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Enhancing Food Security through Gender-Inclusive Empowerment: A Localized Model for Rural Farming Households

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Abstract

Food insecurity persists in rural Indonesia despite agricultural abundance, disproportionately affecting women in farming households. This study investigates the interplay of food security, gender inclusion, and women's empowerment among 296 pineapple farming households in East Kotawaringin Regency, Central Kalimantan. Employing a cross-sectional design, data were collected via structured questionnaires and analyzed using the Household Food Insecurity Access Scale (HFIAS), a Localized Women's Empowerment in Agriculture Index (LWEAI), and Partial Least Squares Structural Equation Modeling (PLS-SEM). Results reveal that access to credit and market information significantly reduces food insecurity, while larger household sizes increase vulnerability. Gender inclusion strongly predicts empowerment, enhancing women's autonomy and leadership, though food insecurity undermines both. The LWEAI, tailored to local contexts, and PLS-SEM's robust analysis offer novel frameworks for understanding these dynamics. Findings advocate for gender-responsive policies – such as women-targeted microcredit and extension services – to strengthen food security and equity, aligning with Indonesia's national development goals and Sustainable Development Goals (SDGs) 2 and 5.

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Introduction

Food insecurity remains a paradoxical and persistent challenge in many developing countries, where agricultural households despite being primary food producers are disproportionately vulnerable to hunger and malnutrition. This vulnerability stems from structural constraints such as limited access to land, credit, market infrastructure, and public services (FAO, 2022; Nour & Abdalla, 2021). In Indonesia, the COVID-19 pandemic further exposed these fragilities, with more than 50% of households reporting moderate to severe food insecurity (Akbar *et al*., 2023; Amrullah *et al*., 2023). The situation is particularly evident in East Kotawaringin Regency, Central Kalimantan, a major pineapple-producing region where agricultural productivity coexists with rising poverty, illustrating that food surplus does not necessarily translate into household food access (Statistics Office of East Kotawaringin Regency, 2023). This contradiction raises urgent questions about the structural and gendered dimensions of food security at the local level.

Rural women play a critical yet undervalued role in agricultural production and household food provisioning. In Indonesia, women account for up to 64% of agricultural labor, with around 25% formally classified as farmers or landowners (Ratnasari & Sugiyanto, 2023). Beyond production, they shoulder responsibilities for caregiving, resource management, and food preparation. Yet, their agency is routinely constrained by insecure land rights, gender-biased credit systems, weak access to extension services, and exclusion from decision-making platforms (Osanya *et al*., 2020; Puspitawati *et al*., 2019). These barriers suppress women's economic potential and undermine collective agricultural productivity. Addressing gender inequality in agriculture is therefore not only an ethical imperative but also a practical necessity for strengthening food security and rural resilience.

An expanding body of literature emphasizes women's empowerment as a pathway to improved nutrition, household welfare, and livelihood sustainability (Kehinde *et al*., 2021; Shuai *et al*., 2019). However, most existing frameworks, such as the Women's Empowerment in Agriculture Index (WEAI), rely on standardized indicators like control over income and access to resources, while neglecting localized dimensions such as group participation or access to market information (A. R. Quisumbing *et al*., 2021). Few studies have examined how these localized forms of agency interact with food insecurity under systemic shocks such as pandemics. In remote and agriculturally active regions like East Kotawaringin, empirical evidence on the interplay between food insecurity, gender inclusion, and empowerment remains scarce.

To conceptualize empowerment, this study draws on Kabeer's Empowerment Framework (1999), which defines empowerment as the process

through which individuals gain the ability to make strategic life choices in contexts where this capacity was previously denied. The framework highlights three interrelated dimensions: resources (material, human, and social), agency (the ability to set and pursue goals), and achievements (the outcomes of agency). In rural agricultural systems, these dimensions manifest through land access, decision-making in farming, income control, time allocation, and leadership in community organizations. Adapting Kabeer's framework to a localized and gendered food system allows this study to capture how empowerment is shaped not only by institutional arrangements but also by cultural norms and lived experiences.

This study develops a localized, gender-inclusive empowerment model tailored to the socio-economic and cultural context of East Kotawaringin. Unlike standardized indices, the proposed model integrates community-grounded indicators such as group participation, access to agricultural information, credit availability, and household decision-making. It further examines how food insecurity, exacerbated by the COVID-19 crisis, influences empowerment pathways through gender inclusion and time poverty. By employing Partial Least Squares Structural Equation Modeling (PLS-SEM), the study explores multidirectional relationships among these variables, providing a more robust analysis of interactions under stress and scarcity.

The research is guided by three objectives: (1) to examine the direct relationship between household food insecurity and gender inclusion in agricultural decision-making; (2) to assess whether gender inclusion mediates the effect of food insecurity on women's empowerment; and (3) to evaluate how localized empowerment variables such as market information, group participation, and access to credit contribute to sustainable food security outcomes.

By situating women's empowerment within a multidimensional and localized framework, this study contributes to theoretical development while informing targeted interventions and policies. It provides critical insights for rural development planners, gender-focused practitioners, and policymakers seeking to address food insecurity and gender inequality through integrated, context-sensitive strategies. Ultimately, the findings aim to support adaptive policies that recognize rural women as co-creators of resilient and equitable food systems.

1. Literature Review

This study adopts Kabeer's Empowerment Framework (1999) as its primary theoretical lens. The framework conceptualizes empowerment through three interrelated dimensions: resources (such as access to land,

credit, and information), agency (the ability to participate in decision-making), and achievements (the realization of improved wellbeing). This multidimensional approach provides a robust foundation for analyzing how gender inclusion shapes food security, particularly in rural agricultural contexts such as East Kotawaringin, where structural and cultural barriers remain deeply embedded.

Women's contributions underpin agricultural production and household welfare in many developing economies. In Indonesia, women provide up to 64% of agricultural labor, yet face persistent marginalization in land ownership, access to credit, and leadership roles (Ratnasari & Sugiyanto, 2023; Puspitawati *et al*., 2019). Such inequalities restrict women's agency, suppress productivity, and undermine broader rural development goals. Evidence shows that gender inequality hampers both empowerment and agricultural performance (Peterman *et al*., 2021). The Women's Empowerment in Agriculture Index (WEAI) offers a useful benchmark, but its aggregated indicators often lack context-specific sensitivity. Shuai *et al.* (2019) demonstrate that when women participate in agricultural decision-making, productivity rises and nutrition outcomes improve. However, institutional biases in credit systems and extension services continue to limit equitable access, highlighting the need for structural transformation alongside individual inclusion.

Gender inclusion in agricultural policy functions not only as an ethical obligation but also as a strategic lever to enhance resilience and food security. Kehinde *et al*. (2021) show that women's control over resources and income directly benefits household investments in nutrition, education, and health. Yet barriers related to land tenure, labor division, and markets persist. In Nigeria, women supply more than half of farm labor but own less than 15% of land (Bello *et al*., 2021). Comparable dynamics appear in Indonesia, including East Kotawaringin, where women's essential contributions remain undervalued (Colfer *et al*., 2015; Puspitawati *et al*., 2019). Addressing these inequities represents a precondition for long-term food system sustainability.

Food insecurity disproportionately affects women and children, intensifying vulnerabilities within rural households. Jemaneh and Shibeshi (2023) in Ethiopia confirm a strong correlation between women's empowerment and household food security, as empowered women prioritize nutritional diversity and child health. Similarly, Madzorera *et al*. (2023) associate women's agricultural decision-making with improved dietary diversity. In East Kotawaringin, where food insecurity persists despite agricultural abundance, these dynamics remain particularly relevant. Strengthening women's roles in agricultural leadership and planning could mitigate access issues and bolster resilience.

Access to credit strongly influences household capacity to stabilize consumption and absorb shocks. Millimet *et al.* (2018) demonstrate the role of financial inclusion in strengthening resilience, yet women often remain excluded due to collateral requirements and insecure land rights. Akbar *et al.* (2023) highlight that households with women in decision-making roles coped more effectively during the COVID-19 pandemic. Gender-sensitive financial services, such as microcredit or cooperative lending, therefore not only empower women but also enhance community-wide food security.

