Resilience of Kebumen Regency fishers in facing the uncertainty of the fishing season

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Abstract. Kebumen Regency is one of the regions on the South Coast of Central Java which has rich marine resources, both in the form of geological diversity of water areas, diversity of water resources, and cultural diversity. Fishers are one of the livelihoods of people in this area. Livelihoods as fishers are very dependent on the seasonal fish resources in the sea. This study aimed to analyze the socio-economic aspects of fishers in Kebumen Regency related to the uncertainty of the fishing season, identify various alternative jobs that are carried out and provide recommendations for improving the welfare of fishermen. The research was conducted through field observations and literature reviews. The data were subJected to financial analysis, descriptive analysis of alternative jobs and analysis of strength, weaknesses, opportunity, and threats. The research results state that although the value of fisheries production is relatively high, the local fishers's economy is still categorized as poor. Alternative types of work carried out by fishers are livestock (46%), farming (17%), basketry (13%), coconut tapping (8%) and others (8%). Recommendations for strategies to improve fishers' welfare include cooperation in fishing communities, developing fishing technology, diversifying the by-catch processing methods and technologies, fisheries-based marine tourism, forming fishers's cooperatives as a source of capital, and utilizing other natural resources outside the fisheries sector.
Key Words: alternative livelihood, fishers, fish season, Kebumen, socio-economic.

Introduction. Kebumen Regency is one of the regions in Central Java's South Coast with rich marine resources, ranging from geological diversity of ocean areas, diversity of water resources, and cultural diversity. The waters of Kebumen Regency are part of the Indian Ocean seas, which are rich in high-value seafood resources, including lobster, shrimp, white pomfret, layur, and snapper. Fisheries operations are quite developed in this region, with fish landing bases (PPIs) and coastal fishing ports (PPP) serving as fishing activity centers. The fishing activity centers are spread from east to west, including PPI Rowo, PPI Tanggulangin, PPI Pasir, PPI Karangduwur, PPI Argopeni, and Logending Beach Fishing Port (Nurani et al 2023). Fishing is one of the people's main sources of income in Kebumen Regency. The local fishermen are operating at a small-scale, during one-day fishing trips with 1-2 GT vessels (Widianti et al 2021). Traditional fishing gear is used, notably gillnets with a mesh size modified according to the species to be caught. This region has a high level of fish output. According to BPS (2020) data, in Kebumen Regency, the consolidated marine fisheries' production volume and value of in reached 1,678,817.69 kg with a value of 7.273.871,77 USD (Dinas Kelautan dan Perikanan Kabupaten Kebumen 2020). A fisherman's livelihood is mainly dependent on the availability of seasonal fish resources. Fish resources are challenging to manage since their populations exposed to seasonal fluctuations. When there is no fishing or off-season, fishermen are not advised to conduct fishing business. Fishing during the lean

season usually results in fishermen losing money since the catch cannot meet the operational expenditures. However, some fishermen continue to fish during the off-season, despite the tiny catch, because they have no other options (Ilhamdi et al 2016).

The uncertainty of the fishing season is one of the main problems for fishermen in this area. Fish catches are plentiful during the season. Meanwhile, during the off-season, fishermen do not catch enough and, implicitly, their income cannot cover their needs. Fishermen must take different job options to fulfill their needs. Outside the fish season, fishermen in this area earn a living through farming, raising livestock, and other means. However, not all fishermen have this capacity; many of them still live only from fishing. The resilience of fishermen in Kebumen Regency is a critical subject to investigate. Resilience in a crisis can be understood as the household's ability to return to normalcy. Household resilience is linked to livelihood strategies. According to Speranza et al (2014), livelihood resilience refers to the ability to withstand stress and interruption. Livelihood resilience is characterized by the assets and strategies of actors to maintain and enhance assets. A livelihood is said to be resilient if it can sustain vital functions (food, income, security, poverty reduction, etc.) and resist the impact of disruptions without causing a drop in output and well-being. These assets are known as livelihood assets. Ellis (2000) explains that livelihood assets or livelihood strategies consist of assets (natural, human, physical financial, and social capital), activities, and the social relationships and institutions that mediate people's access that together determine the life earning process of individuals or households, while rural livelihood diversification is defined as the process by which rural households build an increasingly diverse portfolio of activities and assets to survive and to improve their living standards. Camro & Widjayanthi (2020) stated that there are several reasons why households adopt various livelihood strategies. A distinction is made between diversification by necessity and diversification by choice. Based on this distinction, six determinants of diversification are considered, namely seasonality, risk, labor market, credit market, asset strategy, and coping strategy.

