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The determinants of small-scale fishermen's income in Padang City, Indonesia

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Article Info

Abstract

Small-scale fisheries play an important role in supplying fish protein for the community of Padang city. However, the incomes of fishermen are still far from expectation. This study investigates the effect of fishing input, socioeconomics, demography, and relationship with government agent on fishermen income in Padang. 150 fishermen responded to this study and returned the questionnaire. Using multiple regression analysis, we found that Engine Power (EP), Fishing Cost (FC), Fishing Production (FP), Boat Ownership (BO), and Fishermen Education have a significant effect on fishermen income.Specifically, FP (t statistics 7.954) was registered as the highest contribution on fishermen income, while the GL (t statistics -2.798)was found to have lowest effect on fishermen income, yet direction effect is not expected.

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Introduction

Many millions of people live along coastal zones and rely on the ocean and its resources for sustenance, livelihood, and culture continuity (Kittinger, 2013). The fishery and aquaculture sector is a source of income and livelihood for millions of people around the world (Adili & Antonia, 2017). It is hard to ignore the importance of fish for Indonesia. Around 95 percent of Indonesians who engaged in fishing activities are small-scale fisheries(Sudarmo, Baskoro, Wiryawan, Wiyono, & Monintja, 2015). Padang is a city located on the coast of West Sumatra Province, and has 11 sub-districts or *Kecamatan*.. The fishermen operating in territorial waters of Padang are small-scale fishermen. The number of fishermen in Padang has been increasing over the time. However, it decreased from 7,076 in 2016 to 7,066 in 2017. The fish production also increased from 20,612,8tons with a value of Rp. 435,16 billion (US $ 29,001,066.6 million)in 2016 to 20,814,9 tons with a value of Rp. 439,10 billion (US $ 29,267,333.3 million). Like in other areas in Indonesia, fishermen in Padang are also dominated by small-scale fishermen. Hendrik and Zulkarnain (2016) argue that fishing activities in the west coast waters of Sumatra use various types of fishing gear, such us trolling, hand line and purse seine. Most of the fishing activities are supported by fishing gear using a motor boat (Hendrik & Zulkarnain, 2016). The Padang city map as a study area isshown in Figure 1 below.

The study of determinants of fishermen income has been conducted by previous studies (Adili & Antonia, 2017; Al Jabri, Collins, Sun, Omezzine, & Belwal, 2013; Rahman, Haque, & Rahman, 2011). Adili and Antonia (2017) investigated the factors affecting fishermen income and concluded that the fishing gear, number of laborers, and fishing season are significant factors affecting fishermen income in Tanzania. However, the educational level and financial support do not influence fishermen income significantly. In addition, Al Jabri et al.(2013) studied the
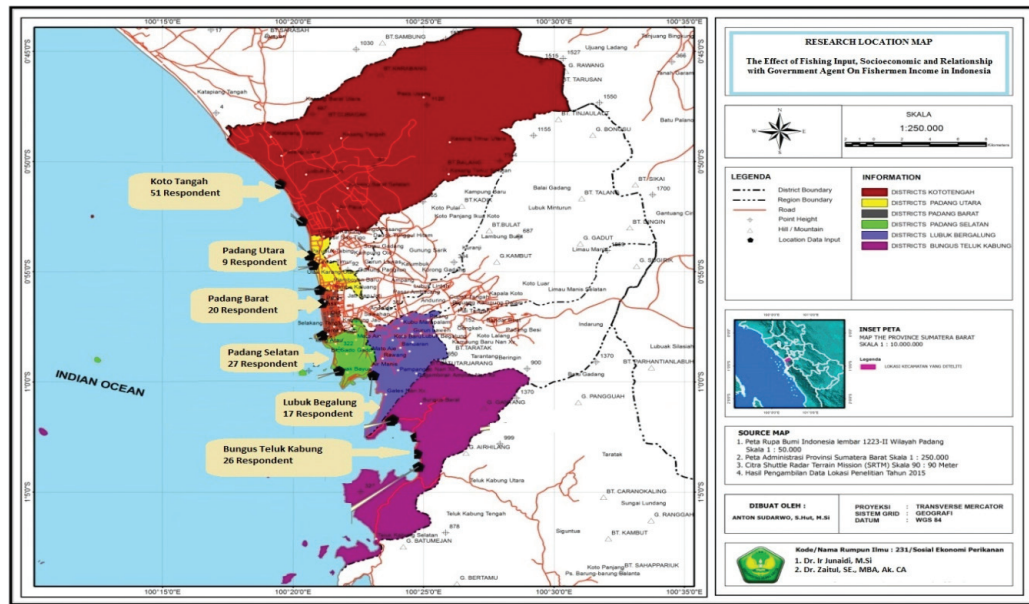
Figure 1 Study Area
Source: Padang City Spatial Plan in 2010

