Study of household welfare level of crab fishermen using Fisherman Exchange Rate (FER) indicators in East Lombok

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Abstract. The aims of this study were: 1) to analyze the household income of crab fishermen, 2) to analyze the household expenditures of crab fishermen, 3) to analyze the welfare level of crab fishermen based on the fisherman's exchange rate indicator (FER), and 4) to analyze the socio-economic factors that affect the welfare of fishermen's households. Crabs based on FER indicators in East Lombok Regency. This research uses a descriptive method. In addition to interviews with respondents, the Focus Group Discussion (FGD) method was also conducted. Respondents in this study were small fishermen. The number of respondents was determined to be as many as 30 people by Simple Random Sampling. Analysis of the data used is a descriptive analysis based on tabulation, and after processing, it isthen presented in tabular form, analysis of cost and income analysis, and analysis of incomeand expenses as well as multiple Linear Regression analysis. The results showed: 1) The household income of crab fishermen is IDR 27,046,415 per year, which comes from income from crab catching IDR 19,492,091, fishing for IDR 4,138,324, income as laborers IDR 1,116,000, other sources IDR 2,300,000, 2) The household expenditure of crab fishermen is IDR 15,098,533 per year, which includes food expenditure of IDR6,922,800 and non-food expenditure of IDR 8,175,733, 3) The Fisherman's Exchange Rate (FER) for crab fishermen is 1.86. in the indicators of prosperity, and 4) The factors that significantly affect the welfare level of small crab fishermen are household income and expenditure, while the level of education, experience and number of family dependent are not significantly different.

1. Introduction

Indonesia has a sea with an area of 5.8 million km^2, 17,508 islands and a coastline witha length of 81,000 km. With the gift of coastal and marine resources, the community should have an established level of welfare, especially those who live in coastal areas and islands. But unfortunately, it is precisely the fishermen groups who have difficulty meeting their basic needs such as clothing and food. The fishing community is categorized as a poor community with indications that their economic level is still weak due to low-income levels, low qualityof life, low social welfare and living in difficulties [1]. This has happened from the NewOrder until the current reform era as evidenced by several research results, including and caused by several factors [2,3]. Namely the harsh natural atmosphere causing uncertainty for fishermen in carrying out continuous socio-economic activities in maintaining the consistencyof catch production, the low quality of fishermen's human resources, limited working capital that makes it difficult for fishermen to increase their economic activities, marketing fishery products that are more profitable for intermediaries, and government policies that were not in favor of fishermen.

Development in the fisheries and marine sector is essential of improving the welfare of fishery actors, especially fishermen. This is relevant because, basic on the social and economic factors, fishing communities are still left behind compared with other communities. This can happen because there are many poverties found in coastal areas [4]. The high level of poverty in rural communities can be used as an indication of a declining level of welfare, which also means a decrease in the level or change in people's consumption patterns. Coastal communities, both socially and economically, are still lagging behind when compared to other communities where the resource of poverty is found in coastal areas.

The welfare aspect of fishermen has become the main concern of the Ministry of Maritime Affairs and Fisheries (KKP), especially after the economic crisis in recent years.The turmoil of the economic crisis was marked by the increase in the value of inflation, the increase in fuel prices, and so on. This will affect the business system and production of fishing communities which can directly reduce the welfare of fishermen. To quickly get a description of changes in fishermen's welfare, an instrument that is easy to use and can fully describe the welfare of fishermen is needed. One of the instruments to measure the welfare of the fishermen is to use the fishermen's exchange rate index (FER) [4].

So far, efforts to measure the level of fishermen's welfare are still using indicators of changes in fishermen's income. According to [5] such indicators are inaccurate and misleading in accurately describing the improvement in fishermen's welfare because they have not compared the fisherman's expenditures for the consumption needs of his family. A similar reason is put forward by [6] that a decline in the fisherman's exchange rate relative to the prices of other goods and services can result in a decrease in income.

Therefore, a more appropriate indicator is FER which considers all revenue and all expenditure of the fisherman family. The concept and method of estimating far have been very limited. Even, the general guidelines and technical guidelines just were published in 2001 by the Directorate General of Coasts and Small Islands of the Ministry of Marine Affairs and Fisheries. The concept will be applied as an approach to measuring the welfare level of fishermen throughout Indonesia.