The resilience of fishermen facing the uncertainty of the fishing seasonis one of the important issues to be addressed because it determines the perrenity of the capture fisheries business in Kabumen Regency. This study aimed to analyze the socio-economic aspects of fishermen in Kebumen Regency, related to the uncertainty of the fishing season, to identify various alternative lucrative activities, and to provide recommendations for improving the welfare of fishermen.

Material and Method

Study site and period. Data were collected in Kebumen Regency waters at three fish landing bases in Ayah Subdistrict, namely PPI Pasir, PPI Karangduwur, and PPI Argopeni (Figure 1), between May and June 2022 and March and April 2023. Data on the social and economic conditions of fishermen in Kebumen Regency were gathered through interviews and direct observation.
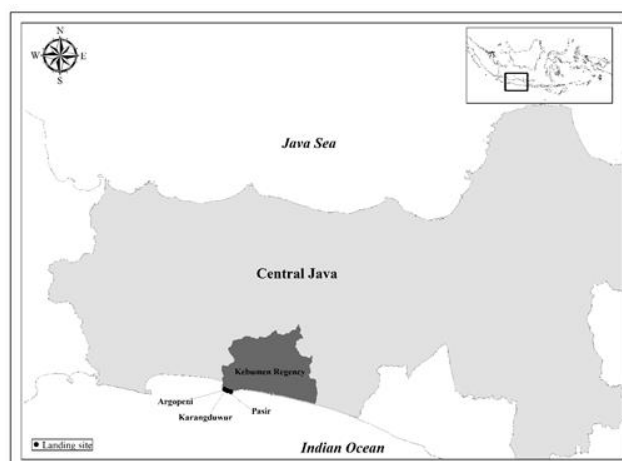

Figure 1. Research location.

Data collection method. The method used in this research is a case study. Researchers explore the case of the resilience of Kebumen district fishermen facing the uncertainty of the fishing season. Data collection methods used in case study research include document collection, interviews, and observation. The data sources for this research are the results of interviews with respondents at the research location and the fishing port administrative reports. Data collected directly by researchers through interviews and observations are investment value, technical age, fixed costs, operational costs, quantity of fish caught per season, selling price of fish caught per season, access to sources of financing, independence of fishermen, the guarantee of of the catch marketing and the opportunity to get more financing. Meanwhile, the data documents concerned the fish catches. Sampling in interview activities in this research was carried out using purposive sampling. The number of samples taken was in accordance with the research objectives, with 16 fishermen as respondents from 16 joint venture cooperatives in Ayah District, Kebumen Regency.

Research methods. The study used financial analysis to assess the feasibility of the capture fisheries industry in Kebumen Regency, and SWOT analysis to determine strategies to improve fishermen's welfare by identifying alternative jobs. Financial analysis was conducted by calculating the Net Present Value (NPV), Benefit Cost Ratio (Net B/C), Internal Rate of Return (IRR), and payback period (PP) based on their respective equations.

The Net Present Value (NPV) is the difference between the Present Value of the cash inflows and the present value of cash outflow over a period of time. The NPV value can be found using the following formula (Rahmawati et al 2022):

$$NPV = \sum_{t=1}^{n} \frac{Bt - Ct}{(1 + i)^t}$$

Where:
Bt - income (benefit) of capture fisheries business in year t;
Ct - costs of fishing business in year t;
t - time period (1,2,3,…,n);
n - economic age;
i - internal rate of return.