determinants of fishermen income in Oman and classified the determinants into three groups: fishing inputs and catch, socioeconomic and demographic, and extension and R&D. Al Jabri et al. (2013) concluded that engine power, boat length, fishing cost, fishing trip, difficulty in obtaining ice, average weekly catch, number of crew, and use of fiberglass boat are significant determinants of fishermen income. In addition, income sharing, board ownership, partnership in other boat and fishermen age have a significant relationship with fishermen income (Al Jabri et al., 2013). Further, exchange information and cooperation with MAF and being strongly involved with MAF also influence fishermen income significantly. Rahman et al. (2011) examine the effect of age, education, family members, family land holdings, pond size, experience of fishing farming, training on fish farming and access to information on fish farming on fishermen income among fishermen in Bangladesh. Family land holdings, pond size, training on fish farming, and access to information on fish farming are significant factors affecting fishermen income.

There is lack of studies investigating fishermen income using Indonesian fishermen data (Hendrik & Zulkarnain, 2016). Most studies using Indonesian data focus on other aspects, such as fishermen's poverty (Darwis, Elfindri, Syafrizal, & Mahdi, 2015), socioeconomic characteristics of small-scale fishermen (Sudarmo et al., 2015), and fishermen management system (Tan, 2014). Even though, Hendrik and Zulkarnain (2016) conducted a study on fishermen income, the study emphasized fuel price fluctuation. Therefore, there is the need of a more comprehensive study to investigate the determinants of fishermen income in Indonesia's setting. This study would probably enrich fisheries economic literature due to the uniqueness of Indonesia' fisheries environments compared to other countries. For instance, there is no fishing

on Friday and women are not allowed to participate.

This study aims to investigate the effect of fishing input and catching, socioeconomics and demographics, and exchange of information and involvement with government agents on fishermen income. This paper is organized as follow: the first session is about background of the study. The second is theoretical aspects. Further, the third session discusses methodology. The fourth session is about results and discussion. The study is finally closed by conclusion and recommendation.

Literature Review

Fishermen Income

Fishermen's income is an objective of fisheries management system (Cunningham, 1994). Fishing management is characterized by multiple and conflicting objectives, multiple stakeholders with divergent interests and high levels of uncertainty about dynamics of the resources being managed (Smith, Sainsbury, & Stevens, 1999). Cunningham (1994) argues that it is hard to understand the determinants of fisheries income in the situation within the standard fishery economics model. Panayotou (1980) stated that fishermen income depends on the opportunities income. Copes (1988) offered six reasons why opportunities income may be low in small-scale fisheries. These are: (1) the isolation of fishing communities, (2) the existence of surplus labor due to productivities gains, (3) capital asset fixity, (4) lifestyle preferences, (5) high liner illusion, and (6) perverse assistance. Al Jabri et al., (2013) classified determinants of fishermen income: fishing input and catch, socioeconomics and demographics, and relationship with government agents.