Crab fishermen, as a community of small fishermen in East Lombok Regency, are facing various problems related to the decreasing number of catches (swimming crabs) because theyuse fishing gear that is not environmentally friendly, such as the use of lake nets. On the other hand, the high demand for crab commodity markets both at locally and abroad also affects the exploitation of crab catching. Meanwhile, there is no other option that will provide additional income for crab fishermen or switch professions, such as becoming a fishing fisherman, because apart from a lack of capital to buy fishing equipment, fishermen have been accustomed to catching crabs for generations.

In the marine and fisheries sector, the measurement of the fisherman exchange rate is still lagging behind when compared to the agricultural sector. The measurement of exchange rates in fishing communities in 2000 was carried out by individuals or government agencies with the object of measuring FER in the fishing community in general. Fishing communities have different characteristics seen from each region or typology. This study focuses onmeasuring the FER of crab fisheries. Crab is the fish export commodity of the Indonesian state, which can be seen from the results of foreign exchange earnings.

The purpose of this study was to analyze the household income of crab fishermen, analyze the household expenditure of crab fishermen, analyze the welfare level of crabfishermen based on the fishermen's exchange rate indicator (FER), and analyze socio-economic factors that affect the household welfare of crab fishermen based on FER indicators in East Lombok Regency.

2. Materials and methods

This research uses a descriptive method, which is a method that aims to solve problems that exist at the present time by collecting, compiling, analyzing and interpreting data and then drawing conclusions and copying them in the form of a systematic report on the object under study [7]. Data collection techniques used survey techniques, namely direct interviews with respondents based on a list of questions that was made in advance [8]. In addition tointerviews with respondents, the Focus Group Discussion (FGD).

This study used a case study, which is a more in-depth research method over a certain period of time. The determination of Pemongkong Village was carried out by purposive sampling on the basis that the village had the largest number of crab fisherman households compared to Ekas Buana, Serewe, Batu Nampar, and Jerowaru Villages. The respondents in this study were crab fisherman households. A number of small crab fishing households in Pemongkong Village 300 families which selected as many as 30 crab fishing households using Simple Random Sampling.

Data analysis includes

Fishermen's income from fishing (crabs and or fish):

$$TFI = FR - CFP \quad (1)$$

Note:
TF = Total fishing income (IDR/year)
FR = Fishing revenue (IDR/year)
CFP = Cost of fishing production (IDR/year)

Another household income

$$OHI = IFL + NFI \quad (2)$$

Note:
OHI = Other household income (IDR/year)
IFL = Income as fisherman's labour (IDR/year)
NFI = Non-fishing income (IDR/year)

Total income of crab fisherman household

$$(IFH)IFH = TFI + OHI \quad (3)$$

Household Expenditure (HE)

$$HE = FE + NFE \quad (4)$$

Note:
HE = Total household expenditure (IDR/year)
FE = Food expenditure (IDR/year)
NFE = non-food expenditure (IDR/year)

The fishermen's exchange rate (FER) of crabs is formulated in the form of:

$$IFH_t = TFI_t + OHI_t$$
$$HE_t = FE_t + NFE_t$$
$$FER = IFH_t / HE_t \quad (5)$$

Note:
IFH_t = Total household income of crab fisherman period t
He_t = Total household expenditure of crab fisherman period t

Criteria:

- If FER > 1 means that the small crab fisherman household has a level of welfaresufficient to meet primary needs and has the potential to meet non-primary needs or save.
- If FER < 1, then the crab fisherman's household has a low level of welfare, unable tomeet primary needs.

To determine the socio-economic factors that affect the level of household welfare of crab fishermen, multiple linear regression analysis is used [9]:

$$Y= (a +b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + e) \quad (6)$$

Note:

Y	= level of welfare of small crab fisher householda
	= constant
b	= regression coefficient
X1	= education level of crab fishermen
X2	= experience as a crab fisherman
X3	= the number of members of the small crab fisherman's household
X4	= household income of crab fishermen, and
X5	= crab fisherman household expendituree
	= error

