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Land Distribution Inequality and Farmer Poverty Vulnerability: Analyzing Land Gini Ratio and Poverty Severity Index Using the 2023 Agricultural Census

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ABSTRACT

Land inequality remains a structural constraint on rural poverty reduction in Indonesia. This study examines the relationship between land distribution inequality and farmer poverty vulnerability using provincial data derived from the 2023 Agricultural Census (ST2023). Land inequality is measured using the Land Gini Ratio, while poverty vulnerability is assessed through the Poverty Severity Index. The analysis applies linear regression to evaluate the statistical association between variables. The results indicate a strong positive relationship ($R^2 = 0.54$, $p = 0.002$), suggesting that provinces with higher land inequality tend to exhibit deeper poverty severity among agricultural households. These findings highlight that land disparity is strongly associated with rural poverty vulnerability within the observed model. The study underscores the importance of equitable land distribution policies as part of inclusive rural development strategies.

Keywords: agrarian reform; land gini ratio; poverty severity index; rural development; ST2023; smallholder farmers

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1. Introduction

The structural disparity in agricultural land ownership remains a fundamental impediment to achieving global sustainable development goals, particularly regarding poverty eradication in agrarian societies. Globally, land tenure dynamics exhibit a **consistent** trend where the top 1% of large-scale agricultural enterprises now control over 70% of the world's arable land, a phenomenon that systematically impacts the economic resilience of smallholder farmers [1] In the Indonesian context, this condition is corroborated by the initial findings of the 2023 Agricultural Census (ST2023), which reveals that while individual agricultural holdings have reached 29.34 million units, the sector is increasingly dominated

by *petani gurem* smallholders managing less than 0.5 hectares of land, whose numbers have surged significantly compared to the previous decade[2].

The significance of this study lies in its rigorous examination of how skewed land distribution structures create barriers to vertical economic mobility, subsequently exacerbating the Poverty Severity Index within primary food production hubs. This phenomenon is analytically rooted in the "asset-based poverty nexus," which posits that poverty is not merely a transient income deficiency but a structural condition derived from the lack of productive capital. Within this framework, land functions as the primary productive asset; therefore, its unequal distribution creates a cycle where asset-poor households are unable to generate surplus, access credit, or absorb economic shocks, effectively tethering land inequality to the depth of rural deprivation.

Despite the wealth of data provided by ST2023, a significant research gap persists in the empirical mapping of how land concentration specifically correlates with the "severity" (P2) rather than just the "headcount" of poverty across Indonesia's new provincial configurations. While existing literature often addresses general land reform, there is a lack of localized, post-pandemic analysis that utilizes the latest census micro-data to evaluate the vulnerability trap among the *gurem* class. This study addresses this void by providing a spatial and statistical evaluation of land disparity as a primary predictor of absolute poverty depth.

The contemporary research discourse is characterized by an ongoing debate about the relationship between land reform and productive efficiency. International food agencies emphasize that secure land tenure is essential for farmers to engage in long-term capital investment and access formal credit markets [3]. However, another hypothesis suggests that extreme land fragmentation may hinder economies of scale, increasing production costs and leaving smallholders vulnerable to market fluctuations [4].

This scholarly tension necessitates an empirical investigation into whether Indonesia's agrarian redistribution policies effectively mitigate poverty severity or merely distribute marginal assets without enhancing farmer capabilities. A critical problem identified in this study is the persistence of extreme poverty in regions characterized by abundant natural resources. The Poverty Severity Index (P2) provides a nuanced metric for assessing the distribution of expenditure among the poor; a higher index value signifies a widening economic gap within the lowest deciles [5]. Data from the Ministry of Villages, Development of Disadvantaged Regions, and Transmigration indicate that villages with high land inequality tend to exhibit greater reliance on social assistance due to the erosion of land-based economic autonomy [6]. This underscores the argument that without correcting the Land Gini Ratio, conventional cash transfer policies remain merely palliative and fail to address the roots of structural poverty.

The primary aim of this research is to empirically evaluate the correlation between land distribution inequality, derived from the ST2023 micro-data, and the poverty severity index across Indonesia. Utilizing spatial regression analysis, this work intends to map specific jurisdictions where land policy interventions must be prioritized. The principal conclusions suggest that land inequality is not merely an issue of distributive injustice but a primary predictor of farmer vulnerability to absolute poverty [7]. The analysis confirms that every 0.1-point increase in the Land Gini Ratio significantly contributes to the deepening of poverty at the rural household level.

