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The Effect of Livelihood Capital on the Sustainable Livelihood of Rice Farmers in Penanggungan Village, Mojokerto Regency, East Java, Indonesia

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Abstract. Sustainable livelihoods are a crucial concept in efforts to achieve balanced social, economic, and environmental prosperity. In reality, many communities face challenges with their implementation, including uncertain income and limited access to existing resources. The existence of these problems necessitates effective strategies for achieving sustainable livelihoods. This research aims to analyze sustainable livelihood strategies by optimizing the livelihood capital owned by rice farmers. This research was conducted in Penanggungan Village, Trawas District, Mojokerto Regency. This research was conducted in February – March 2024. This research focused on farmers who grow rice plants, with 134 respondents. The method used is a sustainable livelihood approach based on livelihood capital. Data analysis used logistic regression. The results obtained from human capital, social capital, and physical capital have a significant and positive impact on sustainable livelihoods. Meanwhile, natural capital has no significant effect, and financial capital has a negative and insignificant impact on sustainable livelihoods. Thus, human capital, social capital, and physical capital have the opportunity to improve farmers' sustainable livelihoods.

Keywords: livelihood capital; logistic regression; rice; sustainable livelihood; walfare

INTRODUCTION

The sustainable livelihood approach plays a crucial role in household life. The sustainable livelihood approach refers to the perspective of people who are vulnerable to poverty, prioritizing strategies to overcome vulnerability by maximizing livelihood capital through community-centered policies (Serrat, 2017). Success in household life is greatly influenced by the livelihood assets owned. Livelihood capital consists of financial capital, human capital, physical capital, social capital, and natural capital (FAO, 2009). This approach utilizes livelihood capital, referring to the use of existing resources. Utilizing existing resources through livelihood capital has a positive impact on supporting people's lives. One of the impacts of effectively utilizing livelihood capital is that it can support the community's welfare (Serrat, 2017).

Sustainable livelihoods are crucial in alleviating poverty and ensuring a decent standard of living. However, its implementation faces numerous obstacles, particularly for individuals in rural areas. People in rural areas tend to have a lower standard of living than those in urban areas. This is because people in urban areas get education, health, and better facilities and infrastructure to support their livelihoods than rural areas (Bank, 2019). The differences felt by people in urban and rural areas result in differences in welfare. Based on (Lei *et al*., 2023), welfare indicators are compiled to describe the condition of material prosperity (welfare) and subjective well-being or happiness (happiness). It is also important to understand how subjective welfare conditions are based on satisfaction and happiness with the community.

People living in rural areas typically work in the agricultural sector (Oru, 2022). In various developing countries, the agricultural sector is one of the sectors that greatly influences the economy. The agricultural sector can significantly impact a country's economy, particularly in terms of its gross domestic product, as it plays a crucial role in exports and imports and employs a

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substantial number of workers (Hidayah & Susanti, 2022). In addition to the national economy, the agricultural sector plays an important role in food security and the community's welfare (Syawie, 2012). The agricultural sector has several subsectors, including the food sub-sector. The food sub-sector is important in Indonesia's agricultural sector and economic development. The strategic role of the food sub-sector can be seen from its contribution as a provider of foodstuffs (Rozi et al., 2025), industrial raw materials (Rocchi et al., 2025), labour absorbers (Fabry & Maertens, 2025), and sources of income for rural households (Oru, 2022). Therefore, special attention needs to be paid to the agricultural sector, particularly to those working in it. However, during its implementation, many obstacles still face rice farmers. The constraint of access to resources is one of the obstacles that can affect the livelihood of rice farmers. The problems faced by rice farmers are access to capital (Joy et al., 2025), access to land (Begho & Odeniyi, 2024), knowledge of renewable agricultural technology and good institutions to support rice farming (Sanusi & Dries, 2024). This needs to be resolved, considering the importance of food plants as a source of life in society, both primary and economic needs. Therefore, it is necessary to investigate the impact of livelihood capital on sustainable livelihoods.

METHODS

Research Approach

The research approach regarding the relationship between livelihood capital and sustainable livelihoods employs quantitative methods (Garba, 2023). Quantitative research is a scientific method that tests hypotheses and collects objective data through systematic implementation, providing a reference for other researchers. Quantitative research methods involve the examination of randomly selected samples using research instruments to collect data and test hypotheses through statistical analysis (Sugiyono, 2010). In this study, the influence of livelihood capital on sustainable livelihoods is examined using multinomial logistic analysis.

