

Research Article

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Gender, empowerment, and rural sustainable development: A case study of crab business integration

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Abstract: The study explores the integration of gender roles within local economic organizations (LEOs) to support sustainable rural development, using Ampekale Village in Indonesia as a case study. While existing studies acknowledge women's significant contributions to post-harvest fisheries and rural entrepreneurship, there remains limited understanding of the shared roles of men and women in business settings. This study addresses this gap by examining gender-specific contributions and task allocation in business operations, focusing on the Ujung Parappa company, a leading LEO in crab capture and processing. Employing a case study methodology, which included purposive sampling, in-depth interviews with business participants and development facilitators, and descriptive analysis, the research provides critical insights. The findings reveal that women, more than men, possess a comprehensive understanding of LEO functions and actively engage in economic activities, particularly in processing and marketing. LEOs play a vital role in providing training and financial support, which boosts productivity and strengthens the resilience of their members. Furthermore, the study underscores how integrating crab fishing enterprises managed by men with crab processing enterprises operated by women fosters gender-inclusive business practices. This integration promotes community empowerment, generates employment,

and enhances income, thereby contributing to sustainable economic growth. These results underscore the importance of balanced gender involvement in advancing rural socioeconomic development and inform policies that aim to strengthen gender equality and sustainable practices. This research contributes to the broader discourse on strategies for rural development that leverage inclusive business practices to achieve resilient and thriving communities.

Keywords: empowerment, entrepreneurship, resilience, inclusivity, productivity

1 Introduction

Integrating gender dynamics into local economic organizations (LEOs) is essential for fostering sustainable rural development. The study demonstrates that the active involvement of both genders in community business frameworks substantially enhances resilience and economic development [1,2]. Highlighting gender roles within law enforcement organizations increases productivity and fosters equity and empowerment, which are vital for sustained socio-economic advancement [3]. LEOs serve as crucial forums for community participation, promoting entrepreneurship, and imparting vital knowledge; hence, they cultivate an inclusive atmosphere that appreciates varied contributions [4,5].

This study explores sustainable development's multidimensional aspects through gender inclusion, empowerment, and local economic growth. Integrating gender roles into LEOs is crucial for fostering not only economic advancement but also social cohesion and resilience within communities. Coastal areas like Ampekale Village in Indonesia illustrate significant involvement of both men and women, showcasing complementary roles that enhance productivity and community well-being [6,7]. Women's participation in post-harvest and entrepreneurial activities alongside men's resource extraction underscores a dynamic that supports holistic development [8,9]. However, a notable gap remains

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in literature regarding comprehensive analyses of gender roles within LEOs and their impact on sustainable business integration and community development [10,11]. This study aims to address these gaps and provide insights to inform strategies for inclusive and sustainable rural development.

These concepts form a framework for understanding how gender integration in business development drives community empowerment and sustainable economic progress. Integrating gender roles into LEOs and ensuring active community participation across all business areas establish a foundation for lasting economic and social resilience. The inclusion of gender dynamics in LEOs is crucial for sustainable rural development. Research indicates that active participation by both men and women in community business structures significantly enhances resilience and economic growth [1,12]. Emphasizing gender roles in LEOs not only boosts productivity but also supports equity and empowerment, essential for sustainable socio-economic progress [2]. LEOs serve as platforms for community engagement, entrepreneurship, and knowledge dissemination, fostering collaborative environments that value diverse inputs [3,5].

Enhancing crab economic operations in isolated coastal villages necessitates the active involvement of residents as essential contributors to both business and development efforts [13–15]. Community participation must include all phases of corporate operations, such as organizational establishment, management, partnership cultivation, network expansion, and product creation [16]. Cohen and Uphoff's concept emphasizes that participation entails individuals actively engaged in activities to guarantee an equitable distribution of rewards [17]. Enabling communities in commercial enterprises ensures that locals are essential for initiatives focused on attaining sustainable rural development [4,13,16,18]. Understanding gender dynamics in business development is essential for economic advancement, highlighting inclusive strategies that leverage the capabilities of both men and women [19–21].

The literature highlights the crucial functions that LEOs fulfil in enhancing resilience in coastal areas, especially during crises. LEOs significantly enhance community resilience through service provision, awareness-raising, and leadership in collaborative initiatives [22]. Community empowerment initiatives that collaborate with social enterprise projects enhance this process and align with broader efforts to educate individuals in rural regions, foster creativity, improve communication, optimize resource utilization, and address environmental challenges [23–25]. Comprehensive initiatives are essential for improving the overall quality of life in coastal areas.

