Marine Fisheries P-ISSN 2087-4235
Vol. 11, No. 2, November 2020 E-ISSN 2541-1659
Hal: 121-133

SKALA EKONOMI DAN EFISIENSI PERIKANAN TANGKAP SKALA KECIL DI DESA KURAU, KABUPATEN BANGKA TENGAH

The Economies of Scale and Efficiency of Small-Scale Capture Fisheries in Kurau Village, Central Bangka Regency

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Diterima: 8 September 2020; Disetujui: 16 April 2021

ABSTRACT

Evaluation on marine and fisheries development program in the regional level is fairly limited, especially in terms of defining the economic scale and efficiency of fishing industries. This study investigated the economic scale and efficiency of small-scale capture fisheries as well as learned how the socio-economic variables have influenced the small-scale capture fisheries business in the Kurau village, Central Bangka regency. A quantitative method was used by applying multiple linear regression models to adopt the Cobb-Douglas production function. This study found that the economies of scale in the small-scale fisheries experienced a decrease in scale of production. This study also found that the results of allocative efficiency in this small-scale fisheries business were relatively inefficient. Other findings of model estimation indicated that the variables of capital, labor, and fishing distance had a positive and significant effect, while the variables of age, experience, and educational level of fishermen hadno significant effect on small-scale fisheries production. The main factor that becomes an obstacle for local fishermen was technology; therefore, technology assistance and support from the government are needed as a policy to improve small-scale capture fisheries business and fishermen welfare.

Keywords: *Economies of scale, efficiency, small-scale fisheries, socio-economic, production.*

ABSTRAK

Evaluasi pembangunan subsektor perikanan dan kelautan di tingkat daerah relatif terbatas, terutama dalam menentukan skala ekonomi dan efisiensi usaha perikanan tangkap. Informasi ini nantinya dibutuhkan untuk menentukan tingkat kesejahteraan nelayan di tingkat daerah. Studi ini menyelidiki skala ekonomi dan efisiensi perikanan tangkap skala kecil, serta untuk mengetahui bagaimana variabel sosial ekonomi mempengaruhi produksi bisnis perikanan tangkap skala kecil di desa Kurau, Kabupaten Bangka Tengah. Metode menggunakan pendekatan kuantitatif dengan menerapkan model regresi linier berganda dengan mengadopsi fungsi produksi Cobb-Douglas. Hasil studi ini menunjukkan bahwa skala produksi menurun pada usaha perikanan skala kecil. Hasil studi ini juga menunjukkan bahwa efisiensi alokatif dalam bisnis perikanan skala kecil relatif tidak efisien. Temuan lain dari estimasi model menunjukkan bahwa variabel modal, tenaga kerja, dan jarak penangkapan ikan memiliki efek positif dan signifikan, sedangkan variabel umur, pengalaman, dan tingkat pendidikan nelayan tidak berpengaruh signifikan terhadap produksi perikanan skala kecil. Faktor utama yang menjadi kendala bagi nelayan lokal adalah teknologi, oleh karena itu bantuan teknologi dan dukungan dari pemerintah diperlukan sebagai kebijakan untuk meningkatkan usaha perikanan tangkap skala kecil dan kesejahteraan nelayan.

Kata kunci: Skala ekonomi, efisiensi, perikanan skala kecil, sosial ekonomi, produksi

INTRODUCTION

The main goal of national development is to achieve a balanced economic structure, i.e., a structure that has a strong industrial sector driven by an advanced and resilient agricultural sector (Dahlman 2007; and Yusoff *et al.* 2000). Agriculture is one sector that has quite a strategic role in the national economy to include maintaining food security, providing employment opportunities, supplying industrial raw materials, and serving as a source of foreign exchange (Bashir *et al.* 2019; and Dethier & Effenberger 2012).

Fishery is one of the agricultural sub-sectors after food crops, plantations, livestock, and forestry. Indonesia has an exclusive economic zone covering 200 nautical miles from the coastline and has rights to the natural resources contained therein. Therefore, this sub-sector can provide livelihoods for communities, especially fishers and other coastal communities due to its potential and high economic value (Bashir *et al.* 2019). Additionally, fishery sub-sector significantly contributes to equitable development and improvement of the community's well-being within the archipelago.(Andersen 2015; Anriquez & Stamoulis 2007; and Ismi & Budi 2020).

