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Women's Contribution to Cassava Cultivation and Household Fund Allocation in Rural Lampung

Sri Indaryati[1*], Dewi Utari[2], Novia Ambar Sari[3]
Universitas Nahdlatul Ulama Lampung, Lampung, Indonesia[1,2,3]
sriindar2774@gmail.com[1*]

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Abstract

Purpose: This study examines the contribution of women to cassava (*Manihot esculenta*) cultivation in Teluk Dalem Ilir Village, Rumbia Subdistrict, Central Lampung Regency, Indonesia, and analyzes how the economic value of their labor is allocated within the household economy.

Methodology: A qualitative descriptive design was applied using snowball sampling to recruit 83 women who assist their husbands in cassava farming. Data were collected through observation, semi-structured interviews, and documentation, and were analyzed following the interactive model of data reduction, data display, and conclusion drawing and verification.

Results: Women contributed labor across land preparation, seedling planting, and maintenance activities, averaging 40.41 hours per production season and generating an estimated contribution value of IDR 406,566 per harvest. The largest share, IDR 138,089 (34%), was allocated to agricultural inputs, followed by educational needs and staple food purchases. Women's involvement accelerated cultivation tasks but reduced the time available for domestic responsibilities such as sweeping, laundry, and childcare.

Conclusions: Women's labor is economically material yet remains informally recognized within household and community accounting systems.

Limitations: The single-village, cross-sectional, self-reported design constrains generalizability and causal inference.

Contributions: The study contributes empirical time-use and monetary-valuation evidence on women's often-invisible agricultural labor in a smallholder cassava system, offering a basis for gender-responsive extension and rural policy design.

Keywords: *Cassava Cultivation, Fund Allocation, Gender Division of Labor, Rural Women, Time Use*

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1. Introduction

Agriculture remains the principal source of livelihood for a large share of Indonesia's rural population, and it continues to absorb a substantial portion of the national workforce, including a significant number of women (Doss, Kieran, & Quisumbing, 2025). Rural women constitute roughly three-quarters of Indonesia's female population living outside urban centers, and more than half of them derive their household income directly from farming activities, cassava being one of the commodities most closely tied to their daily labor (Qanti, Peralta, & Zeng, 2022). Cassava, or Manihot esculenta, ranks among Indonesia's principal food staples after rice and maize, and its adaptability to varied soils

and climates has made it a strategic commodity for smallholder households across Sumatra, including Lampung Province (Hafif, Pujiharti, Yani, Sjafrina, Asnawi, Wibowo, Frediansyah, Nurida, & Dariah, 2023).

Lampung Province, and Central Lampung Regency in particular, is one of Indonesia's largest cassava-producing regions, supplying raw material for the tapioca-starch industry as well as household consumption (Hafif et al., 2023). Government area-level statistics show that cassava production in Central Lampung consistently exceeds one million tonnes annually, underscoring the commodity's centrality to the local agrarian economy. Within this landscape, Teluk Dalem Ilir Village in Rumbia Subdistrict has developed into a cassava-growing community in which the number of households engaged in cassava farming has risen steadily over recent years, alongside a parallel and often under-documented rise in women's direct participation in field activities (Doss et al., 2025).

The gendered division of agricultural labor is well established in the literature: men are typically assigned tasks requiring physical strength and endurance, such as land clearing and weeding, while women are assigned tasks that demand precision, care, and sustained attention, such as fertilizer application, seed handling, and light maintenance work (Doss et al., 2025; Mahajan, 2023). This pattern is not unique to Lampung. Comparable divisions have been documented among cassava farmers in Nigeria, where women dominate planting, weeding, and harvesting activities even as men retain control over land preparation (Pierotti, Friedson-Ridenour, & Olayiwola, 2022), and among smallholder households more broadly across Sub-Saharan Africa and South Asia, where mechanization has been shown to reallocate, rather than eliminate, women's farm tasks (Mahajan, 2023).

