

GENDER-RESPONSIVE STRATEGIES IN HIGHLAND FARMING: EVALUATING WOMEN EMPOWERMENT IN INDONESIA

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Abstract

Background: Women farmers in regions such as Cianjur and Tabanan, Indonesia, consistently face systemic challenges, including limited access to resources and decision-making power, which can hinder their productivity and well-being.

Purpose: This study evaluates innovative strategies to enhance women's empowerment in highland agriculture by focusing on empowering women to play a more significant role.

Design/methodology/approach: This study employed a combined methodological approach, utilizing the women's Empowerment in Agriculture Index (WEAI) framework and integrating the Analytic Hierarchy Process (AHP) to evaluate the empowerment factors. This study utilized five domains for AHP-WEAI: production decisions, resource access, income control, leadership participation, and time allocation.

Findings/Results: This study identified key factors that significantly influence women's empowerment, such as access to credit and leadership roles. Economic factors (credit/land access) dominated in Cianjur (AHP weight: 0.45), while social factors (leadership roles) were significant in Tabanan (0.40).

Conclusion: This study identifies key factors influencing women's empowerment in Cianjur and Tabanan, using the AHP-WEAI framework. These findings highlight the need for region-specific strategies, such as economic interventions in Cianjur and social capital building in Tabanan, to enhance women's roles in highland farming systems.

Originality/value (State of the art): This study offers a novel approach to quantify domain-specific empowerment drivers in Indonesian highlands using AHP-WEAI integration.

Keywords: women's empowerment, agribusiness management, food security, climate change, sustainable agriculture

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INTRODUCTION

Women play a crucial role in agriculture, particularly within highland farming communities where their contributions are essential for ensuring food security. In Indonesia, women constitute a significant portion of the agricultural labor force, contributing to more than 40% of farming activities (FAO, 2018; BPS, 2023; Sraboni et al. 2014). This involvement is especially pronounced in highland regions such as Cianjur Regency (hereafter: Cianjur), West Java, Tabanan Regency (hereafter, Tabanan), and Bali, where women are integral to cultivation, post-harvest processing, and marketing (Rahayu and Haryanto, 2023; Kusuma and Wijaya, 2022).

Despite their extensive involvement, women's agricultural roles are frequently undervalued, owing to persistent structural barriers. Women farmers in Indonesia's highlands face layered vulnerabilities, including limited resource access (e.g., land ownership) that restricts economic opportunities (Meinzen-Dick et al. 2019), climate change impacts (landslides/floods increasing workloads) (UN Women, 2022), and cultural norms that limit decision-making autonomy (Johnson et al. 2016). These intersecting challenges constrain productivity, decision-making power, and overall well-being (Glazebrook et al. 2020), thereby reducing women's potential to contribute to agricultural development. Aligned with the UN Sustainable Development Goals (SDG 5 on gender equality and SDG 2 on ending hunger), this study addresses the urgent need for gender-responsive strategies to empower women in highland farming systems.

While prior research examines women's empowerment in agriculture (Johnson et al. 2016; Peterman et al. 2020), significant gaps persist regarding the Indonesian highlands. Existing studies often focus on national trends without analyzing local socio-agroecological contexts (Kusuma and Wijaya, 2022; Rahayu and Haryanto, 2023). This overlooks critical dynamics, such as how Tabanan's male-dominated Subak irrigation system or Cianjur's climate vulnerabilities uniquely shape empowerment outcomes. Our research bridges this gap through methodological innovation by integrating the Women's Empowerment in Agriculture Index (WEAI) with the Analytic Hierarchy Process (AHP). This novel approach quantitatively prioritizes domain-specific empowerment drivers (production, resources, income, leadership, and time), offering

granular insights that are absent in generalized studies (Nurhayati and Setiawan, 2023).

We employed a comparative mixed-methods framework to address contextual complexities through methodological integration, contextual analysis, and regional comparisons. First, five WEAI domains (production decisions, resource access, income control, leadership participation, and time allocation) were quantitatively evaluated using Analytic Hierarchy Process (AHP) weighting to identify key empowerment factors (e.g., prioritizing credit access versus leadership roles). Second, these quantitative AHP results were triangulated with qualitative data to capture sociocultural nuances (such as Tabanan's governance) and climate vulnerabilities (including Cianjur's landslide risks). Third, a systematic regional comparison between Cianjur (characterized by diverse crops and climate fragility) and Tabanan (defined by traditional irrigation and strong cooperatives) reveals how agroecological and institutional differences shape empowerment pathways, ensuring that context-specific solutions are derived from localized evidence.

