



BEYOND MARKET PROXIMITY: GENDER, MARKET ACCESS, AND SOCIOECONOMIC RESILIENCE AMONG SMALL-HOLDERS OF PATCHOULI FARMERS IN INDONESIA

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ABSTRACT

Despite persistent socioeconomic challenges in Indonesia's aromatic crop sector, gender dynamics within the patchouli value chain remain underexplored. This study analyses the socioeconomic resilience of smallholder farmer households by highlighting the interrelationships among gender governance, market access, and adaptive strategies in the patchouli (*Pogostemon cablin*) value chain in Sulawesi, Indonesia. Primary data from 287 respondents in ten villages was collected through focus group discussions (FGDs) and interviews with 30 key informants. Data collection was conducted using a systematic random sampling method. This study investigated the relationship between gender roles and household resilience using the Gender-Sensitive Value Chain (GSVC) framework and correlation analysis. The results show that women's participation is significant throughout the value chain. However, they are still not involved in strategic decision-making. This indicates continuing structural gender-based inequality in the agricultural production system. With higher resilience scores ($r = 0.32$, $p < 0.01$), women's involvement in household financial management was positively correlated with resilience scores. This shows that women make a significant, but often unrecognized, contribution to household adaptive capacity. This study shows that for a competitive and sustainable aromatic crop economy, policies that empower women in the patchouli value chain, promote local institutions, and improve financial literacy are essential.

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INTRODUCTION

Patchouli (*Pogostemon cablin*), although commercially significant, is inadequately studied in terms of how global market integration influences

smallholder resilience and gendered involvement. Understanding the social and institutional processes that support this value chain is increasingly important as global demand for natural aromatic oils rises. This subsector is particularly important for the household incomes of farmers in regions such as Aceh, Central Sulawesi, and West Sulawesi, as Indonesia accounts for more than 80% of global market demand. (Sinaga et al., 2022; Yusran, 2021). According to Research Dive (2023), the global patchouli oil market is projected to grow from \$43.4 million in 2022 to \$64.4 million by 2032, with a compound annual growth rate (CAGR) of 4.1%. This gives local farmers and business owners a significant opportunity to expand their businesses and market their goods worldwide.

While Indonesia dominates the global market in terms of production volume, the benefits of this comparative advantage have not been equitably distributed, particularly for rural producers and women farmers, due to market access constraints, price fluctuations, and dependence on lengthy, opaque supply chains. (Kandi et al., 2025; Lee et al., 2022; Torero, 2011). In addition, farmers face challenges related to access to raw materials and technology, weak bargaining power, dependence on intermediaries, and a lack of appropriate institutional support. (Gurtu & Johny, 2021; Indraningsih & Swastika, 2022; Sikandar et al., 2023).

So far, the price of patchouli oil in the global market is determined by demand from international perfume markets, such as France, Switzerland, and the United States. Meanwhile, farmers lack a binding sale-and-purchase contract, leading to prices that fluctuate sharply at any time. The socio-economic vulnerability of agricultural workers is greatly influenced by unstable prices and limited access to markets (Asibey et al., 2019; Karunarathna et al., 2024). This vulnerability involves farmers' ability to cope with various challenges, such as crop failure, shifting operating costs, and lack of support from the formal financial system (Das, 2022; Kalogiannidis et al., 2023; Uduji et al., 2021). When faced with economic shocks or a decline in the market value of patchouli oil, many producers are pressured to sell their supplies at a large discount or liquidate their productive resources, which ultimately undermines their future stability. This trend is evident in patchouli-producing areas such as Sulawesi, East Kutai, and South Aceh.

The gender dynamics within the patchouli value chain have been insufficiently examined. Women are involved at all stages of the process, from cultivation to refining to marketing; nonetheless, their contributions are sometimes overlooked, particularly in strategic decision-making processes. Several studies indicate that women predominate in post-harvest stages, including drying and refining, although they lack authority over the sale of the crop (FAO, 2020). Also, women's informal roles are not recognized economically, despite their significant contributions to oil quality (Njuki et al., 2025; Li et al., 2024). Structural gender barriers, particularly access to land, credit, and technology, also amplify male dominance in the formal value chain (Li et al., 2024; Asibey et al., 2019). Furthermore, in patchouli farming households, women often contribute significantly to cultivation and financial management, yet their involvement in strategic decision-making and market transactions remains constrained. These dynamics are further complicated by market asymmetries and gendered labor divisions that constrain smallholder empowerment and equitable benefit distribution. Social norms and conventional

division of labor are regarded as substantial barriers to women's progression into decision-making roles (Barrientos, 2023).

