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A Quantitative Model of Social Capital and Economic Development in Palm Oil Farming Communities

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Abstract

Background: Economic development in farming communities is linked to social capital embedded in interactions, norms, and collective practices. In palm oil farming settings, social capital is often assumed to be uniformly beneficial, yet empirical patterns can differ across dimensions.
Aims: This study examines the associations between social capital dimensions and economic development in palm oil farming communities using a quantitative model.
Method: A cross sectional quantitative design was used with primary data from structured questionnaires administered to smallholder palm oil farmers in Central Lampung Regency, Indonesia. Social capital was operationalized into social networks, reciprocity, trust, social norms, and social values. Ordinary least squares multiple regression was applied.
Results: The regression results show heterogeneous associations. Social norms have a positive and statistically significant association with economic development indicators. Trust has a statistically significant negative association. Social networks, reciprocity, and social values are positive but statistically insignificant. The negative association of trust may reflect unequal power relations, elite control in marketing arrangements, or internal stratification and distrust within farmer groups, conditions that can raise transaction frictions rather than strengthen collective outcomes.
Conclusion: Social capital is not uniformly beneficial. Its association with economic development depends on specific dimensions and local institutional context, supporting the use of quantitative modeling to capture these differences.

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INTRODUCTION

The palm oil plantation sector has been one of the main drivers of Indonesia's economy in recent decades. In 2023, Indonesia accounted for approximately 58–60 percent of global palm oil production, with a total plantation area of about 14.7 million hectares (Khatiwada et al., 2021; Zhao et al., 2023). Central Lampung Regency, as one of the major palm oil production centers in Lampung Province, contributes substantially to this sector, with approximately 35,000 hectares managed by more than 15,000 farmers.(Herdiansyah & Mamola, 2025) eyond its direct economic contribution, the expansion of palm oil cultivation has also shaped distinctive social structures and interaction patterns within farming communities. In the context of community-based economic development, social capital is frequently discussed as an important enabling factor. Social capital, encompassing trust, norms, and social networks, has been shown to facilitate coordination, collective action, and

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information exchange across diverse community settings (Tran et al., 2025). In palm oil farming communities, these social interactions are embedded in smallholder production systems where cooperation, informal arrangements, and group-based activities play a central role in managing production and market access. Nevertheless, while social capital is often assumed to support more equitable and efficient economic outcomes, empirical evidence on how its specific dimensions operate within palm oil farmer communities remains limited.

Previous studies have examined the relationship between social capital and community economic development, highlighting its strategic role in enabling economically beneficial collective action. However, much of this literature focuses on urban or semi-urban contexts, with relatively fewer studies dedicated to agricultural and plantation-based communities. (Braga et al., 2024). identify a key research gap in the limited quantitative examination of the mechanisms through which social capital is transformed into economic advantages in palm oil farming communities. Existing studies tend to emphasize particular dimensions of social capital, such as formal institutional arrangements in South Sumatra or social network structures in West Kalimantan, without providing an integrated quantitative assessment across multiple dimensions. Moreover, while value-based or religious orientations are sometimes discussed as contextual influences, they are rarely operationalized or tested empirically in quantitative models (Pretty & Ward, 2001).

In the case of Central Lampung Regency, anecdotal indications drawn from qualitative accounts and local reports suggest that farmer groups with strong value-based orientations may exhibit higher levels of social cohesion, reflected in frequent collective activities and informal mutual support mechanisms (Hendrawan & Musshoff, 2024). However, these indications have not been systematically operationalized, measured, or empirically tested. As a result, the extent to which such value orientations contribute to social capital formation and economic performance among palm oil farmers remains unclear. Similarly, although social capital is often assumed to facilitate knowledge sharing and adaptation in agricultural communities, empirical evidence explaining the specific mechanisms involved remains limited (Belay & Fekadu, 2021; Ogunleye et al., 2021).