Fishermen Input

Al Jabri et al.(2013) state that there are three categories of factors affecting fishermen's income: input factor, socioeconomic and demography and fishermenextension and R&D. Fishermen's input refers to the all fisheries economic resources used for fishing activity. This includes engine power, boat length, fishing cost, fishing trips, etc.(Al Jabri et al., 2013). Engine power is the power of an engine to push the boat to get to the fishing ground quickly. The moreengine power , the more quickly a soat arrivesat the fishing ground. Usually, fishermen who have more engine power, catch more fish and finally get more income., Boat length isa measure ofcapacity for fish caught. Agreater length of boat, means fishermen have more space for stocking the fish. The artisanal fishermen failed to compete with the larger powered boats. Therefore, it may bring a lot of fish and finally more income. Gillnetlengthis length of net used by fishermen. The longer the net, the more opportunities to catch fish and more income will be earned by fishermen.

Fishing cost refers to the money spent by fishermen to do fishing activities. With more cost incurred, fishermen can go far from coastal areas and have an opportunity to catch more fish and finally earn more income.. Further, fishing trips are defined as the number of setting and hauling activities. The more trips that fishermen do, the more production and thus, the more income. The next factor is the number of fishing crew. The higher the number of fishing crew, the faster hauling is done. This factor will increase fishing production and finally result in more income. Finally, all input will produce the output in terms of fishing production. Fishing production refers to the quantity of fish.

Fishermen Socioeconomic and Demographic

Fishermen socioeconomic and demographic variables are significant factor affecting fishermen income, such as income sharing with crews, age and partnership in other boat (Al Jabri et al., 2013). Al Jabri et al. (2013) identified several factors from socioeconomic and demographic: income sharing with crews, boat ownership, partnership in other boat, fishermen age, literacy level of fishermen, relationship with crew, and alternative sources of income. Boat ownership refers to the fishermen having their own boat to be used in fishing operation. Due to boat ownership, the fishing income will be distributed more to owner of boat. Therefore, the fishermen will earn more income. Fishing experience is defined as long tenure of fishermen engaging in fishing activities. With more experience, fishermen know a lot about fishing activities. This experience will help them to catch more fish and finallythis will increase fishing production as well as fishermen income. Further, fishermen education is the level of education of fishermen. With level of education, they can plan, organize and control all aspects of fishing well. Most of the time, the higher the fishermen education, the higher the fishing production and therefore, increase of income. The relationship between fishing crew is defined as a family relationship. A fishing crew with good family relationship has more commitment to increase fishing production. Thus, fishermen income would

increase. Other fishermen income refers to other income earned by other family members beside fishing income. Family members help to earn additional income and this condition will increase fishermen income. A family member is defined as the number of family burden in one family. The higher the number of family burden, the higher the fishermen income. This is because they show more motivation to increase their income. They know that they have to cover all costs incurred in the family.

Exchange of Information and Participation

The relationship with a government agent,the last factor, is information exchange and participation in government agent activity. Exchangeof information and cooperation with the government agent is useful for initiatives in order to get updated information regarding fishing matters. With updated information, fishermen are expected to experience an impact on fishermen income (Al Jabri et al., 2013).In concluson, fishermen income could be explained as havinga good relationship and open communication with extension services. In addition, discussion with government agent brings better knowledge of fishing areas, awareness of better tools and technology, information about financial schemes, and realising promising opportunities. These condition would create the opportunities to have more fishing production and finally fishermen income.

Methodology

The object of this study is small-scale fishermen in Padang City. One hundred and fifty fishermen are included as sample of the study. Primary data used were gathered by doing a surveyduringFebruary, 2018. There are 15 independent variables and one dependent variable,which is fishermen incomemeasured by rupiah kilogram per week. The independent variables are grouped into 3 categories: inputs of fishing, socioeconomics and demographic, and relationship with government agent. Fishing input, and socioeconomics and demographics are ratio and ordinal variables.

Boat ownership (BO) is conceptualized as boats used in fishing activities that are neither owned by the fisherman itself nor owned by other parties.Fishermen education (FeD) is the level of formal education possessed by fishermen.Fishing experience (FE) is the duration of being a fisherman in units of years, while fishing crew (FC) is the crew of the boat involved in fishing activities whether they have family relationships or not.