These structural inequities also affect household bargaining power and long-term resilience, highlighting the necessity for a more systematic examination of gender dynamics in this sector. Despite the expansion of literature on gender and agriculture, there has been less focus on gendered issues within non-food value chains, such as patchouli. The majority of current research concentrates on staple or food crops (e.g., rice, maize, vegetables), resulting in a lack of attention to aromatic crops (Barrientos, 2023; Coles & Mitchell, 2010; Kini, 2022).

Despite its significant impact on food production stability, the role of gender in household economic resilience is rarely officially recognized. Restricted access to information reduces women's capacity to respond to market price variations. Women depend more on informal sources from their agricultural collectives, whereas men have direct access to wholesalers (Njuki et al., 2025). This gap is especially critical in the current environment, as smallholder households encounter heightened vulnerability due to price volatility, climate-induced pressure, and market reliance (Carr, 2020; Li et al., 2024). In this regard, addressing gender imbalance is a crucial prerequisite for achieving equality and significantly contributes to poverty alleviation, food security, environmental sustainability, climate change mitigation, and the formulation of effective rural development policies. This disparity is especially noteworthy given that South Sulawesi has considerable potential for patchouli oil production, which is an essential economic source for local farmers. Few studies have systematically examined the interplay between gender participation, market access, and resilience strategies in the patchouli value chain in Indonesia.

This study aims to integratively assess how the dynamics of gender participation, market access structures, and socioeconomic resilience mutually influence the lives of patchouli farmers. By adopting an interdisciplinary, field-based approach, this article is expected to contribute to agrarian literature and to more equitable and sustainable rural development policies, particularly in the lesser-highlighted non-food crop sector.

RESEARCH METHOD

This research utilized a mixed-methods approach that combined quantitative and qualitative data collection. This design enables a comprehensive and in-depth understanding of the intricate relationships between gender, market access, and resilience in the patchouli farming sector (Creswell & Plano, 2017). Meanwhile, case studies were used as an ideal research method to obtain a broad picture and an in-depth understanding of a phenomenon's current conditions and real context (Yin, 2012).

The research was conducted in the patchouli production centers of two provinces: West Sulawesi and Southeast Sulawesi. The research encompassed 10 pre-existing farmer groups in 10 villages across the districts, including Bambang Village in Majene District, Botteng in Mamuju District, and Salumaka in Mamasa District, all in West Sulawesi. Wolasi farmer group in South Konawe and Lasalimu in Buton District of Southeast Sulawesi. These regions, also with the population, were

selected because they represent variations in cultivation practices, supply chain structures, and the intensity of women's involvement in patchouli production. These locations were purposively selected based on production volume, market connectivity, and the presence of gender-based farmer groups. A total of 287 smallholder farmers were surveyed, of which 204 were in West Sulawesi Province, and 83 were in Southeast Sulawesi Province, using systematic random sampling to ensure balanced representation across gender and production characteristics. The systematic sampling was used because households in the study areas follow a semi-regular pattern—mainly lined along roads and clustered in hamlets. This approach ensures that all spatial segments of the village are proportionally represented and prevents the oversampling of easily accessible households.

Table 1. Distribution of Respondents and Research Locations

Province	District	Poktan	Village	Farmers
West Sulawesi	Mamuju	Botteng	Botteng	15
			Botteng north	94
	Majene	Bambangan	Bambangan	41
			Salumaka	54
Southeast Sulawesi	South Konawe	Wolasi	Leleka	33
			Kamaru	6
			Ranowila	16
			Aunupe	11
			Aoma	3
			Button	Lasembangi
Total:				287

Data collection

Structured household surveys were used to collect quantitative data. These surveys collected data on demographic information, sources of income, access to resources, gender roles, decision-making in farming, and coping strategies. Respondents were systematically selected to ensure a balanced distribution of men and women, landholding size, and market orientation.

Focus group discussions (FGDs) were used to collect qualitative data, which added depth to the context. The qualitative data were then compared to quantitative data to make the results more reliable (Kitzinger, 1995). Interviews with 30 key informants, including women farmers, local market players, extension agents, and community leaders. These qualitative methods offered contextual insights into the gender division of labor, market dynamics, and structural barriers that influence decision-making and income management.

Key variables are operationalized into measurable indices, such as household economic security (rated on a scale of 1-4) : (1) very insecure, (2) insecure, (3) moderately secure, and (4) secure (stable in income, regular saving, and adequate food consumption). A composite resilience index was constructed by combining economic security. Saving capacity, land ownership, and productive asset ownership. Scores above the median were categorized as 'high,' while those at or below the median were classified as 'low resilience.' Reliability checks were conducted using Cronbach's alpha ($\alpha = 0.78$), indicating acceptable internal

consistency of the index. Gender indicators include women's involvement in cultivation, financial management, and strategic decision-making (e.g., marketing and planting). Each gender-related activity was coded as a binary variable (1= involved, 0 = not involved) to construct indices of participation and compare across households.