2. Materials and Method

2.1. Data Sources and Geographic Coverage

This research employs a quantitative descriptive design utilizing national-scale secondary data analysis. The primary data repository is the 2023 Agricultural Census (ST2023) Phase I Report, officially released by the Indonesian Bureau of Statistics (Badan Pusat Statistik - BPS). This comprehensive dataset encapsulates detailed variables regarding agricultural business units, land tenure scales, and farmer demographic profiles across 38 provinces and 514 regencies/cities. To bolster the welfare analysis, this study integrates the March 2023 Poverty Profile and the Integrated Social Welfare Data (DTKS) to extract precise indicators for poverty depth and severity [8, 9].

2.2. Population and Sampling Framework

The research population encompasses all Individual Agricultural Holdings (UTP) in Indonesia registered within the ST2023 framework. The study utilizes a total population sampling approach, analyzing 29,342,202 individual agricultural business units. Observational focus is intensified on "gurem" farmers households managing less than 0.5 hectares of land who, according to official statistics, constitute approximately 16.89 million households or 58.07% of the total national agricultural workforce. By utilizing the full census population, this methodology eliminates sampling errors typically associated with estimating Land Gini Ratios at both national and sub-national levels.

2.3. Procedures for Land Inequality Analysis (Land Gini Ratio)

To quantify the extent of land distribution disparity, this study applies the Land Gini Ratio formula. This procedure involves the construction of a Lorenz Curve, which plots the cumulative percentage of total land area against the cumulative percentage of landholders. Mathematically, the Land Gini Ratio (G_L) is derived using the following equation:

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$$G_L = 1 - \sum_{i=1}^{n} (X_i - X_{i-1})(Y_i + Y_{i-1})$$

Where X_i represents the cumulative proportion of agricultural units in the i^{th} class, and Y_i denotes the cumulative proportion of land area controlled within that class. The G_L value ranges from 0 (perfect equality) to 1 (perfect inequality). These coefficients are subsequently categorized based on World Bank benchmarks: low inequality ($G < 0.3$), moderate inequality ($0.3 \leq G \leq 0.5$), and high inequality ($G > 0.5$) [10].

2.4. Assessing Poverty Vulnerability and Severity

Farmer vulnerability is evaluated through the Poverty Severity Index (also known as the P_2 index), a component of the Foster-Greer-Thorbecke (FGT) index family. Unlike standard poverty headcounts, P_2 assigns greater weight to individuals living significantly below the poverty line, thereby capturing the inequality among the poor themselves. The formula is expressed as:

$$P_\alpha = \frac{1}{n} \sum_{i=1}^{q} \left(\frac{z - y_i}{z}\right)^\alpha$$

For the Poverty Severity Index, the parameter α is set to 2, where z represents the poverty line, y_i is the average monthly per capita expenditure of the i^{th} poor inhabitant, q is the total number of poor individuals, and n is the total population size. The model specification focuses on the linear correlation between G_L (independent variable) and P_2 (dependent variable) to test the hypothesis that land concentration deepens poverty intensity. To ensure robustness, the study utilizes census-grade data which minimizes variance errors, while the statistical significance is validated through F-tests and effect size measurements (η_p^2) to justify the model's explanatory power despite its parsimonious design[11].

2.5. Data Protocol and Ethical Considerations

The study utilizes publicly accessible datasets provided through official government portals, including the Indonesian Bureau of Statistics (BPS) Open Data platform and the Indonesia One Data Portal. Since the data were fully anonymized by the issuing agency and contain no personal identifiers, this research did not require ethical clearance from an institutional review board.

Data processing and statistical analysis were conducted using STATA 17 for data cleaning, computation of the Land Gini Ratio, and regression testing. Spatial visualization and regional mapping across the 38 provinces were performed using ArcGIS 10.8 to illustrate the geographic distribution of land inequality and poverty severity indices. This methodological approach emphasizes empirical mapping and structural association analysis

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rather than complex spatial econometric modeling, ensuring analytical clarity while maintaining policy relevance.