Social capital in palm oil farming communities can therefore be understood as a multidimensional collective resource that supports coordination, cooperation, and collective problem-solving. Prior studies suggest that key dimensions including social networks, reciprocity, trust, social norms, and social values may influence economic outcomes by reducing transaction costs and strengthening collective action. However, quantitative evidence that systematically compares the relative contribution of each dimension to economic development indicators in palm oil farming communities remains scarce. Accordingly, this study focuses on quantitatively examining the relationships between measurable dimensions of social capital and economic development outcomes, without extending claims to subgroup dynamics or contextual factors that are not directly captured by the sample design and empirical model. Issues such as gender participation, generational dynamics, religious orientations, and digital technology adoption are acknowledged as important contextual considerations and potential directions for future research, but they are not empirically tested within the scope of the present analysis.

From an advanced science perspective, this study positions social capital as a measurable multidimensional system embedded in local economic structures. By operationalizing social capital into quantifiable indicators and estimating their relative contributions through econometric modelling, this research contributes to data-driven analysis of socio-economic systems in agricultural communities

METHOD

This study was designed using quantitative methods as the main framework for investigation, with a correlational descriptive approach as a specific strategy to understand the relationship

between variables(Muhammad, 2019). The choice of quantitative methods was based on the need to systematically and objectively measure the influence of social capital on the economic development of palm oil farming communities, as well as to analyze its implications in the context of Islamic community development(Azharsyah, 2023). This approach allows researchers to quantify complex social phenomena into variables that can be measured and analyzed statistically. The quantitative characteristics in this study are reflected in the structured data collection process, the use of standardized research instruments, and data analysis using statistical methods(Ghozali, 2013). The data collected is numerical and measurable, allowing researchers to test hypotheses empirically. This approach also allows the generalization of research results from the sample to a wider population, with a statistically calculable confidence level**.**

The study population comprised oil palm farmers who were registered as active members of farmer groups in Central Lampung Regency. Based on data obtained from local farmer group records, the total population of active members across the observed farmer groups was 210 farmers. Sampling was conducted using a non-probability purposive sampling technique based on predefined inclusion criteria, including active engagement in oil palm farming, formal membership in a farmer group, and involvement in farm-level production or marketing activities.

Using the Krejcie and Morgan sample size guideline, a minimum sample of 136 respondents was considered adequate for a population of 210 oil palm farmers. Accordingly, this study targeted 136 respondents, and all collected questionnaires were complete and valid for analysis

Research Instrument

Data for this study were collected using primary data obtained through a structured questionnaire administered to respondents selected based on the predefined sampling criteria. The questionnaire served as the main instrument for gathering information on respondent characteristics, dimensions of social capital, and indicators of economic development examined in this study. Data collection was conducted through direct visits to respondents within the selected farmer groups. The use of a structured questionnaire enabled systematic, efficient, and standardized data collection across the sampled respondents.

The purpose of creating a questionnaire is to obtain information that is relevant to the research with a high degree of validity.(Ismail Muhammad Ilyas & Ilyas Nurfikriyah Irhashih, 2023) Questionnaires are usually used to obtain information from respondents who are spread over a wide area (making it difficult for researchers to meet them face to face). The list of questions is sent to respondents scattered across this area by mail, so that the time and cost involved are not excessive.

In compiling the questionnaire, researchers must also define clear variables. Clear variables will result in clear and relevant questions. Often, vague questions are caused by variables that have not been clearly defined. What can be studied through questionnaires? Information about attitudes and views on economic and social life can be obtained through questionnaires. However, questionnaires are not suitable for finding information (e.g., population size, economic development level, etc.). Data on “quantity” is better sought from the Statistics Office (documentation), except for “questionnaires” for census purposes (comprehensive).

Data Analysis Techniques

Data analysis using descriptive statistics and multiple regression In this study, it is divided into two parts, namely the development of the Islamic palm oil farming community and social capital, which is divided into: social networks, reciprocity, trust, social norms, and social values.