Thus, methodological transparency can be seen in each research objective, which was explicitly paired with the following analytical tools: Objective 1, which aimed to describe the demographic and socioeconomic characteristics of patchouli farmers, was analyzed using descriptive statistics. Objective 2, which examined the relationship between gender roles and decision-making, was addressed through Chi-square tests and Pearson correlation analysis. Objective 3, which assessed household resilience strategies in the face of market uncertainties, was examined through correlation analysis of socioeconomic indicators and the resilience index. Ultimately, Objective 4, which examined contextual barriers and adaptive strategies within patchouli value chains, was assessed through thematic coding of qualitative interviews and FGDs. This clear connection reinforced the correspondence between research inquiries and analytical methods.

Table 2. Farmer Characteristics

Variable	N	Mean	Std. D
Gender	287	1.42	0.495
Education	287	2.28	1.257
Age	287	3.52	1.077
Income	287	1.83	1.291
Number of families	287	2.16	0.915
Savings	287	1.64	0.767
Longtime farmer	287	1.42	0.495
Vehicle ownership	287	2.70	0.655
Land ownership	287	3.53	0.868

With most respondents having completed secondary education, the demographic profile of the farmers surveyed indicates a relatively adequate educational background. Most of them are men between the ages of 31 and 50, and their households have an average of 3 to 5 members. Most households have basic savings, their own agricultural land, and access to vehicles. This is despite the fact that their income levels are generally low. The fact that patchouli cultivation is a relatively new industry provides an important context for interpreting the research results. By explaining the structural components that shape gender roles, market access, and resilience outcomes, this profile directly supports the research objectives. These characteristics help explain why women are widely involved in cultivation and post-harvest work but less involved in strategic decision-making and market transactions. These characteristics also explain why households with lower assets and income demonstrate lower bargaining power and are more vulnerable to price fluctuations. Therefore, the respondent profile is not merely a descriptive background; it is an essential part of the analytical process for understanding gender-based participation patterns and the adaptive capacity of patchouli farmer households.

Data Analysis

This study aims to examine how the economic sustainability of patchouli farmers' households is influenced by gender dynamics, market access, and adaptive strategies. It is based on the Gender Value Chain Analysis (GVCA) theory and the livelihood resilience framework. To examine the relationship between resilience indicators and gender participation, descriptive and inferential statistics (Chi-square and Pearson correlation) were used. This was done using SPSS version 26, following Cohen's (1988) interpretation thresholds. The criteria are r between 0.10 and 0.29, which is considered weak; 0.30-0.49, which is considered moderate; and r must be greater than 0.50. Specifically, the economic activity index was combined with a binary measure of female participation (where 1 indicates involvement, and 0 indicates low involvement) and cross-tabulated with household characteristics. This operationalization ensures that statistical procedures and data collection are consistent and provides a solid basis for chi-square tests and correlation analyses that examine how household economic resilience, women's involvement, and decision-making relate to each other. The general formula for the Pearson correlation coefficient is as follows:

$$r = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum (x_i - \bar{x})^2} \sqrt{\sum (y_i - \bar{y})^2}}$$

In this formula, x_i and y_i each represent the individual values of the two measured variables, while \bar{x} and \bar{y} are the average values of each variable. The numerator of the formula calculates the covariance between the two variables, which is the extent to which they change together. The denominator calculates the product of the standard deviations of each variable, which serves as a scaling adjustment so that the r value always falls within the range of -1 to +1. A r value close to +1 indicates a strong positive linear relationship; the higher the value of one variable, the higher the value of the other variable. Conversely, a r value close to -1 indicates a strong negative relationship. If the value is close to zero, the linear relationship between the variables is weak or non-existent.

Qualitative data from focus group discussions (FGDs) and interviews were thematically analyzed through an open coding process to identify push and pull factors influencing farmers' decisions to shift from traditional crops (such as cocoa and coconut) to aromatic crops like patchouli. Qualitative analysis complements quantitative results by explaining the institutional dynamics and socio-economic motivations behind the observed changes in livelihoods. Qualitative results are also used to triangulate survey data and enhance our understanding of gender dynamics, market access, and the resilience of patchouli farmer households in a social and structural context. At the same time, this mixed analytical method ensures that the methodological design and empirical discussion are consistent.

RESULTS AND DISCUSSION

Livelihood Transformation: Before and After Patchouli Farming

To understand the broader socioeconomic implications of patchouli cultivation, it is essential to investigate livelihood transformations. The shift to

patchwork livelihoods from traditional subsistence farming or mixed farming systems not only indicates a change in income sources; it also indicates changes in social status, asset ownership, and consumption patterns. A comparative analysis of household conditions before and after involvement in patchwork farming is presented in this section. It highlights both economic gains and emerging vulnerabilities.