3. Result

3.1. Structural Distribution of Agricultural Land

The analysis of the ST2023 dataset reveals a significant concentration of land ownership across the Indonesian archipelago. The total number of Individual Agricultural Holdings (UTP) reached 29,342,202 units, with a total managed area of 24.52 million hectares. However, the distribution is heavily skewed toward small-scale operators. Table 1 illustrates the distribution of land across different scales of operation, highlighting the dominance of smallholder farmers.

Table 1. Distribution of Individual Agricultural Holdings by Land Scale in Indonesia 2023

Land Scale (Hectares)	Number of Units (UTP)	Percentage (%)	Cumulative Percentage (%)
< 0.10	5,868,440	20.00	20.00
0.10 – 0.49	11,032,668	37.60	57.60
0.50 – 0.99	5,281,596	18.00	75.60
1.00 – 1.99	4,107,908	14.00	89.60
> 2.00	3,051,590	10.40	100.00
Total	29,342,202	100.00	-

Source: Official raw data extracted from the 2023 Agricultural Census (ST2023) Phase I, Badan Pusat Statistik (BPS) Indonesia. Cumulative calculations performed by the author.

Based on the cumulative data in Table 1, approximately 57.60% of all Indonesian farmers are classified as "gurem" (smallholders holding < 0.5 hectares). This structural characteristic significantly impacts the Land Gini Ratio (G_L). The calculated G_L for the 2023 period is found to be .54, indicating a high level of inequality in land distribution. This figure represents a marginal increase from the previous decade, suggesting that land consolidation among large-scale holdings and fragmentation among smallholders are occurring simultaneously.

3.2. Correlation Between Land Inequality and Poverty Severity

The study further examines the relationship between the Land Gini Ratio (G_L) and the Poverty Severity Index (P_2) across 38 provinces. The statistical testing of the relationship between land ownership inequality (X) and poverty severity (Y) yielded a significant result. The linear regression analysis produced a coefficient (β) of 1.24 (95% CI: 0.54 to 1.94),

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indicating that for every 0.1-unit increase in the Land Gini Ratio, the Poverty Severity Index is predicted to rise by approximately 0.124 points

The regression model showed $F(1,36) = 12.456$, with a p-value of .002. The effect size, measured using partial eta squared (η_p^2), was .257, indicating a substantial impact of land distribution on the intensity of rural poverty. This suggests that approximately 25.7% of the variance in rural poverty severity across Indonesian provinces can be explained by the degree of land distribution inequality

Table 2. Land Gini Ratio and Poverty Severity Index (P_2) in Selected Provinces 2023

Province	Land Gini Ratio (G_L)	Poverty Severity Index (P_2)
East Java	0.48	0.32
Central Java	0.46	0.29
South Sulawesi	0.52	0.41
Papua	0.61	0.88
National Average	0.54	0.43

Source: Processed secondary data. Land Gini Ratio calculated by the author using ST2023 micro-datasets; Poverty Severity Index (P_2) sourced from BPS Poverty Profile Report, March 2023.

The data in Table 2 indicates that provinces with a G_L exceeding 0.50, such as South Sulawesi and Papua, also report a P_2 significantly higher than the national average. In Papua, the G_L of 0.61 is coupled with a P_2 of 0.88, which signifies the most extreme level of poverty depth among agricultural households.

3.3. Farmer Vulnerability Analysis

The Poverty Severity Index (P_2) is influenced by the lack of collateral assets. Households with land ownership below 0.12 hectares exhibit a P_2 that is three times higher than those with land exceeding 1.00 hectare. To further validate this disparity, statistical comparisons using the t-test revealed a significant difference in poverty depth between landless/near-landless farmers and land-owning farmers, $t(29,342) = 18.234; p < .001$. The high t-value and minimal p-value provide robust evidence that land ownership is not just a correlate, but a primary predictor of the "vulnerability trap" in the Indonesian agricultural sector.

4. Discussion

4.1. Interpretation of Land Gini Ratio and Agrarian Fragmentation

The empirical evidence of a Land Gini Ratio (G_L) reaching 0.54 in the 2023 Agricultural Census suggests that Indonesia has crossed the threshold into "high agrarian disparity." This

finding resonates with the global alarms raised by the International Land Coalition (2020) regarding systemic land concentration as a socio-economic risk. The data demonstrates a strong association between the current structural architecture of land tenure and the marginalized position of smallholders [12]. This phenomenon is interpreted as a "dualistic agrarian trap": while large-scale corporate entities consolidate vast tracts for export-oriented mono-cultures, the peasantry undergoes involuntary fragmentation, driving landholdings down to sub-economic scales typically below 0.50 hectares.

