Vol. 14(1): 226-248, May 2026 DOI: https://doi.org/10.23960/jsl.v14i2.1411

Jurnal Sylva Lestari

P-ISSN: 2339-0913
E-ISSN: 2549-5747

Journal homepage: https://sylvalestari.fp.unila.ac.id

Full Length Research Article

Disempowered on Household Plots: A Study on Gendered Division of Labor in Small-Scale Agroforestry Practices in Lamala Sub-District, Banggai Regency, Indonesia

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ARTICLE HISTORY:

Received: 14 December 2025
Peer review completed: 6 March 2026
Received in revised form: 20 March 2026
Accepted: 7 April 2026

KEYWORDS:

Agroforestry
Community empowerment
Gender equality
Harvard Analytical Framework
Subsistent farmer

ABSTRACT

Understanding gender aspects in the management of small-scale agroforestry is important to creating an inclusive and sustainable model in subsistence agriculture. This research aimed to analyze the actualization of the gender dimension in productive, reproductive, and social-political activities in small-scale agroforestry management among subsistence farmer groups in Lamala Sub-District, Banggai Regency, Indonesia. The study employed a mixed-methods case study approach using the Harvard Analytical Framework (HAF) to analyze the gender-based division of labor, integrating observations, interviews with 5 key informants, and a questionnaire administered to 50 respondents. The data collected were then analyzed thematically and descriptively. The results showed a gender imbalance in the management of small-scale agroforestry. HAF mapping indicated that women were involved in only 52.63% of the identified productive activities, whereas men were involved in all productive activities. In contrast, women carried out all identified reproductive activities, while men were involved in only 33.33% of them and only occasionally. In socio-political activities, women were involved in 66.67% of the identified activities, again only occasionally, whereas men were involved in all activities and dominated 66.67% of them. These findings suggest that small-scale agroforestry is not gender-neutral, as its productive, reproductive, and socio-political activities are structured through unequal gender relations. This research recommends education for small-scale farmers on gender and productivity, helping the community understand gender equality in efforts to improve access, productivity, and outcomes through equitable, egalitarian role distribution.

1. Introduction

Over the last 10 years, agroforestry has become an important paradigm for land management and the utilization of natural resources. Its existence aims to maintain the sustainability of the food chain and local economic resilience at the micro level (Kheiri et al. 2023; Mukhlis et al. 2022; Telwala 2023). Certainly, this trend is encouraged by the essence of the agroforestry concept,

which seeks to combine agricultural and forestry elements into a single management system. This system integrates the cultivation of plants (seasonal) and tree vegetation (annual) on the same land (Budiastuti et al. 2021; Udawatta et al. 2019). Ecologically, this concept is trusted by many experts to be capable of creating ecosystem diversity, not only providing environmental benefits (Ariyanti 2016; Mganga et al. 2015), but also playing a role in optimal carbon absorption (Ahmad et al. 2022), and providing a positive economic impact for local farmers sustainably (Thiesmeier and Zada et al. 2022; Zander 2023).

The reliability of agroforestry as a land management system that supports the economic sustainability of local farmers is certainly influenced by its management capacity, namely the farmer group itself (de Lauwere et al. 2022; Riskayanti 2023). A farmer group with a work culture and positive intrinsic values will enhance its capacity for land management and other land-related work (Ramadhan et al. 2018). A well-established work culture within a farmer group will certainly improve the group's endurance in establishing a productive agricultural business system (Ramadhan et al. 2018; Suwandewi and Heryanda 2022).

One characteristic of a work culture aligned with the spirit of productivity is support for gender equality, namely a distribution of male and female roles that is proportional and equal in carrying out group work activities (Julien et al. 2023). Gender itself is a cultural construct that reflects the roles, functions, and social responsibilities between men and women in accordance with the principles of equality (Adhikari and Sigdel 2024; Bonvillain 2020). Gender mainstreaming in the cultural environment of farmers' group work has become an important issue in the agriculture sector, including in agroforestry, which is allegedly plagued by gender disparities (Catacutan and Naz 2015; Duffy et al. 2021; Riskayanti 2023; Ty et al. 2023). However, gender disparities in agricultural activities are not always directly observable at the normative level. This phenomenon is often only detectable through investigations within empirical contexts that are sometimes much more specific, especially at the local level with the smallest community units. At this level, the phenomenon of gender disparity is clearly observable, allowing analysis of the ongoing distribution of roles between genders, comparisons of access to resources by gender, how gender dynamics influence household business management, and the position of genders in daily decision-making.

In such a framework, indications of gender inequality in the agricultural sector can begin to be analyzed from the structure of agricultural household businesses at the local level, as seen in Lamala District, Banggai Regency, Central Sulawesi, which in this context is used as a sample locus assumed to represent the gender perspective in small-scale agricultural sector cases. Data from the Banggai Regency BPS in 2023 shows that this sub-district has 1,227 agricultural household enterprises, consisting of 1,077 male-headed households and 150 female-headed households (BPS Kab. Banggai 2023). On a broader scale, the 2023 Agricultural Census also noted that women account for only about 14.4% of all individual agricultural business managers in Indonesia and around 9.7% in Central Sulawesi (BPS 2023). Indeed, these figures do not directly explain the division of labor, access, control, or decision-making within agroforestry households. However, the data still provide initial indications that the gender dimension is not merely a peripheral issue but has become a significant structural issue highly relevant for further examination at the micro level (BPS Kab. Banggai 2023).

In practice, agroforestry management at all levels and places (including practices in the Lamala sub-district) frequently involves power dynamics and complex gender roles. Some research reveals significant differences in participation between male and female farmers in the

management of agricultural businesses. Female farmers often experience gender discrimination, making it difficult for them to access technology and control resources (Fauziyah 2018; Kinasih and Wulandari 2021; Makate and Mutenje 2021; Nchanji et al. 2021; Yuliani 2016). This discrimination is often rooted in strong patriarchal cultures (Apriliandra and Krisnani 2021; Wignall et al. 2023). The contributions of female farmers are not adequately recognized within existing management schemes (Bina Desa 2017). This leads to role disparities that significantly differentiate between female and male farmers within their small communities, ultimately marginalizing, minimally recognizing, and underappreciating the roles of female farmers (Julien et al. 2023). In the end, the concept of gender equality is forgotten because, even in the context of small-scale agriculture, it tends to prioritize masculine values, giving male farmers a greater share of access and resources. Whereas the concept of gender role equality has become a key success factor in efforts to achieve social endurance and productivity at the village level, especially in farmers' households. Without gender role equality, achieving the desired level of productivity will be difficult (Julien et al. 2023).