What distinguishes women's agricultural labor from that of men is not merely its content but its invisibility in formal economic accounting. Because much of women's contribution is classified, both by households and by official statistics, as an extension of domestic duty rather than as productive labor, its monetary value is rarely computed, reported, or recognized in local agricultural planning (Blakeley, 2023; Fabry, Schuster, & Maertens, 2024; Farnworth, Jafry, Bharati, Badstue, & Yadav, 2021). Time-use evidence from multiple developing-country contexts indicates that women's unpaid care and domestic responsibilities already consume between four and seven hours per day, and that additional agricultural tasks are absorbed into, rather than added onto, an already saturated daily schedule, producing a measurable time-poverty effect concentrated among women (Blakeley, 2023; Eissler, Heckert, Myers, Seymour, Sinharoy, & Yount, 2022).

This dynamic is particularly salient for cassava systems, in which the crop cycle from land preparation to harvest spans several months and requires repeated, time-staggered interventions base fertilization, planting, fertilization at the fruiting stage, pruning, and fertilization for tuber enlargement each of which draws women away from domestic tasks for extended periods (Kehinde, 2023). Pierotti et al. (2022) demonstrate that such time constraints do not simply reduce women's leisure; they actively shape what and how much women are able to farm, reinforcing a feedback loop in which time poverty constrains agricultural productivity, which in turn constrains household income and women's bargaining power within the family (Lecoutere & Van, 2023).

Despite the breadth of international literature on gendered agricultural labor, empirical studies that simultaneously quantify the time women devote to specific cassava cultivation tasks and trace how the resulting economic value is allocated within the household budget remain scarce, especially at the village level in Indonesia. Existing Indonesian studies on women's agricultural roles have tended to focus on decision-making authority by Qanti et al. (2022), livestock and dairy systems by Mehraban, Debela, Kalsum, and Qaim (2022), or commercialization of food crops at a broader regional scale by Reaping (2025), leaving a gap in fine-grained, activity-level time-and-value accounting for cassava, a crop whose cultivation calendar and labor structure differ meaningfully from rice, livestock, or plantation commodities (Food & Agriculture, 2023).

This study addresses that gap. Its novelty lies in combining an activity-disaggregated time-use accounting of women's labor across the full cassava production cycle from land preparation through maintenance, with an explicit monetary valuation of that labor, and a household-level analysis of how the resulting funds are allocated among competing family needs, within a single smallholder cassava community in Central Lampung. Accordingly, the purpose of this study is twofold: first, to document the extent and structure of women's contribution to cassava cultivation in Teluk Dalem Ilir Village; and second, to examine the domestic and economic consequences of that contribution, including its effect on women's time for household responsibilities and the manner in which the monetary value of their labor is allocated within the family economy. In doing so, the study aims to provide an evidentiary basis for formal recognition of women's agricultural labor and for the design of gender-responsive extension and rural development policy.

2. Literature Review

2.1 Women's Role in Smallholder Agricultural Systems

The concept of women's contribution to agriculture has evolved considerably over the past two decades, moving from a narrow focus on labor supply toward a broader recognition of women as co-managers of household production systems (Anderson, Reynolds, Biscaye, Patwardhan, & Schmidt, 2021). Contemporary scholarship frames rural women's agricultural work not as auxiliary to men's farming but as a structurally embedded component of household production that shapes yield outcomes, food security, and the intergenerational transfer of farming knowledge (Doss, Kieran, & Quisumbing, 2025). At the same time, women's access to productive resources land, credit, extension services, and labor-saving technology continues to lag behind men's, which constrains the returns they can generate from the time they invest (Agarwal, Anthwal, & Mahesh, 2021; Gupta, 2024; Hetzer, 2022).

In cassava-growing regions specifically, the gendered allocation of tasks tends to follow a consistent pattern across very different national contexts. Women are disproportionately responsible for planting, fertilizer application, and post-planting maintenance, while land clearing and heavy tillage are performed by men or contracted out, often on a piece-rate basis (Pierotti, Friedson-Ridenour, & Olayiwola, 2022). This pattern reflects both physiological assumptions about labor capacity and social norms that assign tasks requiring endurance and repetitive precision to women (Mahajan, 2023). Importantly, several studies caution against interpreting this division as a fixed biological fact; rather, it is a socially negotiated arrangement that shifts with mechanization, market integration, and intra-household bargaining (Doss et al., 2025; Afridi, Mahajan, & Sangwan, 2022).

