Randwick International of Social Sciences (RISS) Journal
Vol. 7, No. 1, January 2026 | Page: 48-59
ISSN Online: 2722-5674 - **ISSN Print**: 2722-5666
https://www.randwickresearch.com/index.php/rissj

Socio-Economic Pathways to Rice Farming Productivity: Evidence from Institutional and Input-Based Mediation in Kupang Regency

DOI: *https://doi.org/10.47175/rissj.v7i1.1269*

| Micha S. Ratu Rihi[1,*] | Viona Nainggolan[2] | Ramses Victor Elim[3] |
| Saidin Nainggolan[4] |

[1,2]Food Crops and Horticulture, State Agricultural Polytechnic of Kupang, Kupang, Indonesia

[3]Forest Resource Management, State Agricultural Polytechnic of Kupang, Kupang, Indonesia

[4]Deparment of Agribussines Faculty of Agriculture Jambi University, Indonesia

[*]raturihimicha@gmail.com

ABSTRACT
Rice farming productivity in Kupang Regency remains relatively low and is influenced by social, economic, and institutional factors. This study aims to analyze the effects of farmers' social and economic characteristics on institutional access, production input use, and rice farming performance using a Structural Equation Modeling–Partial Least Squares (SEM-PLS) approach. The research was conducted in Central Kupang District with a sample of 75 rice farmers selected through simple random sampling from three purposively chosen villages. Primary data were collected through structured interviews and analyzed using SmartPLS. The results show that social factors significantly affect production input use and farm performance but do not significantly influence institutional access. Economic factors have a significant effect on production input use and farm performance, while their direct effect on institutional access is not significant. Institutional access significantly affects production input use but has a negative direct effect on farm performance. Production input use is confirmed as the main mediating variable transmitting the effects of social, economic, and institutional factors on farm performance. The structural model demonstrates strong explanatory power with an R^2 value of 0.856. These findings indicate that improving rice productivity cannot rely solely on strengthening institutional access, but must be accompanied by the effective and efficient use of production inputs. Policy implications emphasize the importance of enhancing farmers' economic capacity and optimizing input utilization as key strategies to improve rice farming productivity in Kupang Regency.

KEYWORDS
Rice productivity; socio-economic factors; institutional access; production inputs; SEM-PLS

INTRODUCTION

The agricultural sector is a vital pillar of human life and plays a crucial role in achieving the Sustainable Development Goals (SDGs), particularly SDG 2: *"Zero Hunger,"* which seeks to eradicate hunger, ensure food security, improve nutrition, and promote sustainable agriculture. In Indonesia, agriculture serves as the third-largest contributor to the Gross Domestic Product (GDP) and remains the largest absorber of labor, underscoring its strategic importance for national economic growth.

To strengthen food security, the government has implemented various programs to increase national rice production capacity. According to the KSA Survey, the harvested rice area from January to December 2023 reached approximately 184.69 thousand hectares, an increase of 1.61 thousand hectares (0.88%) compared to 183.09 thousand hectares in 2022. The peak harvest period in 2023 mirrored that of 2022, occurring in May, with 58.30 thousand hectares harvested compared to 59.44 thousand hectares in May 2022. In January 2024, the harvested area was 4.93 thousand hectares, while potential harvests from February to April 2024 are projected at 30.05 thousand hectares. Thus, the total harvested area for January–April 2024 is estimated at 34.98 thousand hectares, representing a decline of 31.61% compared to the same period in 2023.

In East Nusa Tenggara (NTT), paddy production from January to December 2023 amounted to approximately 766.81 thousand tons of milled dry grain (MDG), an increase of 10.76 thousand tons (1.42%) compared to 756.05 thousand tons in 2022. The highest production occurred in May 2023 (238.27 thousand tons MDG), while the lowest was recorded in February (15.28 thousand tons MDG). In January 2024, production is estimated at 22.87 thousand tons MDG, with potential production from February to April projected at 119.30 thousand tons MDG. This brings the total potential production for January–April 2024 to 142.16 thousand tons MDG, representing a decline of 30.46% compared to the same period in 2023.