Decision making on NPV value as follows:
- If NPV > 1, the business is worth continuing;
- If NPV < 1, the business is not worth continuing;
- If NPV = 0, the business is worth continuing.

The benefit-cost ratio (B / R ratio) is a strategy to evaluate projects that compare the present value of all income typically earned by the business with the present value of all costs/expenses (Sururi & Agustapraja 2020). To calculate the net benefit-cost ratio, the following formula was used (Amura & Pirhel 2021):

$$Net \frac{B}{C} = \frac{\sum_{t=0}^{n} \frac{Bt - Ct}{(1 + i)^t}}{\sum_{t=0}^{n} \frac{Bt - Ct}{(1 + t)^t}}$$

Where:
Bt - total benefit in year t (USD);
Ct - total cost in year t (USD);
i - interest rate;
t - time;
n - economic life of the project (year).

According to Hastuti et al (2013), a business or investment can be said to be feasible when it has the following criteria:
- If the B/C Ratio < 1, the business can be declared unfeasible;
- If the B / C Ratio> 1, the business can be declared feasible.

Internal Rate of Return (IRR) is an interest rate that produces a Net Present Value equal to zero (Nugroho et al 2019). According to Idrus et al (2022), to calculate the IRR value, the following formula can be used:

$$IRR = i_1 \frac{NPV_1}{NPV_1 - NPV_2} \; x \; (i_2 - i_1)$$

Where:

i_1 - 1st interest rate;

i_2 - 2nd interest rate;
NPV_1 - NPV at the 1st interest rate;
NPV_2 - NPV at the 2nd interest rate.

The business analysis with IRR aims to make the following decisions:
- If the IRR value > discount rate, then the investment can be declared feasible.
- If the IRR value < discount rate, then the investment can be declared unviable.

The Payback Period (PP) will be calculated on fisheries businesses that are considered profitable using the following formula:

$$PP = \frac{investment \; value}{benefit} \; x \; 1 \; year$$

If the PP value is <3 years, the rate of return on capital is considered rapid; if the value is 3<PP<5 years, the rate of return on capital is considered moderate; and if the PP value is greater than 5, the rate of return is considered slow.

SWOT analysis is a strategic planning method used to predict the best steps when determining a strategy. SWOT analysis analyzes strengths, weaknesses, opportunities, and threats (Fatimah 2020). This method is used to identify the strengths, weaknesses, opportunities, and risks of any alternative fishermen's job development strategy. This analysis is based on the assumption that an effective strategy can maximize strengths and opportunities while minimizing weaknesses and risks (Astuti 2020). SWOT analysis has three stages: identifying internal and external elements, weighing the factors, and defining alternative plans and priorities (Amarala et al 2020).

Results

The condition of the capture fisheries in Kebumen Regency. Kebumen Regency contains eight coastal subdistricts that directly border the Indian Ocean, namely Ayah, Buayan, Puring, Petanahan, Klirong, Buluspesantren, Ambal, and Mirit (Nurani et al 2023). Due to the Logending Beach, the Ayah sub-district (comprising the Fishing Port (PPP), Argopeni PPI, Karangduwur PPI, and Pasir PPI) is the heart of Kebumen fishermen's activity. Ayah Beach's waters, which are rocky and undulating, with strong currents, provide an ideal habitat for lobster resources (Kusuma et al 2012). The condition of the coastal areas of Pasir Beach and Argopeni Beach in Ayah waters tends to be sloping with the right and left flanked by cliff beaches, making it very suitable as a habitat for shrimp and lobster fisheries commodities, even white pomfret. Other characteristics of these waters are found in Karangduwur Beach, with the geographical condition of the coastal area surrounded by limestone hills, tending to be rocky and craggy (Widianti et al 2021,2022). The fishing equipment utilized varies, including monofilament gillnets, multifilament gillnets, trammel nets, fishing rods, pocong nets, and binturs (Nurani 2008; Widianti et al 2021,2022). Each fish landing base in Kebumen Regency mostly employs gillnets with varying mesh sizes in their fishing operations.