Market information likewise serves as a critical determinant of household resilience. Hlatshwayo *et al.* (2023) find that timely access to price and demand data reduces losses and improves income. Gendered restrictions on mobility and technology, however, often prevent women from benefiting fully. In Indonesia, initiatives to expand digital literacy and inclusive information channels have begun to address this gap (Budiwiranto *et al.*, 2025). Such interventions demonstrate how local institutions can mitigate structural inequities.

Intersectionality further conditions women's empowerment. Variables such as age, marital status, and ethnicity influence the degree of agency women exercise. Gualoto (2023) documents how Indigenous women in the Galápagos face multiple layers of exclusion, exacerbating time poverty and reducing access to services. Comparable patterns emerge in Indonesia, where younger women or those in polygamous households often experience less autonomy than their older or widowed counterparts. Interventions must therefore remain sensitive to these intersecting identities to achieve equitable outcomes.

Time poverty constitutes another critical barrier. Adeyeye *et al.* (2021) note that women in rural Nigeria devote significantly more time to unpaid care than men, constraining their participation in training, cooperatives, and decision-making. Labor-saving technologies, improved water access, and community childcare centers can release women's time for productive engagement. In East Kotawaringin, initiatives such as communal food processing or childcare services could support women's economic participation while maintaining household wellbeing.

Extension services, long oriented toward men, require redesign to reflect women's needs. Osanya *et al.* (2020) demonstrate that joint training for spouses enhances household productivity and decision-making, yet many programs continue to target male heads of households. Indonesian evidence shows that flexible schedules and female-led facilitation significantly improve women's participation (Anik & Rahman, 2021). Female extension agents and peer-learning models can strengthen women's confidence, leadership, and technical capacity, thereby contributing to long-term resilience.

Empirical models that combine food security and empowerment indicators remain limited. Quisumbing *et al.* (2021) call for integrated metrics that

capture both structural (access to land, income) and relational (decision-making, autonomy) dimensions. The Localized Women's Empowerment in Agriculture Index (LWEAI), developed in this study, addresses this gap by contextualizing indicators for East Kotawaringin. By incorporating household size, access to credit, and community participation, the LWEAI enhances explanatory power compared to standardized indices. Pre-testing with 20 respondents and validation by agricultural and gender experts confirmed cultural relevance, while Cronbach's alpha values above 0.80 indicated strong internal consistency.

The methodological design integrates PLS-SEM with empowerment indices to analyze complex multidirectional relationships. Hair *et al.* (2019) recommend PLS-SEM for exploratory research where distributional assumptions and large sample requirements cannot be met. This approach yields nuanced insights into how resource access shapes both food security and empowerment outcomes. Convergent and discriminant validity were established (AVE > 0.50, CR > 0.70), while bootstrapped path coefficients and VIF confirmed mediation effects and absence of multicollinearity. The model's explanatory and predictive capacity provides evidence for targeted interventions and contributes to a more equitable agricultural system that recognizes women as central actors.

2. Research Methodology

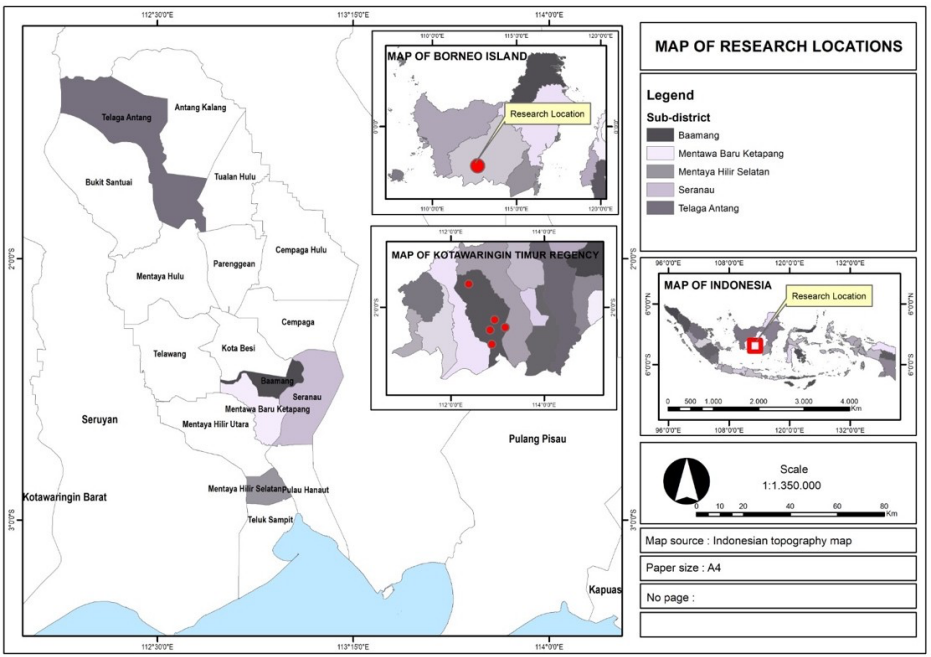
2.1. *Study Area and Population*

The study was conducted in East Kotawaringin Regency, located in Central Kalimantan Province, Indonesia. This regency ranks as the fourth-largest pineapple- producing area among the 14 regencies and municipalities in the province, with total production reaching 336.4 tons in 2022 (Statistics Office of East Kotawaringin Regency, 2023). The research focused on five sub-districts (Baamang, Mentawa Baru Ketapang, Mentaya Hilir Selatan, Seranau, and Telaga Antang) which were purposively selected based on their consistent levels of high pineapple output and the density of farming households (Figure 1).

These sub-districts were not only agriculturally significant, but also characterized by socio-economic vulnerabilities, including relatively high poverty rates and persistent food insecurity despite agricultural abundance (Agriculture and Food Security Office of East Kotawaringin Regency, 2024). This paradox provides a compelling context for analyzing the interactions between agricultural productivity, household food security, and women's empowerment in rural settings. Particular attention was given to women

actively engaged in agricultural work both as contributors to farm labor and as decision-makers within their households.

Figure 1 - Map of Kotawaringin Timur Regency Highlighting the Selected Sub-Districts



Source: Indonesian topography map.

2.2. *Research Design and Sampling*

A cross-sectional research design was adopted to capture data at a single point in time, providing a snapshot of prevailing conditions related to food security, gender inclusion, and women's empowerment among rural farming households. The target population comprised all wives of pineapple farmers residing in the five selected sub-districts of East Kotawaringin, totaling 1,132 individuals. Data collection was conducted through structured questionnaires administered via face-to-face interviews by trained enumerators.

A stratified random sampling technique was employed to ensure proportional representation across the selected sub-districts. Stratification was based on five purposively chosen sub-districts Baamang, Mentawa Baru

Ketapang, Mentaya Hilir Selatan, Seranau, and Telaga Antang identified as the region's primary pineapple-producing zones. Sample allocation within each stratum was conducted proportionally based on the number of active pineapple-farming households in each sub-district, as recorded by the East Kotawaringin Agriculture and Food Security Office (2023). This approach ensured both geographical and socio-economic representativeness of the sample.

The sample size was calculated using Yamane's formula (1973), with a 5% margin of error (α = 0.05), yielding a required sample size of 296 respondents:

$$n = \frac{N}{1 + N(e)^2} = \frac{1{,}132}{1 + 1{,}132(0.05)^2} = 296$$

where n is the sample size, N is the total population (1,132), and e is the margin of error (Yamane, 1973). The proportional distribution of respondents per sub-district was determined using the formula:

$$n_i = \frac{N_i}{N} \, x \, n$$

where n_i is the number of samples from sub-district i and N_i is the total pineapple-farming household population in sub-district i. This proportional allocation strategy enabled the research to capture contextual variations in agricultural engagement, demographic composition, and household-level vulnerability across locations.

To clarify the sampling unit, the study focused on married women who directly participated in pineapple farming, either as co-farmers or key decision-makers. This included spouses of land-owning farmers, tenant farmers, and smallholders managing less than 2 hectares. Women-headed farming households were also included. Selection was based on active engagement in agricultural production and management rather than legal land ownership, ensuring diverse representation across farming roles.

2.3. *Data Collection Instrument*

A structured questionnaire was developed to collect data on four major areas: (1) socio-demographic and economic characteristics, (2) household food insecurity, (3) gender inclusion, and (4) women's empowerment in agriculture. The Household Food Insecurity Access Scale (HFIAS) was

used to assess household-level food access over the previous 30 days. The instrument captured various dimensions of food insecurity, ranging from concerns about food availability to more severe experiences such as skipping meals or not eating for an entire day (Salarkia *et al.*, 2014). A composite score was calculated for each household, ranging from 0 to 27, where higher scores indicated greater levels of food insecurity.