Indonesia has benefited from having enormous potential fisheries resources in terms of both quantity and diversity. The sustainable potential of capture fisheries resources is estimated at 12.54 million tons per year, while the potential that can be exploited (allowable catch) of 80% of MSY (maximum sustainable yield) is 10.03 million tons per year (Renstra DJTP, 2020). Nevertheless, there has been an imbalance in the level of utilization of fisheries resources between regions and types of resources (Bashir *et al.* 2019).

Sustainable development in the marine and fisheries sector has received the main priority and attention of the Indonesian government, and this can be done through efforts to conserve marine and fisheries ecosystems to increase the outputs and quality of penetration of marine and fisheries in the future. (Bashir *et al.* 2019). These efforts can also involve fishery business actors at the local level to improve the welfare of the surrounding community.

Increasing the community prosperity achieved if it has achieved an efficient economy of scale. The economic efficiency of production is very important for change in order to increase income. Economic efficiency is also very important for the economy as a whole because it means increasing the efficiency of optimal resource use at the economies scale in the fisheries sub-sector. Community welfare interpreted as an increase in community income in an area. The fisheries sub-sector is one of the potential sources of income for people living in coastal in Indonesia. According to Abowei & Tawari (2011) and Njai (2000), the fishery sub-sector functions as an income source for the community, facilitates the development of home industries, and provides jobs for many people involved in fisheries production, processing, and marketing.

Additionally, the increase in economic efficiency can be achieved if it is supported by technology and environmentally friendly. The utilization of the optimal input encourages economies of scale. In terminology, the efficiency associated with using technology appropriately is technical efficiency, the efficiency associated with using optimal input combinations is allocative efficiency, while the efficiency associated with the scale of business is economies of scale.

A large amount of Indonesia's capture fisheries production is certainly inseparable from the role of the capture fisheries sector in each province. One of the contributing provinces to the Indonesia's capture fisheries production is the Bangka Belitung Islands. The province has a strategic location bordered by the Natuna Sea to the north, the Java Sea to the south is, the Bangka Strait to the west, and the Karimata Strait to the east. This region has enormous potential for capture fisheries. With a sea area of 65,301 km², the average production of fishery resources in Bangka Belitung reaches 499,500 tons per year (BPS Bangka Tengah 2020). This number comes from seven regencies in the province, the largest contribution comes from Belitung Regency, followed by South Bangka, East Belitung, Bangka, Central Bangka, West Bangka, and Pangkal Pinang City (BPS Bangka Tengah 2020).

The focus of the study was carried out in Central Bangka. This area has a strategic location adjacent to the Natuna Sea, but the level of fishermen's welfare is poor (Ismail, Kusasi, & Fitriana 2018). The welfare level of the most population in this region is relatively still dependent on fishery resources, so it can also be said that their main livelihood is fishermen (Ismail *et al.* 2018). The fisheries production in Central Bangka Regency in 2019 was 26,536.25 tons comprising marine fisheries, 25,068.94 tons and aquaculture, 1,467.31 tons (BPS Bangka Tengah 2020). The realization of capture fisheries production is because fishermen have already used relatively more adequate fishing gear.

As previously explained, Central Bangka Regency is an area that has relatively large potential, but capture fisheries production is still relatively low compared to other regions. In fact, in Central Bangka Regency, there are relatively many fishermen groups and cooperatives involved in fish production and marketing. During 2015-2019 the average growth in marine fishery production in this region reached 8.78 percent (BPS Bangka Tengah 2020). Koba sub-regency was the largest contributor to the fishery production with an average of 42.12 percent of Central Bangka's total production (BPS Bangka Tengah 2020). Koba sub-regency is a coastal area inhabited by households, the majority of whom are fishermen. In Figure 1, it can be seen that Koba sub-regency had largest capture fisheries production compared to other sub-regencies. The average growth of capture fisheries production during 2015-2019 reached 5.43 percent, and fishery production in this region was the most stable compared to other sub-regencies (BPS Bangka Tengah 2020). Koba sub-regency consists of eleven villages, and from our search it was found that there are two villages located in the coastal area, namely Kurau and West Kurau villages. Fishing households are dominant in Kurau Village.

Nevertheless, as narrated from data, the implementation of capture fisheries business in Koba sub-regency is still lowly. At least, there are three important factors that must be considered and can affect the success or failure of this business, i.e. (1) natural conditions, such as distance, salinity, waves, temperature, bottom waters, and sea depth; (2) the technology availability, in the sense of available technology such as fishing gear and ships, has been optimally utilized by fishermen; and (3) socio-economic conditions which include the number of fishermen's laborers, age, level of education, experience, capital institutions (such as banks, cooperatives), and markets (supply, demand and price). Assumed some of these factors are of concern in this study. There are at least six factors that are considered in influencing the production value, i.e. capital, labor, distance, age, education, and experience.