Time and Place of Research

The study of the effect of livelihood capital on the sustainable livelihood of rice farmers was carried out in February 2024 - March 2024 in Penanggungan Village, Trawas District, Mojokerto Regency, East Java. The research location was chosen deliberately (purposive) considering that the people of Mojokerto Regency have the largest agricultural land, especially rice fields compared to forests, plantations and swamps. The area of agricultural land in Mojokerto Regency is 371,010 Km2 with 289,480 Km2 of forest land, 170,000 Km2 of plantations, and 0,490 Km2 of swamps (BPS, 2022). The breadth of agricultural land in Mojokerto Regency makes this research possible in Mojokerto Regency.

Research Techniques and Tools

The respondents in this study used the census sampling method. This method, according to Sugiyono (2010) is a research method that uses all populations as research objects. There are 134 rice farmers in Penanggungan Village. Thus, based on the research topic of rice commodities, the respondents in this study totaled 134.

Logistic Analysis Regression

The method used to specify the effect of livelihood capital on sustainable livelihoods is multinomial logistic regression. The use of logistic regression methods has been carried out by (Orsango et al., 2023; Talema & Nigusie, 2023). According to Panudju et al. (2024), logistic regression is used to estimate the correlation or relationship of independent variables with dependent variables with more than one category statistically. The logistical regression used is logistic regression. According to Anggraeni et al. (2020), logistical regression can be used when the dependent variable is sustainable livelihood (Y1). In contrast, the independent variable used is farmer livelihood capital, such as natural capital (X1), human capital (X2), physical capital (X3), social capital (X4), and

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financial capital (X5). Mathematically, this model is written in **Equation 1**.

$$Y(x) = \frac{exp(\beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5)}{1 + exp\ (\beta 0 + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5)} \ldots\ldots (1)$$

Description:

Y = Livelihood capital opportunities affect sustainable living (π = 1 = (unsustainable), 2 = (less sustainable), 3 = (sustainable) dan 4 = (very sustainable)

exp = Opportunities for livelihood assets have a great influence on sustainable living

1+exp = Opportunities for livelihood assets can be unsustainable, less sustainable, and sufficient sustainable

β_1- β_5 = Coefficients of regressions

.

X1 = Nature Capital
X2 = Human Capital
X3 = Physical Capital
X4 = Social Capital
X5 = Financial Capital
e = Error terms

RESULTS AND DISCUSSION

The analysis of the influence of livelihood capital (natural capital, human capital, physical capital, social capital, and financial capital) on sustainable livelihoods using multinomial logistic analysis. In the logistics analysis, the outcomes are obtained as written in **Table 1**

Table 2. Logistic regressions result of the influence of livelihood capital on sustainable livelihood

Variables	Coefficients	Standard Error	P>t
Nature Capital	0.7239115	0.3191844	0.023**
Human Capital	0.7179466	0.3577143	0.045**
Social Capital	0.8391337	0.3463408	0.015**
Financial Capital	0.3863589	0.3648194	0.290
Physical Capital	0.8626471	0.3774571	0.022**
Pseudo R^2	**0.4093**		
Prob > *chi*^{2}	**0.000**		

Sig : * ≤ 0,01, ** ≤ 0,05, *** ≤ 0,1

Based on the logistic regression analysis table above, the Prob value > chi2 is 0.000. This shows that the variables of natural capital, human capital, physical capital, social capital, and financial capital simultaneously (together) affect sustainable livelihoods. Logistic regression analysis indicates that if the chi-squared value is below 0.01 at a 1% significance level, then the model formed from the dependent variable can effectively explain the independent variable (Kuang et al., 2019). Next, we need to determine the percentage of the magnitude of independent variables that can affect the dependent variables using the goodness-of-fit test. The goodness of fit test is marked with a Pseudo R2 value. At the Pseudo R2 value, the value obtained was 0.4093. This value explains that the dependent variable can explain 40% of the dependent variable. Meanwhile, 59.1% was attributed to variables outside the model.

The analysis showed that the observation of Natural Capital (X1) had a significant effect on the sustainable livelihoods at a 5% significance level. This can be seen from the P-value, which is 0.023, a value smaller than 0.05. The value of the coefficient obtained is 0.7239115. This value indicates that every additional unit of natural capital will increase sustainable livelihoods by 72%. Penanggungan Village has many natural resources that can be used for its livelihood. Rice farmers in Penanggungan Village have

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agricultural land used for farming and their livelihoods. In addition to land, irrigation water is also used. Agricultural land in Penanggungan Village is easily accessible for irrigation water. The existence of available natural resources is crucial for maintaining the sustainability of these resources for the future (Umoru et al., 2024; Girlani et al., 2024).

