UDC 332; DOI 10.18551/rjoas.2022-01.09

THE IMPACT OF FINANCIAL CAPITAL AND SOCIAL CAPITAL ON TECHNICAL EFFICIENCY OF CAPTURE FISHERIES IN EAST JAVA OF INDONESIA

Efani Anthon*, **Sari Mariyana**, **Farizi Wildan Al**
Faculty of Fisheries and Marine Science, University of Brawijaya, Indonesia
*E-mail: anthonefani@ub.ac.id

ABSTRACT
This study aims to estimate the impact of financial and social capital on capture fisheries activity. This study was conducted in Malang Regency, East Java of Indonesia. The data was collected from 100 fishermen using face to face interview and structured questionnaire. Furthermore, the data was analysis by data Envelopment analysis (DEA) to estimate the technical efficiency of fishermen, and tobit regression to estimate the effect of financial and social capital on the technical efficiency level. The DEA indicated that fishermen's technical efficiency remain low, the average value is about 0.652. In addition, the Tobit regression show fishermen's ethnic, and infestation was positively and significantly affected the fishermen technical efficiency level.

KEY WORDS
Technical efficiency, DEA, Tobit regression, financial capital, social capital.

Sendangbiru waters are still the prima donna for fishermen from various regions. This is because, Malang Regency has 14 beaches with a coastline of 77 km which is directly adjacent to the waters of the Indian Ocean and has a large diversity of large pelagic fish species, such as yellowfin tuna (Thunnus albacares), bigeye tuna (Thunnus obesus), albakora (Thunnus albacares). allalunga), southern bluefin tuna (Thunnus macoyii), and gray tuna (Thunnus tonggol) and skipjack tuna (Katsuwonus pelamis) (Merta et al., 2003; Jaya et al., 2017). Not surprisingly, most of the large pelagic fishermen in Malang Regency are andon fishermen who come from Sulawesi (South Sulawesi) and Kalimantan (Balikpapan) (Firdaus and Witomo, 2014).

However, the abundance of resources is not entirely a determining factor for income levels. For high profits and productivity to be achieved, businesses need to have better access to technology and improve their technical efficiency. An inefficient production process can be caused by the following two things. First, because it is technically inefficient, this happens because of the failure to achieve maximum productivity, meaning that per unit input package (input bundle) cannot produce maximum production. Second, it is allocatively inefficient because at certain levels of input and output prices, the proportion of input use is not optimum.

The previous discussion explained that differences in the use of fishing technology used by fishermen from various regions affect the catch. Bugis fishermen who use fishing rods get abundant catches to worry local fishermen. One of the fishing gear that is widely used by fishermen to catch tuna is a fishing rod (UPT P2SKP, 2017). Efani (2010) reported that the Javanese had 45% ownership of the lifeboats, followed by the Bugis people who owned 42% of the lifeboats. While the Madurese showed ownership of the boat fleet as much as 13%. It was further explained that the Bugis tribe had more expertise in operating a fleet of lifeboats as seen from the percentage of boat captains who came from the Bugis tribe as much as 75%,

Based on the description above, this study seeks to find best practice in tuna fishing activities in Sendangbiru by analyzing technical efficiency based on financial and human capital (ethnic and educational) backgrounds. Thus it can be seen how the pattern of resource allocation both capital and expertise to increase business profits. In addition, the results of this study are expected to be input and facilities for the government and institutions in understanding the values, methods and production systems of each ethnic fisherman, so that in making empowerment programs can be right on target.

LITERATURE REVIEW

Financial capital is one of the factors that can determine the level of productivity (Sari, 2014). In this case, financial capital consists of investment and access to financial institutions. Investment is a number of funds or other resources made at this time, with the aim of obtaining a number of benefits in the future (Tandelilin, 2000). Furthermore, one of the efforts to develop the financial sector is through expanding access to finance. Thus, the increase in productivity will occur in a wider scope (Arwiya, et al., 2014). Financing financial institutions demands an increase in the production sector so as to encourage increased productivity.

Human capital is considered as one of the determinants of productivity. Human capital is a qualitative dimension of human resources, such as expertise and skills, which will affect the productive ability of these people. The qualitative dimension is obtained through education (Sari, 2014). In this case, human capital consists of ethnicity and education.

Ethnicity is a term that denotes a sense of shared ownership, based on common ancestry, language, history, culture, race, or religion (or a mix of these lists). According to Tajfel, the meaning of "ethnicity is" that part of an individual's view that derives from his knowledge of being a member of a social group with values and significant emotional attachment to that group." Meanwhile, according to Article 1 paragraph (3) of Law Number 40 of 2008 concerning the Elimination of Racial and Ethnic Discrimination, what is meant by ethnicity is the classification of people based on beliefs, values, habits, customs, norms, language, history, geography, and kinship. Within an ethnicity, it is possible to have differences. Different characteristics between ethnic groups will have an impact on different production patterns. For example, in a fishing community, of course, there will be differences in the way of working between each ethnic group, such as Javanese, Madurese, and Bugis ethnicities which will have an impact on production patterns.