The development evaluation of the fisheries and marine sub-sector at the regional level is currently relatively limited, especially in determining the economies of scale and efficiency of capture fisheries businesses, which can also be linked to the level of welfare of fishermen at the regional level. For this reason, this study aimed to ensure the economies of scale and efficiency of small-scale capture fisheries, as well as to find socio-economic variables toward small-scale fisheries production in Kurau Village, Central Bangka Regency.

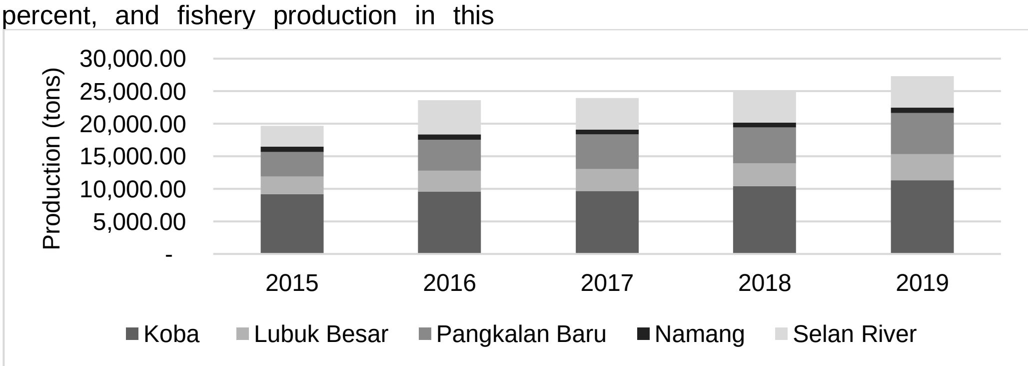

Figure 1 **T**he fisheries production in Central Bangka by sub-regency, 2015-2019
Source: BPS, Central Bangka in figure 2020 (processed)

METHODOLOGY

The study location was chosen by clustering, namely Kurau village as a coastal area where most of their livelihoods are fishermen. Kurau village is located in Koba sub-regency with abundant natural resources (fisheries), so it is also called a fishing village. The high realization of capture fisheries production is because fishermen have already used relatively more adequate fishing gear. The facilities and infrastructure for fishing in the sea are 43 fishing ships, varying in size between 3-10 GT, 810 outboard motorboats and 931 motorboats. Kurau Village is administratively located 21 kilometers from the sub-district capital and 35 kilometers from the capital city of Central Bangka, with an area of 13.06 km2, or 3.34 percent of the total area of Koba District. The village is bordered by Peyak village in the south, West Kurau village in the north, the South China Sea in the east, and Belilik village in the west. The weather and climate conditions in Kurau are not much different from those in Central Bangka Regency, which has a tropical climate that tends to be dry and wet. Air temperature varies between 23.4o Celsius to 32.1o Celsius, while humidity varies between 51-98 percent. The monthly rainfall ranges from 21.4 – 2,643.3 mm. Air temperature is determined by the high and low places from the surface and the distance from the coast, while rainfall is influenced by climatic conditions and the rotation or meeting of air currents in the area. This village has a height of 2 meters above sea level.

The data type in this study is primary data, which was collected through a questionnaire instrument. This data was obtained by cross-sectional in July-September 2019. The data collection used in-depth interview method. Sampling in the study used a simple random sampling method to overcome the bias arising in the selection of sample members. Based on observation and data reduction, the study took a sample of 100 small-scale fishing households in Kurau village. The questions in kueisoner include the profile of the respondent, the value of production, capital (equipment, boats, fuel, etc.), the number of fishermen's laborers, assets value, distance to sea, age, level of education, and experience in fishing. The descriptions and measurements of the socio-economic and production variables in this study are presented as follows Table 1.

The economies of scale determined empirically by using the production functions, profit dan biaya. Prior to that, the scale of business was estimated using the production function with the criteria of business scale in the Cobb Douglas production function is the sum of the coefficients of the input L and K. These criteria are easily applied from the Cobb-Douglas production function, this study applied the linear regression model to explain the relationship between independent and dependent variables. The model was based on the Cobb-Douglas production function with the following equation:

$$Q = \beta_0 . L^{\beta_1} . K^{\beta_2} . e^u \text{ ....(1)}$$

Equation (1) is then expressed in the form of natural logarithms to be as follows:

$$lnQ_i = \beta_0 + \beta_1 lnL_i + \beta_2 lnK_i + e_{1,i} \text{......(2)}$$

Where: Q is production total (IDR value); L is the number of labor, and K is the capital (IDR value). Based on equation (2) the economies of scale in the capture fisheries business can be determined as follows:

- If $\beta_1 + \beta_2 > 1$, the condition of the capture fisheries business is in a condition of increasing return to scale;
- If $\beta_1 + \beta_2 = 1$, the condition of the capture fisheries business is in the condition of constant return to scale;
- If $\beta_1 + \beta_2 < 1$, then the condition of the capture fisheries business is in a condition of decreasing return to scale.