This study uses five WEAI domains—production, resource access, income control, leadership, and time allocation—to analyze women's empowerment in Cianjur and Tabanan. Therefore, this study aims to 1) identify the key factors influencing women's empowerment through AHP-based weighting of WEAI domains, and 2) evaluate empowerment strategies that contribute to food security for women farmers. The comparative aspect of this study, focusing on Cianjur and Tabanan, allows for the exploration of how sociocultural and agroecological differences shape women's experiences and empowerment outcomes. Cianjur is characterized by its diverse agricultural production and vulnerability to climate-induced landslides and floods, in contrast to Tabanan, which is known for its traditional Subak irrigation system and strong community-based farming management. While many studies have broadly discussed women's empowerment (e.g., Johnson et al. 2016; Nurhayati and Setiawan, 2023), few have investigated the distinct sociocultural dynamics that influence empowerment in Indonesia's highland agriculture. Quantitative and qualitative data ensured a holistic understanding of the complex dynamics at play, providing rich insights into the lived experiences of female farmers and the effectiveness of the empowerment strategies.

METHODS

This study utilized primary data collected from 120 female farmers (stratified as 70 in Cianjur and 50 in Tabanan) through structured surveys capturing demographic profiles and empowerment indicators across five women's Empowerment in Agriculture Index (WEAI) domains: production decisions, resource access, income control, leadership participation, and time allocation. Complementary expert inputs were derived from seven agricultural specialists in gender-responsive programs, highland agriculture, and agribusiness using pairwise comparison matrices for the Analytic Hierarchy Process (AHP). Qualitative insights were gathered through two region-specific Focus Group Discussions (FGDs), where in Cianjur, three key informants (agricultural officers and Women Farmer Group/KWT leaders) and another in Tabanan had four participants (administrators and policymakers). Primary sources ensure contextual validity, with WEAI domains grounded in established empowerment frameworks (Malapit et al. 2015; Cole et al. 2022).

Data were collected from August to September 2024 to align with the peak agricultural activity by employing purposive sampling to ensure representation across contrasting agroecological contexts (Gibbs et al. 2020). We conducted structured face-to-face surveys with all 120 female farmers to minimize response bias and enhance reliability (Patton, 2002), complemented by expert consultations where seven specialists performed pairwise comparisons of WEAI domains using Saaty's 9-point scale for Analytic Hierarchy Process (AHP) weighting. Region-specific Focus Group Discussions (FGDs), one in each research location, probed institutional barriers and empowerment strategies (Morgan, 1997), with Cianjur's session involving three agricultural officers and Women Farmer Group (KWT) leaders, and Tabanan's involving four administrators and policymakers. Quantitative data (WEAI scores and AHP matrices) and qualitative transcripts were triangulated to validate the findings and capture multidimensional insights (Creswell, 2014).

A mixed-methods analytical approach was implemented, beginning with quantitative analysis where Super Decisions software (v3.2) computed eigenvector

weights for women's Empowerment in Agriculture Index (WEAI) domains through the Analytic Hierarchy Process (AHP), with consistency ratios maintained below 0.10 to ensure logical coherence in expert judgments (Saaty, 2008). Concurrently, the survey data were scored against five WEAI domains (production, resources, income, leadership, and time) to quantify empowerment levels (Malapit et al. 2015). Qualitatively, thematic analysis of Focus Group Discussion (FGD) transcripts has identified socio-cultural barriers and empowerment strategies through iterative coding (Braun and Clarke 2006). Integration occurred via methodological triangulation, revealing convergent empowerment drivers, while comparative analysis contrasted region-specific influences, particularly Cianjur's climate fragility against Tabanan's Subak irrigation governance, to contextualize empowerment pathways (Meinzen-Dick et al. 2019).

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Overall, this study offers insights into the critical dimensions of women's empowerment in agriculture, and provides valuable guidance for the development of targeted interventions, especially in climate-vulnerable regions. The research framework illustrating this integrated approach is shown in Figure 1.