2.2 Time Use, Time Poverty, and the Double Burden

A substantial body of time-use research documents that rural women across low- and middle-income countries perform a disproportionate share of unpaid domestic and care work in addition to productive farm labor, a phenomenon commonly termed the double burden or dual role (Blakeley et al., 2023; Levine et al., 2001). Aggregated evidence compiled by the Food and Agriculture Organization indicates that, in predominantly rural settings, women spend substantially more hours on unpaid domestic and care activities than men, and that when paid and unpaid work are combined, women's total work burden routinely exceeds men's by one to two hours per day (Kaur & Sharma, 2022). This asymmetry generates a condition of time poverty in which women's ability to reallocate time toward income-generating opportunities, rest, or self-care is structurally constrained (Eissler, Heckert, Myers, Seymour, Sinharoy, & Yount, 2022).

The consequences of this constraint are not merely a matter of fatigue. Pierotti et al. (2022) show, using a mixed-methods framework in southwestern Nigeria, that time constraints causally shape the crops women choose to cultivate, the plot sizes they manage, and the intensity of labor they can apply, meaning that time poverty translates directly into constrained agricultural choice and, ultimately, constrained income. Similarly, evidence from Pakistan indicates that exogenous shocks such as floods can further redistribute the domestic-agricultural labor balance toward women, compounding pre-existing time burdens (Akter, 2021). These findings collectively support the proposition that any accounting of women's agricultural contribution that ignores its opportunity cost in terms of foregone

domestic time provides an incomplete picture of the true burden women carry (Mulyasari, Djarot, Sasongko, & Putra, 2023).

2.3 The Economic Invisibility of Women's Agricultural Labor

A recurring theme across the literature is the systematic undervaluation of women's agricultural labor in both household and national accounting. Because much of this labor occurs on family land, is unpaid in cash terms, and is interwoven with domestic duties, it is frequently excluded from formal labor statistics and rarely assigned a monetary value at the household level (Niehof, Gartaula, & Quetulio-Navarra, 2018). This invisibility has material consequences: agricultural extension programs, credit schemes, and rural development policies that rely on official labor statistics tend to under-target women, reinforcing existing resource gaps (Anderson et al., 2021; Ambler et al., 2022).

Attempts to make this labor visible have taken various methodological forms, including time-use surveys, shadow-wage valuation, and women's empowerment indices such as the Women's Empowerment in Agriculture Index and its cassava-specific adaptations (Eissler, Heckert, Myers, Seymour, Sinharoy, & Yount, 2022). These instruments consistently find that when women's unpaid agricultural labor is assigned a monetary value using local wage-equivalent rates, its contribution to household income is far from marginal – often comparable to, or exceeding, the value of some cash-crop sales (Vimefall & Levin, 2023). This reframing has important policy implications: it shifts the conversation from whether women contribute to agriculture, which is empirically settled, to how that contribution should be formally recognized, compensated, or factored into household financial decision-making.

2.4 Household Decision-Making and Fund Allocation

Beyond the question of how much women contribute, a parallel literature examines how the economic value generated by women's agricultural labor is allocated once it enters the household budget. Intrahousehold bargaining models suggest that resources controlled or generated by women are more likely to be allocated toward child education, nutrition, and other welfare-enhancing expenditures than resources controlled by men (Lecoutere & Van, 2023). In Indonesia specifically, social norms continue to position men as primary agricultural decision-makers even where women perform substantial field labor, which can create a disjuncture between who generates value and who controls its allocation (Qanti, Peralta, & Zeng, 2022; Sitorus, Latupeirissa, & Wattimena, 2022).