3. Results and discussion

3.1. Household income of crab fishermen

In Table 1 shows that the average total income of fishermen from catching crabs is IDR. 19,492,091 per year. The income is obtained from the number of crabs catches multipliedby the price of the crab per kg. The price of crab at the fisherman's level is IDR 60,000 per kg when compared to the price at the collector's level because the crab has gone through a processing process, namely by separating the meat from the crab shell. The crab meat is distributed to Surabaya at a price of IDR 500,000-600,000 per kg. The contribution of income from crab catch is quite high at 72.07% of the total household income. This condition proves that crabs are the main source of income for fishermen in the research location. Therefore, to maintain the sustainability of this potential resource, efforts are needed such as the conservationof crab habitat and local regulations *(awiq-awiq).*

In addition to catching crabs, crab fishermen carry out fishing activities around their homes. The production costs incurred by crab fishermen in catching fish that are calculated are only variable costs, while fixed costs have been calculated in crab catching activities because the tools and fishing fleet used are the same both for catching crabs and for catching fish. The dominant catches (production) are stingrays, oras, mullet, langgor, and totek. The frequency of fishing for crab fishermen for fishing is lower than for catching crabs because crab fishing activities are the main livelihood for fishermen in meeting basic needs.

In addition to earning income from the catch, crab fishermen also earn outside income as fishermen to meet household needs, both food and non-food needs. There are only 2 fisherman households (6.67%) who work outside to earn income. This condition indicates thatlimited employment opportunities in coastal villages have become a central issue so far. But on the other hand, there are also higher job opportunities in coastal villages, only working as fishermen, so that time for other activities is not carried out.

Income from other sources (PKH and BLT) will also help small crab fishing households, especially from government assistance, especially the poor to help with theirdaily needs, especially during the COVID-19 pandemic, which is valued at IDR 2,300,000 peryear. Total income from catching crab and fishing activities *(on fishing)* and income from outsideas a fisherman *(non-fishing and other sources)* is presented in Table 1 below.

Table 1. Total income of crab fisherman households per year in East Lombok Regency, 2021.

Type of Income	Total (IDR)	Percentage (%)
Income on fishing crab	19,492,091	72.07
Income on fishing fish	4,138,324	15.30
Income non-fishing	1,116,000	4.13
Income from other sources (PKH and BLT)	2,300,000	8.50
Total Income	27,046,415	100.00

Table 1 shows that the average household income of crab fishermen is 27,046,415 per year or 2,253,868 per month. The monthly income of fishermen is higher than the Regional Minimum Wage (RMW) for the Province of NTB in 2021, which is IDR 2,183,883 permonth.

3.2. Crab fisherman's household expenditure

The household expenditure of crab fishermen includes food and non-food expenditures. Total household expenditure of IDR 18,389,533 per year is allocated for food expenditure of IDR 6,922,800 (37.65%) and non-food expenditure of IDR 11,466,733 (62.35%).

3.3. Food expenditure

The proportion of household expenditure on food is an indicator of food security in thehousehold. Poor households use no less than 70% of all expenditures for food expenditure and52% of them for rice.

Based on the allocation of expenditure on types of food to the total staple food expenditure of crab fishermen in Pemongkong Village, East Lombok Regency, the highest expenditure was used for purchasing staple food (rice), which is 52.24% of total income,while expenditure on fish was ranked second, that is 5,08% of total income. This shows that crab fishing households continue to consume fish. That means they do not sell all of their catch. In detail, the pattern of food expenditure and the percentage of fishermen's household income is presented in Table 2.

Table 2. Average food expenditure of crayfish fishermen per year in East Lombok Regency, 2021.

Type of	Expenditure (IDR/Year)	Percentage (%)
Rice	3,616,000	52.24
Fish	352,000	5.08
Meat	198,000	2.68
Eggs	320,000	4.62
Vegetables	348,800	5.03
Fruits	252,800	3.65
Cooking Oil	316,800	4.58
Seasonings	340,800	5.00
Granulated Sugar	308.800	4.46
Coffee	344,000	4.98
Instant Food	176,800	2.56
Tobacco/cigarettes	348,000	5.03
Total	6,922,800	100.00

Meanwhile, food expenditure which has a high proportion, is also vegetables and tobacco/cigarettes, which are 5.03%. Cigarettes or tobacco are usually consumed when fishermen are not fishing or fishing.