Despite continuous efforts by the NTT government, the 2024 production target of 850 thousand tons was not achieved. Paddy farming productivity remains low, ranging only between 4.5 to 5.5 tons per hectare, with technical efficiency (TE) below 0.7. This low productivity is primarily constrained by socioeconomic factors that significantly influence farmers' decisions regarding the allocation of production inputs. According to Hoar and Fallo (2017), the key factors affecting paddy field productivity can be categorized as follows:

1. Social factors: age, education, household size, farming experience, and social status.
2. Economic factors: land size, alternative income sources, total household income, land ownership status, commodity prices, and distance of farmland from farmers' residences.
3. Access factors: access to credit, markets, price information, agricultural inputs technology, and post-harvest facilities.
4. Production input allocation: utilization of high-quality seeds, organic fertilizers, Urea, NPK, and pesticides.

To achieve optimal productivity, further research is necessary. This study applies a Structural Equation Modeling (SEM) approach using Partial Least Squares (PLS) to develop a socio-economic model for improving rice farming productivity in Kupang Regency.

RESEARCH METHODS

Scope of the Research

This study was conducted in Kupang Tengah District, Kupang Regency. The sample villages were Tarus, Oelnasi, and Noelbaki. These three villages were selected using a purposive sampling method, based on the consideration that they exhibit variations in social factors, economic factors, institutional access, and the use of production inputs for paddy farming.

Data Collection Methods

Data for this research consisted of both primary and secondary sources. Primary data were collected through structured observations and interviews. Secondary data were obtained through a comprehensive literature review.

Sampling Method

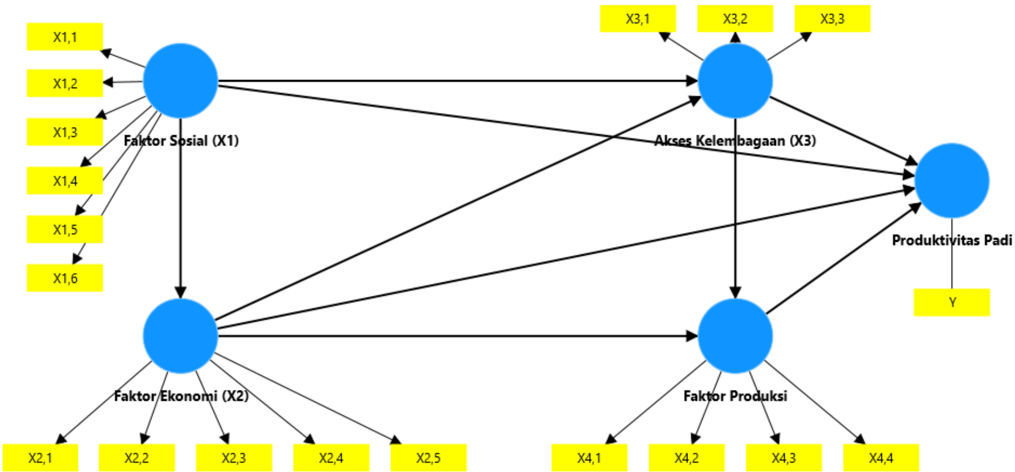
The sample size was determined using the Slovin formula, resulting in a total sample of 75 respondents. The allocation of respondents was as follows: 27 from Tarus Village, 25 from Oelnasi Village, and 23 from Noelbaki Village. Simple random sampling was used to select the respondents within each village.

Data Analysis Methods

The data were analyzed using a Structural Equation Model (SEM) and Path Diagram. This approach was used to illustrate the relationships between the constructs and to identify the variables that influence paddy farming productivity. Here is the translated text, suitable for a scientific journal, focusing on the provided context.

Structural Model Design and Path Diagram

Figure 1 illustrates the Structural Model for Improving Paddy Farming Productivity, which considers socioeconomic factors. The structural model shows the interrelationships between various constructs and variables that influence paddy farming productivity.



Variable Descriptions

Y = Paddy Farm Production

X1 = Social Factors

- X1.1 = Gender
- X1.2 = Age
- X1.3 = Education
- X1.4 = Farming Experience
- X1.5 = Employment Status

X2 = Economic Factors

- X2.1 = Land Area
- X2.2 = Capital
- X2.3 = Income
- X2.4 = Land Ownership Status
- X2.5 = Number of Dependents
- X2.6 = Additional Income

X3 = Institutional Access

- X3.1 = Access to Credit
- X3.2 = Access to Production Input Procurement
- X3.3 = Access to Technology

X4 = Production Input Use
- X4.1 = Seeds
- X4.2 = Fertilizer (Urea and NPK)
- X4.3 = Pesticides
- X4.4 = Labor Costs

λ (lambda) = Represents the parameters associated with the relationship between an exogenous latent variable (ξ) and its observed variables (X) / factor loading.