In addition to ethnicity, education is a factor that affects production efficiency. Community education is a conscious effort that wants to also provide the possibility of social, cultural, religious development, beliefs, skills, expertise, which can be utilized by the people to develop them and build society both in economic and social terms (Nasution, 2011).

METHODS OF RESEARCH

Analysis of fishing capacity using Data Envelopment Analysis (DEA) with the Banker, Charnes and Cooper model approach (BCC model) (Cooper et al., 2004). The DEA analysis model used in the efficiency analysis is a variable return to scale (VRS). The data that has been collected is then tabulated, processed and analyzed by a series of methods and each is presented in the form of tables, figures and graphs. DEA is a mathematical program analysis to estimate the technical efficiency of production activities simultaneously. In this analysis, the production function formed is:

$$Q = F \{K, L)$$

Where: Q = Production; K = Financial Capital (investment and access to financial institutions); L = Human Capital (ethnicity and education).

The next step is to determine the output vector as u and the input vector as x. There are m outputs, n inputs and j fishing or observation units. Input is divided into fixed input (xf) and variable input (xv). The output capacity and the perfect utilization value of the input are then calculated using the following equation (Fare et al., 1989):

$$TE = {}^{Max\ q}_{q,z,l} l \qquad (1)$$

With obstacles:

$$\theta_1 u_{jm} \leq \sum_{j=1}^{J} z_j u_{jm}, \text{ (output versus DMU)}$$
$$\sum_{j=1}^{J} z_j u_{jm} \leq x_{jn}, n \in x_f$$
$$\sum_{j=1}^{J} z_j x_{jn} = \lambda_{jn} x_{jn}, n \in x_v \; n \in x_v$$
$$z_j \geq 0, j = 1,2, \ldots, J$$
$$\lambda_{jn} \geq 0, n = 1,2, \ldots, N$$

Where: zj is the intensity variable for the number of observations;$\theta_1$the value of technical efficiency or the proportion with output can be increased at full capacity level; and *λ_{jn} is the average use of input variables (variable input utilization rate, VIU), namely the ratio of optimal input use xjn to input utilization from xjn observations. The technical efficiency capacity output (TECU) capacity is defined by doubling the actual production. Capacity utilization (CU), based on the observed output, is calculated by the equation:θ_1^*.

$$TECU = \frac{u}{\theta_1^* u} = \frac{1}{\theta_1^*} \qquad (2)$$

The value of technical efficiency is obtained by calculating the DEA technique with the help of DEAP software. Technical efficiency analysis is carried out by comparing the efficiency values between ships that are used as DMU (decision making units). The calculation process is to determine the constant value of the output (μ), fixed input (x) and variable inputλ in each DMU in order to obtain the value of fishing efficiency based on the level of utilization of the fishing capacity (CU) and the level of utilization of the capacity of the input variable (VIU).

Meanwhile, This equation model is then estimated using the tobit method, to analyze the factors that determine the level of technical efficiency of tuna fishermen, it is formulated econometrically as follows:

$$Z1 = \alpha + \beta 1D1 + \beta 2D2 + \beta 3D3 + \beta 4D4 + \beta 5D5 + \beta 6D6 + \beta 7D7 + \beta 8D8 + Vt - Ut$$

Where:

- Z1 = Technical efficiency;
- D1 = Javanese fisherman;
- D2 = Madurese fishermen;
- D3 = Bugis fisherman;
- X1 = Experience of the captain;
- X2 = Investment;
- X3 = Master's education;
- X4 = Catch Tool;
- X5 = Operational Cost;
- X6 = Number of Workers;
- X7 = Number of Working Days;
- α, β = Estimation parameter.

RESULTS AND DISCUSSION

The distribution of the level of technical efficiency from the estimated DEA can be seen in table 1. The technical efficiency value of tuna fishermen in the research location is between 0.25 to 1.00. The results are spread among the respondents in this study. The efficiency value of 12 respondents has a technical efficiency value below 0.5, which means that fishermen need to reduce the use of inputs in large enough quantities to increase their technical efficiency. Meanwhile, fishermen with technical efficiency values greater than 0.5 and less than 1 were 7 respondents. However, the number of fishermen who have technical efficiency equal to 1 or technically efficient are 11 fishermen. This indicates that the faults of the fishermen of Sendang Biru Malang are technically inefficient, so it is necessary to reduce the use of excessive inputs.