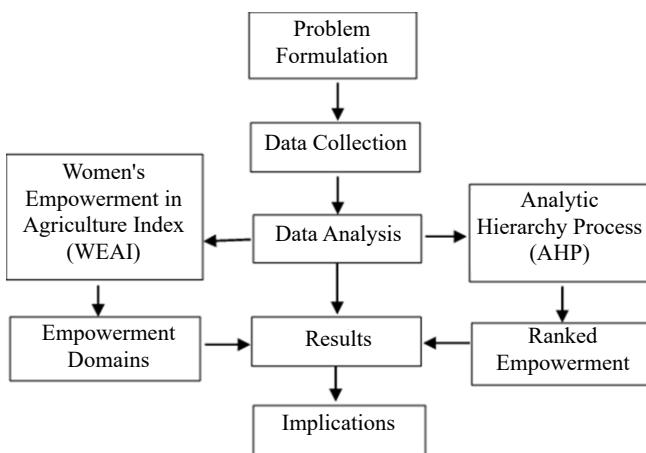


Figure 1. Research framework of process flow and implications

RESULTS

Respondents' Sociodemographic Characteristics

In Cianjur, female farmers face significant challenges related to land scarcity, frequent climate shocks, and limited institutional support, compounding economic vulnerabilities. However, the strong communication networks fostered by female farmer groups, namely Kelompok Wanita Tani (KWT), offer a foundation for mutual support and collective action (Anggraeni and Prasetyo 2021). Qualitative data suggests that informal credit systems and fragmented community networks are crucial for accessing financial resources, although these mechanisms are often inefficient and exclusionary, particularly for women. Comparative sociodemographic characteristics of women farmers in Cianjur, West Java and Tabanan, Bali in Table 1.

In contrast, Tabanan farmers benefit from the collective governance of the Subak system, which facilitates cooperation in water management and provides more equitable access to agricultural resources. However, despite the collective benefits, gender norms within Subak continue to limit women's involvement in decision-making processes (Kusuma and Wijaya, 2022). The integration of women into formal decision-making structures is crucial for improving their roles and leadership in the agricultural sector.

Based on the surveys, the sociodemographic characteristics of respondents (65%) engaged in farming activities for four years in Cianjur and 60% for five years in Tabanan. These women played a central role in agricultural decision-making, including

crop selection and resource allocation, while ensuring household food security. Long-term residency (more than five years) was a key selection criterion to ensure familiarity with the local agricultural conditions. Table 1 shows the results of the comparative sociodemographic characteristics of the female farmers.

Age Distribution

Both regions exhibit a predominantly young female farming population, with 71.4% of women in Cianjur and 68.0% in Tabanan under the age of 30. This suggests that agriculture remains a primary livelihood for younger women in both regions. Previous research supports this trend, showing that younger individuals are increasingly engaging in agriculture because of economic necessity and limited rural employment opportunities (Kusuma and Wijaya, 2022). However, Tabanan has a higher proportion of women aged over 50 years (6.0%) than Cianjur (1.4%), possibly due to the influence of traditional farming systems, such as Subak, which retains intergenerational participation. Studies have emphasized Subak's role in preserving traditional agricultural knowledge and ensuring family farming succession (Kusuma and Wijaya, 2022).

Marital Status

Marriage rates are notably higher in Tabanan (74.0%) than in Cianjur (62.9%), reflecting Bali's stronger adherence to traditional family structures, wherein married women play integral roles in farming households (Rahayu and Haryanto, 2023). In contrast, Cianjur had a significantly larger proportion of single women (27.1%) than Tabanan (10.0%), which may be associated with increased mobility and greater independence in decision-making. Existing research indicates that unmarried women in agriculture often experience higher levels of financial autonomy and greater flexibility in adopting new farming practices (Anggraeni and Prasetyo, 2021).

Widowed or divorced women were more prevalent in Tabanan (16.0%) than in Cianjur, a difference that may be explained by longer life expectancy and cultural acceptance of remarriage in the region. Studies have highlighted that widowed women in Bali often assume a more active role in land inheritance and decision-making, particularly within the Subak system (Wulandari and Susanto, 2023). In summary, significant differences in marital status were observed between

the two regions. Tabanan exhibits a higher marriage rate (74.0% compared with 62.9% in Cianjur), while Cianjur has a considerably larger proportion of single women (27.1% compared with 10.0% in Tabanan).