The concept of gender equality in agroforestry management is a fundamental component that is often overlooked in both scientific discourse and practical implementation. In the context of agroforestry management, gender role disparities contribute to limited access, suboptimal use, and reduced control over natural resources, ultimately undermining participation in decision-making, especially among female farmers. Some previous research has sought to map, elaborate on, and distribute gender roles in agroforestry management, but has left several shortcomings in its understanding. The lack of general understanding stems from the way gender factors influence the governance and management of agroforestry, particularly at smaller scales such as the farmer group level, which serves as the basic foundation and smallest unit of larger agricultural businesses. The limitations of official data also reinforce this need, as available statistics generally categorize agricultural business managers by region, age, and gender but do not capture how productive, reproductive, and decision-making work, as well as access and control, are divided within farming households (BPS 2023). Therefore, comprehensive research that emphasizes the gender element in small-scale agroforestry management, especially in agroforestry technical aspects, farmer households as the smallest unit of the community, and social-political activities related to agroforestry within the scope of farmer groups, is a very urgent need.

Previous research tends to focus more on gender aspects in the value chain, commercialization, markets, landscape/community-scale restoration, and technology adoption. Meanwhile, on a smaller scale, especially at the household level, small-vulnerable groups, and smallholder-subsistence, the gender dimension still does not receive many meaningful reviews (Crossland et al. 2021; Hastings et al. 2023; Haverhals et al. 2016; Kiptot and Franzel 2012; Kroma et al. 2016; Ota et al. 2024). Therefore, the study of gender aspects in small-scale agroforestry is deemed necessary to obtain a comprehensive picture of how gender dynamics operate and influence agricultural activities at a more specific level.

Conceptually, the term small-scale agroforestry operationalized in this study is defined as an agroforestry system at the household level, where management is carried out on limited plots or land, relies on the labor of farmer families, and is undertaken to support the subsistence or semi-subsistence needs of farmer families. Thus, the term "small scale" in this study is not based solely on a universal land-area threshold, but rather on the characteristics of the management unit: household-based management, limited resources, and a strong connection between farming activities and domestic life. In this sense, small-scale agroforestry is not only understood as a

system of cultivating trees and plants on limited land, but also as a family work arena where economic, reproductive, social, and cultural functions intertwine.

Based on the explanation above, this paper aims to present the actualization of the gender dimension in productive activity (agroforestry), reproductive activity (household), and social-political activity (social activity within the farmer scope) in the management of small-scale agroforestry among subsistent farmer groups. Additionally, it seeks to demonstrate how gender-based inequality in role distribution can significantly increase farmers' vulnerability within small agroforestry groups.

2. Materials and Methods

2.1. Research Design

The method used in this research was a mixed-methods case study (Cook and Kamalodeen 2019; Creswell and Creswell 2017; Guetterman and Fetters 2018), employing the Harvard Analytical Framework to analyze the gender-based division of labor by integrating observations, interviews, and questionnaires. This method was selected because it enabled an in-depth investigation of a bounded social unit, such as a farmer group or farming household, within its real-life context (Farquhar 2012; Feagin et al. 2016; Yin 2018). Besides, this method is also part of a cross-sectional case study, which requires the researcher to observe the object for a certain period of time until constructing an understanding as objective as possible of a social reality or phenomenon (Bungin 2012; Creswell 2017).

2.2. Research Location

This research was conducted in Lamala Sub-District (*K. Village*), Banggai Regency, Central Sulawesi Province, Indonesia (**Fig. 1**) from April to May 2023.

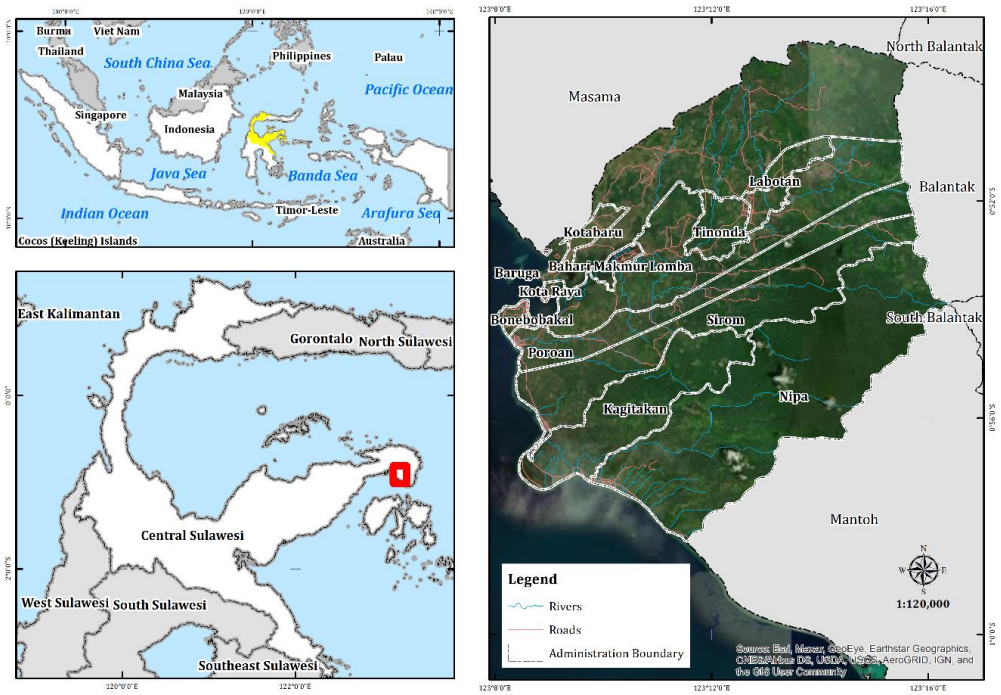

Fig. 1. Research location of Lamala Sub-District, Banggai Regency, Central Sulawesi Province, Indonesia.

