AFFECTING FACTORS FARMER WELFARE IN INDONESIA

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ARTICLE INFO	ABSTRACT
	This study aims to analyze the factors influencing the economic welfare of farmer households in Indonesia, focusing on the impact of arable land area, total production costs, labor allocation, and the percentage of land ownership. The research also seeks to specify the agricultural household economic model and propose alternative policy measures to enhance farmer welfare. Utilizing data from the Indonesian Family Life Survey (IFLS), the study employs Ordinary Least Squares (OLS) and Fixed Effect panel data models for analysis. The findings reveal that larger arable land areas, increased workload, and higher percentages of owned land significantly improve national farming income, thereby enhancing farmer welfare. Conversely, higher total production costs negatively impact welfare levels in both upland and rice field contexts. The economic model's specifications across eight structural equations align well with theoretical expectations, indicating robustness and consistency with observed agricultural phenomena. Policy simulations suggest that promoting employment opportunities in the off-farm sector could be an effective strategy to boost farmer welfare. Such policies may lead to a reduction in labor allocated to agriculture, increased overall household income, higher expenditures on food consumption from agricultural outputs, and an expanded household income surplus. These findings provide valuable insights for policymakers aiming to formulate targeted interventions that address the challenges faced by farmers, ultimately improving their economic well-being and ensuring sustainable agricultural development in Indonesia.

1. INTRODUCTION

The agricultural sector in Indonesia plays a vital role in contributing to the country's economic development and the welfare of its farmers. It is not only a primary source of basic necessities like food and clothing but also supports housing, employment, national income, and foreign exchange for the country (Putri & Noor, 2018). The economic growth and welfare of Indonesian farmers largely depend on their income levels and the profits derived from the agricultural sector. With a majority of Indonesia's population residing in rural areas and engaging in agriculture, the sector is pivotal in enhancing their welfare and livelihood.

The Indonesian government, recognizing the importance of agriculture, has adopted policies to enhance agricultural productivity and farmer welfare. One such policy is regional autonomy, which grants local governments the authority to manage their own economic potential and affairs, including agricultural development. Blitar Regency, for example, is one of the regions where local governance is encouraged to optimize agricultural activities to improve farmer welfare.

In many developing countries, including Indonesia, land management for agricultural activities remains a dominant practice (Dale & Polasky, 2007). According to data from the Center for Agricultural Data and Information Systems (2019), the total land area used for agriculture in Indonesia in 2018 was approximately 39.6 million hectares, with 82.1% being dry land and the remaining 17.9% paddy fields. Studies, such as those by Sumaryanto et al. (2002), emphasize that the agricultural sector is a critical source of income for almost half of Indonesia's population. However, much of Indonesia's agricultural activity takes place on dry land, which requires efficient management to ensure economic viability, food security, minimize the risk of crop failure, and mitigate the impact of climate change.

Farmers' decisions on land use are influenced by a range of objectives, including maximizing income, ensuring food security, minimizing risks, optimizing leisure time, and enhancing the welfare of household members (Kokoye, 2013). Similar studies, such as those conducted by Xia et al. (2020) in China, highlight how changes in agricultural land use and rural land management decisions are influenced by various socio-economic factors. In Indonesia, understanding these decision-making processes is crucial to formulating policies that can enhance farmer welfare.

Agricultural households in Indonesia serve a dual role: they produce agricultural output while managing the consumption needs of household members. This dual role is managed through the allocation of time across on-farm, off-farm, and leisure activities (Chang et al., 2012). In developing countries, where subsistence farming is prevalent, the production and consumption decisions of farm households are often intertwined. This necessitates an analytical approach that integrates household economics, considering both production and consumption aspects Mariyanto et al. (2016). Another research, such as that by Amare et al. (2018), has shown that external factors like rainfall shocks significantly impact poor households' welfare, indicating the need for comprehensive strategies to improve farmer resilience and welfare.