Education Level

Regarding educational attainment, women in Cianjur tended to have higher secondary education levels, with 37.1% having completed high school, compared with 26.0% in Tabanan. This difference may contribute to Cianjur women's greater ability to adopt modern farming techniques and engage in agribusiness ventures (Hakim and Suryani, 2021). Conversely, Tabanan has a larger proportion of women with only elementary education (34.0% compared with 21.4% in Cianjur), which may be linked to early entry into farming within the Subak system, where practical agricultural skills are often prioritized over formal education (Kaaria et al. 2017). University education remains scarce in both regions, with less than 9% of women in either region having obtained a university degree, reflecting the broader issue of limited access to higher education for rural women in Indonesia (FAO, 2021). These findings highlight the need for targeted educational initiatives aimed at enhancing women's agricultural skills and knowledge.

Land Ownership

Land ownership patterns in Cianjur and Tabanan reveal significant differences in the roles and responsibilities

of women in agriculture. In Cianjur, 62.9% of the women were identified as landowners, which is notably higher than the 48.0% identified in Tabanan. This disparity can be attributed to the more individualistic land tenure systems in West Java, where women have greater opportunities to own land independently. Land ownership is a key factor in empowering women, as it strengthens their bargaining power and access to agricultural resources, positively affecting productivity and income (Meinzen-Dick et al. 2019).

In contrast, Tabanan had a higher proportion of women renting land (22.0%) than Cianjur (10.0%). This difference may be influenced by Bali's communal land-use practices, particularly within the Subak system, where the land is often collectively managed. In such systems, communal governance structures may limit individual ownership and rental arrangements become more common. Shared land ownership and rental agreements were frequent in both regions, with 27.1% of women in Cianjur and 30.0% in Tabanan identifying as rent owners. This suggests that informal land tenure arrangements such as renting or sharing land are common among smallholder farmers in both areas (Meinzen-Dick et al. 2019). The contrast in land ownership patterns between Cianjur and Tabanan underscores the influence of local land tenure systems on women's agricultural autonomy. In Cianjur, land ownership provides women with more control and decision-making power, while in Tabanan, communal and rental systems may offer women access to land, although with different levels of control.

Table 1. Comparative sociodemographic characteristics of women farmers in Cianjur, West Java and Tabanan, Bali

Variable	Cianjur (n=70)	Tabanan (n=50)	Variable	Cianjur (n=70)	Tabanan (n=50)
Age (years)			Land Ownership		
Less than 30	71.4%	68.0%	Landowners	62.9%	48.0%
31 to 50	27.1%	26.0%	Rent-tenants	10.0%	22.0%
Over 50	1.4%	6.0%	Mixed Land Tenure	27.1%	30.0%
Marital Status			Household Size		
Married	62.9%	74.0%	=3 people	55.7%	0.0%
Single	27.1%	10.0%	3-7 people	40%	48%
Widowed/Divorced	10.0%	16.0%	>7 people	4.3%	52.0%
Education Level					
Elementary School	21.4%	34.0%			
High School	37.1%	26.0%			
University	5.7%	8.0%			

Household Size

Tabanan households tend to be larger, with 52.0% consisting of more than seven members, compared with only 4.3% in Cianjur. This difference aligns with Bali's traditional multigenerational living structure, where extended families often include grandparents, parents, and children who live together and provide collective support for agricultural activities. Such family structures are widely observed in Bali, where multigenerational living is deeply embedded in cultural norms and practices (Rahayu and Haryanto, 2023). The presence of multiple generations in a single household offers additional labor resources, which can contribute positively to farm productivity (Suryawati and Haryanto, 2021). However, larger households may also increase financial burden, which can affect women's economic participation and decision-making autonomy (Kaaria et al. 2017).

By contrast, Cianjur households are generally smaller, with 55.7% having three or fewer members. This aligns with a more nuclear family structure, in which newly married couples typically live independently from their parents. Smaller households in Cianjur may provide women with greater autonomy in making decisions related to farming and household finance. Previous studies have suggested that smaller household sizes are often linked to increased decision-making power for women, particularly in financial and production-related matters (Anggraeni and Prasetyo, 2021). This autonomy is particularly evident in agricultural practices, where the ability to make independent decisions is essential for adopting new farming techniques and engaging in agribusiness ventures (Meinzen-Dick et al. 2019).