Table 1 Description and measurements of variables

Variable	Description	Unit of Measurement
Q	Production value of the catch fisheries per trips	IDR value
L	The number of fishermen's workers who help in fishing	Number
K	Capital is the entire accumulated value of fishing equipment	IDR value
Dist	The distance covered from the location to the fishing ground	Mile
Age	The age of the fishermen in the sample is calculated based on years	Year
Exp	The length of experience as a fisherman based on years	Year
Edu	The education level of fishermen is based on the length of education	Year

The efficiency value can also be estimated through the marginal production condition is ∂Q/∂X = β (elasticity parameter coefficient). Calculation of the efficiency value in this study is by comparing the marginal productivity value (MP) with the value of the input used in a certain production period. The initial step is to multiply the respective marginal productivity (from the results of the Cobb-Douglas regression coefficient) by the output units then compare them to the inputs. Three possibilities occur:

- Marginal productivity value > value of input X, it is said that the use of input X is not efficient yet;
- Marginal productivity value = value of input X, it is said to have achieved efficiency;
- Marginal productivity value < value of input X, it is said that the use of input X is inefficient.

Furthermore, this study also wanted to know the effect of socio-economic variables, so that the equation to be estimated next is as follows:

$$lnQ_i = \gamma_0 + \gamma_1 lnL_i + \gamma_2 lnK_i + \gamma_3 Dist_i + \gamma_4 Age_i + \gamma_5 Exp_i + \gamma_6 Edu_i + e_{2,i} \text{ ....(3)}$$

Where: Q is total production/output (IDR value); L is the number of labor; K is capital (IDR value); $Dist$ is the distance (mile); Age is the age (year); Exp is the experience (year), and Edu is educational level (year) of the household head.

The standard procedure in applying a linear regression model must follow statistical rules, the estimation method uses ordinary least square (OLS), where the estimating variables are only to the power of one. Linear in parameters explains that the resulting estimate is a linear function of the sample. Theoretically, the OLS method will produce a valid estimation of the parameter values of the estimator model. Therefore, the stages that must be met are data normality testing, cross-sectional correlation, and heteroscedasticity. If these classical assumptions have been fulfilled, the regression results will be the best, linear, unbiased, efficient of estimation (BLUE).

The production function approach is merely a technical relationship that connects input and output factors. The production function also involves concepts that can be used in all aspects of the economy with main concepts including economic scale, efficiency, marginal productivity, the value of substitution and elasticity of substitution, and the intensity factor (Felipe & Adams, 2005; Humphrey, 1997). Therefore, the study assumes that the production function is very appropriate to be used to evaluate the economies of scale and the efficiency of small-scale fishing businesses.

RESULT

In Table 2, the study presents the data frequency distribution to describe the description of respondents consisting i.e. age; education; experience; the number of workers; wage rates; distance to fishing grounds; the work hours; capital; and production value. First, the data presents the age distribution of respondents. In general, the age of fishermen was above that of children, and included in the age group of the labor force. The effect of age on the way of thinking and physical ability of individuals to work is very large. Limited physical abilities often result in poor business continuity. The data presented shows that the average age of fishermen was around 40 years, or most of the fishermen were aged between 30-50 years, and included in the productive age that has a relatively strong physical ability to work.

The results of our study indicated that the educational level in the fishermen's activities did not seem to affect productivity. This was evidenced from the level of education completed by those who graduated from elementary and junior high school and none of the above. As shown in Table 2, most of the education levels of fishermen are primary schools at 65 percent of the total sample, the rest are junior high schools. As it is known that the education level generally determines the quality of individuals, which is the basis of scientific thinking because education adds knowledge both directly and indirectly. Besides, it's also related to productivity increases in work, as well as can accelerate and business support (OECD 2012).