This study focuses on the allocation of labor within farming households towards activities that generate additional income, particularly those outside the farming and agricultural sector. The key variables in this study are the area of arable land, total production costs, labor allocation, and the percentage of land ownership by farmers. These variables are critical determinants of the welfare of farmers in Indonesia. Despite the extensive research on agricultural economics and farmer welfare, there is a notable gap in the literature regarding the integrated effect of these variables on farmer welfare in the Indonesian context. Previous studies, such as those by Andriati (2003) and Asmarantaka (2007), have employed a household economic approach focusing on rice as the primary commodity. Mariyanto et al. (2016) extended this research by including livestock in the economic analysis. However, there remains a need for a more comprehensive model that incorporates a broader range of variables affecting farmer welfare, such as labor allocation and different types of agricultural activities.

Therefore, this study aims to fill this research gap by developing a decision-making model for farmer households, focusing on the relationships between arable land area, total production costs, labor allocation, and land ownership percentage, to improve the economic welfare of farming households in Indonesia. By addressing this gap, the study seeks to contribute to the body of knowledge on agricultural household economics and provide insights into formulating policies that can enhance farmer welfare. The objectives of this study are as follows: 1) To determine the effect of arable land area, total production costs, labor allocation, and the percentage of land owned by farmers on the economic welfare of farming households in Indonesia; 2) To develop specifications for agricultural household economic models that can improve the welfare of farmers in Indonesia; and 3) To formulate alternative policies that can be implemented to enhance the welfare of farming households in Indonesia.

In conclusion, this research not only aims to advance theoretical understanding of the factors affecting farmer welfare but also provides practical recommendations for policymakers. By focusing on a comprehensive set of variables and using a holistic approach, this study seeks to develop more effective strategies to support the welfare of farmers in Indonesia.

2. RESEARCH METHODS

This study adopts a positivistic paradigm, emphasizing objective measurement and empirical analysis of observable phenomena (Collis & Hussey, 2009). This approach is suitable for examining factors affecting the economic welfare of farmer households in Indonesia, using quantitative data to ensure findings are verifiable and generalizable.

The independent variables include the area of arable land, total production cost, labor allocation, and the percentage of land owned by farmers. The dependent variable is the economic welfare of farmer households. Secondary data from the Indonesian Family Life Survey (IFLS) provide a comprehensive panel dataset covering 34 provinces, recognized for its reliability in socio-economic data.

A systematic sampling technique was applied to ensure the sample represents diverse farming practices across Indonesia. Samples were selected based on specific criteria, including the proportion of farming households in each province, to ensure adequate representation. Stratification and clustering methods were used to capture the variations in farming practices, enhancing the generalizability of the results. This approach ensures the study's replicability by providing a clear framework for sample selection.

The Fixed Effect Model (FEM) was utilized, supported by Hausman and Chow tests, confirming its suitability for the study. FEM was chosen because it effectively controls for unobserved heterogeneity, which is crucial for accurately estimating the impact of the selected variables on farmer household welfare. This aligns with the study's objectives to identify the significant factors influencing economic welfare in farming households. The system of equations used further explores the relationships between production decisions, labor allocation, and household income, providing a comprehensive understanding of the factors at play.

Data were collected from the IFLS dataset, which is known for its robustness and extensive coverage of socio-economic variables. The data collection process involved cross-validation with other sources to ensure accuracy and consistency. Potential biases were minimized by implementing robustness checks and handling missing data through imputation methods. This rigorous approach to data validation enhances the reliability of the findings.

Farmer household welfare is defined as the total value of farming outputs received over the past 12 months. Arable land refers to the agricultural land managed by each household during this period. Total production costs encompass all farming expenses, while labor allocation is measured by the time devoted to these activities. The percentage of land owned represents the proportion of cultivated land legally owned by the household.