To measure empowerment, this study developed a Localized Women's Empowerment in Agriculture Index (LWEAI), adapted from the original Women's Empowerment in Agriculture Index (WEAI) (Alkire *et al.*, 2013). The index retained the five core domains of empowerment: (1) decision-making in agricultural production, (2) access to and control over productive resources, (3) control over income use, (4) leadership in community activities, and (5) allocation of time for productive and domestic tasks. Items were scored using a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Domain-specific scores were aggregated into a composite empowerment index.

The gender inclusion index was adapted from indicators developed by (A. Quisumbing *et al.*, 2023), focusing on women's participation in agricultural decision- making, access to resources and training, involvement in group activities, and contribution to market-related agricultural activities. Responses were also collected using a 5-point Likert scale, allowing for both descriptive and multivariate analysis of inclusion levels (Joshi *et al.*, 2015).

Demographic and socio-economic variables collected included age (in years), level of education (total years of formal schooling completed), farming experience (in years), household income (in Indonesian Rupiah), landholding size (in hectares), and household size (number of family members living in the household). Descriptive statistical analyses including means, standard deviations, frequency distributions, and cross-tabulations will be used to profile the sample. These data serve to contextualize the empowerment and food security outcomes explored in subsequent analysis.

To ensure validity and cultural appropriateness, the localized instruments (LWEAI and the Gender Inclusion Index) underwent a two-stage validation process. First, the questionnaire was pre-tested with 20 respondents from a comparable demographic group to ensure clarity, relevance, and local comprehensibility. Second, internal reliability testing using Cronbach's alpha demonstrated strong consistency, with all major constructs exceeding a coefficient of 0.80. Expert judgment from academic and field practitioners was also used to refine item formulation and content validity.

To mitigate the risk of common method bias arising from face-to-face interviews and Likert-scale items, several procedural remedies were applied. The questionnaire incorporated both positively and negatively worded statements to reduce acquiescence bias. Furthermore, enumerators

emphasized respondent anonymity and confidentiality prior to each interview session, encouraging honest and unbiased responses. Survey instructions were standardized to avoid interviewer influence, and participants were assured that there were no right or wrong answers.

2.4. *Data Analysis Techniques*

The data analysis was conducted in two main stages: descriptive statistics and inferential analysis. In the first stage, descriptive statistics were applied to summarize the socio-demographic and economic characteristics of the respondents. Measures of central tendency (mean, median) and dispersion (standard deviation, range) were used for continuous variables, while frequencies and percentages were used for categorical variables. The demographic profile includes variables such as age, education level, farming experience, land size, farm income, and household size, along with access to credit, market information, and agricultural extension services. The summary of these characteristics is presented in Table 1.

Table 1 - Descriptive Statistics of Respondents' Demographic Characteristics

Variable	**Mean**	**SD**
Age (years)	40.82	9.53
Education (years)	7.87	2.33
Farming experience (years)	19.30	25.31
Farm size (hectares)	2.27	1.47
Farm income (IDR)	2,743,936	1,895,423
Household size (members)	2.71	1.266
Variable	**Category**	**Frequency (%)**
Credit Access	Have access	172 (58.11%)
	No access	124 (41.89%)
Market Information Access	Have access	246 (83.11%)
	No access	50 (16.89%)
Agricultural Extension Access	Have access	87 (29.39%)
	No access	209 (70.61%)

Source: Primary data (2024).

In the second stage, inferential analysis was conducted using Partial Least Squares- Structural Equation Modeling (PLS-SEM) via SmartPLS version 4.0 to test the hypothesized relationships (Hair *et al.*, 2019). PLS-SEM was chosen due to its robustness in handling complex models involving multiple constructs and indicators, especially under limited sample sizes and when normal distribution assumptions are not strictly met (Hair *et al.*, 2021). Compared to covariance-based SEM (CB-SEM), PLS-SEM emphasizes predictive accuracy and is appropriate for exploratory modeling.

To evaluate the measurement model, several validity and reliability tests were performed:

- Factor loadings (> 0.70) confirmed indicator reliability.
- Cronbach's Alpha and Composite Reliability (CR) values above 0.70 indicated good internal consistency.
- Average Variance Extracted (AVE) values above 0.50 were used to confirm convergent validity (Fornell & Larcker, 1981).

The structural model was then evaluated based on path coefficients, significance levels, and the explanatory power of endogenous constructs:

- R^2 values (0.25 = weak, 0.50 = moderate, 0.75 = substantial)
- Q^2 values (from Stone-Geisser test) greater than zero confirmed predictive relevance.
- Bootstrapping (5,000 subsamples) was applied to test the significance of direct and indirect effects at the 95% confidence level.

A summary of construct reliability and validity is presented in Table 2, followed by Table 3 showing the R^2 and Q^2 values for the main constructs.

Table 2 - Construct Reliability and Validity

Construct	**Cronbach's Alpha**	**Composite Reliability**	**AVE**
Food Security	0.846	0.890	0.577
Women's Empowerment	0.912	0.935	0.743
Gender Inclusion	0.883	0.914	0.680

Source: Primary data (2024).

Table 3 - Coefficient of Determination (R^2) and Predictive Relevance (Q^2)

Construct	Q^2	R^2	Adjusted R^2	Criteria
Food Security	0.078	0.641	0.630	moderate
Gender Inclusion	0.097	0.176	0.173	weak
Women's Empowerment	0.463	0.472	0.469	moderate

Source: Primary data (2024).

While the R^2 values for gender inclusion and women's empowerment were modest, they remain within acceptable thresholds for exploratory PLS-SEM models (Hair *et al*., 2021). Future research could incorporate additional predictors such as social capital or institutional trust.

To further understand each predictor's contribution, effect size (f^2) was calculated. This metric assesses how much an independent variable contributes to explaining the variance in each endogenous variable. The results are displayed in Table 4.

Table 4 - Summary of Effect Size (f^2)

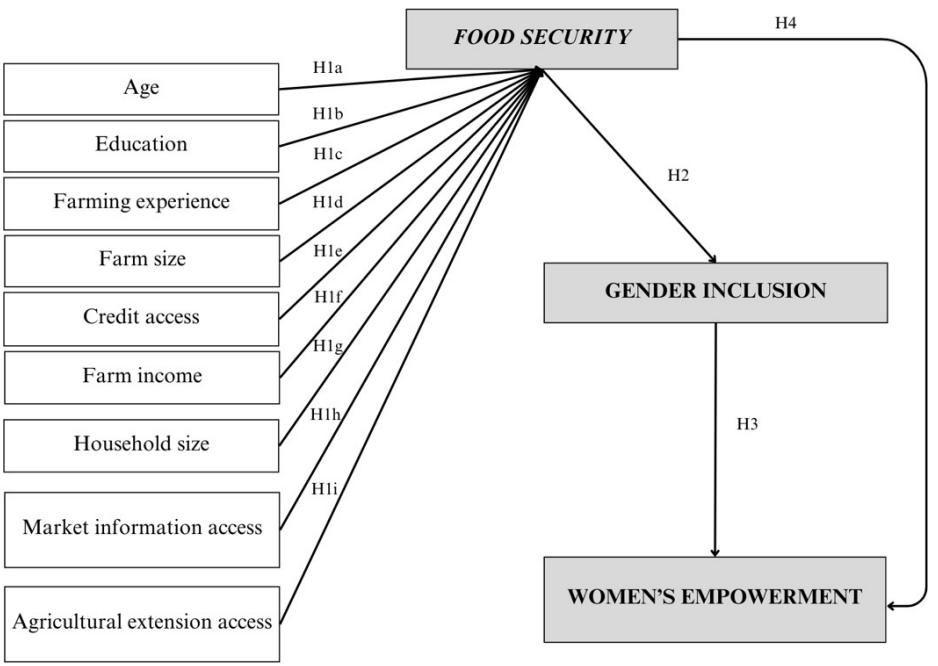
Construct	Food Security	Gender Inclusion	Women's Empowerment
Age	0.003		
Education	0.002		
Farming experience	0.000		
Farm size	0.001		
Farm income	0.004		
Household size	0.197		
Credit access	0.041		
Market information access	0.303		
Agricultural extension access	0.000		
Food security		0.214	0.149
Gender inclusion			0.387

Source: Primary data (2024).