Social conditions of fishermen in Kebumen Regency. The majority of people in Kebumen Regency work as fishermen. Fishermen in Kebumen waters, on average, have completed elementary and junior high school and range in age from 30 to 60 years. Senior high school, influences the level of abilities and knowledge of fishermen who have completed it. Fishermen who lack of formal and informal education often have poor skills and knowledge. In the Kebumen Regency, particularly in the PPI Pasir, there are traditional fishermen whose fishing practices rely heavily on the seasons. When the fishing season ends, Kebumen Regency's fishermen normally engage in other activities. According to the fishermen from PPI Pasir, the fishing season lasts about 4 to 5 months, with the peak season between August and November. When they are not at sea, fishermen use their time to mend nets or perform other tasks that help them meet their daily needs (their income from fishing is insufficient) such as: looking for grass to feed the cows, keeping cattle, tapping coconuts (nderes kelapa), opening stalls, farming, and other odd jobs.

Economic condition of fishermen in Kebumen Regency. The white pomfret and lobster fisheries in Kebumen have a high potential because these are the most important commodities. Financial analysis or capture fisheries' business analysis was used to determine the viability of these two types of fish businesses. Another assessment was carried out on the fishing units, fishing gear and fishing vessels used by Kebumen fishermen. A financial analysis was carried out to find out whether the capture fishery business and the pomfret and lobster fishery business on each fishing equipment and vessel were profitable and had the potential to be sustainable. The business model of the white pomfret fishery was analyzed using information and direct field observations from 16 fishing units at the Pasir Kebumen Fish Landing Base (PPI). White pomfret fishermen at PPI Pasir bring in an average of 40 gillnets per trip. In a single year, there are 22 trips. The data used in this fisheries business model is based on the average catch of 16 white pomfret fishermen in Kebumen. A fisheries business model analysis was also conducted on lobster fisheries landed at PPI Pasir, PPI Argopeni, and PPI Karangduwur Kebumen Regency. The pattern of lobster fishing operations will determine the annual operational costs. This business model's working pattern is a fishing business that operates throughout the year, in the peak fishing season and lean season. During the peak season, the number of fishing trips per month exceeds 41, with more than one fishing trip per day in the first 11 days of the peak season months. During the lean season, fishermen make only 18 trips each month. According to data analysis, the average fisherman in Kebumen waters makes 285 fishing excursions each year.

The net-type is the most widely used fishing unit by fishermen in Kebumen Regency. PPI Pasir Kebumen Regency's fishermen use bag nets, pomfret nets, ciker nets, and mackerel nets. The average number of fishing trips at PPI Pasir in 2022 reached 34 trips year[-1] and the maximum number of trips was 89 trips year[-1]. The capture fisheries business model based on fishing gear was also analyzed in this study. The income, profit/loss, and R/C value calculation results, for the pomfret fishery, lobster fishery, and fishing unit business models applied to the Kebumen Regency, can be seen in Table 1.

Table 1

Business analysis components of pomfret, lobster, and fishing units

| Description | White pomfret | Lobster | | Fishing unit |
		Throughout the year	During peak season	
1. Revenue	1,894.17 USD	12,379.18 USD	8,939.31 USD	2,460.35 USD – 6,456.49 USD
2. Advantages	-2,309.38 USD	3,197.57 USD	3,563 USD	-2,556.71 USD – -1,164.52 USD
3. Revenue cost ratio	0.45	1.35	1.66	0.39–0.85
4. Payback period		1.05	0.94	

The annual salary of white pomfret fishermen at PPI Pasir is 1,894.17 USD. According to the profit and loss statement, the white pomfret fishery at PPI Pasir lost 2,309.38 USD with an R/C value of 0.45. According to the R/C results, the white pomfret fishery at PPI Pasir is no longer viable. The white pomfret catch fishery at PPI Pasir is prone to losses, with an R/C value ranging from 0.36 to 1.03. Based on these results, there is one fisherman out of 16 who's white pomfret fishing company can continue. Based on the R/C calculation results, the white pomfret fishery at PPI Pasir may be viable to continue and develop if the number of trips reaches 50 per year and the income exceeds 5,283.49 USD.

