that the gill net development strategy is in quadrant 1, with the value of the positive X and Y axis. It mean that the selected strategy is SO (Strength Opportunity) strategy approach. This strategy uses factor strengths and opportunity to maximally.

The selected strategy formulations are: Strategy 1: export standard fish needs strategy 2: fishing ground zone , strategy 3: Increasing fishermen's knowledge capacity, Strategy 4: Modernizing gill net technology.

**Table 1. Gill net fishery stakeholders**

Stakeholder	Interest
D Department of Fisheries	Maintaining the sustainability of fishery resources. Fishery data analysis. Prevent fishermen conflicts.
Fisherman	Getting an abundant catch at a high price. Increase the production value of capture fisheries. Utilization of fish resources for the life necessities.
Head of Fish Auction Place	Increasing the value of auction transactions. Increasing the volume of fishing production.
Fishermen Association	Becoming a liaison between fishermen and the government. Channeling the aspirations of fishermen.
Fisheries Extension	Providing outreach related to government policies. Transferring technology to fishermen.
Directorate of Supervision of Marine Resources and Fisheries	Preventing Illegal Unreported Unregulated (IUU) Fishing. Preventing conflicts of interest.
Fishery Harbormaster	Issuance of Sailing Approval Letters. Monitoring of incoming and outgoing vessels.
Fish Seller	Selling the catch directly to consumers and companies.
Fisherman Group leader	making fisherman group members prosperous Promoting fisherman group business units.

**Table 2. Internal Factor Evaluation (IFA)**

Internal factors	Weight	Rating	Calculation
<b>Strength factor</b>			
Fresh fish catch	0.10	3.31	0.33
Low investment costs and easy maintenance	0.15	3.13	0.47
Selective fishing gear	0.15	3.75	0.56
Potential fish resources	0.15	2.94	0.44
Local wisdom existence	0.10	3.56	0.36
<b>Strength Total</b>	<b>0.65</b>		<b>2.16</b>
<b>Weakness factor</b>			
Short fishing gear use	0.05	2.44	0.12
Limited venture capital	0.15	2.13	0.32
Limited fishing ground	0.05	2.56	0.13
Simple Technology	0.05	2.44	0.12
Low education	0.05	2.13	0.11
<b>Weakness Total</b>	<b>0.35</b>		<b>0.80</b>
<b>IFA Total</b>	<b>1</b>		<b>1.36</b>

**Table 3. External Factor Evaluation (EFA)**

External Factors	Weight	Rating	Total
<b>Opportunity Factor (O)</b>			
Export market opening	0.15	3.94	0.58
Fishing cooperative formation	0.05	3.38	0.16
Job opportunity of coastal community	0.12	3.69	0.45
Fishing gear modifications	0.15	3.75	0.55
Capture fishery investment increasing	0.10	3.25	0.32
<b>Total</b>	<b>0.56</b>		<b>2.06</b>
<b>Threat Factor (T)</b>			
Overfishing	0.10	1.94	0.19
Fishing gear conflict	0.15	2.19	0.32
There are still small fish caught	0.05	2.56	0.12
Polluted sea ecosystem	0.10	2.69	0.26
Destructive fishing gear	0.05	2.44	0.12
<b>Total</b>	<b>0.44</b>		<b>1.02</b>
<b>EFA Total</b>	<b>1</b>		<b>1.04</b>