The relationship between the variables was analyzed using the following primary model:

$$\ln Y_1 \, it \ = \ \beta_0 \ + \ \beta_1 \ln X_1 \, it + \ \beta_2 \ln X_2 \, it \ + \ \beta_3 \ln X_3 \, it \ + \ \beta_4 \ln X_4 \, it + \ e$$

Where as:
Y_1: Farmer Household Economic Welfare
X_1: Area of arable land
X_2: Total production cost
X_3: Allocation of outpouring of work
X_4: Percentage of land owned by farmers

Additionally, the study uses the following system of equations to examine production decisions, labor allocation, and household income:

Farming Business Revenue (FBR)

$$FBR = a_0 + a_1 LL + a_2 PPUK + a_3 PPUKS + a_4 TCKKT + a_5 TCKLKT \dotfill (1)$$

Farming Costs (FC)

$$FC = BSPS + BTKS + BLS \dotfill (2)$$

Farming Income (FI)

$$FI = PDUTS + PDUTT \dotfill (3)$$

Off-farm Income (OFI)

$$OFI = c_0 + c_1 PDUT + c_2 PDNP + c_3 TCKKOFF \dotfill (4)$$

Expected guess parameters: $c_1, c_2 < 0$; $c_3 > 0$

Total Household Income (THI)

$$THI = PDUT + PDOFF + PDNP \dotfill (5)$$

Total Outpouring of Family Work for Farming (TOFWF)

$$TOFWF = TCKKS + TCKKT \dotfill (6)$$

Expenditure on Consumption of Food from Own Farming Business (ECFFOFB)

$$ECFFOFB = k_0 + k_1 PNUS + k_2 PDRT + k_3 JAR \dotfill (7)$$

Expected guess parameters: $k_1, k_2, k_3 > 0$

Surplus Household Income (SHI)

$$SHI = PDRT - PTOT \dotfill (8)$$

By detailing the sampling technique, data validation, and maintaining the equation models, this revised research method section ensures replicability, transparency, and robustness, enhancing the study's reliability and validity.

3. RESULTS AND DISCUSSION

Factors Affecting Farmer Household Welfare in Indonesia

As of February 2017, the Agricultural Sector remained the largest employment sector in Indonesia, engaging 39.68 million individuals, representing 31.86% of the national workforce. This sector includes plantations, forestry, hunting, and fishing, which are critical for the livelihoods of many Indonesian households. The economic welfare of farmer households, as explored in this study, is measured by the income generated from farming activities, encompassing both upland and paddy fields. This section delves into the factors influencing farmer welfare, using Ordinary Least Squares (OLS) and Fixed Effects models to analyze the determinants across different regions and time periods.

The analysis identified four primary factors impacting the economic welfare of farmer households: arable land area, total production costs, labor allocation, and the percentage of land owned by farmers. The regression results for both the Fixed Effects and OLS models are summarized in Table 1 on the next page

Table 1. Fixed Effect and OLS Panel Regression Results on the Factors Affecting the Welfare of Farmers in Indonesia

Variable	Outcome of national farming acceptance	
	Panel (Fix Effect)[1]	OLS[2] 2014
Cultivated area	452.3**	193.7**
	(80.14)	(23.99)
Total cost	-0.951**	-0.996**
	(0.0926)	(0.0619)
Outpouring of work	129622.2**	1470450.9**
	(567310.3)	(347561.7)
Percentage of own land	8640.8**	28387.9**
	(12081.1)	(7907.5)
Constanta	3243122.4**	1465035.7*
	(1387571.3)	(769731.8)
N	1000	1000

Note: Standard errors in parentheses $^*p < 0.1$, $^{**}p < 0.05$; 1) For panel data using fixed effects regression panel; and 2) For 2014 IFLS data analyzed using the OLS model
Source: Processed Data (2021)

The cultivated area has a positive and significant impact on farming income, consistent across both models. This suggests that larger landholdings enable households to generate more income, supporting the notion that land access is crucial for enhancing farmer welfare. The significant relationship aligns with studies by Asmarantaka (2007) and Setiani (2014), who found that the area of land cultivated significantly influences labor allocation and income levels.

The total production costs exhibit a negative relationship with farming income, indicating that higher costs reduce net income. This finding is in line with economic theory, where increased input costs, such as fertilizers and labor, can diminish overall profitability if not managed efficiently. The study confirms the results of previous research by Mariyanto et al. (2016), highlighting the importance of cost management in farming practices.