The final structural model was developed to visualize the hypothesized relationships among constructs. Each latent construct was operationalized using 4 to 6 reflective indicators adapted from validated sources. Figure 2 presents the path model, illustrating both direct and indirect causal effects between demographic characteristics, resource access variables, food security, gender inclusion, and women's empowerment. Key relationships explored include how factors such as market information access and household size influence food security, and how gender inclusion functions as a mediating variable in the empowerment process of women in agricultural households. The figure includes standardized path coefficients and significance levels, obtained through bootstrapping with 5,000 iterations.

Specifically, hypotheses H1a-H1i examine the influence of socio-economic characteristics and access to agricultural resources on food security. H2 and H3 assess the mediating role of gender inclusion between food security and women's empowerment. Finally, H4 represents the direct effect of food security on women's empowerment. These pathways provide a comprehensive framework to analyze both structural and relational dimensions of empowerment in the context of rural food systems.

Figure 2 - Structural Model of Hypothesized Relationships



Source: Author's own work.

SmartPLS 4.0 was used to test the structural model, including direct and indirect paths among food insecurity, gender inclusion, and women's empowerment. To test for the mediating role of gender inclusion, a bootstrapping procedure with 5,000 resamples was employed. Mediation was confirmed using the Variance Accounted For (VAF) criterion, where partial mediation is established if VAF exceeds 20%.

All research procedures adhered to ethical standards for studies involving human participants. Prior to data collection, formal approval was obtained from the Agriculture and Food Security Office of East Kotawaringin Regency. Participation was voluntary, and verbal informed consent was secured after explaining the study's objectives, confidentiality, and the right to withdraw at any time. No personal identifiers were collected, and all data were treated anonymously and analyzed in aggregate. Enumerators were trained to conduct interviews respectfully and in accordance with local cultural and gender norms.

3. Results

The results of this study provide comprehensive insights into the factors influencing food security, gender inclusion, and women's empowerment within agricultural households in East Kotawaringin Regency, Indonesia. This section is structured into several subsections, including demographic characteristics, levels of food security, dimensions of gender inclusion and empowerment, as well as findings from structural equation modeling. The analysis integrates both descriptive and inferential statistical approaches, with the inferential component utilizing Partial Least Squares Structural Equation Modeling (PLS-SEM) to examine hypothesized relationships among variables.

3.1. *Demographic and socio-economic characteristics of the respondents*

The demographic and socio-economic profiles of respondents provide essential contextual information for interpreting the dynamics of food security, gender inclusion, and empowerment in the study area. As shown in Table 1, the mean age of respondents was 40.82 years (SD = 9.53), suggesting a mature group of women engaged in agricultural activities. On average, respondents had 7.87 years of formal education (SD = 2.33), indicating limited educational attainment, which may affect access to agricultural knowledge and services.

The average farming experience was 19.30 years (SD = 25.32), showing extensive engagement in agriculture, although the high standard deviation suggests wide variation in experience levels. The average household size was 2.71 members (SD = 1.27), which reflects a trend toward smaller family units in the region.

In terms of access to agricultural support systems, a majority of respondents (83.11%) reported having access to market information, and 58.11% had access to credit. However, only 29.39% had access to agricultural extension services, highlighting a significant institutional gap that may affect farmers' capacity to implement improved practices and enhance productivity. These characteristics are critical for understanding the determinants of food security and empowerment outcomes examined in subsequent sections.

3.2. *Levels of Food Security, Gender Inclusion, and Empowerment*

Household food security was assessed using the Household Food Insecurity Access Scale (HFIAS), which captures a household's access to adequate food over the past 30 days. As shown in Table 5, the majority of households (71.62%) were classified as food secure, indicating reliable access to sufficient and appropriate food throughout the year. Additionally, 23.99% of households experienced mild food insecurity, characterized by occasional difficulties in food access without major impacts on quantity or quality. A further 4.39% were found to be moderately food insecure, facing more frequent disruptions that compromised both the quality and quantity of food consumed. Notably, no respondents fell into the category of severe food insecurity.

Table 5 - Food Security Levels of Respondent Households

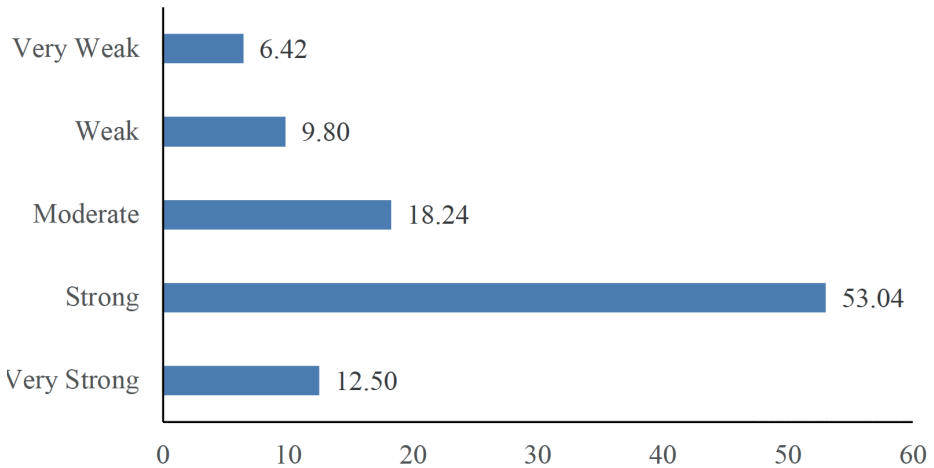
Food Security Level	**Frequency**	**Percentage (%)**
Food Secure	212	71.62
Mildly Food Insecure	71	23.99
Moderately Food Insecure	13	4.39
Severely Food Insecure	0	0.00
Total	**296**	**100.00**

Source: Primary data (2024).

Gender inclusion was measured using composite indicators reflecting women's participation in agricultural decision-making, access to productive resources, involvement in farming activities, and access to extension services

or training. As presented in Figure 3, 6.42% of respondents reported very weak inclusion, while 9.80% were categorized under weak inclusion. The largest group (53.04%) demonstrated strong gender inclusion, indicating partial but meaningful participation in agriculture-related decisions and moderate resource access. Additionally, 18.24% of respondents experienced moderate inclusion, and 12.50% were classified under very strong inclusion, characterized by full participation in decision-making, leadership, and access to diverse agricultural support services.

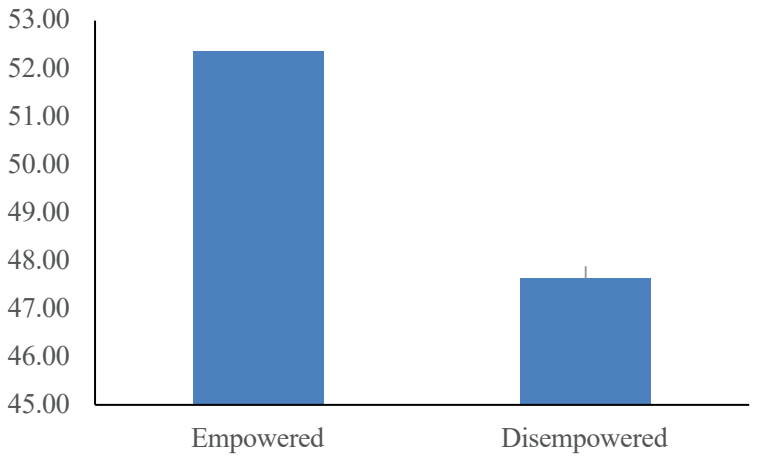
Figure 3 - Gender Inclusion Levels Among Respondent Households



Source: Author's own work.

Women's empowerment in agriculture was assessed using a localized version of the Women's Empowerment in Agriculture Index (WEAI), adapted to the study context. Based on a composite scoring system covering five domains, respondents were classified as empowered if they achieved adequacy in at least 80% of the indicators. Results in Figure 4 show that 52.36% of women were classified as empowered, while 47.64% were considered disempowered. Among the disempowered, constraints included limited access to land, credit, and training opportunities, as well as minimal participation in income-related and production decisions. In contrast, empowered women were more actively engaged in leadership roles, household income control, and agricultural decision-making. These findings indicate persistent gendered barriers in agricultural empowerment, despite some progress.