The influence of social capital was analyzed using ordinary least squares (OLS) multiple regression analysis. (Gujarati, N Damodar dan Porter, 2013) In general, OLS is a commonly used regression analysis method because it is intuitive and mathematically simpler. Multiple regression is one solution for analyzing cases where there is more than one independent variable (predictor variable). The dependent variable in this study is the development of the Islamic palm oil farming

community, while the independent variables in this study are social networks (X1), reciprocity (X2), trust (X3), social norms (X4), social values (X5), as in the following formulation

$$Y = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + \varepsilon$$

Explanation:
Y = indicator of economic development of oil palm farmers
α = intercept
β1, β2, β3, β4, β5 = regression coefficients
X1 = social network
X2 = reciprocity
X3 = trust
X4 = social norms
X5 = social values
ε = error term

The analytical framework of this study adopts a quantitative modelling perspective, where social capital indicators are treated as independent variables within an econometric model of economic development. Ordinary least squares (OLS) regression is applied to estimate parameter significance and evaluate the relative contribution of each social capital dimension. This approach enables statistical inference and model-based interpretation of socio-economic dynamics

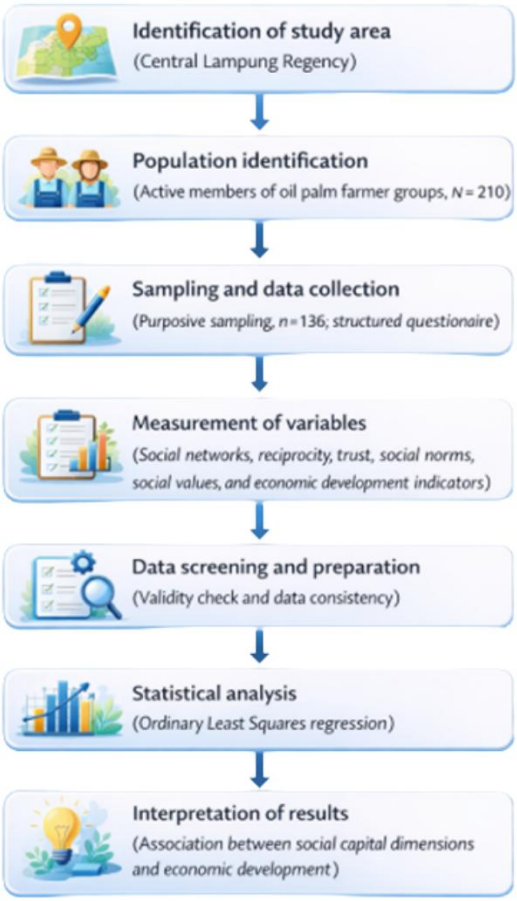

Figure 1. Research Procedure

RESULTS AND DISCUSSION

Results

The analytical framework treats social capital dimensions as independent system components within a quantitative economic development model. Ordinary least squares estimation is used not merely for hypothesis testing, but to evaluate the relative structural influence of each component within the modeled system.

The regression results are interpreted within a quantitative modelling framework, emphasizing statistical significance, coefficient direction, and economic interpretation. This approach enables the identification of dominant explanatory variables influencing economic development outcomes within the farming community.

Table 1 summarizes the estimated coefficients for social networks, reciprocity, trust, social norms, and social values, along with their corresponding t-statistics and significance levels.

Tabel 1. Multiple Regression Test Results

Variable	Coefficient (β)	t-statistic	p-value	Significance (α=0.05)	Direction
Constant (C)	323.3700	5.3500	<0.001	Significant	+
Social Network (X1)	0.0761	0.3820	0.7038	Not significant	+
Reciprocity (X2)	-0.0908	-0.6084	0.5452	Not significant	−
Trust (X3)	-0.8852	-3.0230	0.0037	Significant	−
Social Norms (X4)	1.0384	2.9168	0.0050	Significant	+
Social Values (X5)	0.2319	1.3316	0.1881	Not significant	+

The OLS regression results reported in Table 1.1 summarize the statistical associations between Social Network (X1), Reciprocity (X2), Trust (X3), Social Norms (X4), and Social Values (X5) and the economic development indicator in palm oil farming communities. The coefficients show heterogeneous patterns across dimensions of social capital, with only two variables exhibiting statistically significant associations at the 5 percent level.