Furthermore, research by Meinzen-Dick et al. (2019) and Kaaria et al. (2017) highlights that women in smaller households are often better able to allocate resources efficiently and make key decisions about land use, crop selection, and labor allocation. The presence of fewer family members in a household typically means more flexibility in the distribution of household income and responsibilities, allowing women to participate more actively in economic activities and decision-making. Thus, the larger household sizes in Tabanan, often indicative of multigenerational living, offer both benefits in terms of labor support and challenges related to financial pressures. On the other hand, Cianjur's smaller nuclear families may provide women with

greater independence and autonomy in agricultural decision-making, which can potentially lead to more innovative and productive farming practices.

Cianjur's Profile: Younger, More Educated, Nuclear Households

Cianjur's socio-demographic profile suggests substantial potential for women's leadership in modernized farming, as indicated by the region's younger and more educated female population. However, challenges such as land scarcity, climate change-induced disruptions (e.g., droughts and landslides), and limited access to extension services remain significant obstacles (Meinzen-Dick et al. 2019). These climate-induced risks disproportionately affect women's resilience in agricultural production systems (Kassie et al. 2021). These issues exacerbate economic vulnerabilities, as women in Cianjur often depend on informal credit systems that rely on fragmented community networks for financial support (Sari and Putra, 2022). Given these constraints, targeted policy intervention is crucial. Future strategies should focus on improving financial inclusion, enhancing land rights, and establishing microcredit programs tailored to female farmers to leverage their educational advantages and provide more opportunities for empowerment (Sari and Putra, 2022).

The presence of nuclear family structures in Cianjur, with 55.7% of households comprising three or fewer members, likely fosters greater autonomy for women in decision-making, as smaller family units often allow for more efficient resource management and greater flexibility in adopting new farming practices (Anggraeni and Prasetyo, 2021). The relatively high level of female education in Cianjur (37.1% had attained high school education) further bolsters the potential for women's leadership in agriculture. Studies have shown that higher levels of education correlate with increased participation in farm management decisions, as educated women tend to adopt innovative farming methods more rapidly (Sari and Putra, 2022).

Tabanan's Profile: Collective Farming System

In contrast, Tabanan's reliance on communal farming structures, such as the Subak system, emphasizes collective resource management and water governance, which enhances agricultural resilience. However, while this system provides institutional support for farming

communities, it also perpetuates patriarchal norms that often limit women's autonomy in decision-making (Kusuma and Wijaya, 2022). The collective nature of Subak, in which decisions are typically made at the community level, may hinder individual women's ability to exercise control over farming practices and financial decisions. This is reflected in previous studies, in which women's limited participation in collective decision-making bodies has been identified as a significant barrier to their empowerment in rural Bali (Suryawati and Haryanto, 2021). Policies aimed at increasing women's integration into subak governance coupled with leadership training programs could address this gap and enhance women's agency in agricultural communities.

Women in Tabanan benefit from the social capital provided by larger households and the Subak system's cooperative structure, which allows for better resource management and market access (Kusuma and Wijaya, 2022). However, despite these advantages, traditional gender norms continue to constrain women's leadership roles within KWT, limiting their potential in decision-making and leadership positions within the agricultural sector (Meinzen-Dick et al. 2019).

Insights from Key Informants: Perspectives on Agricultural Challenges and Opportunities

This study also included seven key informants who provided institutional and technical insights. Table 2 presents respondents based on their years of experience. These included three agricultural extension officers, two leaders of farmer organizations, and two provincial governments as policymakers, as well as decision-makers. They have worked in highland agriculture, gender-responsive support programs, and agribusiness management for more than ten years.

Experts have identified restricted credit access as a major constraint affecting farm productivity and sustainability in Cianjur (Figure 2 and Figure 3). In contrast, Tabanan farmers benefited from the well-established Subak collective action system, which provided better resource management and cooperation. However, experts noted that traditional gender norms continued to limit women's leadership roles in KWT in Tabanan.