This location was selected based on three technical considerations, namely (1) Some farmer groups afforded agroforestry agricultural system which tended to be subsistent-oriented, making them relevant to the research purpose, namely to see how far the dynamics of the gender issue took place in the management of small-scale agriculture; (2) The location's accessibility which enables the researcher to gather primary data easily; (3) The availability of respondents and informants who were trusted to provide adequate information related to the dynamics of the gender aspect in agroforestry management.

2.3. Data Collection

Data were collected through in-depth interviews, distribution of questionnaires, document analysis, and field observations (Sugiyono 2021). The data sources for this research include five key informants and 50 respondents, all purposively selected. The five key informants were selected based on their knowledge, direct involvement, and ability to explain local agroforestry practices and household gender relations in greater depth. Meanwhile, the questionnaire was distributed to 50 eligible individuals to obtain a descriptive picture of gender role distribution in the limited case (not to produce estimates that can be statistically generalized). In general, the adequacy of participants in this study is determined by the relevance and richness of the information they can provide in the case, rather than by a universal, fixed sample-size rule.

2.4. Data Analysis

The analysis tool for the gender aspect was the Harvard Analytical Framework (HAF), which aimed to map and/or record the roles of female and male farmers across the productive, reproductive, and social-political domains (March et al. 1999). HAF was chosen because it aligns with the objectives of this research: to identify the division of labor by gender, access and control over resources, and map decision-making patterns at the household and community levels. HAF is a micro-level gender analysis framework designed to map who does what and who has access and control over resources and benefits (March et al. 1999; Mishra 2022; Warren 2007), making it suitable for analyzing productive, reproductive, and socio-political activities in small-scale agroforestry management. Technically, data analysis (**Fig. 2**) is conducted through 3 strategic steps, namely: (a) All data (from observations, questionnaires, and interviews) are thematically analyzed and used to map the activity profiles of men and women in the productive, reproductive, and socio-political spheres; (b) The data is then analyzed to identify each gender's access and control over resources, benefits, and decision-making spaces; (c) The mapping results are then interpreted by considering the factors influencing gender relations, so that patterns of inequality, domination, or role division occurring in small-scale agroforestry management can be explained. To strengthen the findings, data validation was conducted through data source triangulation, namely by comparing data from interviews, observations, and questionnaire administration (Sugiyono 2021). Next, the findings are discussed descriptively-narratively based on their thematic groups.

3. Results and Discussion

Drawing on the survey and in-depth interviews with respondents and key informants, we assembled detailed evidence on gender in the management of small-scale (subsistence)

agroforestry. A subsequent thematic analysis identified three sub-themes: (i) The dynamics of women's and men's roles in agroforestry practice; (ii) Access to knowledge and managerial decision-making; and (iii) The distribution of roles across productive, reproductive, and sociopolitical activities. These sub-themes structure the discussion that follows.

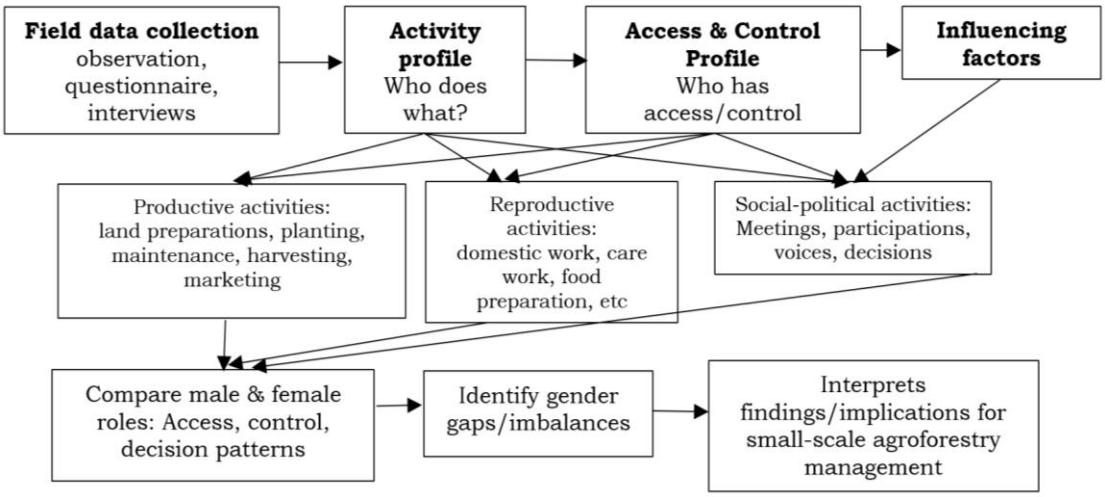

Fig. 2. Analytical flow of the Harvard Analytical Framework (HAF) used in this study.

3.1. Dynamics of Women's and Men's Roles in Small-Scale Agroforestry

In small-scale agroforestry, the roles of female and male farmers are complex and dynamic. The findings showed that the male role tended to be more dominant than the female's in several important aspects. The productive side of agroforestry often involves dominant physical tasks performed by males, such as planting, maintaining, and harvesting. On the other hand, females tended to be involved in reproductive tasks such as childcare and household chores. In the social-political sphere, women often have limited access to power and decision-making, while men are more dominant. The general description of the division of this role between men and women in the analysis unit at the research location is presented in **Tables 1–3**.