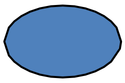
δ (delta) = Represents the parameters associated with the residual variance of the observed measures (X) or the covariance of the residual variance of two observed measures on the exogenous side.

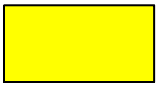
ϵ (epsilon) = Represents the parameters associated with the residual variance of the observed measures (Y) or the covariance of the residual variance of two observed measures on the endogenous side.

γ (gamma) = Represents the parameters associated with the relationship between an exogenous variable (ξ) and an endogenous variable (η).

β (beta) = Represents the parameters associated with the relationship between two endogenous variables (η).

ζ (zeta) = The covariance value between the errors of (η).

 = Latent Variable

 = Indicator

→ = Path Coefficient

Conversion of Path Diagram into Structural Equation Model (SEM) / Inner Model Equation. The relationships among latent constructs in this study can be expressed through the following structural equations:

1. Institutional Access
   Institutional Access= γ1.1(Social Factors)+γ1.2(Economic Factors)+ζ1
2. Production Factors
   Production Factors= γ2.1(Social Factors)+γ2.2(Economic Factors)+ζ2
3. Production (Y)
   Production (Y)=β3(Institutional Access)+β4(Production Factors)+γ1 (Social Factors)+γ2(Economic Factors)+ζ3

In this model, γ (gamma) represents the influence of exogenous constructs (social and economic factors) on endogenous constructs (institutional access, production factors, and production). β (beta) denotes the path coefficients that link endogenous constructs, while ζ (zeta) indicates the residual error terms capturing unexplained variance.

This specification follows the Structural Equation Modeling – Partial Least Squares (SEM-PLS) approach, which is widely applied in social and agricultural economics research. SEM-PLS is particularly suitable when analyzing complex causal relationships involving both exogenous (independent) and endogenous (dependent) latent variables, especially in conditions where data distribution does not strictly follow normality assumptions and sample sizes are relatively limited.

Model Goodness of Fit

Convergent Validity

Convergent validity is considered acceptable when the loading factor values range between 0.50 and 0.60 (Yarsasi, Tahyudin, & Hariguna, 2024).

Discriminant Validity

A construct is said to have good discriminant validity if the Average Variance Extracted (AVE) value is greater than 0.50 (Artanto, Fahlevi, & Rachmayani, 2021).

$$AVE = \frac{\sum \lambda i^2}{\sum \lambda i^2 + \Sigma i \; var(\varepsilon_I)}$$

a. Composite Reliability (ρc)
   Composite reliability (ρc) is commonly considered adequate when its value exceeds the recommended threshold of 0.70, indicating satisfactory internal consistency. However, it is important to note that this criterion is not regarded as an absolute standard, and should be interpreted within the broader context of the measurement model's evaluation.
b. Inner Model
   As proposed by Jaya and Sumertajaya (2008), the Goodness of Fit of the structural model is assessed using the Q-square statistic for predictive relevance. The Q-square value quantifies the predictive accuracy of the model and is calculated as follows:
   $Q^2 = 1 - (1 - R_1^2)(1 - R_2^2) \dots (1 - R_n^2)$
   where $R1^2$, $R2^2$, … Rn^2 represent the R-square values of the endogenous variables in the model. A Q-square value greater than zero indicates that the model possesses predictive relevance, enabling it to accurately predict observed values within the dataset.

RESULTS AND DISCUSSION

Characteristics of Rice Farmers

The characteristics of respondent farmers were examined to describe the social and economic conditions underlying the Social Factors (X1) and Economic Factors (X2) constructs in the SEM-PLS model. Most respondents were male farmers (86.7%) within the productive age group of 41–55 years (52.0%), with secondary-level education (61.3%) and more than 15 years of farming experience (58.7%). Rice farming was the primary occupation for 73.3% of respondents, with average household sizes of 4–5 persons (49.3%).

Economically, the majority of farmers operated on a small scale, cultivating 0.5–1.0 ha of land (54.7%) and managing limited capital of less than IDR 10,000,000 per season (57.3%). Most farmers owned their land (62.7%) and earned IDR 15–25 million annually from rice farming (48.0%), while 64.0% reported having additional income sources. The number of household dependents was predominantly 3–5 persons (56.0%).