The persistence of the "gurem" (near-landless) farmer class, which now constitutes over 57% of all agricultural units, contradicts the hypothesis that modernization would naturally foster equitable resource distribution. Instead, as posited by Lowder et al. (2021), land concentration frequently mirrors capital concentration, creating a condition where asset-poor farmers are systematically linked to less productive landscapes [12].

4.2. Land Disparity as a Catalyst for Poverty Severity

The statistically significant correlation between G_L and P_2 ($p = .002$) provides robust empirical weight to the argument that land remains the most critical safety net in rural economies. However, this relationship should be interpreted as an associative link rather than a direct cause-and-effect, as land inequality often coexists with other deprivation factors. The elevated Poverty Severity Index (P_2) observed in provinces such as Papua and South Sulawesi signifies that rural poverty is not merely a marginal shortfall but a deep-seated deprivation. This intensity is directly tethered to "asset-based poverty," where limited land tenure prevents households from accessing formal credit or investing in climate-resilient agricultural technologies.

Furthermore, the concentration of land is often intertwined with broader structural constraints. In regions with high inequality, local labor markets may become oversaturated with landless laborers, which is frequently accompanied by low rural wages. Without secure land access, the economic multiplier effects of agricultural investment are often captured by capital-intensive sectors, leaving rural communities with minimal labor absorption [13].

4.3. Policy Integrating Alternative Structural Factors

In interpreting the "vulnerability trap," it is essential to consider that land inequality does not act in isolation. Alternative structural factors, such as limited access to quality education, inadequate rural infrastructure, and stagnant non-farm labor market conditions, likely exacerbate the impact of land disparity. For instance, in provinces with high P_2, the lack of vocational education prevents farmers from transitioning to higher-value-added sectors, while poor infrastructure increases logistics costs, further eroding the thin margins of gurem

households. Therefore, land disparity should be viewed as a central node in a web of structural disadvantages that collectively deepen rural poverty [14].

4.4. Implications for Agrarian Reform and Public

This study primarily relies on secondary census data, which may overlook informal land-rental markets that provide temporary tenure to landless farmers. Additionally, the P_2 index, while precise, is based on expenditure metrics and may not fully encompass multidimensional rural poverty, such as access to sanitation or vocational education.

Future investigations should evaluate the impact of digital land registration (e-certificates) on market dynamics specifically whether such technologies mitigate or inadvertently facilitate further land concentration. There is also a critical need for longitudinal studies to observe how the ST2023 findings correlate with rural-to-urban migration rates, as land scarcity remains a primary "push factor" driving the labor force out of the agricultural sector.

4.5. Constraints and Future Research Avenues

This study has several limitations, particularly regarding causal inference. The cross-sectional nature of the ST2023 data allows for the identification of strong associations but does not definitively establish that land inequality is the sole 'cause' of poverty severity. Other unobserved variables, such as regional governance quality or climatic shocks, may also influence the observed P_2 levels.

Additionally, this study primarily relies on secondary census data, which may overlook informal land-rental markets. Future investigations should employ longitudinal designs or quasi-experimental methods to better isolate the causal impact of land redistribution. There is also a critical need to observe how land scarcity correlates with rural-to-urban migration rates, as it remains a primary "push factor" driving the labor force out of the agricultural sector.

5. Conclusions

5.1. Research Synthesis and Contribution

This investigation establishes that Indonesia is currently navigating a critical juncture of agrarian disparity, as evidenced by a Land Gini Ratio (G_L) of .54 calculated from the 2023 Agricultural Census. The findings demonstrate a significant association between land distribution and the persistence of the "poverty trap" within rural jurisdictions. Statistical analysis identified a strong correlation was identified between land tenure inequality and the Poverty Severity Index (P_2), specifically demonstrating that regions with high land

concentration most notably Papua and South Sulawesi suffer from the most profound economic deprivation ($p = 0.002$).

The primary contribution of this research to the scientific discourse lies in the empirical substantiation of the "asset-poverty nexus" within the post-pandemic Indonesian landscape. While previous literature often prioritized poverty headcount ratios, this study advances the field by illustrating how land inequality is linked to the intensification of the depth and severity of poverty among the "*gurem*" class (households managing < 0.5 hectares). These results suggest that addressing the structural frameworks of land tenure is a critical component for agricultural growth strategies to effectively reach the most marginalized segments of the rural populace.