Labor allocation also shows a positive and significant relationship with farming income. This underscores the role of labor in agricultural productivity, particularly in labor-intensive farming systems. The study's findings resonate with Irfany et al. (2020), who noted that household participation in off-farm activities could complement farming income, leading to higher overall welfare.

The percentage of land owned by farmers positively affects farming income, as it reduces the need for land rent payments, thereby increasing net income. This finding is consistent with Kubitza's et al. (2018) research, which demonstrated the impact of land ownership on farm income. Ownership not only secures a stable production base but also enhances the ability to invest in and improve the land.

While the results are robust, it is essential to acknowledge the limitations of this study. The reliance on secondary data from the Indonesian Family Life Survey (IFLS) provides a broad perspective but may not capture all regional nuances or the effects of informal land arrangements, such as sharecropping. Additionally, the fixed effects model, while controlling for unobserved heterogeneity, may not fully account for time-varying factors that could influence farmer welfare.

Moreover, the findings indicate that larger land areas and ownership improve income, but this could inadvertently marginalize smaller farmers who may lack access to these resources. The negative impact of production costs suggests a need for more efficient input use, which could be hindered by limited access to credit or extension services for smallholders. These limitations should be considered when interpreting the results and their applicability to broader policy recommendations.

The study's findings are consistent with previous research but also offer new insights into the specific context of Indonesia. For instance, while Mariyanto et al. (2016) and Soepriati (2006) found similar relationships between land, labor, and income, this study extends the analysis to include a broader range of factors and a more extensive geographical scope. The use of both OLS and Fixed Effects models also provides a more nuanced understanding of the temporal dynamics affecting farmer welfare.

Specifications of the Farmer Household Economic Model in Indonesia
The specification of the Farmer Household Economic Model in Indonesia in this study consists of 8 structural equations. The estimation results from the model are as follows:

Farming Business Revenue (FBR)
$$FBR = 24878231 + 14381318LL + 663.2958PPUK - 194.3343PPUKS + 795248.41TCKKT + 64289.56TCKLKT \dots\dots(9)$$

Farming Costs (FC)
$$FC = 589487.5BSPS + 5912.964BTKS + 194.902BLS \dots\dots(10)$$

Farming Income (FI)
$$FI = 224761PDUTS + 52384.74PDUTT \dots\dots(11)$$

Off-farm Income (OFI)
$$OFI = 2548921 - 0.59873PDUT - 0.0598PDNP + 25323.46TCKKOFF \dots\dots(12)$$

Total Household Income (THI)
$$THI = 81.50482PDUT + 0.3582PDOFF + 0.134PDNP \dots\dots(13)$$

Total Outpouring of Family Work for Farming (TOFWF)
$$TOFWF = 0.08302TCKKS + 0.06908TCKKT \dots\dots(14)$$

Expenditure on Consumption of Food from Own Farming Business (ECFFOFB)
$$ECFFOFB = 0.039273 + 0.349075PNUS + 0.043402 PDRT + 64492.60JAR \dots\dots(15)$$

Surplus Household Income (SHI)
$$SHI = 0.329288PDRT - 0.02827164POT \dots\dots(16)$$

The farmer household economic model in this study includes eight structural equations to capture the complexities of farming income, costs, labor allocation, and household expenditures. The estimation results are detailed in Table 2.

Table 2. Statistical Test Results of Farmer Household Economic Models in Indonesia

Equality	R2	Prob-F
Farming Business Revenue (FBR)	0.91405	<0.0005
Farming Costs (FC)	0.88372	<0.0005
Farming Income (FI)	0.67469	<0.0005
Off-farm Income (OFI)	0.57422	<0.0005
Total Household Income (THI)	0.87105	<0.0005
Total Outpouring of Family Work for Farming Business (TOFWF)	0.63450	<0.0005
Expenditure on Consumption of Food from Own Farming Business (ECFFOFB)	0.57429	<0.0005
Surplus Household Income (SHI)	0.47101	<0.0005
Average	0,699691	

Source: Processed Data (2021)

The R² values range from 0.47101 to 0.91405, with an average of 0.699691, indicating that the model explains approximately 70% of the variance in the endogenous variables. This suggests a strong predictive capability, with the exogenous variables included in the model providing a substantial explanation of the factors influencing farmer household economics. The overall F-tests further confirm that the model is statistically significant at the 5% level, underscoring the robustness of the findings.