The experience as a fisherman can be seen from how long they have worked. The length of experience can directly affect production behavior, both related to the fleet and fishing gear used, season, difficulties encountered when fishing, and so on. As seen in Table 2, most fishermen (56.00%) had been involved in their work between 11 - 20 years and 38.00 percent had the experience of 5-10 years, whereas only 4.00 percent had the experience under 5 years, even those with more than 20 years of fishing experience were relatively less, only 2 percent.

Table 2 The data frequency distribution of characteristics of small-scale fisheries

Description	Sample	Percent (%)	Mean
Age of household head (year)			44.00
< 30	1	1.00	
30 – 35	9	9.00	
36 – 40	26	26.00	
41 – 45	26	26.00	
46 – 50	18	18.00	
> 50	20	20.00	
The education level of household head (year)			7.00
Elementary school	65	65.00	
Junior high school	35	35.00	
Senior high school	0	0.00	
Experience (year)			12.50
< 5	4	4.00	
5 – 10	38	38.00	
11 – 15	28	28.00	
16 – 20	28	28.00	
> 20	2	2.00	
Labor (person)			4.00
< 3	11	11.00	
3 – 4	76	76.00	
5 – 6	13	13.00	
The total wage of labors per catch (IDR 000)			7,800
< 4,000			
4,000 - 6,000	25	25.00	
6,001 – 9,000	47	47.00	
9,001 – 12,000	16	16.00	
> 12,000	12	12.00	
Distance (mile)			108.50
< 100	14	14.00	
100 – 120	70	70.00	
> 120	16	16.00	
Work hours per day (hours)			17.50
< 15	6	6.00	
15 – 20	91	91.00	
> 20	3	3.00	
Asset value (IDR 000)			35,000
< 30,000	21	21.00	
30,000 – 40,000	68	68.00	
40,001 – 50,000	10	10.00	
> 50,000	1	1.00	
Production value (IDR 000) per catch			28,000
< 20,000	25	25.00	
20,000 – 30,000	47	47.00	
30,001 – 40,000	16	16.00	
> 40,000	12	12.00	

Source: Field study 2019 (Authors processed)

This study further observed that every fisherman who wanted to catch fish always brought along some workers to lighten their work. As shown in Table 2, most fishermen (76.00%) performed their work assisted by around 3-4 people, 13.00 percent assisted by 5-6 people, while only 11.00 percent of fishermen had a workforce of 2 people. As applied in the production theory that the additional law of diminishing returns, because adding more labor will reduce production output, in other words, will get relatively less production value. The result of our observation to fishermen showed that this work was assisted by 2 people minimum and 6 people maximum, depending on the distance and the ship cargo used to catch fish in the sea.

This study also tracked the level of wages paid to workers each time they caught fish. As shown in Table 2, majority (47.00%) of the workforce received wages in one trip between IDR. 6,000,001-9,000,000, then 25.00 percent of the workforce was paid between IDR. 4,000,000 - 6,000,000, 16.00 percent was paid between IDR. 9,000,001-12,000,000, and only 12.00 percent of small-scale fishermen paid workers more than IDR. 12,000,000. This data shows the total wages paid based on one trip with a standard of 6-14 days and the number of fishing workers on average is 3 to 4 people. The wages received by working fishermen depend on the amount of fish caught and the proceeds from the sale value (Marschke & Vandergeest 2016). Catching fish is not done every day because fishermen must pay attention to weather conditions. The wages paid by small-scale fishermen to these workers were relatively diverse. It was also known that the income earned by small-scale fishermen from fishing at sea depended on the season and the equipment they used. In addition, fishermen must also have knowledge and experience to help them get more fish catches (FAO, 2005, 2016).

The fishing mileage by fishermen relatively varied ranging from 85 miles to the furthest 130 miles from the shoreline, the mileage far from the fishermen journey to catch fish usually produces more catch fish. Table 2 shows that 86.00 percent of fishermen tripped over 100 miles to catch fish and only 14.00 percent caught fish with a distance of fewer than 100 miles. The results of in-depth interviews with fishermen explained that most of them had more catches of fish with relatively farther mileage compared to short mileage. Therefore, fishermen need large-powered, powerful boats with powerful engines to sail the ocean and get more fish catches.

Table 2 also shows that 91.00 percent of fishermen worked 15 to 20 hours per day. Fishermen who worked less than 15 hours were 6.00 percent and those who worked more than 20 hours were 3.00 percent per day. Fishermen only worked between 3-4 days per week depending on weather conditions. The results of this study also indicated that in general fishermen worked 4 days per week (92.00%) and only 8.00 percent worked for 3 days per week. It seems that this is already a kind of agreement and habit in the fishing community, and also related to the distance of each fisherman. As it is also known that working hours can affect results or income, it can be assumed also the longer working hours, the greater the results or income obtained (Berniell & Bietenbeck 2017; Holly & Mohnen 2012; and Pencavel 2014).