Geographically, the village boasts a diverse range of natural resource potentials, including agricultural commodities, plantations, forestry, and other natural resources. Before switching to patchouli farming, villagers mostly worked as cocoa and coffee farmers. In recent years, since the arrival of the world's largest perfume company, which has sought patchouli oil and generated significantly greater profits than chocolate, farmers have shifted their focus to planting patchouli. This is due to some differences in the benefits felt by farmers as follows:

Table 3. Differences Before and After Patchouli Farming

Before patchouli, coffee, corn, and chocolate	Now Farming patchouli
<ul style="list-style-type: none"> - Farmers cannot relax at work because they must always guard their land from animal disturbances, pests, and thieves. - Much expenditure is on land management and agricultural processes, especially fertilizers. - Transportation is also heavier because corn, chocolate, and coffee products have a different weight from patchouli leaves. Besides that, the transportation cost is also greater due to the vehicle's limited capacity. - The income from the sale of cocoa, corn, and coffee farms is not comparable to the sales of patchouli, even though they are much more satisfactory than patchouli. 	<ul style="list-style-type: none"> - Farmers can be much more relaxed in their work because they do not feel anxious about patchouli leaves being eaten by animals or pests. So, farmers do not need to take care of their gardens every day. - Patchouli maintenance only involves cleaning the surrounding grass. - In terms of cost, it is more cost-effective for land management and agricultural processes because there is no need for frequent fertilization. - Patchouli leaves are lighter than cocoa beans, coffee, and corn, so transportation is easier and can carry much more in one transport. - The yield of patchouli farming is much larger and 10 times more satisfying than that of coffee, corn, and chocolate. The harvest distance is short and can be produced every month.

The change in the livelihoods of patchouli farmers is strongly felt by villagers in the work area. Interviews revealed that farmers are generally satisfied and enthusiastic about their current patchouli farming income. Compared to their previous income as corn farmers, they have a lower income due to the price of corn ranging between IDR 2,000 and IDR 5,000 per kilogram. Cocoa farmers earned between IDR 50,000-110,000 per kilogram, or coffee prices reaching 30,000-50,000 per kilogram. Patchouli farmers now earn between 2 million and 50 million per 3-6 month harvest period. Not to mention that the management process is also relatively

straightforward, with less maintenance and cost-effective compared to previous types of agriculture.

This change in income has further impacted changes in farmers' socio-economic lives. In addition to farmers having new insights into patchouli farming skills, farmers also felt a change in their lifestyle. The results of in-depth interviews revealed that those who previously could not afford gadgets now have them, on average. The need for online communication tools in this day and age has become part of the basic needs. It is useful not only for remote areas, such as rural areas, to get new information, but also for introducing patchouli farming to other regions in Indonesia. Some farmers even used social media to express their happiness as patchouli farmers by campaigning for the slogan 'Selamat Tinggal Kemiskinan' (goodbye poverty!). These indicate that the shift was driven by both push and pull factors. On the one hand, declining profitability and unstable market prices of previous commodities have reduced the sustainability of traditional livelihoods. On the other hand, patchouli has many advantages, especially higher market value, shorter cultivation cycles, and lower land requirements, making it a better choice for families with limited resources. According to Ellis (2000), this transformation is in line with the livelihood diversification approach, in which small farmers change their production systems to reduce risk and maintain household income when markets and institutions change

Level of Women's Involvement in the Patchouli Chain

In Indonesia, many interrelated actors form the patchouli value chain. Cultivation and drying of the leaves are carried out by smallholder farmers at the upstream level, consisting of men working in the fields and women working in post-harvest handling. At the downstream level, wholesalers and exporters handle collection and marketing to the cosmetics and fragrance industries, which are largely dominated by men. Local traders and distillers dominate collection and processing in the middle stage, where women's participation is still limited due to restricted access to capital and processing equipment. Understanding this provides a clearer picture of where women's contributions are concentrated and reveals the structural barriers that limit women's equitable participation, as reinforced by the following findings:

Table 4. Women's involvement in economic resilience

Activities	Percentage of Respondents
Engaged in patchouli farming	100%
Growing patchouli	100%
Distilling patchouli	0.00%
Selling patchouli products	42.3%
Managing patchouli money	90.2%
Make planting/selling decisions	15.7%