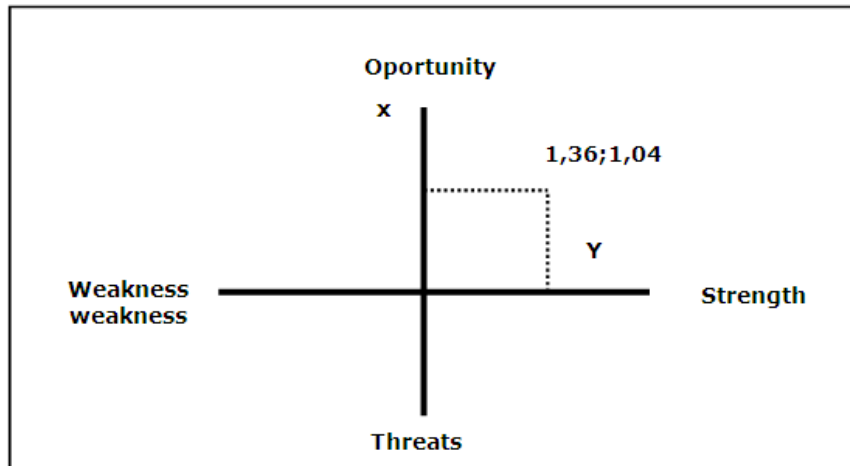


Fig. 1. SWOT analysis quadrant

Table 4. Quantitative Strategic Planing Matrix Analysis

Code	Weight	Strategy 1		Strategy 2		Strategy 3		Strategy 4	
		AS	TAS	AS	TAS	AS	TAS	AS	TAS
S1	0.10	4	0.3902	2	0.1951	4	0.3902	4	0.3902
S2	0.15	4	0.5854	4	0.5854	4	0.5854	3	0.0000
S3	0.15	4	0.5854	2	0.2927	3	0.4390	3	0.4390
S4	0.15	3	0.4390	2	0.2927	2	0.2927	-	0.0000
S5	0.05	-	0.0000	2	0.0976	3	0.1463	3	0.1463
W1	0.15	-	0.0000	1	0.1463	4	0.5854	2	0.0000
W2	0.05	2	0.0976	1	0.0488	4	0.1951	-	0.0000
W3	0.05	-	0.0000	4	0.1951	4	0.1951	4	0.0000
W4	0.05	-	0.0000	-	0.0000	-	0.0000	4	0.1951
W5	0.07	-	0.0000	-	0.0000	4	0.2667	-	0.0000
O1	0.15	4	0.5854	2	0.2927	2	0.2927	2	0.2927
O2	0.05	3	0.0000	1	0.0488	4	0.1951	2	0.0000
O3	0.12	4	0.0000	-	0.0000	2	0.2439	4	0.4878
O4	0.15	-	0.0000	-	0.0000	-	0.0000	3	0.4390
O5	0.05	3	0.1463	4	0.1951	1	0.0488	1	0.0488
T1	0.15	2	0.2927	4	0.5854	-	0.0000	4	0.5854
T2	0.15	-	0.0000	4	0.5854	-	0.0000	4	0.5854
T3	0.10	1	0.0976	4	0.3902	2	0.1951	-	0.0000
T4	0.05	-	0.0000	4	0.1951	-	0.0000	-	0.0000
T5	0.05	2	0.0976	2	0.0976	-	0.0000	-	0.0000
		<b>Total</b>	<b>3.3171</b>	<b>Total</b>	<b>4.2439</b>	<b>Total</b>	<b>4.0715</b>	<b>Total</b>	<b>3.6098</b>

**Stage 3 Decision Stage:** Determining strategic priority uses QSPM Analysis. The QSPM Analysis is used to determined relatively attractive because in the SWOT method, strategic priorities have not been drawn. The QSPM technique lies in the Total Attractive Score (TAS) add the highest score is the first priority. The QSPM analysis can draw conclusions which selected strategy is in the top sequence.

The Priority decision making in QSPM analysis is carried out by academics, practitioners and researchers so that it is neutral and there is no

conflict of interest. The results of the priority calculation are illustrated in the Table 4.

From the calculation of Table 3 it can be concluded that: fishing ground zone (strategy 2) has the highest Total Atratactive Score (TAS) and export standard fish needs (strategy 1) have the lowest score in the QSPM Analysis.

#### 4. CONCLUSION

The stages of strategy making are the input, matching and decision stages. The result of the research on the selected strategy from the

SWOT analysis is the SO (Strength Opportunity) strategy in quadrant 1 with a value of (1.36:1.04). Based on the QSPM analysis, the priority of the strategy with the highest Total Attractive Score (TAS) is priority Strategy 1: fishing ground zone with a value: 4.2439, strategy 2: Increasing fishermen's knowledge capacity with a value: 4.0715, strategy 3: Modernizing gill net technology with a value:3.6098, Strategy 4: export standard fish needs, with a value 3.317.

### COMPETING INTERESTS

Authors have declared that no competing interests exist.

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