3.4. Non-food expenditure

Non-food expenditures in small fisherman households include expenditures for education, health, recreation, house repairs, clothing, electricity, water, and transportation. Small fishing households in Pemongkong Village spend 24.47% of the total non-food expenditure. Expenditures for transportation costs, namely the purchase of fuel (gasoline) ranked first at 39.77%. This shows that crab fishing households have a high level of mobility, such asvisiting family in other areas and social activities. Then for the cost of maintaining tools and equipment fishing fleet is 32.05%, which is used in boat repair and maintenance, house repair and maintenance is 4.83% and purchasing fuel for cooking (LPG) 4.20%. Then education and health rank fifth and sixth, with a proportion of 3.23% and 2.98%, respectively. This shows that small fishing households are committed to pursuing higher education and maintaining better family health.

Table 3. Non-food expenditure of crayfish fisherman's food per year in East LombokRegency, 2021.

Type of expenditure	Total expenditure (IDR/Year)	Percentage (%)
Electricity Tariff	310,000	2.70
Water Tariff	274,000	2.39
LPG	482,000	4.20
Gasoline	4,560,000	39.77
Education	370,667	3.23
Health	342,000	2.98
Clothes	93,000	0.81
Savings/*Arisan*	393,600	3.43
Tax and Insurance	148,333	1.29
Home Improvement	553.333	4.83
Maintenance of fishing gear and fleet	3.675.000	32.05
Motorcycle/Car Service	146.000	1.27
Credit/Quota	118.800	1.04
Total	11.466.733	100.00

3.5. Crab Fishermen's Exchange Rate (FER)

The concept of fisherman's exchange rate used is basically an indicator to measure the relative welfare of fishing communities. Therefore, this indicator is also a measure of the ability of fishermen's families to meet their subsistence needs. This FER is also known as the Subsistence Terms of Trade. According to [5], FER is the ratio of total income to total household expenditure of fishermen over a certain period of time. In the past, the calculation of fishermen's welfare was measured simply by comparing income and expenditure, but the Ministry of Marine Affairs and Fisheries continues to make improvements to the calculationof fishermen's welfare by setting FER as a standard.

The FER concept was developed to determine indicators of the welfare of coastal communities with reference to the concept of poverty mapping. Furthermore, this povertymap uses 3 approaches, namely (1*) the poverty headcount index*, which describes the percentage of the families population which living in per capita consumption expenditures below the poverty line, (2) *the poverty gap index*, namely the depth of poverty in an area isthe difference between the average income of the poor and the poverty line, and (3*) the severity of poverty* which shows the severity of poverty in an area.

FER is the ratio of total income to total household expenditure in a certain period (BPS, 2008). Based on this definition, the FER of small crab fishermen households in Pemongkong Village, East Lombok Regency, is presented in Table 4.

Table 4. FER of crayfish fishermen households in East Lombok Regency, 2021.

Description	Value
Income (IDR)	27,046,415
Expenditure (IDR)	19,389,533

Table 4 shows that the size of the fishermen's exchange rate (FER) for crab fishermen in East Lombok Regency is greater than 1. That means the crab fishing households have a sufficient level of welfare to meet primary needs and have the potential to meet non-primary needs or save. The same condition is also from the results of research by [10] the exchange rate of seaweed fishermen, which is 1.07, means that the welfare level of fishermen is included in the fairly prosperous category. This is because most of the seaweed cultivation fishermen have been able to meet the production needs of their cultivation business and their subsistence needs or the daily consumption needs of the family from the total income received, even fishermen are able to save.

Meanwhile, based on the level of welfare, there are 93% of fishermen who have a FER value of more than 1 and 7% have a FER value less than 1. The dominance of an FER value of more than 1 is also supported by the socio-economic conditions of coastal communities in the study area. Most of them have permanent residences and adequate infrastructure.

3.6. Factors affecting the level of welfare of crab fisherman's household

The factors that influence the level of household welfare of crab fishermen include education, experience as a fisherman, number of family dependents, household income, and household expenditure. In measuring the accuracy of the model from adjusted $R^{2,}$ it shows that the independent variables in the model of the crab fisherman welfare function presented can explain the percentage of the contribution of the independent variables (education, experience, number of family dependents, income, and household expenses) of 99.1 % of the variation (up anddown) of the dependent variable (welfare level), while 0.9% is a contribution from other factors that are not included in the model (Table 5).