Table 1. The productive activity profile (agroforestry)

No.	Production activities	Gender of farmers	
		Women	**Men**
	Cultivation		
	Cultivation of Hardy/Annual Plants		
1	Cultivation of red jabon (*Neolamarckia macrophylla*)	-	Men
2	Cultivation of cashew (*Anacardium occidentale*)	-	Men
3	Cultivation of candlenut (*Aleurites moluccanus*)	-	Men
4	Cultivation of super teak (*Tectona grandis*)	-	Men
5	Cultivation of coconut (*Cocos nucifera*)	-	Men
	Cultivation of Seasonal Plants (Palawija)		
6	Cultivation of peanuts (*Arachis hypogaea*)	Sometimes Women	Mostly Men
7	Cultivation of chilies (*Capsicum annuum*)	Mostly Women	Sometimes Men
8	Cultivation of vegetables: eggplant (*Solanum melongena*), pumpkin (*Cucurbita moschata*), beans (*Phaseolus vulgaris*), kangkong	Mostly Women	Sometimes Men

No.	Production activities	Gender of farmers	
		Women	Men
	(*Ipomoea aquatica*), mustard greens (*Brassica juncea*) and tomatoes (*Solanum lycopersicum*)		
9	Cultivation of corns (*Zea mays*)	Sometimes Women	Mostly Men
10	Cultivation of mung beans (*Vigna radiata*)	Sometimes Women	Mostly Men
11	Cultivation of red ginger (*Zingiber rubrum*)	Sometimes Women	Mostly Men
12	Cultivation of bananas (*Musa* spp.)	-	Men
13	Cultivation of sweet potatoes (*Ipomoea batatas*)	Sometimes Women	Men
	Non-Cultivation		
14	Land clearing before planting	Sometimes Women	Mostly Men
15	Harvesting and drying candlenuts	Sometimes Women	Mostly Men
16	Construction of farmer huts	-	Men
17	Harvesting of hardy/annual plants	-	Men
18	Harvesting of seasonal plants	Mostly Women	Sometimes Men
19	Maintaining cattle	-	Men
	Overall involvement	10/19 Activities (52.63%)	19/19 Activities (100.00.00%)
	Pattern of involvement	Mostly Women = 15.79%; Sometimes Women = 36.84%; No Involvement = 47.37%	Men = 52.63%; Mostly Men = 31.58%; Sometimes Men = 15.79%

Note: Percentages refer to identified productive activity types (n = 19), not respondents.

Table 2. The reproductive activity profile (household and income)

No.	Reproduction activities	Gender of farmers	
		Women	Men
1	Saving and managing money (from both farming and non-farming activities)	Women	-
2	Taking care of the kids while working in the garden	Mostly Women	Sometimes Men
3	Selling farm produce (through a stall/small shop)	Women	-
	Overall involvement	3/3 Activities (100.00.00%)	1/3 Activities (33.33%)
	Pattern of involvement	Women = 66.67%; Mostly Women = 33.33%; No Involvement = 0.00%	Sometimes Men = 33.33%; No Involvement = 66.67%

Note: Percentages refer to identified reproductive activity types (n = 3), not respondents.

The findings from **Tables 1, 2,** and **3** reveal the gender-based job division in the agroforestry system of small farmers. The productive activity profile (**Table 1**) showed that of the 19 identified productive activities, women were involved in 10 (52.63%), including 7 activities in which they were involved only occasionally (36.84%) and 3 in which they played a more dominant role (15.79%). By contrast, men were involved in all 19 productive activities (100.00%), including 10 activities with full involvement (52.63%), 6 with predominant involvement (31.58%), and 3 with occasional involvement (15.79%). Also, from **Table 1**, it can be seen that males dominated the activity related to annual plant cultivation, such as red jabon (*Neolamarckia macrophylla*), cashew (*Anacardium occidentale*), candlenut (*Aleurites moluccanus*), and super teak (*Tectona grandis*). They were also more involved in land clearing, building the work hut, and livestock maintenance. Meanwhile, females had more activities in the cultivation aspect of seasonal plants such as peanuts (*Arachis hypogaea*), chilies (*Capsicum annuum*), eggplant (*Solanum melongena*), pumpkin

(*Cucurbita moschata*), beans (*Phaseolus vulgaris*), kangkong (*Ipomoea aquatica*), mustard greens (*Brassica juncea*), tomatoes (*Solanum lycopersicum*), and corn (*Zea mays*). They were also involved in harvesting annual and seasonal plants. These results are consistent with studies indicating that males tend to focus more on commercial hardy-tree plant cultivation and forest management (Triwanto et al. 2021), while females play a key role in seasonal food plant cultivation (Nischalke et al. 2017).

Table 3. The social-politics activity profile (involvement in community organization and activities)

No.	Socio-politics activities	Gender of farmers	
		Women	Men
1	Village meeting or gathering	-	Men
2	Small-scale farmers' group meetings	Sometimes Women	Mostly Men
3	Participation in the local government's socialization	Sometimes Women	Mostly Men
	Overall involvement	2/3 activities (66.67%)	3/3 activities (100.00.00%)
	Pattern of involvement	Sometimes Women = 66.67%	Men = 33.33%; Mostly Men = 66.67%

Note: Percentages refer to identified activity types (n = 3), not respondents.

The profile of reproductive activity (**Table 2**) highlights the female role in managing household finances, child care, and the sale of harvest results. The table shows that of the three reproductive activities identified, women were involved in all (100.00%), comprising two activities classified as women (66.67%) and one activity classified as mostly women (33.33%). In contrast, men were involved in only one activity (33.33%) at the occasional level, while they were not involved in the remaining two activities (66.67%). This also showed women's important contributions to the reproduction activities of the social household, including finance, child rearing, and marketing agricultural products. A similar practice is also found in Lampung Province, Indonesia, where women are more involved in post-harvest activities and sell the harvest, while men tend to handle heavier tasks such as land preparation, planting, and transportation (Pasaribu et al. 2019).

In many cases, even though they play an important role in income management and household affairs, females still face barriers such as long working hours and difficulty accessing land ownership (Gonçalves et al. 2021). Research on guest-house agroforestry (homestead agroforestry) in Bangladesh yielded mixed results, indicating that women play an important role in overseeing various aspects of agroforestry. They contributed their energy, expertise, and decision-making ability to ensure food availability and equitable governance of household finances, despite limitations imposed by community norms, such as husband domination and control over limited resources (Islam 2015).