In lobster fisheries, the income received by fishermen is differentiated according to the fishing season pattern: (1) Fishing is carried out throughout the year, with fishermen earning 12,383.98 USD $year^{-1}$. The findings of the business profit and loss computation indicate a profit of 3,197.18 USD. (2) Fishing is done during the peak season, with a total value of 8,942.75 USD collected by fishermen from an average of 5 types of lobster. The business profit and loss computation findings indicate a profit of 3,562.58 USD. The R/C obtained throughout the year is 1.35, and during peak season, it is 1.66, indicating that the lobster fisheries industry can be sustained. A payback period estimate was performed based on the feasibility of the business in lobster fisheries, which revealed a value of 1.05 while fishing throughout the year and 0.94 during peak season. The rate of return on capital is categorized as fast because the PP value is <3 years.

Based on the business analysis of the fishing unit at PPI Pasir, it is known that the income received by fishermen in 2022 is 2,461.29 USD- 6,459.04 USD. Based on the profit and loss calculation result, fishermen experienced a loss of 2,557.72 USD – 1,165.54 USD because the income received, was less than the expenses. The R/C value is one of the criteria used to see whether the results received from the business activities carried out are profitable. If the R/C value <1, then the business is said to be not feasible. The R/C value obtained by PPI Pasir fishermen in 2022 is 0.39-0.85.

The feasibility of capture fisheries business in the Kebumen Regency was assessed using investment criteria analysis to determine the NPV, B/C, and IRR values. Investment criteria analysis assessed the feasibility of white pomfret fisheries in PPI Pasir and lobster fisheries in PPI Pasir, PPI Argopeni, and PPI Karangduwur, in the Kebumen Regency. The results of the analysis can be seen in Table 2.

Table 2
Investment criteria components of white pomfret and lobster fishing businesses

Description	White pomfret	Lobster	
		Throughout the year	During peak season
1. NPV	−443.44 USD	11,395.15 USD	12,680.32 USD
2. Net B/C	0.75	4.39	4.77
3. IRR	0%	122.39%	133.62%

Based on the calculation of the financial feasibility of investment criteria, the white pomfret fishery business obtained an NPV value of -443.44 USD. The Net B/C value obtained from the calculation of financial feasibility is 0.75. The IRR value obtained from the calculation of financial feasibility is 0%. Based on the NPV, Net B/C, and IRR values obtained, it can be said that the white pomfret business at PPI Pasir is not feasible to continue and develop. The investment criteria implemented according to the seasonal pattern of lobster fishing show results that are both profitable and feasible to develop. This can be seen from the positive NPV value, Net B/C of more than 1, and IRR of over 0%. However, greater profits were obtained during the peak lobster fishing season, even though it lasted only three months.

Job alternatives resilience. Aside from fishing, the majority of responders have other jobs. For example, at PPI Pasir, based on interviews and direct observations, numerous alternative professions exist in PPI Pasir, such as raising livestock, farming, coconut sap tapping, stall merchants, and others. The following pie chart (Figure 2) shows the

percentage and sorts of alternative jobs in PPI Pasir performed bylocal fishermen when they are not fishing.
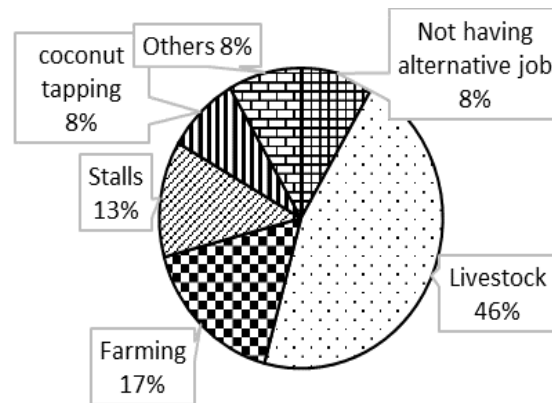

Figure 2. The alternative type of job for fishermen.