The results of the F-test indicate that the function of the welfare level of crab fishermen has a significant effect on an error of 5%. It can be interpreted that all independent variablessimultaneously have a significant effect on the function of the welfare level of the small crab fisherman household. Furthermore, the individual influence (partial) from each independent variable is used t-test and regression value.

Table 5. Analysis of Factors Affecting Welfare Levels Crab Fisherman's Household in EastLombok Regency, 2021.

Independent variable	Regression coefficient	t-hit	Sig
Education level	-0.006	-0.653	0.520
Fisherman experience	-0.002	-0.598	0.556
Total family dependents	-0.004	-0.275	0.786
Household income	6.245E-8	45,164	0.000
Household expenditure	-8.732E-8	-9,295	0.000
Constant	1.451	7.372	0.000
F-count = 545.145			
$R^2 = 0.991$			

The variable level of education has no significant effect on the welfare of fishermen because generally coastal communities (fishermen crabs) receive knowledge from generation to generation from their parents, who generally also work as fishermen. The data shows that the distribution of formal education of small crab fishermen is 53%, who do not go to school until they finish elementary school. The results of [11] show that the level of education has no significant effect on the welfare of the mini purse seine fisherman's family. Likewise, by the study of [10]. Education does not affect the income of fishing fishermen in Galesong Village, Galesong District, Takalar Regency, but it is different from the study by [12] in Tanzania that education affects fishermen's income.

The fisherman's experience variable also has no significant effect on the level of fishermen's welfare. That means the experience of fishermen in catching crabs, both those with low experience of 5 years and 40 years, does not determine the level of fishermen's welfare. The activity of catching crabs is related to production costs, the number of catches, the price of crabs which will determine income. Indirectly these variables determine the level of welfare. Results of research [13] that the age variable has a negative effect on the fisherman's exchange rate variable. Increasing age will reduce the exchange rate of artisanal fishermen at the Pekalongan Fishery Port. This result is in line with research [14] which revealed that age has a negative effect on the welfare of traditional fishermen. The experience of fishermen has no effect on the income of traditional fishing fishermen in Takalar Regency [15].

The variable number of family dependents has no significant effect on the welfare of fishermen and the value of the regression coefficient is negative. That means the greater family dependents, the lower welfare of crab fishermen. In contrast to the research results of [16], if the number of family members increases by IDR. 1 person, then the income of fisherwomen increases by IDR.360,493. The household income variable has a significant effect on the welfare of crab fishermen That means the level of income greatly determines the living conditions of fishermen. Fishermen's income is sourced from *on fishing* (crab and sea fish) and *off fishing* activities as manual labor as well as income from *other sources* (PKH, BST, BLT). According to [10] the total income variable has a positive influence on the fisherman's exchange rate variable. This means that with increased income, the exchange rate of artisanal fishermen at the Pekalongan Nusantara Port Center will also increase. Kusumayanti et al. (2018) in their research also reveals that the income level of fishermen has a positive effect on the welfare of fishermen [17].

The fisherman's expenditure variable has a significant effect on the welfare of crab fishermen with the regression coefficient value being negative, meaning that the higher the fisherman's household expenditure for food and non-food, the lower the level of welfare of crab fishermen. Results of this study are supported by research by [13], increased spending will reduce the exchange rate of artisanal fishermen at the Pekalongan Archipelago Fisheries Port. These results are in accordance with the results of the study of Kusumayanti et al. (2018), where the total cost is stated to have a negative effect on the welfare of fishermen [17].

4. Conclusion

Based on the results of research and discussions that have been carried out, it can beconcluded: (1) The household income of crab fishermen is IDR 27,046,415 per year, which comes from income from catching crabs for IDR 19,492,091, fishing for IDR 4,138,324, income as laborers for IDR 1,116,000, and other sources for IDR 2,300,000. (2) The household expenditure of crab fishermen is IDR 15,098,533 per year, which includesfood expenditure for IDR 6,922,800 and non-food expenditure for IDR 8,175,733. (3) The FER of the small crab fisherman household is 1.86. that means the crab fisherman household is included in the indicator of prosperity, (4) The factors that significantly affect the level of welfare of crab fishermen are household income and expenditure, while the level of education, experience, and number of family dependents are not significantly different.

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