As presented in Table 2, the asset value of each fisherman relatively varied, despite in principle, each fisherman had relatively the same assets. Our results showed that the majority (68.00%) of fishermen had assets ranging from IDR. 30,000,000 - 40,000,000, further 21.00 percent of the sample had assets of less than IDR. 30,000,000, and 10.00 percent of the sample had assets ranging from IDR. 40,000,001 to 50,000,000, while only 1.00 percent had assets of more than IDR. 50,000,000. Assets that have high economic value will provide substantial business benefits in the future, especially in improving the welfare of fishing households (Alemu & Azadi 2018).

From information on the net production value per year in Table 2, the average production value of fishermen was around IDR. 28,000,000. Meanwhile, from the frequency distribution, the majority (47.00%) of fishermen obtained production values ranging from IDR. 20,000,000 - 40,000,000, further 25.00 percent obtained a production value of less than IDR. 20,000,000, 16 percent of fishermen had a production value ranging IDR. 30,000,001 - 40,000,000, while only 12.00 percent of fishermen had a production value of more than IDR. 40,000,000. The value of production that is generated depends on the price and the amounts of fish caught. Catching fish is not done every day because fishermen must pay attention to weather conditions.

Before discussing further, this study reports the results of testing the classic assumptions in the model, the test results show no symptoms of multicollinearity violations, this can be seen from the relative tolerance value of less than 1 and the value of variance inflation factor (VIF) which has a value of less than 10. This gives the sense that the severity of multicollinearity at this model is relatively low. Furthermore, the results of the heteroscedasticity test using the Breusch-Pagan-Godfrey (Breusch & Pagan, 1980) test for estimating the independent variable effect on the residual value, test results indicate that there is no significant influence of the independent variable on residual value, which means that there is a uniform variance from the residuals for all observations in the linear regression model, so the model can be declared valid in observations. The data normality distribution test reported from the Jarque-Bera test results showed that the skewness and kurtosis values of the sample were following the normal distribution.

Estimation results in this study produce two equations. In Table 3, the first model equation indicates that the capital and labor variables have a positive and significant effect on the production value of small-scale capture fisheries, these findings are inline and support to study Fathoni et al. (2019); Padilla & Trinidad (1995); and Quagrainie & Chu (2019). These findings are consistent with the production theory. The estimation results of the model equation are presented in the equation below:

$$\ln Q=28.541+0.60735(\ln L)+0.33789(\ln K)$$

The findings of this study show that the simple condition of small-scale capture fisheries business can be seen from the sum of the coefficient values of labor and capital variables, such as $\beta 1 + \beta 2 = 0.60735 + 0.33789 = 0.94524$, the value exceeds less than one so that this can be understood that the condition of small-scale capture fisheries business is in a condition of decreasing return to scale. Decreasing return of scale due to increased labor input, while capital input is fixed, it is the production carried out is assumed to be in the short-run, this applies of the law of diminishing marginal product. In fact, most fishermen do not expand their business for a long time, thus capture fisheries production tends not to experience significant changes, this causes small-scale capture fisheries business is inefficient. Besides, the coefficient value $\beta 1 > \beta 2$, it can be stated that this small-scale capture fisheries business is a labor-intensive business.

This is consistent with field findings as mentioned above, that the cost component of labor costs is greater than other costs. Besides, the study also finds that there is a relatively tight level of competition among business actors, causing relatively less maximum production, seasonal factors and fish migration also greatly affect capture fisheries production which can ultimately affect the economies of scale and efficiency of small scale capture fisheries businesses (Cohen et al. 2019; and Garcia & Rosenberg 2015).

Further findings indicate that the allocative efficiency of small-scale capture fisheries in this study shows that the marginal productivity value of 0.52586 is less than the value of the labor and capital input coefficient of 0.94524, which means that small-scale capture fisheries is inefficient in Kurau Village, Central Bangka Regency. These findings are related to the amount of labor, fishing equipment, and boat and cargo type used by fishermen. These findings are also in line and support the results of the study Wicaksono & Effendi (2019) and Wardono et al. (2015) which also found evidence that for the case of small-scale capture fisheries business was relatively inefficient. On the other hand, these findings contrast with the study results conducted by (Wardono 2016).

