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THE ROLE OF DEMOGRAPHIC AND OPERATIONAL FACTORS IN OPTIMISING FISHERMEN'S INCOME IN GILI SULAT-GILI LAWANG, INDONESIA: TOWARDS INCOME SUSTAINABILITY

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ABSTRACT

Fishermen's income is defined as the total earnings fishermen receive in exchange for goods and services they sell in the market. However, despite the increase in fishermen's income in Indonesia, the average amount has been below the regional minimum in the last decade. This study aimed to investigate the factors influencing fishermen's income in Gili Sulat–Gili Lawang, Indonesia. Face-to-face interviews were conducted with 85 respondents from four villages surrounding Gili Sulat–Gili Lawang between June and September 2023 to collect data for the study. Data were analysed using Spearman's correlation. The results indicated that operational factors of working hours and distance significantly influence fishermen's income. To improve their earnings, fishermen need to enhance their skills and knowledge in order to attain the optimal working hours and fishing distances.

Introduction

A fisherman's income is the amount of money the fisherman receives in return for their services or performance (Azizi *et al.*, 2017). Income can be classified as gross income and net income. According to the Internal Revenue Service (2011), gross income refers to the total earnings from fishing activities, and net income is the amount remaining after deducting crew shares and operational costs from gross income. However, the average income of Indonesian fishermen has remained below the regional minimum wage over the past decade (Cahyagi & Gurning, 2018). In 2013, the average monthly income of Indonesian fishermen was IDR 561,000, which was lower than the regional minimum wage of IDR 860,000 (Cahyagi & Gurning, 2018). Despite the low average income, Dijk *et al.* (2015) estimated that in 2015, Indonesia's marine and fisheries sectors contributed approximately 20% to the national Gross Domestic Product (GDP), which totalled USD 880 billion.

Several factors such as age, education, experience, and fishing activities may influence a fisherman's income. According to Primyastanto *et al.* (2012), an increase in age is associated with a higher likelihood of poverty among fishermen, whereas higher levels of education and greater experience are associated with a reduced risk of poverty. As fishermen grow older, their physical endurance and health tend to decline, directly affecting their fishing performance (Tsani, 2020). In contrast, improved education can enhance work productivity, as educated fishermen are better equipped to manage their tasks efficiently (Wahyudi *et al.*, 2020). Additionally, increased experience at sea enables fishermen to locate fishing grounds more effectively, thereby improving their catch efficiency (Ansaar, 2019).

Nusyazwin and Zein (2019) discovered that factors such as the number of fishing trips, duration of fishing, and fishing zones significantly influence fishermen's income. While reef areas are considered ideal locations for catching demersal species such as grouper and snapper, areas located 10 to 50 miles offshore are suitable for targeting tuna and other pelagic species (Hidayati & Widayatun, 2021). Tsani (2020) further revealed that income is also influenced by capital and market prices. A fisherman's primary capital includes a vessel and an engine. Without this capital, fishermen are unable to go to sea to carry out fishing activities. Moreover, according to Rogers' theory, the higher the market price of the catch, the greater the potential income for fishermen (Tsani, 2020).

In addition to the aforementioned factors, fishing gear significantly affects a fisherman's income. Trawlers typically yield higher catches and generate greater income than other types of gear such as drift nets and fishing rods (Husain *et al.*, 2020). Due to their limited capacity to reach distant fishing grounds, small vessels are generally restricted to coastal areas (Hidayati & Widayatun, 2021). Moreover, a vessel without an engine is considered inefficient for fishing operations (Primyastanto *et al.*, 2012). Vessels without engines face difficulties in reaching fishing grounds efficiently, particularly when the distance is considerable (Rahim & Hastuti, 2018). Without an engine, fishermen need to spend more time travelling to potential fishing areas, which can increase operational costs and reduce income. Conversely, engine-powered vessels tend to achieve higher catch volumes compared to non-motorised ones (Maulana *et al.*, 2020).

Gili Sulat–Gili Lawang, one of the areas in East Lombok with abundant marine resources is mostly populated by fishermen. The majority of fishers in Gili Sulat–Gili Lawang are small-scale operators who use diverse types of fishing gear such as drift gill nets, lift nets, fishing rods, and hand lines. However, a major issue in Gili Sulat–Gili Lawang is that the utilisation of its marine resources remains suboptimal and lacks clear management direction. Moreover, the designation of conservation zones in the region poses a potential constraint on the mobility of local fishers, who have historically depended on these waters as their primary source of livelihood (Hilyana *et al.*, 2020). This situation is likely to lead to changes in fishing operations, which may subsequently affect the income levels of the fishing community. Accordingly, this study aims to analyse the role of demographic and operational factors in optimising fishers' income in Gili Sulat–Gili Lawang, Indonesia.