Figure 4 - Empowerment Levels of Farmers' Wives in the Study Area



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Source: Author's own work.

3.3. *Path Analysis and Hypothesis Testing*

Path analysis using Partial Least Squares-Structural Equation Modeling (PLS-SEM) with 5,000 bootstrapped subsamples examined the hypothesized relationships between socio-economic factors, food security, gender inclusion, and women's empowerment. The explanatory power of the model was moderate for food security ($R^2 = 0.641$) and women's empowerment ($R^2 = 0.472$), while relatively weak for gender inclusion ($R^2 = 0.176$). Nevertheless, all Q^2 values exceeded zero, confirming predictive relevance across constructs.

Table 7 summarizes the standardized path coefficients, t-values, and significance levels. Results indicate that three factors significantly influenced food insecurity: household size ($\beta = 0.323$, $p < 0.001$), credit access ($\beta = -0.279$, $p < 0.01$), and market information access ($\beta = -0.915$, $p < 0.001$). These findings suggest that larger households are more vulnerable to food insecurity, while access to financial and informational resources reduces vulnerability. In contrast, age, education, farming experience, farm size, farm income, and access to extension services did not significantly affect food security.

Table 7 - Summary of Path Coefficients and Hypothesis Testing Results

Relationship	Path Coefients (β value)	*t*–Value	*n*–Value	Signifcant Level
Age > Food Secuity	0.040^{ns}	0.914	0.361	Not significant
Education > Food Security	0.024^{ns}	0.701	0.483	Not significant
Farming Experience > Food	–0.010^{ns}	0.246	0.806	Not significant
Security Farm Size > Food Security	–0.058^{ns}	0.715	0.475	Not significant
Credit Access > Food Security	–0.279**	3.127	0.002	Significant
Farm Income > Food Security	–0.100^{ns}	1.282	0.200	Not significant
Household Size > Food Security	0.323**	6.296	0.000	Significant
Market Information Access > Food Security	–0.915**	7.696	0.000	Significant
Agricultural Extension Access > Food Security	0.015^{ns}	0.186	0.852	Not significant
Food Security > Gender Inclusion	–0.420**	6.438	0.000	Significant
Gender Inclusion > Women's Empowerment	–0.498**	9.599	0.000	Significant
Food Security > Women's Empowerment	0.309**	6.155	0.000	Significant

Source: Primary data (2024).

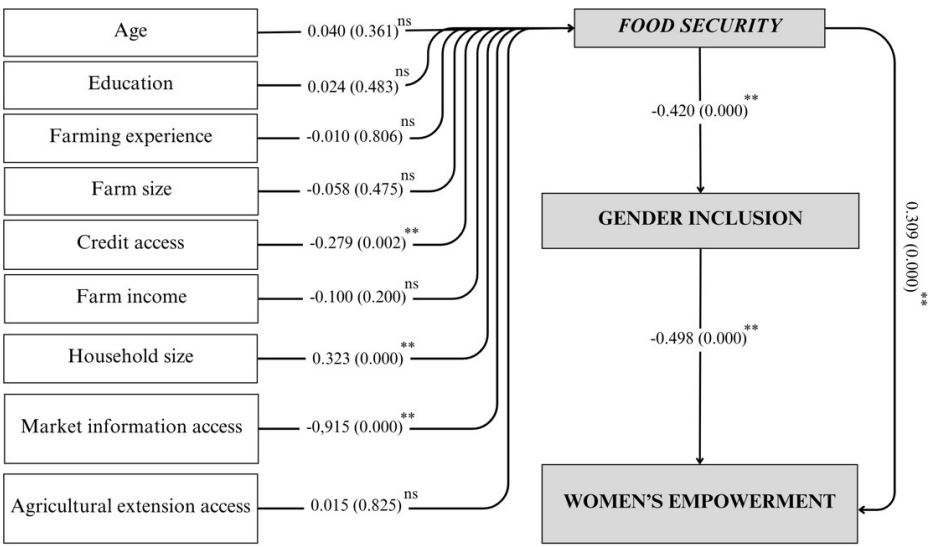
Food insecurity was found to negatively affect gender inclusion ($\beta = -0.420$, $p < 0.001$), indicating that when households face food stress, women's participation in agricultural decision-making and access to productive resources are diminished. Gender inclusion, in turn, exerted a strong positive influence on women's empowerment ($\beta = 0.498$, $p < 0.001$), reinforcing the notion that inclusion is a prerequisite for agency, autonomy, and leadership within rural households. Importantly, food insecurity also directly reduced women's empowerment ($\beta = -0.309$, $p < 0.001$), highlighting its dual role: not only undermining inclusion but also directly constraining women's capacity to exercise agency.

The results provide evidence of both direct and indirect pathways through which resource access and household dynamics shape women's empowerment.

The mediating effect of gender inclusion confirms that empowerment cannot be achieved solely through material resources but requires meaningful participation in agricultural and household decision-making. At the same time, the modest explanatory power for gender inclusion suggests the influence of additional unobserved factors, such as social norms, collective action, or institutional trust, which should be explored in future studies.

These relationships are visually summarized in Figure 5, which illustrates both the direct and indirect causal effects among food security, gender inclusion, and women's empowerment, including the standardized path coefficients and their significance levels. The figure reinforces the central role of gender inclusion as a mediating pathway, while also depicting how food insecurity exerts negative effects through multiple channels.

Figure 5 - Structural Model with Path Coefficients and Significance Levels



Note: * and ** indicate significance levels of 5% and 1%

Source: Author's own work.

4. Discussion

4.1. *Key Findings on Food Security*

This study provides nuanced insights into the determinants of household food security among pineapple farming communities in East Kotawaringin

Regency, Indonesia. Surprisingly, none of the sampled households reported severe food insecurity, despite regional statistics consistently identifying these areas as food-insecure zones. This divergence may reflect contextual factors, including the timing of data collection (post-harvest season), ongoing food assistance programs, and possible underreporting due to cultural norms or social desirability during face-to-face interviews. Such dynamics may have temporarily obscured structural vulnerabilities, underscoring the need for seasonally sensitive and multi-method assessments in future research (Li *et al*., 2025).

Quantitative analysis confirms that access to credit and market information significantly reduces the likelihood of food insecurity. These findings align with broader literature on the importance of financial capital and informational access in improving household resilience (Hlatshwayo *et al*., 2023; Millimet *et al*., 2018). Credit enables investment in productivity-enhancing inputs, while market information improves production and sales decisions, both of which directly enhance food access. Similar evidence from rural Africa and Asia shows that access to formal credit strengthens food security, while reliance on informal credit may have adverse effects due to unfavorable repayment terms (Salima *et al*., 2023).

In contrast, larger household size was positively associated with food insecurity, reflecting the strain of higher dependency ratios where children and elderly increase resource pressure in smallholder systems with limited land. This finding is consistent with recent studies reporting that greater dependency ratios reduce food security outcomes, especially in low-income farming households (Olumba *et al*., 2023). The pattern also reflects gendered labor burdens, where women in large households balance caregiving and farm work, potentially constraining productivity. Given these results, a more detailed discussion of household size dynamics is presented in Section 4.2.

Socio-demographic variables such as age, education, farming experience, farm size, and access to extension services were not significantly related to food security. While earlier studies found these factors influential (Osanya *et al*., 2020), their insignificance here may point to limitations in the relevance of local extension systems or barriers to women's participation. Comparable findings elsewhere show that extension services often underperform due to weak institutional support and limited gender responsiveness (Li *et al*., 2025).

4.2. *Household Size and Food Insecurity*

The positive and statistically significant relationship between household size and food insecurity reinforces the notion that larger families face greater challenges in securing adequate food. This is consistent with Akello &

Mwesigwa (2023) and Olayemi (2012), who observed that increasing household size heightens consumption needs that are not always matched by income, thereby increasing vulnerability. Manyong *et al*. (2024) similarly report that larger family sizes in rural households are associated with lower food security due to trade-offs between food quantity and quality.

Households with more dependents, especially young children or school-age members, must distribute limited resources across more individuals, reducing per capita food availability and heightening poverty risks (Akello & Mwesigwa, 2023). Owoo (2021) likewise found that higher dependency ratios force households to adopt more coping strategies and reduce per capita food expenditures.