In addition, the relationship with a government agent is 5-scaleitems.Thisstudyusesthemultipleregressionmodelusing the SPSS. The relationship with government agent was firstly tested for validity and reliability. Multicollinearity test is conducted to see whether there is anyrelationship among the independent variables. F statistic is applied to see the model fitness. The t statistic or significant value is used to see the effect of independent variables on dependent variable.

Results and discussion

One hundred and fifty small-scale fishermen responded in this study. Based on location, 26 fishermen or 17.33percent are from *BungusTaluakKabuang*area, and 17 fishermen or 11.33 percentare from *LubukBegaluang*. 27 fishermen or 18.00 percent are from *Padang Selatan* and 20 fishermen or 13.33 percent are from *Padang Barat* area. From area of *Padang Utara* and *Koto Tangah* are 9 and 51 fishermen respectively. The age of respondent is categorized as 18 to 30 years (20 fishermen or 13.33%), 31 to 40 years (36 fishermen or 24.00%), 41 to 50 years (36 fishermen or 40.00%), and more than 50 years old are about 60 fishermen or 40.00 percent. Further, all fishermen are male and 141 (94%) of 150 fishermen are married and the rest single. The detail of demographics data is shown in Table 1.

Variable of relationship with government agent is interval using 5-scale. Therefore, the validity and reliability test must be conducted before regression is run. The validity test is using the KMO and Bartlett test(Bartlett, 1950; Kaiser, 1970). The result shows that two variable represented the relationship with government agents: information exchange and participation in government agent. Exchange information consists of three items and all items are valid with KMO value of .654 (greater than .5) (Hair, William, Babin, & Anderson, 2014). Significant value of Bartlett test is .00 and less than .01. Loading factor is also greater than .5. In addition, test of reliability is using the Cronbach Alpha (Cronbach, 1951) and the value must be greater than .7. Theresult shows that the variable is reliable. The mean value of information exchange is 4.033 (higher). The second variable of relationship with government agent is involvement. The validity test also shows that the variable is valid because of KMO and Bartlett test is satisfied. Further, the reliability test also indicates that the variable is reliable due to the value of Cronbach Alpha greater than .7 (Nunnally, 1978). Finally, the mean value of participation in government agent is higher.

This study uses the multivariate analysis and the model must be free from the multicollinearity problem (Sekaran, 2003). Tolerance and VIF are applied to see whether there is a multicollinearity problem. The multicollinearity problem does not exist if the tolerance value is greater than 1 and VIF value must be less than 10 (Gujarati, 1995). The result shows that there is no multicollinearity problem. Besides, this study also uses the Pearson correlation to support the conclusion that there is no multicollinearity problem (see Table 3 and 4). The next

classical assumption is heteroscedasticity. The heteroscedasticity exists when unequal variance is present and it is one of the most classical assumptions (Hair et al., 2014). This problem can be identified using White test (White, 1980). In addition, Wooldridge (2003) recommended that heteroscedasticity corrected regression can be used if heteroscedasticity is identified. The result shows that there is a heteroscedasticity problem (p value = .00007). Therefore, this study applies the heteroscedasticity corrected regression for the final result (see Table 5).

The regression result is demonstrated in table 5. The multivariate model is feasible because statistic is 36.337 with p value of .00. In addition, the ability of independent variables explains the dependent variables 82.39 percent and the rest is explained by other variables. The first independent variable is engine power (EP). The effect of engine power on the fishermen income is positively significant due to the p value of this variable being .0004, which is less than .05. Therefore, it indicates that the higher the engine power, the higher the fishermen income.

The second variable does not have a significant effect on fishermen income. Boat length (BL) has p value higher than .10 (.332). The possible explanation why boat length does not have a significant effect on fishermen income is that most boatsare not in good condition. In fact, some of them are old. Therefore, it is difficult for fishermen to go far from the seashore. In addition, the third variable (Gillnetlength) has lower p value (.006), which means that there is a significant effect of gillnetlength (GL) and fishermen income. However, the signal effect is negative which means the longer the gillnet length, the lower the fishermen income. It is difficult to explain why gillnet length has a negatively significant impact on fishermen income, but it may be related to the condition of the gillnet. The most of fishermen have torn and tangled gillnets.