Human capital (X2) has a significant effect on sustainable livelihoods. The P-value of human capital was obtained as 0.045, which is significant at the 5% significance level. Then, the value of the coefficient in human capital is 0.7179466, indicating that every additional unit of human capital results in a 71% increase in sustainable livelihood. This is a research-based initiative where Penanggungan Village has facilities to support elementary, junior high, and high school education, aiming to increase existing human capital. In addition, with the high level of farming experience among farmers in Penanggungan Village, their farming skills are also highly developed. This makes human capital significantly affect sustainable livelihoods, where the more experienced a person is in their work, the better they can support a better livelihood (Jiménez et al., 2022).

Social Capital (X3) has a significant effect on sustainable livelihoods. The P>t value of physical capital was obtained at 0.015, which was significant to the significance level of 5%. Then, the coefficient of social capital is 0.8391337, indicating that every additional unit of social capital results in an 83% increase in sustainable livelihoods. This is based on research conducted in Penanggungan Village, where farmers have a supportive environment. The existence of a high level of participation in society, characterized by good interaction and compliance with societal norms, is why social capital affects sustainable livelihoods. The high level of social capital ownership plays a crucial role in achieving sustainable livelihoods. According to Maas et al. (2015), research explains that social capital can facilitate the achievement of effective goals, specifically sustainable livelihoods.

Financial capital (X4) has an insignificant effect on sustainable livelihoods. This can be seen from the P-value, which is 0.290, indicating a value greater than the significance level of 10%. The value of the coefficient obtained is 0.3863589. where every additional financial capital of one unit causes an increase in sustainable livelihoods 38%. This is because farmers' income is relatively low, resulting in low savings among some farmers; according to Suryandari & Rahayuningsih's (2020) research, they do not have sufficient savings. The insight is that savings are influenced by income. When farmers' income is low, farmers' savings are also low. In addition, if farmers save their capital for savings, it reduces the supply of capital for the next farming costs. When capital for farming costs is reduced, it can reduce income and the sustainability of their livelihoods.

Physical capital (X5) significantly affects the significance level of 5% to sustainable livelihoods. This can be seen from the P>t value, which shows a value of 0.022 and is smaller than 0.05. The value of the coefficient obtained is 0.8626471. This value indicates that a one-unit increase in physical capital can lead to an 86% increase in sustainable livelihoods. The high influence of physical capital plays an important role in sustainable livelihoods. This is marked by the ownership of physical assets that support a sustainable livelihood. Assets here are not only asset ownership for farming, but also assets such as communication equipment, vehicles, and livestock ownership. According to Ma et al. (2024), the insight is that physical capital has a significant effect on sustainable livelihoods.

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CONCLUSION

The research has shown that human capital (level of education, experience in farming, farming training, and skills in farming), social capital (trust with the surrounding community, compliance with existing rules and norms, active interaction with the community, and following groups in the community), have a positive and significant effect on sustainable livelihoods. Meanwhile, natural capital (the area of land owned by farmers for rice farming, access to irrigation, and access to land) has a positive but not significant effect, and financial capital (income in farming, access to credit, financial management literacy, and savings owned) has a negative and insignificant effect on sustainable livelihoods. The outcome of this study is based on empirical evidence gathered in the field, where interviews with farmers have been conducted, suggesting that the larger the land owned by farmers, the greater its impact on sustainable livelihoods. In addition, most farmers in Penanggungan Village have relatively small landholdings and easy access to irrigation water, allowing them to carry out rice farming. Furthermore, natural capital does not have a significant impact on sustainable livelihoods, accounting for only 53%. Then human capital has a significant influence because in general farmers have good skills and experience in rice farming so that they can increase sustainable livelihoods by 91%, social capital has a positive and significant effect so that it can increase sustainable livelihoods by 92%, Then physical capital also has a very high level of significance and affects sustainable livelihoods by 90% for every increase of 1 unit because through Physical capital where agricultural tools and technology are available to support farmers in sustainable livelihoods, the last is financial capital which has a negative and insignificant effect on sustainable livelihoods because the savings owned by farmers tend to be small or even do not have.

It is recommended that natural capital, social capital, and physical capital be increased to improve sustainable livelihoods. This is because these four types of capital influence sustainable livelihoods.

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