Table 2. Experts Based on Years' Experience

Respondents Initial	Role	Years
IA	policymakers	15
SB	extension officers	15
AN	leaders	12
MN	leaders	10
WS	policymakers	11
NS	extension officers	15
NA	extension officers	15



Figure 2. Focus group discussion in Tabanan



Figure 3. Focus group discussion in Cianjur

Agricultural Production: A Primary Driver of Empowerment

This study integrates the women's Empowerment in Agriculture Index (WEAI) and the Analytic Hierarchy Process (AHP) to evaluate women's empowerment in both Cianjur and Tabanan, with agricultural production decisions emerging as the highest-priority domain in both regions. The AHP weights indicate that women in Cianjur (0.466) have slightly more influence on agricultural production decisions than those in Tabanjur (0.414). This is likely due to the active participation of KWT in Cianjur, which advocates women's involvement in agricultural planning and execution

(Anggraeni and Prasetyo, 2021). The relatively higher weight of Cianjur suggests that women's role in farming decisions is more pronounced, possibly because of smaller household sizes and more individualized farm operations (Meinzen-Dick et al. 2019). This finding emphasizes that increasing women's participation in decision-making directly contributes to empowerment. Empowered women also tend to make more diversified crop choices, thereby improving sustainability (Malapit et al. 2023).

Resource Access: A Stronger Emphasis in Tabanan

Access to productive resources including land and credit is another critical domain of empowerment. The AHP weights for this domain are similar in both regions (Cianjur, 0.227; Tabanan, 0.241), but Tabanan's slightly higher weight suggests a greater recognition of land and credit access as key enablers of women's empowerment. The Subak system's collective land management and irrigation governance may provide women in Tabanan with greater security in resource access, especially when compared to the land tenure constraints faced by women in Cianjur (Kusuma and Wijaya, 2022). In Cianjur, the challenges of land scarcity and limited credit access are exacerbated by reliance on informal financial networks, which are often inaccessible to women without strong social connections (Sari and Putra, 2022). Final AHP Weight Based on WEAI Domains in Cianjur and Tabanan in Table 3.

Table 3. Final AHP Weight Based on WEAI Domains in Cianjur and Tabanan

WEAI Domains	Final AHP Weight	
	Cianjur	Tabanan
Decisions about Agricultural Production	0.466	0.414
Access to and Decision-Making Power over Productive Resources	0.227	0.241
Control over Use of Income	0.109	0.135
Leadership in the Community	0.070	0.074
Time Use	0.128	0.135

Control over Income: A Moderate, yet Distinct Pattern

Another critical domain of empowerment is income control. The AHP reveals that women in Tabanan (0.135) have slightly more control over income than women in Cianjur (0.109), likely because of the economic benefits provided by Subak's cooperative structure. The equitable distribution of revenue within Subak may allow for greater income control by women, enabling them to make more independent financial decisions (Kusuma and Wijaya, 2022). In contrast, women in Cianjur face greater challenges in financial decision-making due to the prevalence of male-dominated financial structures and informal credit reliance (Sari and Putra, 2022).

Leadership: Persistently Weak Domain

Leadership remains a significant area of concern in both regions, with AHP weights of 0.070 in Cianjur and 0.074 in Tabanan, underscoring persistent barriers to women's participation in formal leadership. Although Subak provides a platform for greater community engagement in Tabanan, it has not led to an increase in female representation in leadership positions. This trend reflects broader gender norms that exclude women from agricultural governance, an issue highlighted in studies on rural leadership structures (Suryawati and Haryanto, 2021).

Time Use: Secondary Concerns with Regional Parity

Time use was a secondary but important domain of empowerment, with AHP weights of 0.128 in Cianjur and 0.135 in Tabanan. The slightly higher weight in Tabanan may reflect the additional time burden women face in balancing agricultural labor with household responsibilities, particularly in larger households. The dual burden of unpaid care work and farm labor continues to restrict women's ability to engage in leadership roles or economic opportunities, reinforcing structural gender imbalances in labor distribution (Meinzen-Dick et al. 2019; Kaaria et al. 2017).

Strengthening Decision-Making Power through Agricultural Leadership

In Cianjur, female farmers have long contributed to agricultural production but have had limited influence over key decisions. To shift this dynamic, the KWT implemented training programs aimed at strengthening women's roles in farming decisions. These efforts have enhanced women's involvement in crop planning, resource management, and farming. The AHP analysis highlighted decision-making in production as the most influential empowerment domain (weight: 0.466), underscoring its importance in advancing women's agency (Kabeer, 2001). Women reported increased confidence in land negotiations, technology adoption, and income management. These economic gains were accompanied by social change, as male counterparts began to involve women more in agricultural discussions. KWT's collaborative structure also improved women's access to government support and markets. Once male-dominated, agricultural leadership in Cianjur gradually becomes more inclusive, affirming the connection between decision-making power and women's empowerment (Moges, 2018; Juswanto and Setyowati, 2024).