Further, fishing cost (FC) has a positively significant impact on fishermen income. Fishermen who spend more money on fishing activity, earn more income. Fishing cost consists of direct cost and non-direct cost. However, fishing trips (FT) do not have a significant relationship with fishermen income. Fishing production (FP) has a positive relationship with fishermen income. $p$value of this variable is .0001, which ismuch less than 10 percent. This finding indicates that fishermen who can catch more fish will gain more income. There is a marketing skill of fishermen here and thus they can market their produce well. Finally, they gain more income. In contrast,boat crew do not have a significant effect on fishermen income due to higher p value of this variable (.343).

Table 1 Demographic Data

No	Demography Data	Categories	Number	%
1	Location	Bungustaluakkabung	26	17.33
		Lubukbegaluang	17	11.33
		Padang selatan	27	18.00
		Padang barat	20	13.33
		Padang Utara	9	6.00
		Koto tangah	51	34.00
2	Age	18 sd 30	20	13.33
		31 sd 40	36	24.00
		41 sd 50	36	24.00
		> 50	60	40.00
3	Gender	Male	150	100.00
		Female	0	0.00
4	Married Status	Married	141	94.00
		Single	9	6.00

Table 2 Validity, Reliability and Means Value of Variables

Variable	Item	valid	KMO	Sig Barlett	Loading Factor	CA	Means
Exchange information	3	3	.654	.000	.753 to.903	.795	4.033
Involvement	3	3	.638	.000	.782 to .885	.746	4.058

Table 3 Result of Multicollinearity

Variable	Tolerance	VIF
Engine Power (EP)	.353	2.831
Boat Length (BL)	.433	2.312
Gill Net Length (GL)	.497	2.013
Fishing Cost (FC)	.567	1.763
Fishing Trip (FT)	.856	1.169
Fishing Production (FP)	.350	2.859
Boat Crew (BC)	.314	3.188
Boat Ownership (BO)	.448	2.231
Fishing Experience(FE)	.674	1.483
Fishermen Education (FeD)	.893	1.120
Relationship with Fishing Crew (RFC)	.774	1.292
Other Fishermen Income (OFI)	.733	1.364
Family Members (FM)	.751	1.332
Exchange Information (EI)	.553	1.808
Participation with Government Agent (PGA)	.662	1.510

Table 4 Correlation Matrix of Independent Variables

	EP	BL	GL	FC	FT	FP	BC	BO	FE	FeD	RCF	OFI	FM	EI	PGA
EP	1														
BL	.715**	1													
GL	.588**	.465**	1												
FC	.501**	.439**	.289**	1											
FT	.035	-.109	.074	-.120	1										
FP	.203*	.019	.526**	0.92	.371**	1									
BC	.182*	.091	.374**	.165*	.182*	.637**	1								
BO	.031	.054	-.085	.120	.029	.013	.097	1							
FE	-.059	-.146	-.164*	-.065	.024	-.159	-.118	.068	1						
FeD	-.022	-.017	.002	-.045	-.020	.039	.084	.020	-.194*	1					
RCF	-.129	-.053	-.081	-.196*	-.170*	-.203*	-.064	-.064	-.205*	.226**	1				
OFI	.122	.001	.238**	.044	.179*	.565**	.424**	.017	-.045	-.068	-.209*	1			
FM	.062	.002	.007	.124	.114	.108	.000	-.043	.384**	-.171*	-.192*	.87	1		
EI	.055	-.021	.196*	-.260*	.161*	.424**	.213**	-.045	-.180*	.006	.020	.192*	-.100	1	
PGA	.003	.070	-.028	-.223**	.029	-.090	-.135	-.092	-.108	.054	.131	-.065	.109	.402**	1