However, the relationship is not universally consistent. Olayemi (2012) reported that in Osun State, Nigeria, larger households contributed positively to food security where communal support systems and labor availability offset resource strain. Manyong *et al*. (2024) also note that in some rural settings, larger households with adequate access to credit, inputs, and markets can maintain or even improve food security. These findings indicate that the effect of household size depends on contextual factors such as livelihood structures and access to resources.

Policy interventions are therefore essential to support larger households in resource-constrained contexts. Recommended strategies include nutritional support for high-dependency households, income diversification schemes aligned with household labor capacity, and improved access to microcredit and productive inputs. As Eicher-Miller *et al*. (2020) and Atuoye *et al*. (2019) argue, strengthening economic resilience through market access, social protection, and women's income-generating opportunities can reduce vulnerability and promote equitable food access.

4.3. *Gender Inclusion, Empowerment, and Food Insecurity*

In this study, gender inclusion refers to women's participation in agricultural decision-making, access to productive resources, and involvement in collective or market-related activities, whereas empowerment reflects agency through control over income, time, and leadership within households and communities. While inclusion represents opportunity, empowerment embodies influence.

Findings reveal a significant negative association between food insecurity and gender inclusion, suggesting that women's roles in decision-making and resource access diminish under food stress. This supports Quinonez *et al*. (2019), who argue that scarcity reinforces patriarchal norms and excludes women from productive roles. Recent work confirms that structural

inequalities mediate resilience pathways, with food stress limiting women's engagement in decision-making and collective action (Slavchevska *et al.*, 2024).

These dynamics indicate that deteriorating food access drives women's withdrawal from public and productive spheres, a trend shaped by increased unpaid care burdens, reduced mobility, and prioritization of household survival. Prior studies show that during food scarcity, women's time and autonomy are reallocated toward survival tasks (Kabeer, 1999, 2016; A. R. Quisumbing *et al.*, 2024). Seasonal fluctuations can also obscure these dynamics, as the timing of measurement influences how women's roles are captured (Wubetie *et al.*, 2024).

Time poverty compounds these effects. Adeyeye *et al.* (2021) found that rural women consistently work longer hours than men due to dual productive and reproductive roles. In East Kotawaringin, women face similar constraints, balancing farming, caregiving, and household management, which limits opportunities for training and leadership. This aligns with O'Meara *et al.* (2025), who emphasize that overlapping constraints – mobility limits, caregiving responsibilities, and weak institutional recognition – shape women's agricultural inclusion.

In marginalized contexts, such overlapping burdens are rarely recognized in policy or statistics, perpetuating the invisibility of women's labor (Gualoto, 2023). Nonetheless, the structural equation model in this study confirms that gender inclusion significantly predicts empowerment, as women engaged in farming decisions and training report higher autonomy, income control, and leadership roles (Peterman *et al.*, 2021; Shuai *et al.*, 2019).

The inclusion-empowerment relationship, however, remains context-dependent. Rahmiyati & Rachmawati (2023) show that women's cooperatives can sustain empowerment even under food insecurity. Yet in East Kotawaringin, weak institutional and social capital limit such protective effects. Moreover, concurrent stresses, such as food and water insecurity, intensify gendered vulnerabilities and restrict empowerment opportunities (Charles *et al.*, 2023). Resource scarcity, as highlighted by Tantoh *et al.* (2021), further narrows women's agency and reinforces traditional power structures.

Empowered women, through decision-making autonomy, leadership, and income control, enhance household resilience by improving dietary diversity, farm outcomes, and intergenerational wellbeing (Kehinde *et al.*, 2021; Madzorera *et al.*, 2023). However, without meaningful inclusion, empowerment efforts risk superficiality. Interventions that focus solely on individual capacity, without addressing gender norms and institutional barriers, remain inadequate. Advancing from individual-level initiatives to systemic frameworks that promote inclusion, redistribute household labor, and institutionalize recognition is therefore critical for sustainable change.

4.4. *Implications of the Study*

This study contributes to the theoretical discourse on food security and gender by empirically validating the mediating role of gender inclusion between food insecurity and women's empowerment. The results extend Kabeer's empowerment framework (1999) by showing that empowerment in agricultural households cannot be achieved solely through resource access but requires relational dimensions of inclusion in decision-making. Moreover, the development of the Localized Women's Empowerment in Agriculture Index (LWEAI) demonstrates how empowerment indices can be tailored to local socio-cultural contexts, thus addressing the limitations of universal measures such as the WEAI. This adaptation provides a more nuanced understanding of how household size, time poverty, and market information interact with empowerment outcomes, offering a theoretical lens that is both context-sensitive and globally relevant. Methodologically, the application of PLS-SEM illustrates the value of predictive modelling in exploring multidirectional relationships within rural development research.

Traditional approaches often treat food security and empowerment as separate constructs; however, this study demonstrates the utility of structural equation modelling for examining complex interactions simultaneously. This approach enhances the predictive power of empowerment research, especially under conditions of moderate sample sizes and non-normal data distributions common in rural fieldwork. Future studies can replicate and extend this methodological framework to integrate additional variables such as institutional trust, social capital, or collective action.

The findings underscore the need for integrated, gender-responsive policies to strengthen rural resilience. First, the significant role of market information in reducing food insecurity highlights the urgency of promoting inclusive communication platforms, such as mobile-based applications, farmer WhatsApp groups, or community radio programs that specifically target women. Second, the positive effect of credit access suggests that microfinance schemes tailored to women minimizing collateral requirements and coupled with financial literacy training can enhance both household food security and women's agency. Third, the dual burden of food insecurity and time poverty implies that interventions must go beyond resource provision to address structural inequalities. Community-based childcare, labor-saving technologies, and gender-sensitive extension services are critical to enabling women's participation in leadership and decision-making.

These implications resonate strongly with Indonesia's rural development priorities and the Sustainable Development Goals (SDGs) 2 (Zero Hunger) and 5 (Gender Equality). The evidence presented here advocates for the institutionalization of gender inclusion within agricultural extension systems, monitoring frameworks, and local governance structures. By

embedding gender-sensitive metrics such as the LWEAI into policy evaluation, governments and development agencies can design more adaptive interventions that reflect grassroots realities while advancing national and global development agendas.

4.6. *Limitations and Future Research*

While this study offers valuable contributions to the understanding of gender inclusion, food security, and women's empowerment in agricultural households, several limitations must be acknowledged, which also open opportunities for future research.

First, the study employed a cross-sectional design, collecting data at a single point in time. This limits the ability to infer causal relationships or to capture changes in empowerment, gender roles, or household food security over time. Future studies should consider adopting longitudinal or panel data approaches to examine how shifts in access to credit, household composition, or market dynamics affect gendered outcomes and food security across different seasons or over multiple years.

Second, the study was geographically limited to pineapple-producing communities in East Kotawaringin Regency, Central Kalimantan. While this localized focus allows for in-depth contextual analysis, it may limit the generalizability of findings to other agroecological zones or cultural settings. Future research should expand to diverse farming systems and regions (including rice-based, dryland, or coastal agriculture) to assess the robustness and adaptability of the gender-inclusive empowerment model proposed.

Additionally, the study relied on self-reported measures of empowerment and food security, which may be subject to social desirability bias or subjective interpretation. Complementary qualitative approaches (such as in-depth interviews or ethnographic methods) could enrich future analyses by uncovering the lived experiences and intra-household negotiations behind empowerment and inclusion dynamics.

Lastly, future work could explore the role of intersectional factors such as age, ethnicity, or marital status in shaping women's empowerment trajectories in agriculture. Doing so would help refine and tailor empowerment strategies to the specific needs of marginalized subgroups within farming communities.

Conclusion

This study underscores the critical interplay between food security, gender inclusion, and women's empowerment in rural agricultural households of East Kotawaringin Regency, Indonesia. The findings demonstrate that access to credit and market information significantly mitigate food insecurity,

while larger household sizes exacerbate vulnerability a pattern reflecting the structural inequities embedded in smallholder farming systems. Crucially, gender inclusion is significantly associated with food security dynamics: women's participation in agricultural decision-making correlates with greater empowerment outcomes. Conversely, households experiencing food insecurity tend to report lower levels of women's agency – potentially reflecting increased unpaid care responsibilities, reduced access to mobility, or heightened social stigma. While causality cannot be confirmed due to the cross-sectional design, these patterns suggest interdependent constraints that warrant further longitudinal investigation.