The results are in line with the study by Mariyanto et al. (2016) on dry land agriculture, which used a more extensive set of equations but reached similar conclusions regarding the relationship between land use, labor allocation, and household income.

Alternative Policies to Improve Farmers Welfare in Indonesia Based on Policy Simulation Results

The study explored the potential impact of increasing off-farm employment by 10% as a policy intervention to enhance farmer welfare. The results of this policy simulation are presented in Table 3 below.

Table 3. Simulation Results of 10% off-farm Employment Increase

Variable	Basic Value	Policy Simulation Scenario Increase off-farm employment by 10%	
	Predicted Mean	Predicted Mean	%Δ
FBR	12560787	12676679	0,92
FC	7154276	7154276	0
FI	4906512	4922397	0,32
OFI	3916844	4254661	8,62
THI	36489446	37781379	3,54
TOFWF	116,2	119,7	3,01
ECFFOFB	4743071	4782361	0,83
SHI	7693583	7942332	3,23

Source: Processed Data (2021)

Based on the table 3, the simulation suggests that a 10% increase in off-farm employment would result in a 3.54% increase in total household income, driven primarily by an 8.62% rise in off-farm income. This policy could reduce the dependency on farming income and provide a buffer against agricultural risks, contributing to overall economic stability for farmer households. The modest increase in farming income (0.32%) and surplus household income (3.23%) further supports the notion that diversified income sources are beneficial.

Policy Implication

The findings of this study highlight several policy implications: 1) Land Reform and Access: Enhancing access to arable land through land reform policies could significantly improve farmer welfare. Ensuring that more farmers own the land they cultivate can increase income stability and provide opportunities for investment in agricultural productivity; 2) Cost Management Support: Providing support mechanisms for efficient cost management, such as subsidies for inputs or access to low-interest credit, could mitigate the negative impact of high production costs on farming income; 3) Labor Market Development: Expanding off-farm employment opportunities can reduce reliance on agricultural income and provide additional revenue streams for farmer households. This could be particularly effective in regions where agricultural productivity is constrained by environmental or economic factors; 4) Extension Services and Training: Investing in extension services that offer training in both farming and non-farming skills could enhance the productivity and income potential of farmers, aligning with the findings of this study on the importance of labor allocation.

4. CONCLUSION

Based on the study's findings, several key conclusions can be drawn: First, the area of arable land, workload, and percentage of land owned by farmers positively influence the welfare of farmers in Indonesia. However, higher production costs negatively impact welfare. These findings align with economic theory and are robust across different models.

Given these results, policymakers should consider expanding arable land by converting vacant land into productive agricultural areas and promoting off-farm employment opportunities to diversify income sources. Additionally, efforts to distribute land ownership certificates to farmers can further enhance welfare.

Despite the robustness of the model, this study has limitations, particularly in its reliance on pre-pandemic data from the IFLS. Future research should incorporate post-pandemic data and explore more complex structural equations to capture the evolving realities of farmer welfare.

This study contributes novel insights into the economic factors affecting farmer welfare in Indonesia. Future research could build on these findings by examining the differential impacts of upland versus paddy farming and exploring the role of specific inputs, such as organic versus chemical fertilizers, in enhancing productivity. A call to action for targeted policy interventions based on these findings is essential for improving the economic welfare of farmers in Indonesia.