Nonetheless, evidence from Indonesian livestock and mixed-farming households indicates that women frequently retain informal control over the specific funds their own labor generates, using them to cover recurring household needs such as school expenses, staple food, and small agricultural inputs, even when broader farm-management decisions remain male-dominated (Mehraban, Debela, Kalsum, & Qaim, 2022). This pattern of earmarked, activity-linked financial control is consistent with findings from dairy-farming households in Indonesia, where women are frequently regarded as the practical financial managers responsible for meeting day-to-day family needs, even though men retain nominal authority over larger transactions (Niehof, 2023; Tindangen, Rori, & Pangemanan, 2020).

2.5 Contemporary Relevance and Research Gap

Taken together, the literature converges on three points directly relevant to the present study. First, women's contribution to smallholder crop production, including cassava, is substantial and activity-specific, concentrated in tasks requiring precision and sustained attention rather than raw physical strength (Pierotti, Friedson-Ridenour, & Olayiwola, 2022; Mahajan, 2023). Second, this contribution carries a real but frequently unmeasured opportunity cost in terms of foregone domestic and care time, contributing to a measurable time-poverty burden (Blakeley, 2023; Alkire, Meinzen-Dick, Peterman, Quisumbing, Seymour, & Vaz, 2013). Third, when the monetary value of this labor is made explicit, it tends to be allocated toward welfare-enhancing household needs, suggesting that formal recognition of women's contribution could have direct implications for family welfare and rural development outcomes (Lecoutere, & Van, 2023; Vimefall, & Levin, 2023).

What remains underexplored, particularly in the Indonesian cassava context, is a disaggregated, activity-by-activity time-and-value account that connects each stage of the cassava production cycle to

a specific magnitude of women's time contribution, a specific monetary value, and a specific domestic-task trade-off. The present study is designed to fill this gap by combining activity-level labor accounting with fund-allocation analysis within a single smallholder cassava community, thereby extending the literature reviewed above from a largely policy- and empowerment-index-oriented framing toward a grounded, task-specific empirical account (Duflo, 2012).

3. Research Methodology

This study employed a qualitative descriptive field-research design conducted in Teluk Dalem Ilir Village, Rumbia Subdistrict, Central Lampung Regency, Indonesia, between January and November 2024. The location was purposively selected because the village is one of the principal cassava-producing communities within Rumbia Subdistrict, with a documented increase in both cultivated area and the number of farming households over the 2020–2022 period. A qualitative descriptive approach was chosen because the research sought to document field conditions as they naturally occur, without hypothesis testing or experimental manipulation, consistent with the aim of producing a comprehensive, contextually grounded account of women's contribution to cassava cultivation (Pierotti, Friedson-Ridenour, & Olayiwola, 2022). Two categories of data were collected. Primary data were obtained directly from respondents through in-depth interviews and direct field observation of cultivation activities, while secondary data were drawn from farmer-group records, village monographs, and district agricultural statistics, providing contextual and corroborating information for the primary findings.

The study population consisted of all women who contribute labor to cassava cultivation in Teluk Dalem Ilir Village, totaling 83 individuals. Given the absence of a complete sampling frame for women's informal agricultural participation, a snowball sampling technique was applied, beginning with a small number of initially identified respondents and expanding progressively as each respondent referred additional eligible participants, a method well suited to populations whose informal economic activity is not captured in administrative records (Pierotti et al., 2022). Because the technique ultimately reached the entire identifiable population of contributing women, the sample comprised all 83 respondents. Data were collected through three complementary techniques: direct observation of field activities to verify reported labor patterns; semi-structured interviews using a structured questionnaire to capture quantitative time-use and expenditure data alongside qualitative narratives; and documentation, including photographic records, to substantiate data accuracy. The intensity of women's labor contribution relative to total available working time was computed using a labor-allocation ratio, expressed as the proportion of effective working hours to total available hours across the season, following standard time-allocation accounting used in smallholder labor studies. Data analysis followed the interactive qualitative analysis model comprising three concurrent streams: data reduction, in which raw field notes and interview transcripts were coded, summarized, and organized around cultivation-stage themes; data display, in which reduced data were organized into descriptive narratives and summary tables to reveal patterns across respondents; and conclusion drawing and verification, in which emerging patterns were cross-checked against observational and secondary data to ensure the credibility and dependability of the findings before being finalized as study conclusions.