The primary contribution of this study lies in the development of the Localized Women's Empowerment in Agriculture Index (LWEAI), a context-sensitive adaptation of the Women's Empowerment in Agriculture Index (WEAI). Unlike conventional frameworks that prioritize aggregate metrics (e.g., income control, resource access), the LWEAI incorporates localized indicators such as household size, community participation, and time poverty to capture the socio-cultural and structural barriers unique to rural Indonesia. This model fills a critical gap in empowerment research by bridging macro-level policy tools (e.g., WEAI, Gender Equity Index) with grassroots realities, offering a nuanced lens to analyze how informal decision-making roles and intra-household dynamics shape women's agency. By linking food security indicators with gendered participation metrics, the LWEAI advances a holistic understanding of empowerment, one that acknowledges the interdependence of resource access, social norms, and systemic inequities.

These insights carry transformative implications for policy and practice. First, the LWEAI provides a replicable framework for designing gender-responsive interventions in agrarian Global South contexts, particularly where cultural norms and decentralized governance limit the applicability of universal empowerment indices. Second, the study advocates for integrated strategies that simultaneously address food security and gender inclusion, such as:

- Expanding microcredit programs tailored to women farmers' needs,
- Leveraging digital platforms to democratize market information access,
- Mainstreaming gender quotas in agricultural cooperatives and extension services.

These findings also resonate with Indonesia's national development agenda. The 2020-2024 National Medium-Term Development Plan (RPJMN) explicitly emphasizes improving rural food systems and strengthening women's participation in agricultural decision-making. By integrating empowerment and food security into one analytical framework, this study provides localized evidence to support these policy priorities. Such alignment reinforces the relevance of the LWEAI as both a diagnostic and strategic tool for achieving national food resilience targets.

Such measures align with Sustainable Development Goals (SDGs) on zero hunger (SDG 2) and gender equality (SDG 5), fostering resilient rural livelihoods. Future research should explore the longitudinal impacts of LWEAI-informed interventions and test its adaptability in diverse agroecological settings. By centering women's voices in food systems governance, this work charts a pathway toward equitable and sustainable rural development.

References

Adeyeye, O., Fabusoro, E., Sodiya, C. I., & Fapojuwo, O. E. (2021). Gender differences in time-poverty among rural households in Southwest Nigeria. *Journal of Agriculture and Rural Development in the Tropics and Subtropics, Supplement*, *112*(2), 193-205. Doi: 10.17170/kobra-202107134323.

Akbar, A., Darma, R., Fahmid, I. M., & Irawan, A. (2023). Determinants of Household Food Security during the COVID-19 Pandemic in Indonesia. *Sustainability (Switzerland)*, *15*(5). Doi: 10.3390/su15054131.

Akello, M. C., & Mwesigwa, D. (2023). Household Size and Household Food Security in Ngetta Ward, Lira City, Northern Uganda. International *Journal of Developing Country Studies*. Doi: 10.47941/ijdcs.1479.

Alkire, S., Meinzen-Dick, R., Peterman, A., Quisumbing, A., Seymour, G., & Vaz, A. (2013). The Women's Empowerment in Agriculture Index. *World Development*, *52*, 71-91. Doi: 10.1016/j.worlddev.2013.06.007.

Amrullah, E. R., Tokuda, H., Rusyiana, A., & Ishida, A. (2023). Effect of COVID-19 pandemic on food insecurity in Indonesian households. *International Journal of Social Economics*. Doi: 10.1108/ijse-03-2023-0186.

Anik, A., & Rahman, S. (2021). Women's Empowerment in Agriculture: Level, Inequality, Progress, and Impact on Productivity and Efficiency. *The Journal of Development Studies*, *57*, 930-948. Doi: 10.1080/00220388.2020.1817393.

Atuoye, K., Antabe, R., Sano, Y., Luginaah, I., & Bayne, J. (2019). Household Income Diversification and Food Insecurity in the Upper West Region of Ghana. *Social Indicators Research*, *144*, 899-920. Doi: 10.1007/S11205-019-02062-7.

Babatunde, R. O., Omotesho, O. A., & Sholotan, O. S. (2007). Factors influencing food security status of rural farming households in north central Nigeria. *Agricultural Journal*, *2*(3), 351-357.

Bello, L. O., Baiyegunhi, L. J. S., Danso-Abbeam, G., & Ogundeji, A. A. (2021). Gender decomposition in smallholder agricultural performance in rural Nigeria. *Scientific African*, *13*. Doi: 10.1016/j.sciaf.2021.e00875.

Budiwiranto, B., Jasmadi, J., Maryam, D., & Zaimuddin, L. (2025). Building Inclusive Communication in Empowering Farmers: Opportunities and Challenges for Sustainability in the Digital Era. *Jurnal Ilmu Sosial Dan Humaniora*, *14*(1), 68-79. Doi: 10.23887/jish.v14i1.86105.

Charles, I., Salinger, A., Sweeney, R., Batagol, B., Barker, S. F., Nasir, S., Taruc, R. R., Francis, N., Clasen, T., & Sinharoy, S. S. (2023). Joint Food and Water Insecurity Had a Multiplicative Effect on Women's Depression in Urban Informal

Settlements in Makassar, Indonesia during the COVID-19 Pandemic. *The Journal of Nutrition*, *153*(4), 1244-1252. Doi: 10.1016/j.tjnut.2023.01.010.

Colfer, C. J. P., Achdiawan, R., Roshetko, J. M., Mulyoutami, E., Yuliani, E. L., Mulyana, A., Moeliono, M., Adnan, H., & Erni. (2015). The Balance of Power in Household Decision-Making: Encouraging News on Gender in Southern Sulawesi. *World Development*, *76*, 147-164. Doi: 10.1016/j.worlddev.2015.06.008.

Eicher-Miller, H., Rivera, R., Sun, H., Zhang, Y., Maulding, M., & Abbott, A. (2020). Supplemental Nutrition Assistance Program-Education Improves Food Security Independent of Food Assistance and Program Characteristics. *Nutrients*, *12*. Doi: 10.3390/nu12092636.

FAO (2022). The State of Food Security and Nutrition in the World 2022: Repurposing food and agricultural policies to make healthy diets more affordable. Food and Agriculture Organization of the United Nations.

Fornell, C., & Larcker, D. F. (1981). Evaluating Structural Equation Models with Unobservable Variables and Measurement Error. *Journal of Marketing Research*, *18*(1), 39-50. Doi: 10.2307/3151312.

Getaneh, Y., Alemu, A., Ganewo, Z., & Haile, A. (2022). Food security status and determinants in North-Eastern rift valley of Ethiopia. *Journal of Agriculture and Food Research*, *8*, 100290. Doi: 10.1016/j.jafr.2022.100290.

Gualoto, E. (2023). Female farmers in the Galapagos: An invisible force. *Journal of Agriculture and Rural Development in the Tropics and Subtropics*, *124*(2), 115-127. Doi: 10.17170/kobra-202311028938.

Hair, J. F., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2021). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)*, 3rd edition. 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. Doi: 10.1108/EBR-11-2018-0203.

Hlatshwayo, S., Ojo, T., & Ngidi, M. (2023). Effect of market participation on the food and nutrition security status of the rural smallholder farmers: the case of Limpopo and Mpumalanga provinces, South Africa. *Frontiers in Sustainable Food Systems*. Doi: 10.3389/fsufs.2023.1097465.

Jemaneh, S. A., & Shibeshi, E. M. (2023). Women empowerment in agriculture and its effect on household food security: evidence from Gamo Zone of Southern Ethiopia. *Agriculture & Food Security*, *12*(1), 37. Doi: 10.1186/s40066-023-00437-1.

Joshi, A., Kale, S., Chandel, S., & Pal, D. (2015). Likert Scale: Explored and Explained. *British Journal of Applied Science & Technology*, *7*(4), 396-403. Doi: 10.9734/BJAST/2015/14975.

Kabeer, N. (1999). Resources, Agency, Achievements: Reflections on the Measurement of Women's Empowerment. *Development and Change*, *30*(3), 435-464. Doi: 10.1111/1467-7660.00125.