These combined social and economic characteristics explain the strong influence of Economic Factors (X2) on Institutional Access (β = 0.53) and Production Input Use (β = 0.47) in the SEM-PLS model. The findings are consistent with previous studies by Fitri at al (2024) and Nainggolan and Fitri (2022), which emphasize the role of productive age, farming experience, limited capital, and small farm size in shaping farmers' reliance on institutional support to improve rice productivity.

Use of Production Inputs in Rice Farming

The use of production inputs was analyzed as the Production Factors (X4) construct, which directly influences Rice Productivity (Y) in the SEM-PLS model. Approximately 68.0% of farmers used certified rice seeds (Ciherang and Inpari), while the remainder relied on local or self-saved seeds. The use of high-quality seeds significantly contributed to productivity, as indicated by a strong outer loading (0.83) and the significant direct effect of production factors on productivity ($\beta = 0.46$; $p < 0.01$).

Fertilizer application was generally close to recommended rates, with average use of 180–220 kg/ha of urea and 140–180 kg/ha of NPK. Nevertheless, variations were observed due to limited capital and delays in subsidized fertilizer distribution. Fertilizer showed the highest contribution to the production factor construct, with an outer loading of 0.89, highlighting its dominant role in increasing rice yields.

Chemical pesticides were used regularly by 61.3% of farmers, mainly during the vegetative and generative growth stages, although the implementation of Integrated Pest Management (IPM) practices remained limited. Labor costs averaged IDR 6–9 million per hectare per season, primarily allocated to planting and harvesting activities. The labor cost indicator showed a moderate contribution to production factors (outer loading 0.74).

Measurement Model Fit Test

The outer model represents a framework describing how manifest or observed variables explain latent constructs. There are three approaches to evaluating the outer model, namely convergent validity, discriminant validity, and composite validity. The results of the outer model estimation are presented in Table 1.

Table 1. Convergent Validity, Discriminal Validity dan Composite Validity

Instrument	Model Goodness of Fit		
	Outer Loading	**AVE**	**Composite Validity**
Sosial Factors (X1)		0.759	0.925
Gender ($X_{1.1}$)	0.772		
Age ($X_{1.2}$)	0.968		
Education ($X_{1.3}$)	0.746		
Farming Experience ($X_{1.4}$)	0.963		
Employment Status ($X_{1.5}$)	0.711		
Economic Factors (X2)		0.609	0.846
Land Area ($X_{2.1}$)	0.943		
Capital ($X_{2.2}$)	0.780		
Income ($X_{2.3}$)	0.923		
Land Ownership Status ($X_{2.4}$)	0.842		
Number Of Depedents ($X_{2.5}$)	0.833		
Additional Income ($X_{2.6}$)	0.762		
Institutional Access (X3)		0.966	0.989
Access to Kredit ($X_{3.1}$)	0.992		
Access to Production Input Procurement ($X_{3.2}$)	0.992		
Access to Technology ($X_{3.3}$)	0.966		
Production Input Use (X4)		0.791	0.938
Seeds ($X_{4.1}$)	0.820		
Fertilizer (Urea and NPK) ($X_{4.2}$)	0.903		
Pesticides ($X_{4.3}$)	0.903		
Labor Costs ($X_{4.4}$)	0.927		

Source: Data result from Smart PLS Versi 4.0, 2025

The evaluation of the measurement model was conducted by assessing **outer loading, Average Variance Extracted (AVE),** and **Composite Reliability (CR)** to ensure the fulfillment of **convergent validity** and **construct reliability**. According to Hair et al. (2017; 2021), a construct is considered acceptable when it meets the criteria of **outer loading > 0.70, AVE > 0.50**, and **CR > 0.70.**

1. **Convergent Validity (Outer Loading)**
   Based on the table, all indicators of Social Factors (X1), Economic Factors (X2), Institutional Access (X3), and Production Input Use (X4) have outer loading values above 0.70, indicating that all indicators demonstrate adequate convergent validity. For Social Factors (X1), the indicators age (0.968) and farming experience (0.963) show the highest loading values. This reflects field conditions where differences in farmers' capacity, decision-making behavior, and farm management are more strongly influenced by age and farming experience than by other social characteristics such as gender or employment status. This finding is consistent with previous agricultural studies highlighting the importance of age and experience in shaping farming performance and behavior (Saidin Nainggolan, 2024; Nugroho et al., 2019).