The table shows the average household economic resilience index, calculated based on the amount of time spent by women working in patchouli farming. Structured survey questions were used to measure women's involvement in various phases of patchouli farming, such as planting, harvesting, selling, household financial management, and participation in strategic decision-making. In the early

stages of production, women dominate the clove value chain, especially in planting activities, where 100% of respondents were women. Most are also involved in harvest financial management (90.2%), but their role declines dramatically in the processing stage (only 15.7% of women are involved in decisions about selling and planting) and decision-making. This distribution shows a clear gender-based division of labor: women are given responsibility for running daily life and managing money, but they are largely excluded from complex data processing and strategic decision-making. In-depth interviews with women farmers confirm that: "*Female patchouli farmers work alongside male farmers on patchouli plantations; they even participate in almost all operations involved in the patchouli value chain, from land clearing and planting to canopy closure. Two weeks later, the canopy was opened and treated. After that, one month later, the patchouli plants were fertilized. If the plants were already 4 months old, fertilization was done once a week. Then, at the age of 6 months, the patchouli plants can be harvested. After harvesting, it was then dried in the sun for one to seven days. If the weather is hot, then drying can be done in just 2-4 days. After drying, the patchouli is brought to the distillery to be weighed. However, women were not involved in the distillation process*". This distribution aligns with Farnworth et al., (2019) findings that women's agricultural labor remains undervalued within informal economies, despite its critical role in ensuring production continuity.

Thus, women were actively involved in all agricultural activities except for land clearing, logging, or hole-making, which were mostly done by men. These findings are further reinforced by the Chi-Square test results, which show a significant relationship between gender and women's involvement in decision-making regarding the sale or planting of agricultural products ($\chi^2 = 18.343$, $p < 0.001$). It confirmed a significant association between household gender composition and women's involvement in decision-making. However, the correlation is negative and weak ($r = -0.253$), suggesting that in households where male dominance is stronger, women's role in decision-making regarding sales and planting becomes more limited. This shows that, even though women are often assigned to manage their daily finances, they are still structurally limited in making strategic financial decisions for their households.

The division of labor based on gender in the patchouli value chain is shown in Table 4. Although women play an important role in household financial management and agriculture, they are still often excluded from important strategic processes such as distillation and decision-making. This reflects a broader pattern in agrarian economies, where women are underestimated and their authority is limited, even though female labor is essential (Coles & Mitchell, 2010; Barrientos, 2023).

The absence of women in distillation suggests technological or cultural barriers that restrict their access to more profitable roles. At the same time, their minimal involvement in planting and selling decisions (15.7%) underscores the persistence of patriarchal control over strategic choices. Similar dynamics have been documented in other non-food value chains, where women's work is often concentrated in labor-intensive and unpaid segments (Kini, 2022; Carr, 2020).

Nevertheless, the GVCA approach shows that women tend to be in low-value-added segments of the value chain. At the same time, men dominate strategic and technical positions that have higher economic value. The GVCA highlights how value in supply chains is determined not only by economic activity alone but also by

gender power relations that limit women's access to resources, information, and decision-making (Barrientos, 2023; Kini, 2022). At the same time, women's strong role in managing patchouli finances (90.2%) reflects their central importance to household resilience strategies. Although often invisible in policy and market narratives, this financial stewardship demonstrates women's agency in sustaining household well-being. Linking such financial roles with broader access to decision-making and cooperative participation could enhance both gender equity and household resilience.

In this context, while women are important actors in productivity, they often lack economic benefits and equal recognition. Women's low involvement in refining and sales decisions highlights structural barriers, including limited access to assets, technology, and social norms, that place them at a disadvantage in the value chain.

Access to Prices and Markets: Information Inequality and Dependency

Agricultural commodity supply chains require effective access to connect farmers with broader markets through transportation, distribution, technology, or price information. (Higgins et al., 2023) . However, until now, these forms of access have been a major obstacle for smallholder farmers. This condition is even more complex for women, who often face multiple constraints due to social structures, limited assets, and minimal involvement in market decision-making. (Higgins et al., 2023; Katsekor et al., 2024; Turay et al., 2024). In this study, access to markets can be seen from women's involvement in selling produce, decision-making, and activity distance. Figure 1 illustrates household and women's participation in patchouli marketing channels.

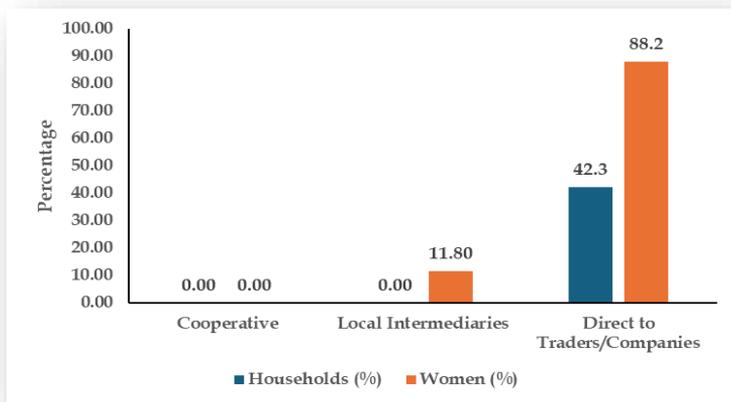


Figure 1. Household and women's participation in patchouli marketing channels

Data showed that patchouli farmers' access to the market shows contrasting dynamics between household-level and women's participation. At the household level, the majority (88.2%) sell directly to traders or companies, while 11.8% depend on local intermediaries, and no households (0%) reported selling through cooperatives. These findings indicated that physical access to the market was

relatively open, highlighting the absence of institutional mechanisms, such as cooperatives.