5. REFERENCES

Amare, M., Jensen, N. D., Shiferaw, B., & Cisséd, J. D. (2018). Rainfall Shocks And Agricultural Productivity: Implications For Rural Household Consumption. *Agricultural Systems*, *166*, 79–89. https://doi.org/10.1016/j.agsy.2018.07.014

Andriati. (2003). *Perilaku Rumahtangga Petani Padi dalam Kegiatan Ekonomi di Jawa Barat* [IPB University]. https://repository.ipb.ac.id/handle/123456789/8821

Asmarantaka, R. W. (2007). ANALISIS EKONOMI RUMAHTANGGA PETANI TANAMAN PANGAN DI PROVINSI LAMPUNG. *Jurnal Agribisnis Dan Ekonomi Pertanian*, *1*(1), 1–18. https://jurnal.ipb.ac.id/index.php/jurnalagribisnis/article/view/5908

Chang, Y. M., Huang, B. W., & Chen, Y. J. (2012). Labor Supply, Income, and Welfare of the Farm Household. *Labor Economics*, *19*(3), 427–437. https://doi.org/10.1016/j.labeco.2012.03.004

Collis, J., & Hussey, R. (2009). *Business Research: A Practical Guide for Undergraduate and Postgraduate Students* (3rd ed.). London: Palgrave Macmillan.

Dale, V. H., & Polasky, S. (2007). Measures of The Effects of Agricultural Practices on Ecosystem Services. *Ecological Economics*, *64*(2), 286–296. https://doi.org/10.1016/j.ecolecon.2007.05.009

Irfany, I., McMahon, P., Toribio, J., Phan-Thien, K., Rifai, M. A., Yusdiyanto, S., Vinning, G., Guest, D., Walton, M., & Nuryartono, N. (2020). Determinants of diversification by cocoa smallholders in Sulawesi. *International Journal of Social Economics*, *47*(10), 1243–1263. https://doi.org/10.1108/IJSE-02-2020-0106

Kokoye, S. E. H. (2013). Econometric Modeling of farm household land allocation in the Municipality of Banikoara in Northern Benin". *Land Use Policy*, *34*, 72–79. https://doi.org/10.1016/j.landusepol.2013.02.004

Kubitza, C., Krishna, V., Urban, K., Alamsyah, Z., & Qaim, M. (2018). Land property rights, agricultural intensification, and deforestation in Indonesia. *Ecological Economics*, *147*, 312–321. https://doi.org/10.1016/J.ECOLECON.2018.01.021

Mariyanto, J., Dwiastuti, R., & Hanani, N. (2016). Household Economic Model of Dry Land Agriculture in Karanganyar Regency, Central Java Province. *Habitat*, *26*(2), 108–118. https://doi.org/10.21776/ub.habitat.2015.026.2.13

Putri, C. K. P., & Noor, T. I. (2018). Analysis of Income and Welfare of Rice Farmers' Households Based on Land Area in Sindangsari Village, Banjarsari District, Ciamis Regency, West Java Province. *AGROINFO GALUH Student Scientific Journal*, *4*(3), 927 – 935. https://jurnal.unigal.ac.id/agroinfogaluh/article/view/1678/1345

Setiani. (2014). PENGGUNAAN INPUT DALAM PRODUKSI PADI OLEH RUMAH TANGGA PETANI DI DAERAH AGROEKOSISTEM LAHAN SAWAH DAN KERING. *Jurnal Ilmiah REKAYASA*, *7*(1), 27–36. https://journal.trunojoyo.ac.id/rekayasa/article/view/2085

Soepriati. (2006). *Peranan Produksi Usahatani dan Gender dalam Ekonomi Rumahtangga Petani Lahan Sawah : Studi Kasus di Kabupaten Bogor* [Institut Pertanian Bogor]. https://api.semanticscholar.org/CorpusID:162933692

Sumaryanto, Syahyuti, Saptana, & Irawan, B. (2002). Masalah Pertanahan di Indonesia dan Implikasinya Terhadap Tindak Lanjut Pembaruan Agraria. *Forum Penelitian Agro Ekonomi*, *20*(2), 1–19. https://epublikasi.pertanian.go.id/berkala/fae/article/view/1373

Xia, M., Zhang, Y., Zhanga, Z., Liua, J., Oua, W., & Zoua, W. (2020). Modeling agricultural land use change in a rapid urbanizing town: Linking the decisions of government, peasant households and enterprises". *Land Use Policy*, *90*, 1–10. https://doi.org/10.1016/j.landusepol.2019.104266