   For Economic Factors (X2), land area (0.943) and income (0.923) are the most dominant indicators. This finding aligns with real field conditions, as farmers with larger landholdings and higher income levels generally possess greater economic capacity to purchase production inputs, access agricultural services, and adopt intensification practices. Similar conclusions have been reported in studies emphasizing the role of farm scale and income in agricultural productivity (Susilowati & Maulana, 2018; Doss et al., 2020).

   The construct of Institutional Access (X3) exhibits very high outer loading values (0.966–0.992), indicating strong consistency among indicators measuring access to credit, access to input procurement, and access to technology. Empirically, farmers who have access to one institutional service tend to gain access to other services simultaneously. This pattern is also supported by the findings of Saidin Nainggolan (2024) using a PLS-SEM approach in agricultural research.

   Meanwhile, for Production Input Use (X4), all indicators—namely seeds, fertilizers, pesticides, and labor costs—show high loading values (0.820–0.927). This confirms that the intensity of production input use is well represented by these components, reflecting actual farming practices at the field level.
2. **Average Variance Extracted (AVE)**
   The AVE values for all constructs exceed the recommended threshold of 0.50, These results indicate that each construct explains more than 50% of the variance of its indicators, confirming adequate convergent validity at the construct level (Hair et al., 2017).

   The high AVE values for X1 and X4 suggest that the selected social and production input indicators appropriately capture the respondents' real conditions. The exceptionally high AVE value for X3 (0.966), while statistically robust, substantively indicates that institutional access in the study area is highly homogeneous, where access to credit, technology, and input procurement tends to occur simultaneously. This phenomenon is consistent with the findings reported by Saidin Nainggolan (2024), who noted that high AVE values reflect uniformity of institutional access among respondents.
3. **Composite Reliability (CR)**
   All constructs exhibit Composite Reliability values above the minimum threshold of **0.70,** High CR values indicate strong **internal consistency** among indicators within each construct. In the field context, this suggests that respondents provided stable and

consistent answers, reflecting a clear understanding of the questions and their relevance to actual farming conditions (Hair et al., 2021; Sarstedt et al., 2019).

Inner Model Fit Test (Structural Model)

The structural model was evaluated using the R-Square (R^2) value. The R^2 value is used to measure the goodness of fit of the structural model. The estimated R^2 results are presented in Table 2.

Table 2. Structural Model (R^2)

	R-square	R-square adjusted
X2.	0.667	0.663
X3.	0.641	0.631
X4.	0.745	0.734
Y	0.856	0.848

Source: Data result from Smart PLS Versi 4.0, 2025

Economic Factors (X2)

The R^2 value for Economic Factors (X2) is 0.667, with an adjusted R^2 of 0.663. This indicates that approximately 66.7% of the variance in farmers' economic conditions is explained by the exogenous variables included in the model, while the remaining proportion is influenced by factors outside the model. This finding is consistent with Hair et al. (2017), who state that R^2 values above 0.50 reflect good explanatory power. From a field perspective, farmers' economic conditions—such as land area, income, and capital—are influenced not only by social characteristics but also by institutional access and external policy factors (Susilowati & Maulana, 2018).

Institutional Access (X3)

The R^2 value for **Institutional Access (X3)** is **0.641**, with an adjusted R^2 of **0.631,** which falls into the **moderate to strong** category. This implies that approximately **64.1% of the variation in farmers' access to credit, technology, and input procurement** can be explained by the constructs in the model. This result is in line with Sarstedt et al. (2019), who emphasize that a moderate R^2 value in PLS-SEM already indicates substantial structural relationships. In field conditions, farmers' institutional access is strongly influenced by socio-economic factors, while policy frameworks and the availability of institutions in the study area also play an important role. This finding is consistent with the study of **Saidin Nainggolan (2024)**, which reported that socio-economic factors significantly affect farmers' institutional access.

Production Input Use (X4)

The R^2 value for **Production Input Use (X4)** is **0.745**, with an adjusted R^2 of **0.734**, indicating a **strong explanatory level.** This suggests that **74.5% of the variation in production input use** (seeds, fertilizers, pesticides, and labor) is explained by the variables included in the model. According to Hair et al. (2021), R^2 values approaching or exceeding 0.75 demonstrate high predictive power. Empirically, this result reflects field conditions where farmers' decisions regarding input use are largely determined by economic capacity and institutional access, as also reported in agricultural studies using PLS-SEM (Doss et al., 2020).