Alternative jobs most typically performed by fishermen in PPI Pasir include livestock (46%), farming (17%), stalls (13%), while coconut tapping, not having alternative jobs, and others each have a total percentage of (8%). Based on this information, a strategy for creating alternative jobs for fishermen during the lean season is required to ensure the survival of the fisheries industry. Following this, a SWOT analysis was performed ~~in order~~ to find a good alternative work to execute during the lean season. The internal factor analysis (Table 3) and external factor analysis (Table 4) fully explain this.

Table 3

Analysis of internal factors

Internal factors	Weight	Rating	Score
Strength			
1. Strong cooperation and kinship in the fishing community.	0.08	3	0.24
2. Easy access to natural resources.	0.08	2	0.16
3. Major seafood commodities have high economic value.	0.10	2	0.20
4. Fishermen's knowledge and skills in fishing.	0.06	3	0.18
5. Easy access to the market.	0.07	2	0.14
			0.92
Weakness			
6. Limited access to modern technology in fishing.	0.09	3	2.7
7. Lack of diversification of knowledge and skills outside the fisheries sector.	0.12	1	0.12
8. Depends on weather and natural conditions that cannot be controlled.	0.10	2	0.20
9. Limited facilities and infrastructure in the management of fishery products	0.07	2	0.14
10. Lack of utilization of fishery products outside the main commodities	0.11	1	0.11
11. Limited capital resources	0.12	2	0.24
			3.51
Total		1.00	4.43

Table 4

Analysis of external factors

External factors	Weight	Rating	Score
Opportunity			
1. High demand for key seafood commodities	0.12	3	0.36
2. Potential for fisheries-based tourism development in coastal areas.	0.15	4	0.60
3. Opportunities of export to international markets.	0.11	3	0.33
4. Potential utilization of bycatch.	0.14	4	0.56
5. Women's Empowerment.	0.13	3	0.39
			2.24
Threat			
6. Climate change and vulnerability to natural disasters.	0.10	3	0.30
7. Resource limitations and sustainability of fish stocks.	0.12	2	0.24
8. High competition due to the high number of fishermen	0.13	1	0,13
			0.67
Total	1.00		2.91

The SWOT matrix and derived strategies for developing alternative jobs for fishermen at PPI Pasir can be seen in Table 5.

Table 5

SWOT matrix of alternative job development strategies for PPI Pasir fishermen

	Strength (S)	Weakness (W)
	S1. Strong mutual cooperation and kinship in the fishing community. S2. Easy access to natural resources. S3. The main seafood commodities have high economic value. S4. Fishermen's knowledge and skills in catching fish. S5. Easy access to the market.	W1. Limited access to modern technology in fishing. W2. Lack of diversification of knowledge and skills outside the fishing sector. W3. Dependent on weather and natural conditions that cannot be controlled. W4. Limited facilities and infrastructure in fishery product management W5. Lack of utilization of fishery products outside the main commodities. W6. Limited capital resources
Opportunities (O)	SO Strategy	WO Strategy
O1. High demand for local fishery products. O2. Potential for fisheries-based tourism development in coastal areas. O3. Export opportunities to international markets. O4. Potential utilization of by-catch products. O5. Women empowerment	Mutual cooperation within the fishing community to build fisheries-based marine tourism.	1. Develop fishing technology to maximize catches. 2. Manage bycatch into diversified food products with economic value and involve women (wives, children) in its management. 3. Manage fisheries-based marine tourism in collaboration with government and non-government institutions. 4. Provision of a fishermen's cooperative as a source of capital for fishing operations.

Threats (T)	ST Strategy	WT Strategy
T1. Climate change and vulnerability to natural disasters. T2. Resource limitation and sustainability of fish stocks. T3. High competition due to the large number of fishermen.	1. Awareness raising campaigns, organized by the government, on sustainable fishing practices and wise resource management. 2. Utilizing other natural resources outside the fisheries sector.	1. Counseling to fishermen groups on work safety and natural disaster evacuation procedures. 2. Training the fishing communities on potential alternative job diversification.