Table 3 indicates that the determination coefficient has a value of 0.626, which means that the variation of the dependent variable can be explained by the variation of the independent variable by 62.60 percent, while 37.40 percent is explained by other variables outside the model, such as technology and weather climate. The estimation results show that the f-stat value of 2,244 with a significance level of 5 percent, which means that jointly the factors of capital, labor, distance, age, experience, and education level of each fisherman have a significant influence on the production value of small-scale capture fisheries business.

Furthermore, the results of individual tests (t-stat) indicate that the variable capital, the number of laborers, and the distance of fishing have a positive and significant effect on capture fisheries production at the significant level of 5 percent. This means that an increase of 1 percent of capital can increase the production of small-scale capture fisheries by 0.701 percent, likewise, an increase in the labor of 1 percent can increase production by 0.450 percent, assuming other factors are considered constant. Meanwhile, an additional one-mile mileage can increase production by 0.0085 units, assuming other factors are considered constant. Meanwhile, socio variables such as age, experience, and education level insignificant influenced the production of small-scale capture fisheries at a significant level of 5 percent.

Table 3 Regression Model Estimation Results

Dependent Variable: lnQ					
Variable	***Description***	***Equation. 1***	***Equation.2***	***Tolerance***	***VIF***
C	*intercept*	28.54146*** (5.006952)	29.20495*** (5.140759)		
lnL	*labor*	0.607349** (0.292558)	0.701322** (0.302053)	0.0945	1.2813
lnK	*capital*	0.337890** (0.168597)	0.450502** (0.179942)	0.0029	1.3495
Dist	*distance*	-	0.008546** (0.003698)	0.0001	1.1129
Age	*age*	-	-0.004840 (0.007100)	0.0005	1.4664
Exp	*experience*	-	0.003707 (0.010114)	0.0001	1.4272
Edu	*education level*	-	0.022118 (0.032450)	0.0010	1.2752
Summary					
R^2		0.600143	0.626474		
Adj. R^2		0.400764	0.570117		
F-stat		3.103581** [0.0494]	2.244172** [0.0046]		
Diagnostic test					
Heteroscedasticity test	*Breusch-Pagan*	0.576272 [0.7497]	1.070212 [0.3861]		
Cross-Correlation test	*Breusch-Godfrey*	5.808379 [0.0548]	3.867601 [0.1446]		
Normality test	*Jarque-Bera*	1.227581 [0.5279]	0.748396 [0.6878]		

Note: Significant level at 1%***, 5%**, 10%*; figure in ( ) is standard error; and [ ] is p-value
Source: Field study (Authors processed)

DISCUSSIONS

In economic theory, the Cobb-Douglas production function explains the relationship between output and input, the input factor consisting of capital and labor which can affect the level of production. In line with its development, production can also be influenced by technology and other factors (Felipe & Adams, 2005). In this study to determine the economies of scale and efficiency of small-scale capture fisheries businesses need to analyze these two main factors in influencing the production of small-scale capture fisheries businesses (FAO 2016).

This study finds that economies of scale imply the condition small-scale capture fisheries in Kurau village have decreasing returns of production scale. In economic theory, this is because there is additional laborers while the capital is fixed, this condition makes economies of scale in the capture fisheries production inefficient. In the long-time, most of the fishermen have not expanded, so the production scale has decreased. these findings are consistent with the observations that have indicated that skills, technology, and weather conditions are can also factors that influence capture fisheries production, besides fishermen laborers and capital.

Usually, production activities depend on capital and labor as the factors that cannot be separated from production activities. Therefore, it is impossible if these factors don't have the dominant influence in producing outputs. In the case of capture fisheries production in small businesses, the study observed that the distance to the location of fishing could also determine production, and this was evidenced from our interviews with fishermen.

The individual tests indicate that the variables of capital, the number of laborers, and the distance of fishing has a positive and significant effect on capture fisheries production. The capital is responsible for production, limited capital can slow expansion. Capital has become a major need in business because it is associated with spending decisions to obtain maximum profits. The Cobb-Douglas production theory explains that capital influences output. The greater capital maximizes production and creates maximum profits. The production value greatly affects the welfare level of fishermen's households, because the greater the production value obtained, then the better the welfare level of fishermen's households (Primyastanto et al. 2017; and Sunarlan & Kusnadi 2018).

Besides, labor is also a factor responsible for production, because labor is a driving factor, without labor, the other factors of production will be meaningless. Increasing labor productivity will encourage increased production so that profits can be maximized. The production value greatly affects the welfare level of fishermen's households, because the greater the production value obtained, then the better the welfare level of fishermen's households. The relationship between capital and labor to production is positive in the Cobb-Douglas production theory. The findings are consistent and in line with the study result by Primyastanto et al. (2017); and Sunarlan & Kusnadi (2018).