4. Results and Discussions

4.1 Study Area and Respondent Profile

Teluk Dalem Ilir Village lies in Rumbia Subdistrict, Central Lampung Regency, Lampung Province, an area characterized by dry-land, plantation, and swamp terrain in which the majority of residents depend on agriculture for their livelihood. The village recorded a total population of 3,810 residents, comprising 1,865 men and 1,945 women. District-level agricultural statistics for 2023 confirm that cassava (*ubi kayu*) is the dominant food-crop commodity in Central Lampung Regency, with a recorded production volume far exceeding that of maize, soybean, sweet potato, and groundnut combined, underscoring the commodity's centrality to the local farming economy. Farm-level records from the Rumbia Agricultural Extension Center further show that, between 2020 and 2022, cassava harvested area in the village expanded from 17 to 25 hectares, production rose from 479 to 1,054 tonnes, and the number of registered cassava farmers increased from 379 to 428, of whom a

substantial share are women who assist their husbands rather than operate as independent registered farmers, a pattern consistent with women's typically informal and unrecorded participation documented elsewhere in the literature.

Respondents were classified across five characteristics: age, education, farming experience, landholding size, and number of dependents. The majority of respondents (38.5%) fell within the 32–40-year age bracket, indicating that most women contributing to cassava cultivation are within the physically productive working-age range. Regarding education, 36.2% of respondents had completed only primary school, reflecting a broader pattern of limited access to secondary and tertiary education among rural farming women. In terms of farming experience, 53.0% of respondents had cultivated cassava for between one and ten years, suggesting a relatively young cohort of active female contributors. All 83 respondents (100%) reported cultivating self-owned land, and the most common landholding category was very small plots of approximately 0.02 hectares (32.6% of respondents), followed by 0.25-hectare plots (30.1%). With respect to household dependents, 43.4% of respondents reported having one dependent.

Table 1. Production profile of selected food crops in Central Lampung Regency in 2023

Commodity	Production (tonnes)
Maize	602,708.83
Soybean	177.88
Cassava (*ubi kayu*)	3,180,332.45
Sweet potato	1,757.52
Groundnut	462.50

Table 1 show the cassava is the dominant commodity with a production of 3,180,332.45 tons, far exceeding the other crops. Maize follows as the second-largest production at 602,708.83 tons. The remaining commodities contribute relatively small outputs, including sweet potato (1,757.52 tons), groundnut (462.50 tons), and soybean (177.88 tons), indicating a highly uneven distribution of agricultural production.

4.2 Labor Contribution Across the Cassava Production Cycle

Women's labor contribution was traced across four sequential stages of cassava cultivation: land preparation, seedling planting, maintenance, and harvest. During land preparation, tillage was performed mechanically using a cultivator and therefore involved no direct labor-hour contribution from either men or women; payment for this task was determined by land area rather than labor time. Within the base-fertilization component of land preparation, men contributed an average of 5.53 hours per activity compared with 3.89 hours for women, with women accounting for 3.04% of the combined labor-hour total. Weeding during land preparation was performed entirely by men (100%), averaging 7.12 hours per activity, owing to its physical intensity and its strict weather-dependence, since the task cannot proceed once rain has fallen.