Materials and Methods

Study Area

The study was conducted from June to September 2023 in the Gili Sulat–Gili Lawang area, located in Sambelia, East Lombok, West Nusa Tenggara, Indonesia. This area consists of two small islands situated in the northeastern part of Lombok Island, bordering the Alas Strait, which separates Lombok from Sumbawa. Specifically, the study was carried out in four villages surrounding Gili Sulat and Gili Lawang, namely, Belanting, Dadap, Labuan Pandan, and Sugian.

Target Respondents

Data for this study were obtained from primary sources through face-to-face interviews and field observation. For the interviews, the target respondents were fishermen around the Gili Sulat–Gili Lawang area. The sample size was determined using the Slovin formula, which was also used by Stephanie (2013), as follows:

$$n = N / (1 + Ne\text{^}2) \quad (1)$$

where:
n = Sample size
N = Population size
e = Margin of error

The four villages surrounding Gili Sulat–Gili Lawang are home to a total of 426 registered fishermen, comprising 109 in Sugian, 73 in Dadap, 19 in Belanting, and 225 in Labuan Pandan. Based on a 10% margin of error, a sample

of 81 respondents was initially determined using the Slovin formula. However, considering the potential challenges associated with face-to-face interviews such as incomplete answers and participant withdrawal during the process, the sample size was increased to 85 to mitigate the risk of obtaining insufficient data for subsequent analysis. Respondents were randomly selected from each village in proportion to the number of registered fishermen: 22 from Sugian, 15 from Dadap, five from Belanting, and 43 from Labuan Pandan. Only individuals with more than one year of fishing experience were included in the sample.

The questionnaire design was adapted and adopted from previous studies (e.g., Gravestock *et al.*, 2008; Gebremedhin *et al.*, 2013; Rahim *et al.*, 2018; Nursyazwin & Zein, 2019; Sukono *et al.*, 2021). The questionnaire was divided into four sections: (1) Fishing vessel, (2) cost per trip, (3) fishing catch, and (4) demographics. The fishing vessel section included questions on the type of engine, engine power, and vessel size. The cost per trip section covered the types of costs and their respective amounts. The fishing catch section contained questions about fishing gear, catch volume, catch area, fishing distance, and number of trips. Lastly, the demographics section included questions related to age, education level, marital status, household size, monthly income, and fishing experience.

Statistical Analysis

This study used Spearman's correlation for data analysis, utilising Microsoft Excel and IBM Statistical Package for the Social Sciences (SPSS) statistics version 26. According to Sedgwick (2014), Spearman's correlation is appropriate for identifying relationships between one variable and other variables. Correlation analysis was also employed by Gebremedhin *et al.* (2013) to identify the factors influencing fishermen's income in Lake Tana, Ethiopia. The variables used in this study include education, experience, age, working hours, number of trips, and distance, as shown in Table 1. Although other operational factors were included in the questionnaire, they were excluded from the analysis due to incomplete answers and difficulties in obtaining data from the fishermen. In addition, fishermen in Gili Sulat–Gili Lawang used more than one type of fishing gear in a single trip.

Results

This section discusses the demographic and operational factors influencing fishermen's income in Gili Sulat–Gili Lawang, Indonesia. The variables analysed include income, education, fishing experience, age, working hours, number of trips, and fishing distance. These variables were selected based on previous

Table 1: Description of variables

Variables	Description of Variables	Measurements
Income	A fisherman's monthly income	Monthly gross income, measured as total income per trip multiplied by the number of trips per month
Education	A fisherman's level of education	The number of years a fisherman received formal education
Experience	The duration of working as a fisherman	The number of years the person has worked as a fisherman
Age	Fisherman age	The age of the fisherman in years
Working hours	The period of time at sea to catch fish	The number of hours spent to catch fish at sea
Number of trips	The number of fishing trips made	The number of fishing trips made in a month
Distance	Distance travelled to fish	The distance of the trip made to catch fish at sea

studies (e.g., Gebremedhin *et al.*, 2013; Ramli *et al.*, 2018; Harahap *et al.*, 2019; Putri & Wulandari, 2020; Amadu *et al.*, 2021; Sujarwo *et al.*, 2022).