The profile of social-political activity (**Table 3**) showed that, of the three socio-political activities identified, women were involved in two (66.67%), both at the occasional level. In contrast, men were involved in all three activities (100.00%), with one activity showing full involvement (33.33%) and two showing predominant involvement (66.67%). This also showed greater male participation in the village forum and farmer group meetings, as well as the involvement of external institutions. This reflects how the norms of traditional gender which support patriarchy is still strong in the life of farmer community in the village where the male tends

to obtain the leadership role in the community and connected to the external stakeholder, meanwhile female is always positioned as the group with limited roles (Dietrich et al. 2021; Nguyen et al. 2021; Paudel et al. 2019). In the agricultural community with a strong patriarchal culture, the marginalized role of female farmers is caused more by the uneven distribution pattern of resources among genders, where access to the land, capital, and technology is more frequently given to male farmers. This is also influenced by social norms that limit women's movement space in agricultural activities and by the lack of opportunities to obtain education or training in the agricultural field. Besides, the presence of a strong power structure held by men in the household and community contexts also influences the marginalized role of female farmers in agriculture (Huot et al. 2023).

Addressing this unequal gender-based division of roles requires interventions that both strengthen women's participation in community forums and expand men's involvement in domestic responsibilities. In the context of small-scale agroforestry management, such inequalities can be mitigated through interventions that provide women with access to skills training and agroforestry-related business knowledge, enabling them to develop competencies comparable to those of male farmers and to participate more actively in income-generating activities (Ogema et al. 2021). These efforts are not merely technical but transformative, as they contribute to reshaping community-level perceptions of gender roles, recognizing women's contributions beyond the domestic sphere, and challenging persistent gender stereotypes that constrain their participation. Ultimately, promoting gender equality must begin at the household level, where everyday divisions of labor are produced and reproduced, positioning the farming household as a critical site for advancing more equitable and inclusive rural livelihoods (Karlsson 2019; Mulyoutami et al. 2016).

3.2. Access to Knowledge and Managerial Decision-Making

Fig. 3 shows a chart of the various sources of knowledge used by farmers to learn agroforestry techniques, broken down by gender. From this chart, it is evident that male farmers tend to rely on personal experience as a knowledge source, while most female farmers rely on fellow farmers in the group. The main sources of knowledge used by male farmers are ancestral customs and socialization from related departments; some of them also rely on fellow farmers in the group and other sources. Meanwhile, other sources mostly used by the female farmers were personal experience, socialization by the relevant department, and ancestral customs. Neither male nor female farmers used the internet, mass media, or TV as sources of knowledge about agroforestry. This phenomenon shows what is called "knowledge lock" or "information isolation," in which innovation and best practices related to agroforestry are unlikely to spread widely due to limited information networks and communication between farmers and external sources of knowledge.

Fig. 3 also showed that male and female farmers use different sources of knowledge to manage agroforestry land. It is seen that female farmers rely more on information from fellow farmers in their group, while male farmers rely more on their personal experience and ancestral customs. According to Kiptot et al. (2012), female farmers tend to obtain more technical information about agroforestry from fellow farmers in their group because they often have limited access to resources and formal training in the field (Nishikant et al. 2025). Limited access to formal education and training frequently impedes female farmers' ability to obtain the technical

information required for effective agroforestry management (Jost et al. 2016; Martini et al. 2016; Njelekela and Sanga 2015). Therefore, they tend to rely on local resources, such as knowledge and experience from fellow farmers in their group. On the other hand, male farmers are likely to rely more on their personal experience in managing agroforestry because they have better access to formal education or technical training and greater support from institutions or related agricultural institutions (Jost et al. 2016; Martini et al. 2016; Paudel et al. 2019). This personal experience is likely to serve as a primary reference for them, given the social norms that reinforce the male role in agriculture and agribusiness.

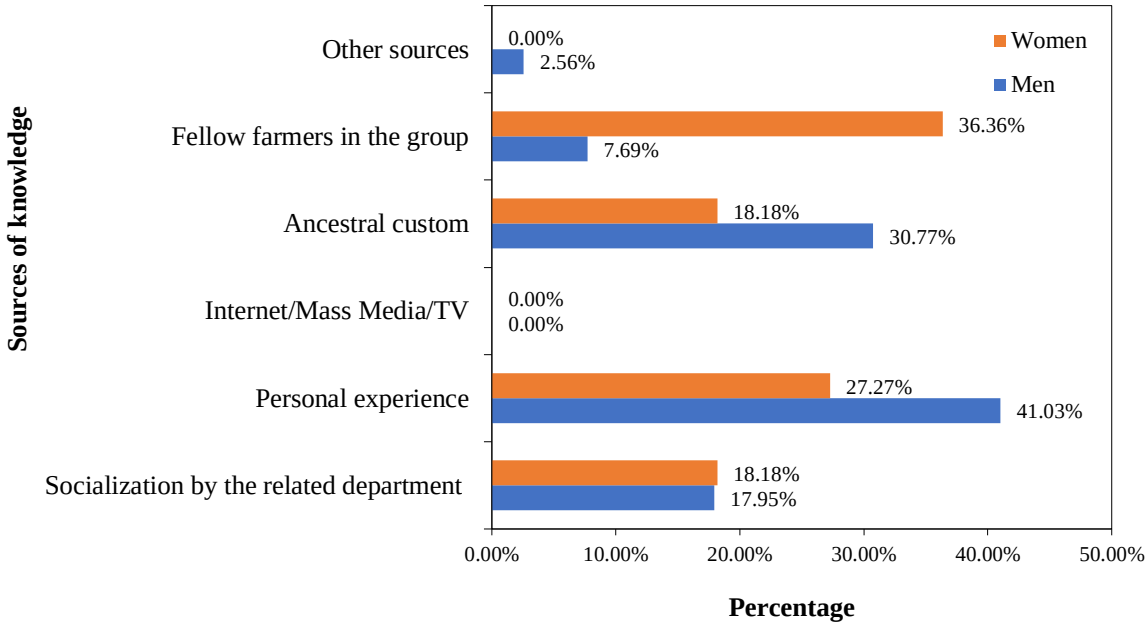

Fig. 3. The source of agroforestry technical knowledge based on gender.