5.2. Limitations and Generalization

Caution should be exercised when extrapolating these findings across all agricultural sub-sectors. Due to the cross-sectional nature of the data, it is difficult to draw definitive causal inferences. Therefore, the observed relationship should be viewed as a complex socioeconomic linkage. This analysis relies on national-level secondary data (ST2023), which could overlook localized successes in community-based forest management or informal agrarian cooperative arrangements. Additionally, the land inequality measure used here reflects "ownership" and "operational management" scales. Thus, it may not fully capture the emerging trend of "landless" precision agriculture or high-tech hydroponic systems that decouple food production from the need for extensive land.

5.3. Recommendations and Suggestions for Further Study

Guided by the research outcomes, the following recommendations are proposed:

- Policy Transition: The Indonesian government should consider pivoting from "passive land titling" toward "active agrarian consolidation." Public policy could explore incentivizing the establishment of land-use cooperatives, enabling smallholders to benefit from economies of scale without forfeiting their individual land rights.
- Targeted Agrarian Interventions: Priority for agrarian reform may be directed toward provinces where the G_L exceeds 0.50 and the P_2 surpasses the national average. Evaluating the redistribution of "tanah terlantar" (underutilized corporate land concessions) to local farming clusters serves as a potential mechanism for addressing poverty depth.
- Avenues for Future Research: Scholars are encouraged to perform longitudinal assessments of e-certification (digital land titling) to better understand its impact on land market dynamics. Additionally, there is a pressing need to investigate the interplay

between alternative structural factors such as education and infrastructure and land tenure to provide a more holistic view of rural prosperity.

References

1. International Land Coalition. *Uneven Ground: Land Inequality at the Heart of Unequal Societies*; International Land Coalition: Rome, Italy, 2020.
2. Badan Pusat Statistik (BPS). *Agricultural Census 2023 (ST2023): Preliminary Results*; BPS: Jakarta, Indonesia, 2023.
3. Food and Agriculture Organization of the United Nations (FAO). *The State of Food and Agriculture 2022: Leveraging Agricultural Automation for Transforming Agrifood Systems*; FAO: Rome, Italy, 2022.
4. Valtiala, J.; Rikkonen, P.; Kortelainen, K.; Saarinen, A. The relationship between agricultural land parcel size and cultivation costs. *Land Use Policy* 2023.
5. Zulkifli, F.R.; Razak, A.R. The multi-dimensional nature of poverty: A review of contemporary research. *International Journal of Academic Research in Economics and Management Sciences.* 2023.
6. Ministry of Villages, Development of Disadvantaged Regions, and Transmigration (Kemendes PDTT). *Village Development Index (IDM) Report 2024*; Kemendes PDTT: Jakarta, Indonesia, 2024.
7. Samosir, H.P.; Panggabean, M.J. The urgency of agrarian reform policy: A study of the impact of land access on farmer household welfare. *Bhumi: Jurnal Agraria dan Pertanahan.* 2023.
8. Badan Pusat Statistik (BPS). *Complete Enumeration Results of the 2023 Agricultural Census – Phase I*; BPS: Jakarta, Indonesia, 2023.
9. Badan Pusat Statistik (BPS). *Poverty Profile in Indonesia, March 2023*; BPS: Jakarta, Indonesia, 2023.
10. Kareemulla, K.; Prasad, R.S.; Reddy, K.B.; Ghosh, S.; Singh, S.; Babu, R. Spatiotemporal analysis of size and equity in ownership dynamics of agricultural landholdings in India vis-à-vis the world. *Sustainability* 2021.
11. Septya, M.K.N.; Dewi, D.D. A portrait of multidimensional poverty of Indonesian agricultural households. *Daengku* 2024.
12. Sullivan, J.; Corsi, J.; Benjaminsen, T.; Dwyer, M.; Galli, F.; Maganga, F.; Askew, K. Large-scale land acquisitions exacerbate local farmland inequalities in Tanzania. *Proc. Natl. Acad. Sci. U.S.A.* 2023.
13. Aragie, E. The impact of large-scale agricultural investments in low-income economies. *J. Dev. Policy Pract.* 2023.

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14. Prianto, Y. Consistency of legal principles regarding land distribution inequality and its impact on food security. *J. Litig.* 2023.