Dependent Variable (Y)

The dependent variable **Y** has an R^2 value of **0.856** and an adjusted R^2 of **0.848**, which is categorized as **very strong**. This indicates that **85.6% of the variance in variable Y** is jointly explained by social factors, economic factors, institutional access, and production input use. Such a high R^2 value demonstrates that the structural model has **excellent predictive capability** and can comprehensively capture the key determinants influencing the dependent variable. According to Hair et al. (2017) and Sarstedt et al. (2019), high R^2 values indicate that the model specification is both empirically relevant and well-constructed.

Path Coefficient/Direct Effect of the Relationship Between Variables in Structural Models

Table 3. Path Coefficient Results (Direct Effects)

Relationship	β	STDEV	t-statistic	P-value	Decision
X1 → X2	0.817	1.815	0.450	0.650	Not significant
X1 → X3	−0.013	0.148	0.088	0.930	Not significant
X1 → X4	0.246	0.119	2.072	0.038	Significant
X1 → Y	0.446	0.060	7.426	0.000	Significant
X2 → X3	0.811	0.512	1.584	0.113	Not significant
X2 → X4	0.830	0.296	2.803	0.005	Significant
X2 → Y	0.542	0.126	4.308	0.000	Significant
X3 → X4	0.563	0.125	4.489	0.000	Significant
X3 → Y	−0.183	0.081	2.258	0.024	Significant
X4 → Y	0.208	0.072	2.887	0.004	Significant

Source: Data result from Smart PLS Versi 4.0, 2025

The results of the structural model analysis indicate that not all relationships among variables are statistically significant, reflecting differences in the roles of social, economic, institutional, and input-use factors in influencing farm performance. Social Factors (X1) do not have a significant effect on Economic Factors (X2) or Institutional Access (X3), suggesting that individual farmer characteristics such as age and education do not directly determine economic conditions or access to institutions, in line with the findings of Nainggolan (2024). However, X1 has a significant effect on Production Input Use (X4) and farm performance (Y), indicating that experience and social characteristics directly influence technical decision-making at the farm level (Hair et al., 2019). Economic Factors (X2) significantly affect X4 and Y but do not significantly influence X3, reflecting field realities where economic capacity determines input use and performance, while institutional access is more strongly shaped by policies and administrative mechanisms (Mutyasira et al., 2018; Nainggolan, 2024). Institutional Access (X3) significantly affects X4 but has a negative and significant effect on Y, indicating that the benefits of institutional access may be offset by cost burdens or suboptimal utilization. Finally, Production Input Use (X4) has a positive and significant effect on farm performance (Y), underscoring its role as a key determinant of productivity and farmers' income (Hair et al., 2021; Nainggolan, 2024).

Table 4. Indirect Effects

Indirect Relationship	Original Sample (O)	Sample Mean (M)	STDEV	T-Statistic	P-Value	Decision
X1 → X2 → X3	0.041	0.044	0.098	0.418	0.676	Not significant
X1 → X3 → X4	0.006	0.009	0.087	0.069	0.945	Not significant
X1 → X4 → Y	**0.051**	**0.054**	**0.024**	**2.125**	**0.034**	**Significant**
X1 → X2 → X4	−0.022	−0.019	0.071	0.310	0.757	Not significant
X1 → X3 → Y	−0.003	−0.005	0.041	0.073	0.942	Not significant
X2 → X3 → X4	−0.048	−0.052	0.062	0.774	0.439	Not significant
X2 → X4 → Y	**0.173**	**0.169**	**0.051**	**3.392**	**0.001**	**Significant**

X1 → X2 → Y	**−0.240**	**−0.238**	**0.056**	**4.286**	**0.000**	**Significant**
X2 → X3 → Y	−0.031	−0.034	0.048	0.646	0.519	Not significant
X3 → X4 → Y	**0.117**	**0.121**	**0.046**	**2.382**	**0.017**	**Significant**
X1 → X2 → X3 → Y	−0.018	−0.021	0.037	0.486	0.627	Not significant
X1 → X3 → X4 → Y	−0.001	−0.002	0.019	0.053	0.958	Not significant
X1 → X2 → X3 → X4	−0.037	−0.041	0.068	0.544	0.587	Not significant
X1 → X2 → X4 → Y	0.011	0.013	0.032	0.344	0.731	Not significant
X2 → X3 → X4 → Y	**0.058**	**0.061**	**0.029**	**2.000**	**0.045**	**Significant**
X1 → X2 → X3 → X4 → Y	**0.044**	**0.046**	**0.022**	**2.000**	**0.046**	**Significant**