Apart from the source of knowledge, the frequency of farmers' attendance at socialization activities organized by the local government also shows differences between male and female farmers (**Fig. 4**). **Fig. 4** above shows the frequency of farmers' attendance at government-organized socialization activities over the last 6 months. Most of the farmers, male or female, said they had not attended any training in the last 6 months. Meanwhile, only a small part of male farmers attended the training once a month for over 6 months. Other male farmers, namely 15.38%, followed the training more than once in 6 months, while 5.13% followed it only once in 6 months. On the other hand, only 9.09% of female farmers followed the training more than once in 6 months, and 9.09% followed it only once in 6 months. Some references indicate that many factors can influence farmers' participation in government activities. Socio-economic conditions and characteristics significantly impact how people respond to certain programs (Azmee et al. 2022). In agriculture, especially, age, experience, and perceptions of agriculture become important factors influencing farmers' involvement in certain programs or activities (Sunday and Edet 2016). Mainly for women, traditional factors, social culture, and community perceptions related to women can inhibit their participation in socialization activities (Zakaria 2015). Additionally, the research conducted by Charatsari et al. (2017) found that motivation, whether internal or external, can influence farmers' decisions to participate in certain training.

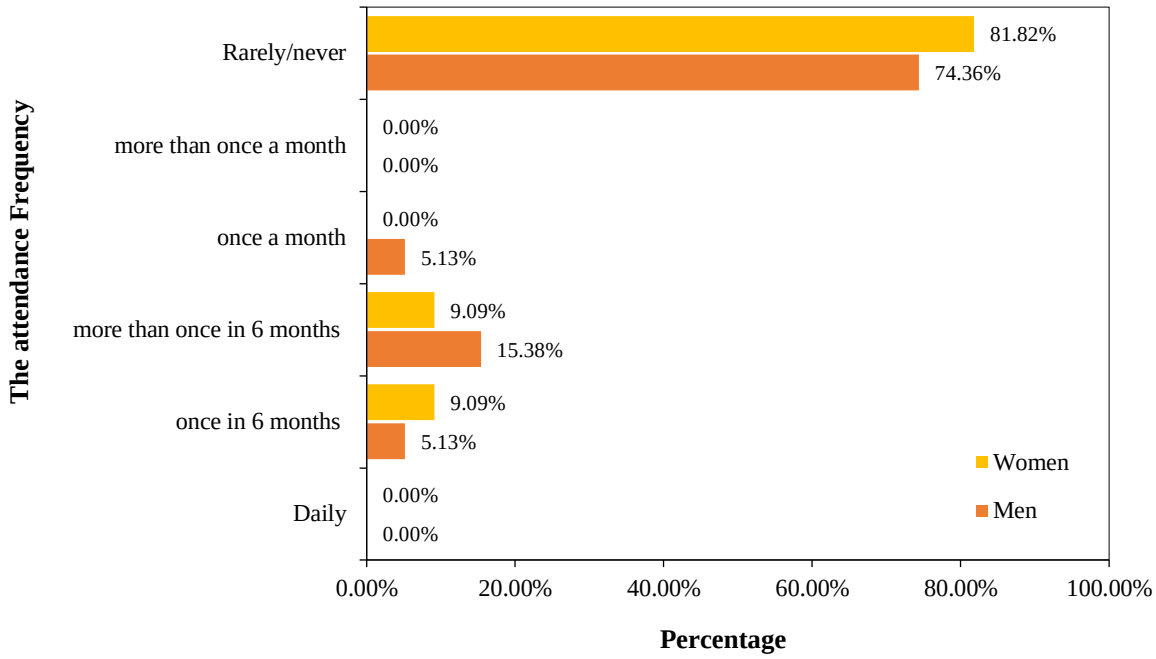

Fig. 4. The attendance frequency of farmers in socialization activities done by the government in the last 6 months.

3.3. The Distribution of Roles Across Productive, Reproductive, and Sociopolitical Activities

3.3.1. The distribution of gender roles in productive activity

The dynamics of the distribution or division of productive work in the agroforestry system at the research site also appear to be influenced by gender construction. As shown in **Table 4**, gender roles in agroforestry's productive activities are highly varied and gender-segregated. However, in general, males assume more dominant roles (Pasaribu et al. 2019). Access for women to land management is still not specifically considered (Fauziyah 2018). This occurs because job stages and land management (agroforestry) are still considered predominantly male roles that usually require significant energy (Hafizianor et al. 2015). For instance, in perennial cultivation (such as red jabon, cashew, candlenut, super teak, and coconut processing), the male role is prominent throughout the upstream and downstream processes. It starts with land preparation, including clearing the land of grass or other unwanted plants, either chemically or mechanically, then continues with soil loosening using a hoe, making planting holes and installing water systems; men typically perform all of these tasks. After completing these preparation stages, the planting stage begins. The female role during planting is more about providing feedback on selecting the right plants based on existing local knowledge, although the final decision is typically made jointly (Triwanto et al. 2021). Additionally, females play a direct role in planting, including placing seeds into planting holes and covering them, as well as participating in fertilizing activities. Sometimes they also help with land clearing (**Fig. 5**). During planting activities, males often transport seeds and fertilizer from temporary storage sites to the perennial cultivation site.

The next step is maintenance. It is a process that requires more labor, especially maintenance tasks such as weed removal, pruning, or mechanical pest control. However, in this stage, women can actually take part, especially in light-level maintenance tasks such as applying fertilizer as explained above or engaging in "*dangir*" activities (removing small weeds around perennials), or in this case, cleaning small pests manually (for example, grasshoppers or caterpillars on teak),

especially when the plants are still young. As with preparation, planting, and maintenance, harvesting perennials is predominantly carried out by men. The active involvement of women occurs after the harvest (Pasaribu 2019), primarily in light tasks such as assisting with peeling harvested seeds, sorting, drying, cooking, and providing recommendations on the utilization of the harvest results, including setting targets for processed products and their markets.

Table 4. The elaboration of the role of gender in productive activity (agroforestry)

The type of activity	The role of women	The role of men
Cultivation of hardy/annual plants	The role of female farmers is almost insignificant, except for assisting with minor tasks; typically, only 3-5 women are involved in field work.	Male farmers generally take on tasks they consider more prioritized and that require more physical labor, which they believe men can do better than women; in fact, almost all agroforestry activities, from land preparation to planting to harvesting, are dominated by them.
Cultivation of seasonal plant	Female farmers cultivate various seasonal crops supported by extension assistance programs (e.g., corn, red ginger, mung beans), as well as other plants used as cooking ingredients, on their own initiative.	Male farmers play roles in directing planting lines, technical planting procedures, constructing protective fences, adjusting planting distances, weeding, and plant care.
Non-cultivation	• Cooking meals for a group, constructing or tidying up farmer huts. • Assisting in picking, peeling, and drying candlenuts, as well as packaging them in plastic wraps;	• Gathering raw materials for the farmer's hut; • Constructing the farmer's hut; • Searching for livestock feed and feeding the cows; • Harvesting, peeling, and drying candlenuts with the assistance of several female farmers.