Social Network (X1) has a positive but statistically insignificant coefficient ($\beta = 0.0761$, $p = 0.7038$). Reciprocity (X2) has a negative but statistically insignificant coefficient ($\beta = -0.0908$, $p = 0.5452$). Social Values (X5) also shows a positive but statistically insignificant coefficient ($\beta = 0.2319$, $p = 0.1881$). In contrast, Trust (X3) is negatively and statistically significantly associated with the economic development indicator ($\beta = -0.8852$, $p = 0.0037$), while Social Norms (X4) is positively and statistically significantly associated ($\beta = 1.0384$, $p = 0.0050$). The constant term is statistically significant ($C = 323.3700$, $p < 0.001$).

Overall, these results indicate that, within the study sample and model specification, economic development outcomes are more consistently associated with Social Norms and Trust than with Social Network, Reciprocity, and Social Values. Given the cross-sectional design, the estimates should be interpreted as statistical associations rather than causal effects.

Discussion

The regression results reported in Table 1.1 indicate that the dimensions of social capital exhibit heterogeneous associations with economic development among oil palm farming households. Among the five explanatory variables, only Trust (X3) and Social Norms (X4) show statistically significant relationships, while Social Networks (X1), Reciprocity (X2), and Social Values (X5) do not demonstrate statistically significant associations at the 5 percent level. These findings suggest that not all components of social capital contribute equally to economic development outcomes in the studied context (Baycan & Öner, 2023; Chetty et al., 2022).

From a modelling standpoint, the heterogeneous coefficients indicate that social capital does not operate as a linear or uniform construct within economic systems. Instead, different dimensions exhibit distinct functional roles, with social norms acting as stabilizing parameters and trust functioning as a context-dependent variable that may introduce inefficiencies under asymmetric institutional conditions.

The coefficient for Social Networks (X1) is positive but statistically insignificant, indicating that broader or more frequent networking among farmers does not, by itself, translate into measurable economic gains. In the context of Pubian Subdistrict, social networks among oil palm farmers may be largely transactional and vertically structured, particularly around intermediaries or collectors (Snashall & Poulos, 2023). Such networks may facilitate routine coordination but appear insufficient to improve bargaining power or economic performance in a statistically detectable way (Arora & Brintrup, 2021; Larson, 2021). An alternative explanation is that social network intensity is relatively uniform across respondents, limiting its explanatory variation in the regression model.

Reciprocity (X2) exhibits a negative but statistically insignificant coefficient, suggesting that reciprocal exchanges among farmers are not systematically associated with economic development outcomes. This finding implies that reciprocity may operate more as a social norm than as an effective economic mechanism in this setting. Where reciprocal relations are embedded in asymmetric arrangements between landowners, workers, or market intermediaries, reciprocity may reinforce dependency rather than promote mutual economic benefit (Fang et al., 2024; Van der Borght & Milian Gómez, 2024). The lack of statistical significance further indicates that reciprocity alone is insufficient to generate observable economic effects without supportive institutional conditions.

In contrast, Trust (X3) shows a negative and statistically significant association with economic development. This result challenges the conventional expectation that trust uniformly enhances economic performance.(Gazdecki & Grześkowiak, 2025; Owot et al., 2022) In the local context, higher reported trust may reflect reliance on dominant actors or established trading relationships that reduce farmers' incentives or capacity to seek alternative markets. Such forms of trust can coexist with power imbalances, information asymmetries, or elite control, which may ultimately constrain economic outcomes for smaller producers. The statistical significance of this negative coefficient underscores the importance of distinguishing between trust that facilitates cooperation and trust that sustains dependency structures.