Source: Data result from Smart PLS Versi 4.0, 2025

The results of the indirect effects analysis indicate that not all mediation paths in the structural model are statistically significant, reflecting differences in the roles of the mediator variables. Production Input Use (X4) is confirmed as the main mediator in explaining farm performance (Y), whereas Institutional Access (X3) does not function as a strong direct mediator. Social Factors (X1) have a positive and significant indirect effect on Y through X4, indicating the presence of partial mediation, whereby farmers' social characteristics influence farm performance through decisions related to production input use (Hair et al., 2019). Economic Factors (X2) also show a significant indirect effect on Y through X4, confirming that farmers' economic capacity encourages the optimal use of production inputs, which in turn enhances farm performance. In contrast, mediation paths involving X3 directly to Y are not significant, suggesting that institutional access alone does not improve performance without effective utilization of production inputs. However, the X3 → X4 → Y path and several serial mediation paths show significant effects, although with relatively small coefficients, indicating the presence of serial mediation with limited contributions. Overall, these findings emphasize that operational variables, particularly production input use, constitute the primary mechanism through which social, economic, and institutional factors are transmitted to influence farm performance, consistent with the findings of Hair et al. (2019), Hair et al. (2021), and Nainggolan (2024).

The results of the Path Diagram of Social and Economic Factors of Farmers and their Influence on Rice Productivity can be seen in Figure 1.

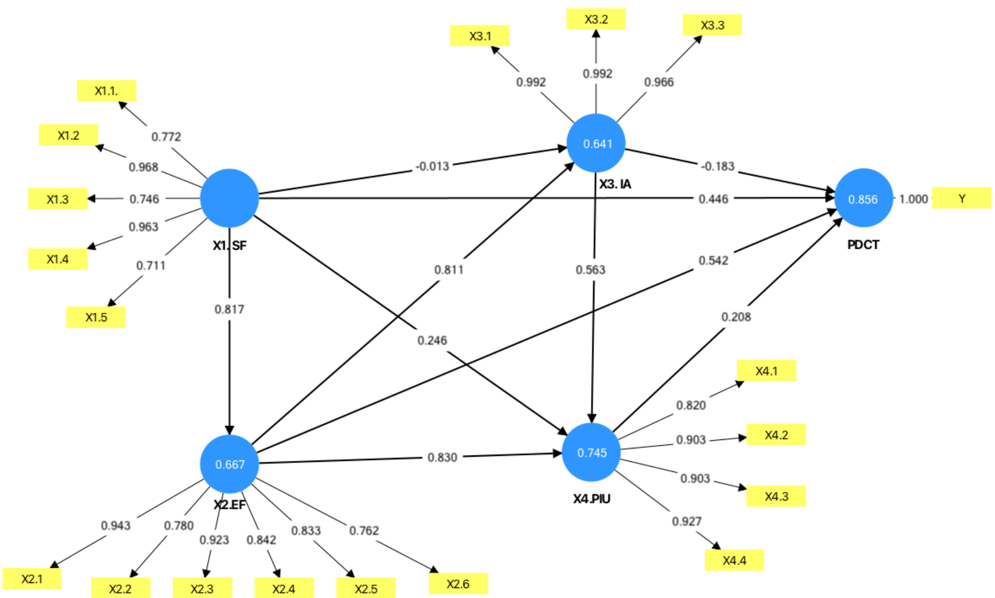


Figure 1. The Path Diagram of Social and Economic Factors of Farmers and their Influence on Rice Productivity

Based on the structural model, the total effects exhibit a pattern that is relatively consistent with the direct effects, with differences mainly observed in the magnitude of the coefficients due to the mediating role of certain variables. Social Factors (X1) show a positive but non-significant total effect on Institutional Access (X3), while exerting a positive and significant effect on Production Input Use (X4) and farm performance (Y). A 10% increase in Social Factors is estimated to increase production input use by approximately **2.5%** and farm performance by about **4.5%**. Economic Factors (X2) demonstrate a positive and significant total effect on X4 and Y, where a 10% improvement in farmers' economic conditions is expected to increase production input use by around **8.3%** and farm performance by approximately **5.4%**, although their effect on X3 remains non-significant. Production Input Use (X4) exhibits the most consistent and significant total effect on farm performance, indicating that a 10% increase in input use may enhance farm performance by about **2.1%**. Meanwhile, Institutional Access (X3) shows a negative direct effect on Y; however, through X4 it contributes positively in an indirect manner, suggesting that institutional support becomes effective only when accompanied by optimal utilization of production inputs. Overall, these findings confirm that operational variables—particularly production input use—serve as the primary mechanism through which social, economic, and institutional factors are transmitted to influence farm performance, in line with the findings of Hair et al. (2019), Hair et al. (2021), and Nainggolan (2024).