Meanwhile, from a gender perspective, the situation differs. About 42.3% of farmer households are directly involved in selling patchouli products, while the majority (57.7%) remain excluded from direct sales. This indicates that women are less involved in the physical market compared to overall household participation.

Although these findings clearly show that women and households are more involved in patchouli marketing, numerical patterns alone cannot fully explain the more fundamental dynamics of the process. These findings must be viewed in the broader context of gender-based power relations and institutional constraints that shape farmers' bargaining position in the value chain in order to better understand them.

These results indicate a persistent structural imbalance in market participation. Overall, households have relatively high physical access to shops and businesses, but women are still less directly involved. This is evidence of gender-based limitations in decision-making and bargaining power. It shows that, although some women work in physical markets, they are still very limited in making strategic decisions and obtaining market price information. Physical markets are also not entirely uniform. However, women's involvement does not automatically guarantee that they can determine selling prices or fully understand market dynamics, as most respondents are within a reasonable distance from the market (average distance to point of sale = 2.7 on a scale of 1-3).

Therefore, although farmers' overall market access appears to be quite active, the distribution of roles and access among households is still very uneven, especially based on gender. This inequality shows that access to markets depends on both positions of power in social and economic relations, according to the theory of smallholder power relations and market access. Female patchouli farmers are still considered peripheral actors who have little control over trade relations, selling prices, or distribution networks, even though they are part of the production system. This is due to gender norms that continue to view women as subordinate in the household economy, as well as women's lack of access to price information, buyer networks, and market institutions.

The data shows that 88.2% of patchouli farmers in the study area sell directly to companies or city traders; only 11.8% of farmers sell to local intermediaries, and no farmers sell through cooperatives. These findings indicate that most farmers have direct relationships with city-level buyers or companies, even though local intermediaries are involved. However, selling directly to city traders does not always mean that farmers have a stronger bargaining position. Although they are not traditional intermediaries, relying on one or two large buyers still creates an unbalanced market relationship. This is especially true in cases where price information is unclear or there are no formal contracts. Cooperatives as an alternative distribution method also demonstrate the weaknesses of collective institutions, which can help farmers gain market access and negotiate prices.

Socioeconomic Resilience: Strategies for Surviving Uncertainty

The socioeconomic resilience of patchouli farming households reflects how well they are able to maintain their livelihoods amid pressures such as falling prices, crop failures, and lack of market access (Carr, 2020; Li et al., 2024).

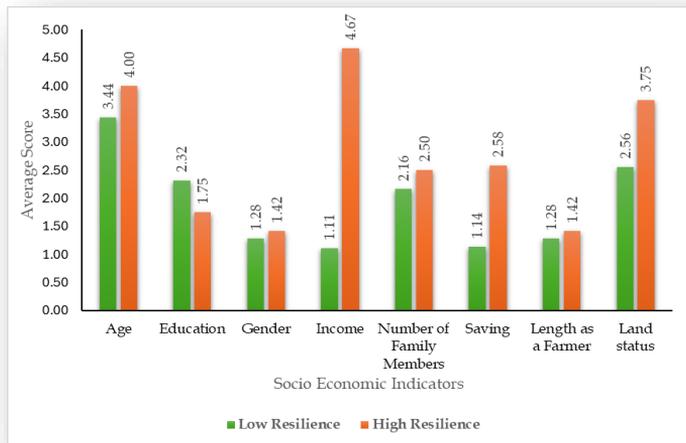


Figure 2: Comparison of Socioeconomic Indicators Between Low and High-Resilience Households

Constructed from household-level indicators such as income stability, savings, land ownership, and access to productive assets, the resilience index shows various categories of socioeconomic resilience. Most clove farmer households (75.9%) fall into the medium resilience category; only 4.2% fall into the high resilience category, and 19.9% fall into the vulnerable category. This distribution shows that very few households can withstand extreme pressures without disrupting their livelihoods. Additional analysis differentiates resilience scores based on various important aspects. Figure 2 shows the relationship between household income, savings, asset ownership, women's involvement in finance, and resilience levels. These differences indicate the uneven capacity of farmer households to withstand external shocks, providing a basis for more in-depth analysis of the socioeconomic factors that shape resilience.