Social Norms (X4) display a positive and statistically significant relationship with economic development, indicating that shared rules, behavioral expectations, and informal enforcement mechanisms are consistently associated with better economic outcomes. Strong social norms may reduce opportunistic behavior, enhance coordination, and support compliance with collective agreements, which are particularly important in smallholder agricultural systems(Sánchez-Navarro et al., 2024) .Compared to other dimensions of social capital, social norms appear to provide a more stable and operational foundation for economically relevant collective action in the study area.

Finally, Social Values (X5) show a positive but statistically insignificant coefficient, suggesting that shared values alone do not have a measurable association with economic development. This may indicate that values require institutionalization through norms or formal arrangements before they can influence economic behavior. Alternatively, the abstract nature of social values may limit their variability across respondents, reducing their explanatory power in the regression framework. Taken together, these results highlight that the economic relevance of social capital depends not on its presence in general, but on the specific mechanisms through which it is structured and enacted within farming communities (Moghfeli et al., 2023).

Limitations

This study has several methodological limitations that should be considered when interpreting the findings. First, the use of non-probability purposive sampling limits statistical generalization to

the broader population of oil palm farmers, meaning that external validity depends on contextual similarity. Second, the analysis relies on self-reported questionnaire data, which may be subject to perception and social desirability biases, particularly for latent social capital dimensions such as trust and social values. Third, although the measurement instruments were informed by the literature, construct validity may remain imperfect, as some dimensions of social capital can overlap or may not fully capture the complexity of social relations within oil palm farming communities. Finally, the regression model is associational rather than causal, leaving room for reverse causality and omitted variable bias, such as unobserved institutional quality, marketing arrangements, or access to extension services that could influence the estimated relationships. Accordingly, the results should be interpreted as context-specific empirical evidence on the heterogeneous roles of social capital dimensions in economic development, rather than as definitive causal conclusions. From a modelling perspective, the linear OLS specification may not fully capture potential non-linear interactions or threshold effects among social capital dimensions, suggesting the relevance of future extensions using structural equation modelling or non-linear econometric approaches.

CONCLUSION

This study develops a quantitative model to examine how selected dimensions of social capital are associated with economic development in palm oil farming communities. Based on the OLS regression results in the study sample, social norms show a positive and statistically significant association with the economic development indicator, whereas trust shows a negative and statistically significant association. In contrast, social networks, reciprocity, and social values do not exhibit statistically significant associations in the specified model. These findings suggest that the economic relevance of social capital may be heterogeneous across its dimensions, with norms appearing more consistently linked to development outcomes in this context than other components. The conclusions should be interpreted in light of the study design and measurement constraints. The cross-sectional OLS specification supports inference about statistical associations within the observed sample, but it does not establish causal effects and may be subject to self-report bias, omitted variables, and potential reverse causality. Nevertheless, the study provides context-specific empirical evidence that incorporating social capital indicators into quantitative analyses can help clarify which social mechanisms are more closely linked to economic development among oil palm farming households. Future research may extend the present model by employing structural equation modelling or non-linear econometric approaches to capture potential interaction effects and threshold dynamics among social capital dimensions. Longitudinal designs and the inclusion of institutional or market-structure variables may further enhance causal inference and system-level understanding.

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AUTHOR CONTRIBUTIONS STATEMENT

Conceptualization and research design were led by Nurlaili, who also coordinated the overall study and manuscript preparation. M. Nasor contributed to instrument development, data collection supervision, and preliminary data organization. Heni Noviarita was responsible for data analysis, including the implementation of the OLS regression model and interpretation of statistical results. Rini Setiawati contributed to the literature review, theoretical framing, and refinement of the Introduction and Discussion sections. Mohd Syahril Ahmad Razimi supported critical revision of the

manuscript, methodological clarity, and contextual interpretation of findings. All authors reviewed, edited, and approved the final version of the manuscript.

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