Expanding Resource Access Through Subak Participation

In Tabanan, the traditional Subak irrigation system is vital for agricultural production; however, women's roles are often informal and unrecognized. The AHP findings (0.241) reinforced the importance of access to productive resources such as land, credit, and farming inputs in women's empowerment (Meinzen-Dick et al. 2019). Community-driven initiatives can address this challenge by encouraging women to actively engage in subak meetings and resource-management discussions. These women were supported in securing land-use rights, obtaining microloans, and forming cooperatives, all of which bolstered their economic stability. As women's involvement grew, so did their ability to influence water distribution decisions, negotiate farm inputs, and collectively advocate for their agricultural needs. The initiative not only enhanced women's roles in farming, but also contributed to their financial independence and increased decision-making power at the household level. This shift aligns with the broader narrative of gender equity, as women in Tabanan were no longer viewed as secondary contributors, but as vital figures in agricultural sustainability. The balance in AHP weightings between resource access (0.241) and income control (0.135)

further reflects this growing recognition, reinforcing the idea that women's economic empowerment is intertwined with their structural inclusion in agricultural decision-making (Aguilar, 2017).

Overcoming Leadership Barriers through Community Engagement

Despite progress in both regions, leadership remains the weakest domain of women's empowerment, with AHP scores of 0.070 and 0.074, respectively. These figures reflect persistent structural barriers that limit women's roles in formal community governance (Nagar, 2018). In both regions, women's participation in groups like the KWT and Subak has grown, yet leadership positions remain largely male-dominated. Targeted interventions such as mentorship, leadership training, and policy advocacy have helped some women build confidence, improve negotiation skills, and take on leadership roles (UN Women, 2022). This reinforces the idea that empowerment must go beyond resource access to include representation in decision-making (Moser, 1993). The findings emphasize that while agricultural decision-making and access to resources are crucial, sustained empowerment requires greater structural inclusion in governance. Aligning with Meinzen-Dick et al. (2019), this study affirms land access as key and contributes to evolving empowerment frameworks in agriculture (Kruijssen et al. 2025), calling for gender-sensitive policies to drive inclusive rural development (Njuki and Sanginga, 2024).

Managerial Implications

This study offers critical insights for policymakers, agricultural organizations, and community leaders in advancing women's empowerment in Indonesian highland agriculture. Gender-responsive initiatives such as KWT in Cianjur and Subak cooperatives in Tabanan have proven effective in enhancing decision-making and resource management. Strengthening these programs through resource integration (linking to government-subsidized credit schemes such as KUR Mikro and land titling initiatives) and capacity building (financial literacy and climate-resilient training) can improve access to land, credit, and inputs. This fosters financial independence and household influence while addressing region-specific barriers: economic interventions for Cianjur's credit/land constraints (AHP weight: 0.45), and leadership development for Tabanan's social gaps (AHP weight: 0.40).

However, persistent leadership deficiencies demand targeted policies, including quota systems (mandating 30% female representation in agricultural governance), mentorship networks, and specialized training to elevate women into formal roles. Strategic collaboration between local governments and financial institutions is essential for securing microloans and land rights. The AHP-WEAI methodology provides evidence-based prioritization for these interventions, enabling focused resource allocation that transforms women from beneficiaries to architects of climate-resilient food systems. This approach delivers practical guidance for inclusive policies, while advancing empowerment measurement tools to accelerate gender-equitable agricultural development.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

This study emphasizes the importance of gender-responsive programs in Cianjur and Tabanan to promote women's empowerment in agriculture. Education, leadership training, and active involvement in decision-making are key to enhancing women's roles in production and resource management. However, barriers to formal leadership persist in this regard. Empowering women requires improving access to land, credit, and collective platforms while addressing demographic factors such as marital status, education, and household structure that influence their farming activities.

Recommendations

Policymakers and agricultural organizations should expand gender-focused programs to build women's leadership and ensure their participation in decision-making. Strengthening cooperative models such as Subak can improve resource access and economic independence. Policy reforms should promote women's inclusion in governance through quotas and reserved roles. Future research should explore how demographic differences affect empowerment across farming systems, especially in terms of time use and decision-making autonomy.

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