Discussion. Kebumen Regency is a superior coastal area, with 6 Fish Landing Bases (PPIs) managed by the Regency and 2 Coastal Fishing Ports (PPPs) managed by the Central Java Province. The main facilities are the Fish Landing Places (PPIs) deployed from the Rowo , in the east, to to the Ayah District in the west, namely: PPI Rowo in the Rowo Village, PPI Tanggulangin in the Tanggulangin Village, PPI Tegalretno in the Tegalretno Village, PPI Tambakmulyo in the Tambakmulyo Village, PPP Pasir in the Pasir Village, PPI Karangduwur in the Karangduwur Village, PPI Argopeni in the Argopeni Village and PPP Logending in the Ayah Village (Dinas Kelautan dan Perikanan Kabupaten Kebumen 2020). However, only 3 of 6 PPIs, PPI Pasir, PPI Karangduwur, and PPI Argopeni, are active and productive in the fish auction process. The research site contains three fish landing locations in Kebumen Regency with the potential to produce lobster commodities, including Pasir, Karangduwur, and Argopeni villages. The three research sites are close to each other and are in the same sub-district, the Ayah sub-district. Despite being geographically close, each area has distinct characteristics of waters, catches, and superior commodities (Sari et al 2015).

Fishermen are still categorized as poor because traditionally they still depend on the fish season, water conditions, fishing gear, and abilities (Wahyudi & Sutisna 2021). According to Patriana & Satria (2013), coastal communities, particularly fishermen, rely on fisheries resources. Based on sociological studies, coastal communities are resource-based communities. Therefore, coastal community activities are linked to fisheries resources. The average local fisherman is classified as a small fisherman, with his earnings utilized to meet his daily necessities. This condition is a worry in Indonesia because it might be hazardous to fishermen's health (Warren & Steenbergen 2021). The livelihoods of local fishermen consist not just of fishing, but also of agriculture and livestock raising, as side jobs. These activities help anticipating the needs of fishermen during the lean season. Fishermen's ability to amass wealth is still limited; if there is surplus income, it is sometimes used for consumptive expenses. This behavior occasionally results in fishermen having insufficient funds to conduct fishing operations, which negatively impacts their fishing activity. To strengthen the capabilities of local fishermen in executing fishing operations, capacity building related to the resources access is required.

Financial analysis can be known through the R/C value, which is one of the criteria used to determine how profitable the business activities are over a certain period. If the R/C>1, the business's activity is profitable and can be continued. If the R/C<1, the business activity is not feasible. The results of the financial analysis of white pomfret fisheries in PPI Pasir with a B/C Ratio value of 0.45 may indicate that the white pomfret fishery business is unprofitable and not feasible to be sustained, because it will lose money. Meanwhile, the value achieved when lobster fishing is done all year and during peak season is 1.35 and 1.66, respectively. This value demonstrates that the lobster fisheries business is profitable and sustainable. The R/C value in examining fishing units at PPI Pasir spans from 0.39 to 0.85, indicating that this activity is unsustainable.

The examination of investment criteria for fishing firms operating with white pomfret commodities has NPV, Net B/C, and IRR values that indicate it is not financially viable. Contrarily, the fishery business throughout the season and the peak season of lobster fishing demonstrates a high value based on the NPV, Net B/C, and IRR

investment criteria, indicating that the lobster fishery can adopt and develop. An investment will be considered feasible if the IRR value is greater than the applicable interest rate and vice versa if the IRR value is lower than the applicable interest rate, then the business will not be feasible to implement (Gittinger 1986).