Table 2. Average labor-hour contribution by cultivation stage and gender in Teluk Dalem Ilir Village 2024

Cultivation Stage	Men (hours/activity)	Women (hours/activity)	Women Share (%)
Land preparation – base fertilization	5.53	3.89	3.04
Land preparation – weeding	7.12	0.00	0.00
Seedling planting	5.50	4.31	2.28
Maintenance – fruiting fertilization	6.21	4.00	3.45
Maintenance – weeding	7.44	0.00	0.00
Maintenance – pruning	5.49	1.84	9.96

Cultivation Stage	Men (hours/activity)	Women (hours/activity)	Women Share (%)
Maintenance – tuber-enlargement fertilization	5.27	1.96	8.19
Maintenance – pre-harvest weeding	7.57	0.00	0.00
Harvest (contracted piece-work)	0.00	0.00	0.00

Table 2 show the men contributed an average of 5.5 hours per activity and women contributed 4.31 hours, with women's share of total planting labor equal to 2.28%, a lower proportion than in fertilization tasks, reflecting the greater physical demands of pre-planting seedling preparation, which is predominantly handled by men. The maintenance stage, comprising fruiting-stage fertilization, weeding, pruning, and tuber-enlargement fertilization, represented women's most substantial contribution: women accounted for 21.6% of total maintenance labor hours, driven primarily by their role in pruning (9.96% of pruning labor hours) and tuber-enlargement fertilization (8.19%). Weeding within the maintenance stage remained entirely male-performed (100%) in both the fruiting and pre-harvest periods, consistent with the pattern observed during land preparation. At the harvest stage, neither men's nor women's direct labor hours were recorded, because harvesting in the study village is conducted under a contracted piece-work (borongan) arrangement in which an external contractor assumes responsibility for labor, transportation, and consumption costs in exchange for a fixed payment, effectively removing direct household labor input from this final stage.

4.3 Discussion

The results confirm that women's role in cassava cultivation in Teluk Dalem Ilir Village is concentrated in precision-based, sustained-attention tasks fertilizer application, pruning, and planting support rather than in physically demanding tasks such as tillage and weeding, a division of labor that closely mirrors patterns documented among cassava farmers in southwestern Nigeria, where women dominate planting and post-planting maintenance while men retain responsibility for land clearing (Pierotti, Friedson-Ridenour, & Olayiwola, 2022). This convergence across geographically and culturally distinct smallholder systems supports the broader proposition in the literature that gendered task allocation in cassava production reflects a socially reproduced, cross-context pattern rather than a locally idiosyncratic arrangement (Mahajan, 2023; Doss, Kieran, & Quisumbing, 2025).

The finding that weeding remained entirely male-performed across all cultivation stages, while fertilization and pruning showed measurable female participation, is consistent with the physiological-and-scheduling explanation offered in the source data: weeding is weather-constrained and must be completed rapidly once conditions allow, favoring the assignment of the task to whichever household member can supply the greatest short-burst physical capacity, typically the husband. This pattern echoes evidence from mechanization studies showing that task reallocation between genders responds less to fixed capability differences than to the specific physical and temporal demands of each activity (Mahajan, 2023; Afridi, Mahajan, & Sangwan, 2022).

The observed trade-off between agricultural labor and domestic responsibilities provides direct village-level corroboration of the double-burden phenomenon documented in the broader time-use literature. Aggregated FAO evidence indicates that rural women's combined paid-and-unpaid work burden routinely exceeds men's, producing a structural time-poverty condition ((Blakeley, 2023)). The Teluk Dalem Ilir data operationalize this general finding at the level of specific, named domestic tasks: sweeping, laundry, and childcare were not abandoned outright but were compressed, postponed, or reduced in frequency during periods of peak agricultural demand, particularly pruning and late-season fertilization. This activity-specific displacement pattern is consistent with Pierotti et al. (2022) argument that time constraints do not simply reduce women's leisure but actively reshape the achievable scope of both their agricultural and domestic work, producing a continuous renegotiation of time rather than a one-off trade-off.

The relatively small monetary magnitude of women's aggregate contribution, IDR 406,566 per harvest, should not be interpreted as evidence of marginal economic importance. Consistent with the literature on the economic invisibility of women's agricultural labor, the value becomes significant when considered against its allocation: fully 34% was directed toward agricultural inputs that directly sustain the household's principal income-generating activity, while the remainder covered education and staple food, both core determinants of household welfare (Cogent, & Agriculture, 2024; Lecoutere, & Van, 2023). This allocation pattern is consistent with intrahousehold bargaining research showing that resources generated or controlled by women are disproportionately channeled toward welfare-enhancing expenditure categories such as children's education and food security, relative to resources controlled by men (Lecoutere and Van, 2023; Vimefall, & Levin, 2023).