Table 1 – Fisherman's Technical Efficiency

TE	Freq.	Percent	cum.
0.25	2	6.45	6.45
0.264	1	3.23	9.68
0.302	1	3.23	12.9
0.314	1	3.23	16.13
0.329	1	3.23	19.35
0.333	3	9.68	29.03
0.361	1	3.23	32.26
0.394	1	3.23	35.48
0.437	1	3.23	38.71
0.532	1	3.23	41.94
0.538	1	3.23	45.16
0.648	1	3.23	48.39
0.7	4	12.9	61.29
0.786	1	3.23	64.52
1	11	35.48	100

Analyzing the factors that affect technical efficiency can use several analytical tools. However, several previous studies have applied the Tobit regression model. This is because the dependent variable used is technical efficiency whose value is limited from 0 to 1. The results of the Tobit regression have been presented in table 8. From the results of the Tobit regression, it can be seen that the variables of the Malay, Javanese, Madurese, and investment tribes have a significant influence on technical efficiency. But other variables Bugis ethnicity, education level, production costs and experience do not have a significant effect on technical efficiency.

Malay fishermen have a positive and significant influence at the 5% level on technical efficiency. This shows that fishermen who are Malay tend to be able to use inputs efficiently. The Javanese have a positive influence on technical efficiency with a significant level of 1%. This variable has the greatest level of influence compared to others. This finding implies that Javanese fishermen have higher technical efficiency than others. This is because Javanese fishermen tend to understand the fishing location better than others. The Madurese have a positive influence with a significant level of 5% on technical efficiency. This is also related to the geographical location of the Madurese who are on the island of Java. So they are more likely to understand the conditions of the fishing ground.

Table 2 – Tobit regression analysis

Variable	coef.	Std. Err	zt	P>|t|
bugis	0.074	0.084	0.880	0.387
Malay	0.232	0.094	2,480	0.021**
Java	0.459	0.098	4.670	0.000***
Madura	0.289	0.129	2.230	0.035**
investment	0.179	0.079	2,250	0.034***
education	-0.005	0.012	-0.380	0.709
cost	0.000	0.000	-0.810	0.429
experience	0.003	0.003	1,110	0.277
_cons	0.252	0.207	1,220	0.236
Log likelihood = 20.807881				
LR chi2(8) = 53.98				
Prob > chi2 = 0.0000				
Pseudo R2 = 4.3668				

*Note: ** significant 5%; *** significant 1%.*

Finally, the investment variable shows a positive and significant effect on technical efficiency with a level of 5%. This shows that fishermen who have investments in productive fishing gear tend to have higher technical efficiency than fishermen who do not. For example, when fishermen invest their money in making FADs or fishing aids they will tend to find it easier to get higher catches. As a result, productivity and technical efficiency will tend to be high.

CONCLUSION

The efficiency value of 12 respondents has a technical efficiency value below 0.5, which means that fishermen need to reduce the use of inputs in large enough quantities to increase their technical efficiency. Meanwhile, fishermen with technical efficiency values greater than 0.5 and less than 1 were 7 respondents. However, the number of fishermen who have technical efficiency equal to 1 or technically efficient are 11 fishermen. This indicates that the faults of the fishermen of Sendang Biru Malang are technically inefficient, so it is necessary to reduce the use of excessive inputs.

Tobit regression results show that the variables of Malay, Javanese, Madurese, and investment have a significant influence on technical efficiency. However, other variables are Bugis ethnicity, education level, production costs and experience have no significant effect on technical efficiency. The investment variable shows a positive and significant effect on technical efficiency with a level of 5%. This shows that fishermen who have investments in productive fishing gear tend to have higher technical efficiency than fishermen who do not.