Prior to conducting the correlation analysis, the study performed a normality test to assess whether the data followed a normal distribution (Sukono *et al.*, 2021). According to Gogtay *et al.* (2016), the Kolmogorov–Smirnov test is commonly employed to assess data normality. In this study, the results of the normality test indicated that the majority of the variables were not normally distributed, as presented in Table 2.

Spearman's rho (ρ) should be used when the variables in the group do not follow a normal distribution (Gogtay & Thatte, 2017). According to Dancey and Reidy (2004), the strength of Spearman's rho correlation can be classified as no or negligible relationship (0.01 to 0.19), weak relationship (0.20 to 0.29), moderate relationship (0.30 to 0.39), strong relationship (0.40 to 0.69), and very strong relationship (≥ 0.70). Table 3 presents the results of the Spearman's rho analysis in this study. Working hours ($\rho = 0.328$, $p < 0.01$) showed a moderate positive correlation and distance ($\rho = 0.550$, $p < 0.01$) demonstrated a strong positive correlation with fishermen's gross income.

Discussion and Conclusion

The study's findings indicate that both working hours and fishing distance are positively correlated with income, suggesting that fishermen's earnings tend to increase as their working hours and travel distances expand. These findings are in parallel with previous research, which found that the longer fishermen stayed at sea (Putri & Wulandari, 2020), the greater the fishing distance required to reach productive fishing grounds (Azizi *et al.*, 2017). In other words, fishing distance and working hours are interrelated; greater distances generally require more time at sea. As highlighted by Hafid and Abu (2019), a longer fishing duration increases

Table 2: Normality test (Kolmogorov–Smirnov) for factors relating to income

Variable	Significance	Conclusion
Income	0.200	Normally distributed
Distance	0.004	Not normally distributed
Number of trips	0.000	Not normally distributed
Age	0.179	Normally distributed
Working hour	0.000	Not normally distributed
Experience	0.000	Not normally distributed
Education	0.000	Not normally distributed

Table 3: Spearman's rho (ρ) test results

Variable	Income
Education	–0.170
Experience	0.193
Age	0.077
Working hours	0.328**
Number of trips	0.132
Distance	0.550**

Note: ** and * represent correlation at the significance levels of 0.01 and 0.05, respectively.

the likelihood of a higher catch volume. This is because extended time at sea increases the likelihood of reaching areas with abundant fish stocks (Dimas & Sutrisna, 2018).

Interestingly, fishing at greater distances tends to yield higher catches compared to nearshore fishing activities (Heryansyah *et al.*, 2013). This is because travelling farther allows fishermen to access offshore areas with higher fish densities and avoid competition with other fishermen (Dimas & Sutrisna, 2018). Moreover, coastal waters near villages are often subjected to intense human activities such as fishing, domestic waste disposal, and marine transportation. These activities contribute to increased sedimentation and decreased water quality (Madiyani *et al.*, 2018). In other words, anthropogenic activities in coastal areas can degrade marine ecosystems and reduce fish abundance.

The limitations of this study primarily pertain to its scope and the selected research methodology. Data were collected from only 85 respondents across four villages surrounding the Gili Sulat–Gili Lawang area due to financial constraints and time limitations. Limited financial resources restricted the researchers' ability to include a wider geographic area and increase the number of participants, resulting in potentially reduced representativeness of the sample. Likewise, time limitations curtailed opportunities for extended field engagement, in-depth interviews, and triangulation of data. Consequently, the findings may not fully reflect the variability in fishing practices or socio-economic conditions across the broader region. Future research supported by more substantial funding and extended data collection periods is recommended to enhance the depth of analysis and improve the accuracy of results.

Additionally, there is a notable lack of prior research on this topic, particularly in the Gili Sulat–Gili Lawang area, thus posing challenges to obtain relevant data and supporting information. Another limitation encountered in this study was the language barrier between researchers and respondents. Future studies could address this issue by employing local enumerators to facilitate more effective communication. Moreover, comparative studies involving the socio-economic conditions of respondents in the Gili Sulat–Gili Lawang area and those in other regions are encouraged in order to provide a broader understanding of resource management and local livelihood dynamics.

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Conflict of Interest Statement

The authors agree that this research was conducted in the absence of any self-benefits, commercial, or financial conflicts and declare absence of conflicting interests with the funders.

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