Notes: based on the thematic analysis, consistent with observation and interview with 5 informants (validated by triangulation).

Fig. 5. The portrait of some female farmers who joined the productive activity in the form of maintenance and land cleaning.

Unlike the perennial cultivation business, the female role in seasonal plant cultivation is more significant. Seasonal plant cultivation, such as peanuts (*Arachis hypogaea*), chili (*Capsicum*

annuum), eggplant (*Solanum melongena*), pumpkin (*Cucurbita moschata*), beans (*Phaseolus vulgaris*), kangkoong (*Ipomoea aquatica*), mustard (*Brassica juncea*), tomatoes (*Solanum lycopersicum*), white and yellow corn (*Zea mays*), mung beans (*Vigna radiata*), red ginger (*Zingiber rubrum*), banana (*Musa* spp.), and sweet potato (*Ipomoea batatas*), either through socialization programs or personal initiatives, is primarily undertaken by women. In practice, in seasonal plant cultivation, the main function is reversed, with women playing a more central role in planting activities, particularly for chili and vegetables that require less physical strength but demand female tenacity for planting, maintenance, harvesting, and marketing. In cultivating these seasonal plants, tasks such as setting plant distances, weeding, and plant maintenance are typically handled by women. However, for other seasonal plants that require more physical strength, women's roles are usually limited to assisting men.

The non-cultivation activities that require extra energy, such as building the hut, finding livestock feed, and harvesting perennials, are mainly carried out by men. Women only assist in preparing food for the group that builds the hut, or help with other small activities that require less power. The differences in capabilities between males and females create opportunities for cooperation and complementarity in their respective roles (Kinasih and Wulandari 2021). Both males and females have their own duties in agroforestry businesses, whether in cultivation activities (perennials or seasonal plants) or non-cultivation activities. The development of a gender-cooperation system fosters positive relationships (Megantara and Prasodjo 2021) that support agroforestry sustainability, thereby contributing to the Sustainable Development Goals (SDGs) (Togubu et al. 2022).

3.3.2. The distribution of gender roles in reproductive activity

Beyond the productive sphere, the gender-based division of labor also applies to the reproductive sphere, including household chores and the management of household income. Both of these aspects also influence the work patterns of small-scale agroforestry farmers. Based on the household income management illustrated in **Table 5** and **Fig. 6**, the role of female farmers is as wives who also participate in household activities and care for the family, and who finance the family's needs with the husband's income, whose profession is also farming. If it felt that it was not enough, most of these female farmers chose to work outside agriculture. In this context, women face 3 roles and responsibilities at once: as wives (who also manage household activities), farmers, and seekers of additional income outside the agricultural business (agroforestry). Meanwhile, the male farmers' role, besides being husbands and household leaders, is as the main breadwinner, deriving income from agricultural production and other sources such as coconut picking, carpentry, construction labor, and fishing. In these conditions, husbands are always positioned as the highest decision-makers who must be listened to singularly and become the determinants of household direction. From here, it can be seen that the farmers' households are still strongly influenced by patriarchal culture, even though women as wives play a strategic role in income management and other household chores. This phenomenon can be viewed through a lens of masculinity. In a patriarchal culture that prioritizes masculinity, higher income is considered a symbol of manliness and power (Cheng and Sheng 2023). Therefore, male farmers may feel encouraged to assert their dominance in the household to strengthen their masculine identity.

Table 5. The role description by gender in reproductive activity (household and income)

The type of activity	The role of women	The role of men
Money management	All the income earned from both farming and non-farming jobs goes to the wife to save and manage for household expenses; in fact, to meet those needs, some wives (female farmers) also pitch in with non-farming work.	The husbands (farmers) are responsible for earning a living; some rely solely on farming, while others earn income from other sources, such as coconut picking, carpentry, construction, and fishing.
Domestic work of the household	Cleaning the house, cooking, and caring for the children are the responsibilities of the farmers' wives. Most of the farmers' children have already grown up, so it is not a problem for them to go down to the fields.	• Male farmers typically entrust household matters to their wives. Some male farmers also participate in household chores when they are not working in the fields or engaging in other activities. • Male farmers also share roles with their wives in terms of nurturing and educating children, although wives predominantly carry this out.
Selling agroforestry products	Female farmers usually sell vegetables harvested from their gardens by laying out their produce on wooden stalls built in front of the yard fence. Some of these are also used for consumption.	• Male farmers (husbands) also participate in harvesting agroforestry products to be cooked at home or sold upon their wives' request. • Male farmers look for and prepare wood/boards to build wooden stalls in front of their house as a sales medium for their wives.

Notes: Based on the thematic analysis in accordance with observation and interview with 5 key informants (validated by triangulation).

(a) (b)

Fig. 6. Household income management and productive responsibility. (a) The shop for trading vegetables by female farmers, (b) Female farmers take part in peeling candlenut (*Aleurites moluccanus*).

In detail, in the household work section, we found that the wife is responsible for domestic tasks, including housekeeping, cooking, and parenting. This fact actually reinforces the inferior position of women in a household, as mentioned above. Nevertheless, the husband generally still

helps the wife with household chores when not farming or otherwise engaged. Here, it is evident that the patriarchal ego does not always manifest in rigid and strict forms in farmers' households. There are times and spaces where husbands do not always assert their dominance because they have affection for their wives as partners in managing the household. The collaboration between husbands and wives is also well-established beyond domestic affairs. This can be observed in the cooperation between husbands and wives in selling the agroforestry products. Typically, the farmer's wife harvests vegetables from the agricultural land and sells them in front of their house. On the other hand, husbands also frequently assist their wives in harvesting produce for sale (and some of it is processed for their own consumption), all at the wife's request. They also gather and prepare wood to build a temporary stall in front of their house, where their wives can sell the harvested products.