Income Differentials

The results show that households with high resilience received an income score of 4.67, much higher than households with low resilience, which received a score of 1.11. This shows how important income stability is for maintaining household livelihoods. These results support the belief that having a stable and sufficient source of income is an important factor in creating household financial resilience (Ellis, 1999).

Asset and Land Ownership

Savings indicators and land ownership status show another significant difference. Households with high resilience scored 2.58 for savings and 3.75 for land

status, while households with low resilience scored only 1.14 and 2.56. This shows that households with savings, land ownership, and access to productive assets such as tools and transportation are better able to adapt to environmental changes, such as price fluctuations or crop failures. Households that have abundant resources and are unable to save demonstrate greater adaptive capacity. The results show that asset accumulation increases the ability to cope with change and enables a more flexible approach to livelihoods. A new study shows that control over assets is a material and symbolic aspect of power relations that influences household resilience trajectories (Li et al., 2024).

Role of Education

Households with higher levels of education do not always achieve better resilience outcomes, especially if they do not have access to financial resources, because their education scores are higher in groups with low resilience (2.32 compared to 1.75). The results show that economic security, rather than formal education, is the main factor shaping the socioeconomic resilience of clove farmer households. This is in line with the idea that transforming education into real economic resilience requires institutional and structural commitment (Dorward et al., 2009).

Figure 2 shows that income and asset ownership determine household resilience, but Table 4 shows how women's role in financial management contributes to adaptive strategies. This shows that resilience is not only determined by material resources; gender dynamics within households shape access to and control over resources.

However, the data does not show clear evidence of income diversification beyond patchouli. Households that depend on a single commodity without broader market access or institutional support remain structurally vulnerable, according to livelihood resilience theory. This suggests that resilience strategies must go beyond short-term coping and address systemic barriers.

Gender, Market, and Resilience Linkages

Households with better market access and greater female participation tend to have more stable economic resilience, according to the integrative analysis. These findings support the theory that gender inequality and limited market access are not only issues of equality but also issues of long-term resilience for farming communities.

The results of the correlation analysis show a significant positive relationship between the resilience index of patchouli farmer households and various economic and social factors. Access to production tools or transportation is positively correlated with the resilience index ($r = 0.48$), indicating that motorcycle transportation is a very important productive asset variable for improving household economic resilience. This shows how important it is to have assets as capital that can be adapted to crises and market uncertainty.

In addition, there is a strong correlation between access to savings and resilience ($r = 0.46$). Households can manage their own risks with savings, which protect them from economic pressures. Resilience is also strengthened by land ownership status ($r = 0.37$), indicating that control over land resources remains an important part of household economic stability.