REFERENCES

1. Paul.D. Leedy and Jeanne.E. Ormrod. Practical Research: Planning and Design Research 8th Edition [2005]. Ohio: Pearson Merrill Prentice Hall. Page 145-187
2. Abate, GT, Francesconi, GN, & Getnet, K. (2014). Impact Of Agricultural Cooperatives On Smallholders' Technical Efficiency: Empirical Evidence From Ethiopia. Annals Of Public And Cooperative Economics, 85(2), 257–286. doi:10.1111/apce.12035
3. Ahmed, MH, & Mesfin, HM (2017). The impact of agricultural cooperatives membership on the wellbeing of smallholder farmers: empirical evidence from eastern Ethiopia. Agricultural and Food Economics, 5(1). doi:10.1186/s40100-017-0075-z
4. National Development Planning Agency (BAPPENAS), 2008. “Evaluation Study (impact) of New Autonomous Regions in 2008”. Directorate of Regional Autonomy Deputy for Regional Development and Regional Autonomy.
5. Cahyono, N. and M. Nadjib. 2014. Implications of Structural Constraints and Scarcity of Capital on Fishermen's Socio-Economic Behavior. Journal of Economics and Development Vol. 22 (2) of 2014.
6. Cooper, WW (2014). Origin and Development of Data Envelopment Analysis: Challenges and Opportunities. Data Envelopment Analysis Journal, 1(1), 3–10. doi:10.1561/103.00000002
7. COULTER J., GOODLAND A., TALLONTIRE A. and STRINGFELLOW R., 1999, Marrying farmer cooperation and contract farming for service provision in a liberalizing Sub-Saharan Africa, ODI: Natural Resources Perspectives 48.
8. DAVIS K., 2008, 'Extension in Sub-Saharan Africa: Overview and assessment of past and current models and future prospects', Journal of International Agricultural and Extension Education, 15 (3), 15–28.
9. Grashuis, J & Su, Y 2018, 'A review of the empirical literature on farmer cooperatives: Performance, ownership and governance, finance, and member attitude', Annals of Public and Cooperative Economics.
10. Gupta K., and Pandit C. (2007) Importance of Fishermen's Cooperatives. Economic and Political Weekly, Vol. 42, No. 10, pp. 825-827
11. John P D., & Frank O (1981, Production Economics, Second Edition, New York
12. Kumar, A, Parappurathu, S & Jee, S 2013, 'Do dairy co-operatives enhance milk production, productivity and quality? Evidences from the Indo-Gangetic Plain of India', Indian Journal of Agricultural Economics, vol. 68, no. 3, pp. 457-468.

13. Ma, W & Abdulai, A 2017, 'The economic impacts of agricultural cooperatives on smallholder farmers in rural China', Agribusiness, vol. 33, no. 4, pp. 537-551.
14. Mashyuri. 2014. Non-formal Financing of Capture Fisheries: The Muncar and Bitung Cases. Journal of Economics and Development Vol. 22 (2) of 2014.
15. Olguner M T., Yilmaz S., and en E B. (2015). The Place and Importance Of Fishery Cooperatives In Aquaculture Marketing In Turkey: The Case Of Antalya. International Journal of Development Research Vol. 5, Issue, 01, pp. 3149-3151
16. Partomo, TS and Soejono, AR. 2002. Economy: Small and Medium Scale & Cooperatives. Jakarta: Ghalia Indonesia.
17. Rosenbaum PR & Rubin DB, 1983, 'The central role of the propensity score in observational studies for casual effects', Biometrics, 70 (1), 41–55.
18. Samian, M., Saadi, H., Asadi, M., Mirzaei, K., Ansari, E., Ahmadihagh, E., & Soleymani, A. (2017). The role of fishing cooperatives on social – Economic and cultural development of rural areas of Bord Khun city of Bushehr, Iran. Journal of the Saudi Society of Agricultural Sciences, 16(2), 178–183. doi:10.1016/j.jssas.2015.06.001
19. Satria, A. 2015. Introduction to the Sociology of Coastal Communities. Jakarta: Indonesian Torch Library Foundation.
20. Shahidur R., et al., 2010. "Handbook on Impact Evaluation Quantitative Methods And Practices". The Wood Bank; Washington, DC
21. Sugiyono. 2013. Educational Research Methods Quantitative, Qualitative, and R&D Approaches. Alphabeta: Bandung.
22. Wanyama, F. (2009). Surviving Liberalization: The Cooperative Movement in Kenya. International Labor Office - Geneva: ILO, 2009
23. Wassie, SB, Kusakari, H., & Sumimoto, M. (2018). Community Level Factors Affecting Participation Rate in Agricultural Cooperatives in Ethiopia. Japanese Journal of Agricultural Economics, 20(0), 57–60. doi:10.18480/jjae.20.0_57
24. Weersink, A., Turvey, CG, & Godah, A. (1990). Decomposition Measures of Technical Efficiency for Ontario Dairy Farms. Canadian Journal of Agricultural Economics/Revue Canadienne D'agroeconomie, 38(4), 1023–1023. doi:10.1111/j.1744-7976.1990.tb03538.x
25. Wijoyo & Wahyu., (2012). Technical Efficiency Analysis of Fishing Using Purse Seine Fishing Equipment in Muncar, East Java. Department of Fisheries Resources Utilization, Faculty of Fisheries and Marine Sciences, Bogor Agricultural Institute, Bogor.
26. Wollni, M & Zeller, M 2007, 'Do farmers benefit from participating in specialty markets and cooperatives? The case of coffee marketing in Costa Rica1', Agricultural Economics, vol. 37, no. 2-3, pp. 243-248.
27. WORLD BANK, 2008, World Development Report: Agriculture for development, World Bank, Washington, DC: World Bank.
28. Wossen, T, Abdoulaye, T, Alene, A, Haile, MG, Feleke, S, Olanrewaju, A & Manyong, V 2017, 'Impacts of extension access and cooperative membership on technology adoption and household welfare', Journal of rural studies, vol. 54, pp. 223-233.