A comparative reading against Sitorus, Latupeirissa, & Wattimena, 2022 study of women vegetable traders in Ambon, in which women's trading income constituted 76.60% of household income, situates the Teluk Dalem Ilir findings within a spectrum of women's economic contribution models: whereas market-based trading generates a clearly monetized and dominant income share, cassava-support labor generates a smaller, in-kind-adjacent value that is nonetheless directly reinvested into the productive base of the household. Both cases, however, converge on a shared structural finding also echoed in Tindangen, Rori, & Pangemanan, 2020 study of women rice-field laborers in Minahasa: women's economic participation in agriculture is frequently a direct response to insufficient household income from other sources, and it consistently requires a trade-off against domestic time, regardless of whether the resulting income is monetized through trade or embedded within an unpaid family-labor arrangement.

The concentration of respondents in the youngest productive-age bracket (32–40 years, 38.5%) combined with a relatively short median farming tenure (53.0% with one to ten years of experience) suggests that women's engagement in cassava cultivation in this village is not a residual activity of older, less mobile household members but an active, generationally renewing form of labor participation. This pattern aligns with findings that younger farmers, regardless of gender, tend to be more receptive to new techniques and extension messaging (Kehinde, 2023), suggesting that this cohort may be a particularly effective entry point for gender-responsive extension programming focused on labor-saving technology, financial literacy, and formal recognition of contribution.

Finally, the universally self-owned landholding status of respondents (100%) is a distinctive structural feature that differentiates Teluk Dalem Ilir from many of the tenancy-constrained smallholder systems described in the comparative literature such as, land-rental contexts examined in gendered labor-allocation studies of rural China. Full land ownership removes rent-extraction and tenure-insecurity as constraints on women's agricultural engagement, but the correspondingly small average plot size, with 32.6% of respondents farming just 0.02 hectares, indicates that fragmentation, rather than tenure insecurity, is the more binding structural constraint on the scale of production and, by extension, on the monetary ceiling of women's potential contribution.

4.4 Trade-offs with Domestic Responsibilities

Women's involvement in each cultivation stage coincided with the temporary displacement of specific domestic tasks. During base fertilization, 19.3% of respondents (16 women's) reduced their sweeping frequency from twice to once daily. During seedling planting, 28.9% of respondents (24 women's) forwent both laundry and sweeping on planting days. During fruiting-stage fertilization, 20.5% of respondents (17 women's) were unable to complete laundry tasks. During pruning, 25.3% of respondents (21 women's) reported forgoing time spent playing with or escorting children to school, the largest reported displacement of childcare-related activity across all stages. During tuber-enlargement fertilization, 22.9% of respondents (19 women's) again reported forgoing childcare-related activities. Across all stages, laundry and sweeping were the most frequently displaced domestic tasks, while direct childcare time was most affected during the pruning and late-fertilization stages, which coincide with periods of peak field-labor demand.

4.5 Economic Value and Household Fund Allocation

Table 3. Average household allocation of the economic value generated by women's cassava related labor in 2024

Allocation Category	Average Value (IDR)	Respondents (n)	Share (%)
Agricultural needs	138,089	30	34
Educational needs	135,055	29	33
Staple food (sembako)	133,422	24	33
Total	406,566	83	100

Table 3 show the monetary value of women's aggregate labor contribution across all cultivation stages was computed using local wage-equivalent rates. Combining base fertilization, planting, fruiting fertilization, pruning, and tuber-enlargement fertilization, women's total average labor time reached 40.41 hours per production season, corresponding to an estimated contribution value of IDR 406,566 per harvest. Seedling planting accounted for the largest single share of this value (21%, IDR 86,506), followed closely by pruning (21%, IDR 83,133) and fruiting fertilization (20%, IDR 80,602), with base fertilization and tuber-enlargement fertilization each contributing 19%.