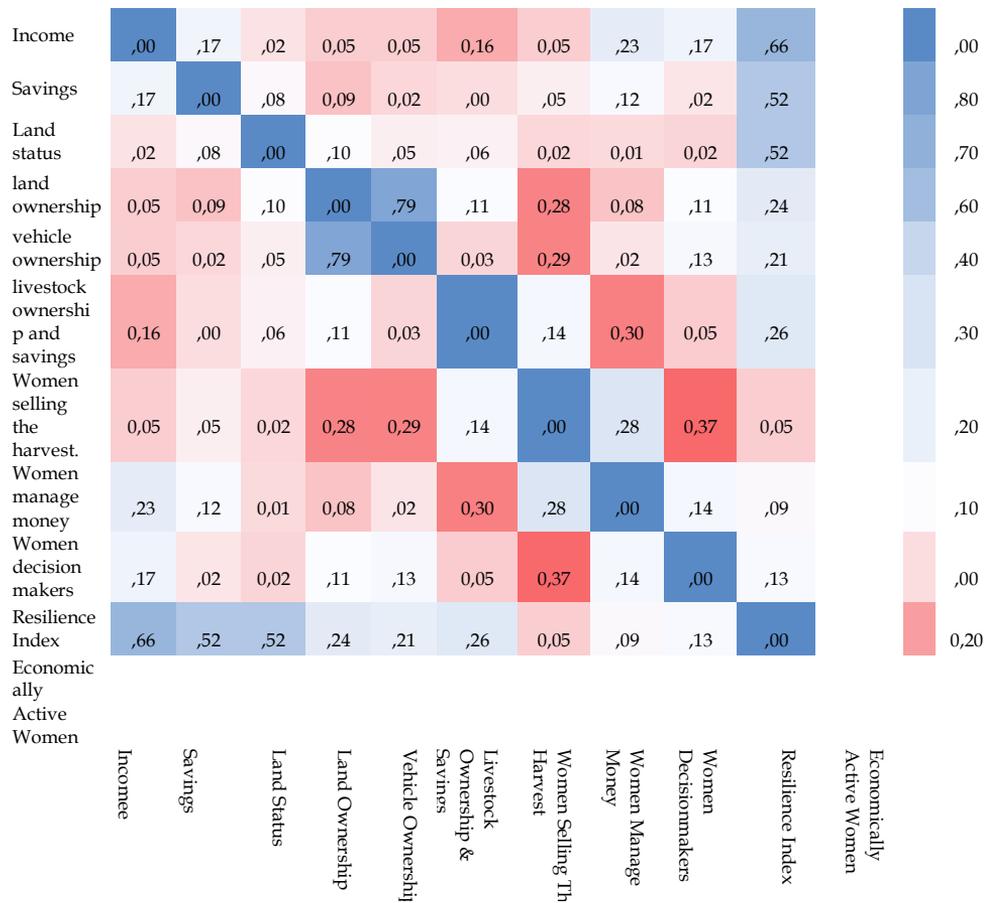


Figure 3. Correlation between variables

Although at a moderate level, women's involvement in economic activities ($r = 0.29$) and financial management ($r = 0.27$) showed a positive correlation with resilience. The results show that households with more space for women to play productive and financial roles tend to have higher adaptive capacity. However, there is still structural inequality in strategic decision-making, which can limit women's contribution to ideal resilience. In this case, the low correlation value indicates that women's participation in patchouli farming is not significantly related to market access, price negotiation, or household economic outcomes. This method reveals different gender dynamics in different places and reflects the paternalistic cultural context in the study area. In Majene and Mamasa in West Sulawesi, women are more involved in cultivation and household finances, but less so in decision-making and marketing. Women's involvement in sales is higher in Buton, South Konawe, Southeast Sulawesi, indicating greater market exposure. Although women constitute a large part of the production workforce, they have no control over decision-making, land control, or market involvement. As a result, there is no strong statistical correlation between gender participation and other structural variables. These differences indicate that gender roles and local production systems play a role in

shaping resilience. The results are consistent with Gender-Based Value Chain Analysis, which emphasizes that in highly patriarchal environments, women's contributions are concentrated in low-value segments of the chain, while men still dominate strategic nodes such as marketing, pricing, and processing.

Local organizations such as farmer groups and informal networks are responsible for buyer access, information, and bargaining power. Households rely more on intermediaries in areas where farmer groups are strong (e.g., South Konawe) and coordinate sales; in areas where farmer groups are weak (e.g., Buton, Mamas), they rely more on price information. Informal kinship networks provide temporary support, but cannot replace formal mechanisms. Therefore, the main avenue for improving market inclusion and gender-equitable resilience is the strengthening of cooperatives and associations.

However, it is important to remember that these findings are correlational and not causal. Even if correlations indicate an association, they cannot determine causality. While increased income can improve resilience by enabling savings and asset accumulation, resilience itself, through social capital, land tenure security, or household adaptation, can also lead to more stable income growth. On the other hand, structural factors such as male-dominated inheritance patterns or cooperative membership can drive both. These causal pathways require further study using regression models, structural equation modeling, or longitudinal designs (Barrett & Carter, 2013; Ellis, 2000).

Although the correlation levels varied, the correlation results showed that household income and women's financial participation were positively associated with resilience. This trend suggests that gender roles and decision-making processes also influence resilience, in addition to economic variables. This allows for a more comprehensive examination of how market access and gender relations interact to influence families' adaptive capacity.

CONCLUSION

Across the value chain, this study shows uneven gender participation in small-scale patchouli farming households in Sulawesi. Women are still less involved in strategic decision-making, processing, and market negotiations, even though they remain active in cultivation and household financial management. Because women's roles are often limited to the domestic and operational levels rather than the strategic domain, these differences reveal structural inequalities that shape household resilience. Furthermore, these findings suggest that economic security is closely linked to household resilience; this is particularly true for stable income, savings, and asset ownership. These results suggest that gender-sensitive institutional mechanisms are crucial for the transition from individual adaptation to systemic resilience in smallholder agricultural systems. Consequently, policy measures should not only promote gender-inclusive cooperative governance models but also ensure that people are connected to each other within institutions to enhance collective resilience.

AUTHOR CONTRIBUTION STATEMENT

[Author 1]: Research methods, revisions, research design, location and sample, data collection, variables and indicators, and data analysis. The goal is to eliminate redundancy and make operationalization clearer.

DECLARATION OF COMPETING INTEREST

The authors declare no conflict of interest.

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ETHIC STATEMENT

Ethical review and approval were waived for this study as it did not involve any intervention and posed minimal risk to participants. Nevertheless, informed consent was obtained from all respondents before participation, and all data were anonymized and kept confidential.

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