Fishing activities cannot be carried out all year and are only carried out during certain seasons, thus alternative strategies are required for the right job during the lean season. Examples of alternative businesses include livestock raising, farming, stall business, coconut sap tapping, tourism industry, and diversification of processed by-catch items. Local fishermen believe raising livestock to be an investment because it can be resold whenever they need money. According to Widyaningrum (2017), many fishermen engage in the cattle business since it is deemed beneficial even if money is not obtained monthly. Some fishermen who own land operate as rice farmers on the side, but the crops they grow are for personal consumption rather than resale. Another activity that fishermen do is running a stall merchant business. The majority of the enterprises are grocery stores or food booths. This type of business has the potential to grow since individuals cannot be separated from their daily requirements (Widyaningrum 2017). They can also become sap tappers for coconuts. Tapping coconuts is commonly done in the morning and evening. The tapping results are dropped off in the morning, then put up again in the afternoon, and so on; fishermen can tap up to ten coconut trees in one day. The sap yield from tapping is approximately 10 L. One liter of coconut water can yield 500 grams of coconut sugar. Each 1 kg of coconut sugar can cost up to 0.95 USD. Fishermen tap coconuts from the tree, and the processing is done by family members such as wives and children. In one day, each household can produce at least 5 kg of Javanese sugar, which is then sold to Javanese sugar collectors before being sold to the market.

According to Fachry (2021), tourism development in an area has three beneficial effects: increased community income, absorption of a large enough workforce, and increased entrepreneurship around tourist destinations. Tourism development in fishing areas can provide an alternative career and help fishermen overcome poverty (Lazzari et al 2021). Despite poor management, several areas around the fish landing base in Kebumen Regency have been utilized as tourist spots. Modern fishing communities can provide an alternative for fishermen so they do not have to rely solely on the fishing industry for a living. Apart from providing an alternative business for fishermen, modern fishing villages can help to eliminate social and ecological conflict by encouraging fishermen to work together to protect the environment (Aguilera et al 2023; Hossain et al 2021). Developing and optimizing of existing tourism through fisheries-based marine tourism, such as seafood restaurants, housing around the beach tourist region, and beach excursions using boats, can be an alternative to other professions outside the fishing sector (Yahya et al 2023). By-catch from fishermen, such as fish, has a poor selling value or does not sell at all and is occasionally given away for free. Post-harvest operations rely heavily on the processing of fishing products, particularly bycatch. Food diversification technology can be a solution in utilizing and processing bycatch to have economic value and increase the income of fishing communities (Nurani et al 2023). Diversification of bycatch processing as raw materials can result into various quality products with nutritional (Feliatra 2022).

The development of alternative jobs for fishermen can be carried out following strategy recommendations, namely: cooperation in fishing communities to build fisheries-based marine tourism, developing fishing technology to maximize catches, converting bycatches into diversified processed food with economic value and involving women (wives, children) in these operations, managing fisheries-based marine tourism in collaboration with government and non-government institutions, founding fishermen cooperatives as a source of capital for fishing operations, awarenass raising on sustainable fishing practices and wise resource management, utilization of other natural resources outside the fisheries sector, counseling to fishermen groups on work safety procedures and natural disaster evacuation, and training the fishing communities on the diversification of potential alternative jobs. Some of these initiatives will benefit fishermen's economies by allowing them to form communities and to find new livelihood

prospects together (Camara & Sanchez 2019). Various stakeholders must support these strategies in order to improve the fishermen's economic conditions and social welfare (Custodio et al 2022).

Conclusions. Fishermen in Kebumen Regency produce important commercial fish such as white pomfret and lobster. According to the financial feasibility analysis based on the NPV, B/C Ratio, and IRR calculations, the white pomfret business at PPI Pasir is not viable to be continued and developed. Meanwhile, the lobster fishery enterprise, according to simulations for two distinct fishing season patterns, yields profitable and developable outcomes. In the Kebumen fish landing base, the most prevalent alternative jobs for fishermen are livestock (46%), farming (17%), stalls (13%), coconut tapping (8%), and others (8%). Based on a SWOT analysis, several strategy recommendations were formulated for the development of alternative jobs in order to improve the fishermen communities' economic conditions and social welfare.

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