Note: ** Correlation is significant at the .01 level (2-tailed)
* Correlation is significant at the .05 level (2-tailed)

Table 5 Results of Multiple Regressions

Variables	Coef Reg	t stat	p	Conclusion
constant	-985722	-2.400	.0178**	
Engine Power (EP)	**15645.300**	**3.665**	**.0004*****	**Significant**
Boat Length (BL)	8934.920	.975	.332	Not-significant
Gill Net Length (GL)	**-132.822**	**-2.798**	**.0059*****	**Significant**
Fishing Cost (FC)	**.192**	**4.635**	**.0001*****	**Significant**
Fishing Trip (FT)	3694.910	.259	.796	Not-significant
Fishing Production (FP)	**4048.530**	**7.954**	**.0001*****	**Significant**
Boat Crew (BC)	58788.200	.953	.343	Not-significant
Boat Ownership (BO)	**243549.000**	**4.343**	**.0001*****	**Significant**
Fishing Experience(FE)	-1649.340	-1.337	.183	Not-significant
Fishermen Education (FeD)	**21180.600**	**3.653**	**0.0004*****	**Significant**
Relationship with Fishing Crew (RFC)	-8079.260	-.334	.739	Not-significant
Other Fishermen Income (OFI)	.000	.000	1.000	Not-significant
Family Members (FM)	31896.190	1.396	.168	Not-significant
Exchange Information (EI)	48768.600	1.492	.138	Not-significant
Participation with Gov. Agent (PGA)	22275.700	1.576	.118	Not-significant
Fstat (F sig)			36.337	
R square			.8239	
Durbin Watson			1.893	

*Note: * $p < .01$, ** $p < .05$, *** $p < .01$.*

Boat ownership (BO) has a positively significant relationship with fishermen income (*p* value of .036). Fishermen who own boatstendto increase their income. However, fishermen experience (FE) does not influence the fishermen income. In addition, fishermen education (FeD) has a positively significant relationship with fishermen income. The fishermen with higher education level tend togain more income. Other variables; Relationship with fishing crews (RFC), other fishermen income (OFI), family members (FM), exchange information (EI) and participation with government agent (PGA), do not have a significant effect on fishermen income.There are three group variables in this study; fishing input, socioeconomic and demography, and relationship with government agent. Significant variablesare engine power (EP), fishing cost (FC), fishing production (FP), boat ownership (BO), and fishermen education.

Engine power has a positive significant effect on fishermen income. This finding is aligned with findings of Al Jabri et al. (2013) who also found a positive effect of engine power on fishermen income. The significant variable is fishing cost and it is also supported by Al Jabri et al. (2013). Al Jabri et al. (2013) found a negative relationship with fishermen income. However, this study shows a positive relationship. Fishing production also has a positive relationship with fishermen income and implies that fishermen in Padang city are able to do marketing management. Therefore, it positively contributes to ishermen income. From socioeconomics and demographics, only boat ownership and education have a significant effect on fishermen income. Boat ownership has a positive relatioship with fishermen income but this finding is not supported by previous research (Al Jabri et al., 2013). In contrast to findings of Al Jabri et al. (2013), fishermen education has a positive relationship with fishermen income. Furthermore, the result of the study revealed R square .8239 meaning that the variances of fishermen income are explained by the 15 independent variables 82.39 percent.

Conclusion and Policy Recommendation

The study on fishing input, socioeconomics, demography, and relationship with government agent and their effect on fishermen income in Padang was carried out. Some conclusions that can be drawn are that fishing production (FP) registered as the highest contribution on fishermen income, followed by fishing costs (FC), boat owner (BO), engine power (EP), fishermen education (FeD), and gillnet length (GL) respectively.In addition, the variances of fishermen income are shown as 82.39 percent by the 15 independent variables.

Policy recommendation could be addressed to government agencies. In order to increase the income of fishermen in Padang in future, it is recommended to improve the aids of boat, engine, fishing training, as well as fishing operational costs.

Conflict of Interest

There is no conflict of interest.

Acknowledgments

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