3.3.3. The distribution of gender roles in social-political activity

Gender role disparities in the socio-political sphere appear very wide, with male farmers dominating almost all activities. Details of this inequality are shown in **Table 6.**

Table 6. The role description among genders in social-political activity (the involvement in village community organization or other collective community activity)

The type of activity	The role of women	The role of men
Village Meeting or Gathering	Almost no women participate in village meetings or gatherings.	Male farmers dominate village meetings or deliberations; Men generally lead the deliberations, and most of the dynamics of opinions and arguments are produced by men.
Small-Scale Farmers' Group Meetings	Sometimes there is only one or two female farmers who accompany their husbands in small gatherings.	Male farmers dominate small gatherings of farmer groups, and scheduling meetings is arranged and agreed upon collectively, including with female farmers.
Participation In Local Government's Socialization	The level of female participation is relatively low, with most women primarily obtaining information from their husbands, who engage in socialization.	Male farmers dominate in the socialization activities conducted by the local government.

Notes: Based on the thematic analysis in accordance with the observation and interview with 5 key informants (validated by triangulation).

In **Table 6** and **Fig. 7**, it is evident that across all types of social activities, including meetings, discussions, small-group meetings, and socialization, male farmers significantly dominated. Female farmers had limited participation in social and institutional activities. The village's patrilineal social structure can explain this phenomenon. It is understood that within the village community's social structure, gender plays a distinct role in land management, encompassing agriculture and forestry (Akbar et al. 2023; Surjadi and Kartitiani 2020). The differing roles result in distinct needs between males and females. In practice, land management is predominantly handled by males due to social perceptions and cultural norms (Surjadi and Kartitiani 2020; Megantara and Prasodjo 2021; Haverhals et al. 2016). Males, with their masculine roles, are responsible for tasks such as land preparation, hunting, trap installation, fishing, and seeking income outside the village. Females, with their feminine roles, are responsible for agricultural activities, including field crops, tubers, sago, corn, and vegetables (Surjadi and Kartitiani 2020). In a case study conducted in Malinau, Central Kalimantan, both genders

collaborate in ensuring food security within the family unit. Males contribute to food provision by hunting wild game and earning income from logging and timber sales, while females generate income from non-timber forest products such as rattan crafts. Both genders play distinct roles and employ different methods in utilizing natural resources to meet their livelihood needs (Akbar et al. 2023; Surjadi and Kartitiani 2020).

Fig. 7. The portrait of some female farmers in a social activity.

Gender role diversification also influences participation in social-political activities, such as village community organizations and other collective activities. Males tend to hold positions in the village organizations (Haug 2017; Surjadi and Kartitiani 2020). In Malinau, traditional roles such as the Village Chief, Head of Village Security and Traditional Figure positions are held by men. Even during village meetings, discussions, arguments, and debates, men dominate. Similarly, in farmers' small-group meetings and in participation by external parties, such as socialization from related departments and organizations outside the village, although aimed at females, the meetings are frequently held and directed toward male leaders (Akbar et al. 2023; Surjadi and Kartitiani 2020). The normalization of this interaction often leaves women without opinions or arguments, making it difficult for them to disclose their needs (Haug 2017; Surjadi and Kartitiani 2020).

The dominance of masculine figures in male heredity influences the existence of weakness in women's involvement in the process and public decision-making. They frequently become victims of the negative impacts of gender-biased decision-making in agroforestry management (Akbar et al. 2023; Haug 2017; Surjadi and Kartitiani 2020). Traditional perceptions also often view women as having less knowledge and capability in masculine areas such as forest management (Haug 2017). Women commonly perceive themselves as inferior to men in knowledge and skills, leading them to act passively within community organizations (Haug 2017; Laplonge 2016). Additionally, the lack of knowledge contributes to the root problem of women's low willingness to express their voices (Haug 2017).

4. Conclusions

This study concludes that gender relations in small-scale, subsistence-oriented agroforestry systems remain characterized by persistent inequalities. These are reflected in the unequal distribution of roles and responsibilities between female and male farmers across productive, reproductive, and socio-political activities. Although women are involved in various agroforestry

activities, they have not achieved proportional control over management processes. In particular, women are often excluded from socio-political and decision-making spaces. At the same time, male dominance persists across most aspects of agroforestry management, including access to information and control over resources. These inequalities are evident in multiple dimensions. In productive activities, women's involvement remains limited, especially in the cultivation practices of seasonal crops, which men predominantly control. In reproductive activities, women continue to be positioned within domestic responsibilities that constrain their broader participation. Meanwhile, socio-political activities are largely structured around male-dominated participation, reinforcing gendered power imbalances within farmer groups. As a result, gender relations in small-scale agroforestry management continue to reflect structural disparities rather than equitable distribution of roles. Cumulatively, these conditions constrain the socio-economic resilience of farming households, as the unequal distribution of roles, access, and control limits the optimal utilization of available human resources. This indicates that gender inequality in agroforestry is not only a matter of task division but also relates to deeper issues of access, participation, and control within the community-based land management. Therefore, this study highlights the need for more targeted and context-sensitive efforts to address gender inequality in agroforestry systems. Future research should further examine the relationships among gender equality, access to land resources, and livelihood sustainability, with a focus on identifying practical strategies to enhance women's participation, strengthen equitable access, and support more inclusive and sustainable agroforestry management practices.

Acknowledgments

The authors would like to express their sincere gratitude to the Research Center for Society and Culture, OR-IPSH BRIN, for the institutional support provided for this research under Decree No. B-2557/III.7.1/HK.01.00/5/2023. We also extend our appreciation to Mahmuddin, an extension staff member at the Forestry Service of Banggai Regency, Central Sulawesi, for his assistance in field data collection and other technical support.

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Conflict of Interest

The authors declare no conflict of interest.

Declaration of Generative AI And AI-Assisted Technologies in the Manuscript Preparation

During the preparation of this manuscript, the authors used ChatGPT Pro to align language, enhance clarity, and reduce typographical errors. After using this tool, the authors reviewed and edited the content as needed and assumed full responsibility for this publication.

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