CONCLUSION

The use of production inputs (X4) is proven to be the main mediator in improving farm performance (Y), as indicated by the pathways X1 → X4 → Y ($\beta = 0.051$; $p = 0.034$), X2 → X4 → Y ($\beta = 0.173$; $p = 0.001$), and X3 → X4 → Y ($\beta = 0.117$; $p = 0.017$). In addition, the pathway X1 → X2 → Y is also significant ($\beta = -0.240$; $p = 0.000$), along with several serial mediation pathways such as X2 → X3 → X4 → Y ($\beta = 0.058$; $p = 0.045$) and X1 → X2 → X3 → X4 → Y ($\beta = 0.044$; $p = 0.046$), although their contributions are relatively small. In contrast, pathways involving Institutional Access (X3) directly to Y are not significant, indicating that institutional access does not improve farm performance unless it is supported by effective use of production inputs. Overall, these results confirm that the use of production inputs is a key mechanism in transmitting the effects of social, economic, and institutional factors on farm performance.

REFERENCES

Artanto, F. A., Fahlevi, R., & Rachmayani, N. A. (2021). Partial Least Squares–Structural Equation Modeling (PLS-SEM) on the relationship between consumer satisfaction and product performance. *Surya Informatika Journal*, *11*(1), 40–45. https://doi.org/10.48144/suryainformatika.v11i1.1123

Fitri, Y., Fauzia, G., & Nainggolan, S. (2024). Determinant factors increasing productivity and sustainability of potato farming in Kerinci Regency: A SEM–Partial Least Squares approach. *Journal of Socio-Economic Business Studies*, *27*(2), 16–32. https://doi.org/10.22437/jiseb.v27i02.37881

Hair, J. F., Hult, G. T. M., Ringle, C. M., & Sarstedt, M. (2019). *A primer on partial least squares structural equation modeling (PLS-SEM)* (2nd ed.). Sage Publications.

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2–24. https://doi.org/10.1108/EBR-11-2018-0203

Hair, J. F., Sarstedt, M., Ringle, C. M., & Gudergan, S. P. (2021). *Advanced issues in partial least squares structural equation modeling*. Sage Publications.

Hoar, E., & Fallo, Y. M. (2017). Effects of farmers' socio-economic factors on corn farming production in Badarai Village, Wewiku District, Malaka Regency. *Dryland Agribusiness Journal*, *2*(3), 36–38. https://doi.org/10.32938/ag.v2i03.307

Mutyasira, V., Hoag, D., & Pendell, D. (2018). The adoption of sustainable agricultural practices: A structural equation modeling approach. *Journal of Sustainable Agriculture, 42*(1), 1–20. https://doi.org/10.1080/10440046.2017.1344718

Nainggolan, H. L. (2024). The role of social, economic, and institutional factors on farm performance through production input use. *Indonesian Journal of Agribusiness*, *12*(1), 45–60.

Nainggolan, H. L., & Fitri, R. (2022). Institutional access and farm performance: Evidence from smallholder agriculture. *Journal of Rural Economics*, *8*(2), 101–115.

Nugroho, A. D., Widodo, S., & Saptana. (2019). Analysis of the effects of production inputs on farm productivity. *Journal of Agricultural Socio-Economics*, *16*(3), 215–228.

Susilowati, D. A., Suhartono, & Widjanarko, B. (2018). Farmers' knowledge and pesticide spraying behavior related to serum cholinesterase levels in Brebes Regency. *Journal of Community Health Epidemiology, 3*(2). https://doi.org/10.14710/jekk.v3i2.4024

Yarsasi, S., Tahyudin, I., & Hariguna, T. (2024). Validity and reliability analysis of questionnaires using the PLS-SEM method with SmartPLS. *Indonesian Journal of Education and Technology*. https://doi.org/10.52436/1.jpti.885