Based on the findings, distance has a significant effect on capture fisheries production by small-scale fishermen. This finding seems very interesting. The further distance of fishing locations can increase the fish caught by small-scale fishers. This is consistent with the results of in-depth interviews with fishermen who explained that most of them got more catches of fish with relatively farther mileage compared to short mileage. However, for long distances to fishing locations, these fishermen usually rent boats with larger sizes and powerful engines to sail the ocean and get more fish capture. However, in many analyzes, small-scale fishers generally determine potential fishing locations using traditional methods obtained from generation to generation and only rely on experience and fishing habits without being supported by data and technology regarding the ideal location for fishing. This of course becomes less optimal and efficient. Remote sensing technology can be utilized by fishermen because it can provide information about objects and phenomena that occur through analysis of satellite data covering a wide, continuous, and accurate area without the need to come into direct contact with these objects or phenomena (Congalton 2010; and Lillesand et al. 2008).

Besides, the estimation results reported earlier indicate that the factors of experience, age, and education have proven to have no significant effect on small-scale fisheries production. These findings seem to be as unacceptable as an analogy in many economic analyzes, which explain that in small business activities in agriculture, social factors can also be responsible for production, such as experience, age, and education. The more experience, age, and education that fishermen have, the quality of activities can be better, and thus more likely to improve welfare. In the social-economic analysis, the experience can be social capital in a business. It is possible to maximize business, but the experience may also not function properly without the support of technology. In this case, the fishermen indeed have a lot of experience, they might be right in predicting the migration season of sea fish, but if the technology used is still simple, then their fish catch will not be maximum. Likewise, with social factors, such as age and education, maybe these factors can play a role if the technology used is more modern. In general, the obstacle faced by local fishermen is that the technology used is relatively simple, for example, most fishing boats used by local fishermen have an average load of 3-10 GT.

The implication of this study model shows that the small-scale capture fisheries business in the village of Kurau still depended on the capital used to purchase supporting and maintenance equipment. Besides the capture fisheries business was still very dependent on labor, this is evident that the labor costs are still relatively large. Besides, the study observed that the distance to the location of fishing had direct implications, which means it has a significant and positive effect on the production of the capture fisheries business. This shows that the greater distance traveled by fishermen in determining the location of fishing has exerted considerable influence an increase in the production of the capture fisheries business in the Kurau village. Meanwhile, factors such as age, experience, and education level did not have implications for increasing the production of the capture fisheries business in the Kurau village. Maximizing the production of small-scale capture fisheries cannot be determined from by the length of experience, educational level, and age. Perhaps, more precisely is that these factors cannot work optimally if the technology used is still simple (FAO 2017). Therefore, assistance and technology support and empowerment programs are needed for fishermen so that they can identify and predict how to catch fish, or at least they can get knowledge of the right technology to catch fish (FAO 2017).

CONCLUSION

The conclusion in this study is divided into three, namely: (1) this study found that the economies of scale in small-scale capture fisheries show the condition of decreasing return to scale, this is quite alarming because the proportion of the addition of production factors relatively exceeds the proportion of production increase; (2) the first findings also provide a signal that this small-scale capture fisheries business is relatively inefficient, this proves from the marginal productivity value is less than the value of production factors; and (3) other findings are from the estimation results of the second model equations indicating that the variables of capital, the number of laborers, and the journey distance of fishing have a positive and significant effect on capture fisheries production. Meanwhile, socio variables such as age, experience, and education level have not significantly influenced the production of small-scale capture fisheries.

RECOMMENDATIONS

There are several recommendations offered, namely the need for support from various parties, as well as empowerment assistance in improving fishermen's skills in the utilized of appropriate technology, knowledge in protecting marine ecosystems, and the effectiveness of fishing from government agencies and the community organization as a form of concern and commitment to improving fishermen's welfare and small-scale capture fisheries production. Specifically, social responsibility can be in the form of helping provide knowledge and competence to fishermen and carry out appropriate and efficient technological innovations. Additionally, the policy program of providing loans without interest or with a low-interest rate helps facilitate financial and market sales, encourages people to consume fish because of its high protein content, and keeps the selling price of the fish stable so that this sector can become one of the leading sectors that can support the wheels of the rural economy.

ACKNOWLEDGMENT

Thanks to the Faculty of Economics, University of Sriwijaya for financial support through the Science, Technology, and Arts Research Grant Scheme in 2019.

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