When asked how the value generated by their labor was allocated within the household budget, respondents identified three principal categories: agricultural needs, educational needs, and staple food (*sembako*) purchases. Agricultural needs received the largest average allocation, IDR 138,089 (34% of total contribution value), reported by 30 respondents, and typically covered tillage-service payments, pesticides, and rice-husk fertilizer. Educational needs received an average allocation of IDR 135,055 (33%), reported by 29 respondents, while staple food purchases received an average allocation of IDR 133,422 (33%), reported by 24 respondents.

5. Conclusions

5.1 Conclusion

This study demonstrates that women in Teluk Dalem Ilir Village play a substantive and structurally embedded role in cassava cultivation, contributing an average of 40.41 labor hours per production season across land preparation, planting, and maintenance activities, with a corresponding estimated economic value of IDR 406,566 per harvest. Their contribution is concentrated in precision-based tasks fertilization, planting support, and pruning while physically demanding, weather-sensitive tasks such as weeding remain almost exclusively male-performed. The value generated by women's labor is allocated predominantly toward agricultural inputs (34%), followed by education and staple food needs, indicating that women's contribution functions simultaneously as productive reinvestment and welfare-oriented household support. This contribution, however, is achieved at the cost of measurable displacement of domestic responsibilities, including reduced frequency of sweeping and laundry and reduced time for childcare, particularly during the pruning and late-fertilization stages. Despite its material significance, women's labor in this context remains largely unrecognized in formal agricultural accounting, reinforcing the case for its explicit acknowledgment in local agricultural policy and household welfare planning.

5.2 Research Limitations

This study is subject to several limitations that should inform the interpretation of its findings. First, the research was confined to a single village, and while Teluk Dalem Ilir is representative of many smallholder cassava communities in Central Lampung, the findings cannot be generalized without caution to other cassava-growing regions with different tenure structures, market arrangements, or cultural norms. Second, the cross-sectional design captures a single production season and does not account for seasonal or year-to-year variation in labor allocation, weather-driven scheduling shocks, or price fluctuations that could alter both time-use patterns and fund-allocation decisions. Third, time-use and expenditure data were self-reported by respondents, which may introduce recall bias or social-desirability bias, particularly regarding sensitive topics such as intra-household financial control. Fourth, the snowball sampling technique, while appropriate for reaching an otherwise undocumented population, may have introduced network-based selection bias, potentially over-representing women

who are socially connected to earlier-identified respondents. Finally, the study did not formally triangulate reported time-use data against independent time-diary instruments, which would have strengthened the precision of the labor-hour estimates.

5.3 Directions and Future Study

Future research should extend this line of inquiry in several directions. Comparative multi-village or multi-district studies would help establish whether the labor and allocation patterns observed here generalize across Central Lampung's broader cassava belt or vary systematically with landholding size, market access, and mechanization levels. Longitudinal designs spanning multiple production seasons would enable researchers to capture seasonal variation in women's labor allocation and its interaction with climatic shocks, consistent with evidence that extreme weather events can further redistribute agricultural and domestic labor burdens toward women. Future studies could also incorporate quantitative time-diary methods or wearable time-tracking tools to reduce recall bias and improve the precision of labor-hour estimates. Given the evidence that resources controlled by women tend toward welfare-enhancing allocation, future research should examine whether formal recognition mechanisms, such as cooperative membership, wage documentation, or microfinance products tied explicitly to women's agricultural contribution, measurably improve household welfare outcomes or women's bargaining position. Finally, intervention-based studies evaluating labor-saving technologies targeted at the specific tasks identified here as high-displacement activities, particularly pruning and fertilization, could generate actionable evidence for extension services seeking to reduce the domestic-agricultural time trade-off documented in this study.

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Author Contributions

SI was responsible for conceptualization, development of the research methodology, and overall supervision of the study design. DU contributed to data collection, data analysis, and interpretation of the research findings. NAS contributed to writing the original draft of the manuscript, as well as revising and finalizing the manuscript for publication. All authors have read and agreed to the published version of the manuscript.

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