Kabeer, N. (2016). Gender Equality, Economic Growth, and Women's Agency: the "Endless Variety" and "Monotonous Similarity" of Patriarchal Constraints. *Feminist Economics*, *22*(1), 295-321. Doi: 10.1080/13545701.2015.1090009.

Kehinde, M. O., Shittu, A. M., Adeyonu, A. G., & Ogunnaike, M. G. (2021). Women empowerment, Land Tenure and Property Rights, and household food security

among smallholders in Nigeria. *Agriculture & Food Security*, *10*(1), 25. Doi: 10.1186/s40066-021-00297-7.

Li, M., Harou, A. P., & Chakrabarti, A. (2025). Agricultural intensification through multiple-season farming: Effects on resiliency, food security and nutrition. *Food Policy*, *134*, 102833. Doi: 10.1016/j.foodpol.2025.102833.

Madzorera, I., Bliznashka, L., Blakstad, M., Bellows, A., Canavan, C., Mosha, D., Bromage, S., Noor, R., Webb, P., Ghosh, S., Kinabo, J., Masanja, H., & Fawzi, W. (2023). Women's input and decision-making in agriculture are associated with diet quality in rural Tanzania. *Frontiers in Public Health*, *11*. Doi: 10.3389/fpubh.2023.1215462.

Manyong, V., Nguezet, P. M. D., Nyamuhirwa, D.-M. A., Osabohien, R., Bokanga, M., Mignouna, J., Bamba, Z., & Adeoti, R. (2024). Drivers and magnitude of food insecurity among rural households in southern Democratic Republic of Congo. *Heliyon*, *10*(21), e40207. Doi: 10.1016/j.heliyon.2024.e40207.

Millimet, D., McDonough, I., & Fomby, T. (2018). Financial Capability and Food Security in Extremely Vulnerable Households. *American Journal of Agricultural Economics*, *100*, 1224. Doi: 10.1093/ajae/aay029.

Nour, S., & Abdalla, E. (2021). The determinants of food security in Sudan: the case of Kassala state. *World Journal of Science, Technology and Sustainable Development*. Doi: 10.1108/WJSTSD-10-2020-0084.

Olayemi, A. (2012). Effects of Family Size on Household Food Security in Osun State, Nigeria. *Asian Journal of Agriculture and Rural Development*, *2*, 1-7. -- https://consensus.app/papers/effects-family-size-household-food-security-osun-state-olayemi/2cd67defde8e5e5a8ac553f5591d4265/.

Olumba, C. C., Olumba, C. N., & Okpara, U. (2023). Household headship, resource ownership and food security: New evidence from Southeast Nigerian cities. *Scientific African*, *22*, e01974. Doi: 10.1016/j.sciaf.2023.e01974.

O'Meara, L., de Bruyn, J., Hope, T., Fajó-Pascual, M., Hodge, R., Turner, C., Stoynova, M., Wellard, K., Ferguson, E., & Dominguez-Salas, P. (2025). Conceptual framework of women's food environments and determinants of food acquisition and dietary intake in low- and middle-income countries: a scoping review. *The Lancet Planetary Health*, *9*(8), 101280. Doi: 10.1016/j.lanplh.2025.06.004.

Osanya, J., Adam, R. I., Otieno, D. J., Nyikal, R., & Jaleta, M. (2020). An analysis of the respective contributions of husband and wife in farming households in Kenya to decisions regarding the use of income: A multinomial logit approach. *Women's Studies International Forum*, *83*, 102419. Doi: 10.1016/j.wsif.2020.102419.

Owoo, N. S. (2021). Demographic considerations and food security in Nigeria. *Journal of Social and Economic Development*, *23*(1), 128-167. Doi: 10.1007/s40847-020-00116-y.

Peterman, A., Schwab, B., Roy, S., Hidrobo, M., & Gilligan, D. O. (2021). Measuring Women's Decisionmaking: Indicator Choice and Survey Design Experiments from Cash and Food Transfer Evaluations in Ecuador, Uganda and Yemen. *World Development*, *141*, 105387. Doi: 10.1016/j.worlddev.2020.105387.

Puspitawati, H., Faulkner, P., Sarma, M., & Herawati, T. (2019). Gender Relations and Subjective Family Well-Being Among Farmer Families: a Comparative Study Between Uplands and Lowlands Areas in West Java Province, Indonesia. *Journal of Family Sciences*, 3(1), 53. Doi: 10.29244/jfs.3.1.53-72.

Quinonez, H. M., De Sousa, L. R. M., & Figueroa, L. S. (2019). Food Insecurity and Gender Inequality in Latin America. *Journal of Nutrition Education and Behavior*. Doi: 10.1016/J.JNEB.2019.05.413

Quisumbing, A., Cole, S., Elias, M., Faas, S., Galiè, A., Malapit, H., Meinzen-Dick, R., Myers, E., Seymour, G., & Twyman, J. (2023). Measuring Women's Empowerment in Agriculture: Innovations and evidence. *Global Food Security*, *38*, 100707. Doi: 10.1016/j.gfs.2023.100707.

Quisumbing, A. R., Meinzen-Dick, R., Malapit, H. J., Seymour, G., Heckert, J., Doss, C., Johnson, N., Rubin, D., Thai, G., Ramani, G., Myers, E., Quisumbing, A., Meinzen-Dick, R., Malapit, H., Dione, M., Heckert, J., Malapit, H., Martinez, E. M., Pereira, A., … Thai, G. (2024). Enhancing agency and empowerment in agricultural development projects: A synthesis of mixed methods impact evaluations from the Gender, Agriculture, and Assets Project, Phase 2 (GAAP2). *Journal of Rural Studies*, *108*, 103295. Doi: 10.1016/j.jrurstud.2024.103295.

Quisumbing, A. R., Sproule, K., Martínez, E., & Malapit, H. J. (2021). Do Tradeoffs Among Dimensions of Women's Empowerment and Nutrition Outcomes Exist? Evidence From Six Countries in Africa and Asia. *Food Policy*, *100*, 102001. Doi: 10.1016/j.foodpol.2020.102001.

Rahmiyati, N., & Rachmawati, T. (2023). Strategy model of coastal women's economic empowerment (fisherman's wife) based on blue economy and local potential in kenjeran beach tourism location city of Surabaya. *JPPI (Jurnal Penelitian Pendidikan Indonesia)*, *9*(4), 363-371. Doi: 10.29210/0202312379.

Ratnasari, A., & Sugiyanto, C. (2023). Improving Women's Empowerment Through Management of Dairy Farms Based on Circular Economy. *Journal of Resilient Economies*, *3*(1). Doi: 10.25120/jre.3.1.2023.4001.

Salarkia, N., Abdollahi, M., Amini, M., & Neyestani, T. R. (2014). An adapted Household Food Insecurity Access Scale is a valid tool as a proxy measure of food access for use in urban Iran. *Food Security*, *6*(2), 275-282. Doi: 10.1007/s12571-014-0335-7.

Salima, W., Manja, L. P., Chiwaula, L. S., & Chirwa, G. C. (2023). The impact of credit access on household food security in Malawi. *Journal of Agriculture and Food Research*, *11*, 100490. Doi: 10.1016/j.jafr.2022.100490.

Shuai, Y., Shuai, C., Li, W., & Huang, F. (2019). Role of women's empowerment in improving farmer's livelihood: empirical evidence from China. *Quality & Quantity*, *53*(2), 621-639. Doi: 10.1007/s11135-018-0778-6.

Slavchevska, V., Acosta, M., Ndiaye, T., & Park, C. M. Y. (2024). Gendered pathways for resilient and inclusive rural transformation. *Global Food Security*, *43*, 100818. Doi: 10.1016/j.gfs.2024.100818.

Tantoh, H., McKay, T., Donkor, F. E., & Simatele, M. (2021). Gender Roles, Implications for Water, Land, and Food Security in a Changing Climate: A Systematic Review. *Frontiers in Sustainable Food Systems*, *5*. Doi: 10.3389/fsufs.2021.707835.

Wubetie, H. T., Zewotir, T., Mitku, A. A., & Dessie, Z. G. (2024). Spatiotemporal modeling of household's food insecurity levels in Ethiopia. *Heliyon*, *10*(12), e32958. Doi: 10.1016/j.heliyon.2024.e32958.

Yamane, T. (1973). *Problems to accompany: statistics: an introductory analysis.* Harper & Row.

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