The establishment of crab fishing associations and processing facilities represents a strategic approach to promote

community empowerment and rural development. These associations foster collaboration between fishing and processing sectors, leading to enhanced productivity through integrated operations [26,27]. This collaboration not only improves operational efficiency but also bolsters community empowerment and supports sustainable rural development [28,29]. Addressing challenges such as market uncertainties and price volatility is essential for these collaborative efforts [30]. The growing number of women-led small enterprises in rural areas further signals a cultural shift, highlighting the significant role of women in entrepreneurship and enterprise management [31]. The solidarity among female entrepreneurs is crucial for the sustainability of rural businesses [32,33]. Moreover, understanding gender relations within these industries is vital for addressing disparities and fostering inclusive development within LEOs [34,35].

This study uses a qualitative case study approach, despite the common use of experimental studies or pre- and post-evaluations to assess impacts. This methodology is well-suited for exploring the complex socio-economic roles of gender in business settings, capturing nuances that rigid designs might overlook [17]. Dynamic cultural and social practices shape gender interactions within LEOs, making it challenging to isolate variables for experimental control [10]. Furthermore, conducting longitudinal pre- and post-analyses requires substantial resources and reliable baseline data, which are often difficult to obtain in rural areas with limited data collection infrastructure [36].

The study utilizes a descriptive methodology, incorporating extensive interviews and direct observation to document real-time gender dynamics and contributions within LEOs. This approach circumvents the constraints of rigid evaluation frameworks and facilitates a comprehensive understanding of gender-specific roles in company operations [30,37]. The extensive understanding of LEO functions, especially in processing and marketing, underscores the possibility of gender-specific interventions to improve rural economic activities [38,39]. Comprehending these dynamics is crucial for policymakers and development practitioners seeking to implement gender-focused measures in analogous rural settings [6,40,41]. However, a research gap persists in thorough investigations of gender roles within LEOs and their impact on sustainable business integration and community development, highlighting the necessity for additional study to guide inclusive initiatives and bolster rural economic advancement.

The objective of this study is to explore the multidimensional aspects of sustainable development through the integration of gender roles, empowerment, and local economic growth within LEOs. Specifically, it seeks to understand how gender dynamics contribute to community

engagement and business development, fostering resilience and socio-economic progress.

Focusing on coastal areas in Indonesia, the aim of this study is to address existing research gaps related to the comprehensive analysis of gender roles and their impact on sustainable business integration and community development. It expects the findings to guide strategies that foster gender inclusion and bolster rural development. Significantly, the study contributes to the broader discourse on gender equity and its role in rural business advancement, providing evidence that gender-inclusive LEOs not only enhance community empowerment but also bolster economic resilience and sustainability.

2 Methods

Ampekale Village, in the Bontoa sub-district of the Maros district in South Sulawesi, Indonesia, served as the study's location. The research locations were chosen using a purposeful approach based on the village's well-developed status resulting from the growth of rural entrepreneurial operations through community empowerment. The study chose local business organizations with a diverse composition of male and female members as its subjects. The research utilized purposive sampling to pick local organizations that have made important contributions to rural development. The criteria for these organizations included their existence for a minimum of 2 years, their active engagement in activities that directly benefit local communities, and their streamlined management structure. Therefore, the study specifically focused on local business organizations (LOEs) involved in economic, human capacity building, and rural development initiatives. This focused approach seeks to offer a deep understanding of the dynamics and effects of local business organizations, which include both men and women, on the development of rural areas in the specified environment.

The research was designed as a qualitative case study to understand the nuanced roles and dynamics within LEOs, prioritizing exploration over measurable outcomes. This approach captured real-time, context-specific insights without the limitations of pre- and post-assessment structures. By focusing on descriptive and interpretative analysis, the study provided deeper insights into gender roles and business integration, allowing for a richer understanding beyond conventional, structured methodologies [17].

The study did not employ a pre- and post-analysis approach with gender as a variable to assess the impact of gender in business integration for several reasons:

- (1) Pre- and post-measurements may not adequately capture the complex social interactions involved in gender roles and business integration. Cultural, social, and economic factors, which evolve and may not isolate effectively within a before- and after-framework, influence the impact of gender.
- (2) Continuous social, economic, and environmental transformations shape the dynamic nature of business activities, especially in rural areas, characterized by fluidity. A pre- and post-approach necessitates distinct, established intervention points, which are frequently absent in real-world environments characterized by incremental and continual progress.
- (3) Resource constraints made a comprehensive pre- and post-analysis impractical due to the significant time, financial investment, and resources required for long-term monitoring. This study, therefore, adopted a more flexible qualitative approach, enabling valuable, context-specific insights without the burden of extensive analysis.
- (4) Collecting dependable baseline data in rural regions, especially concerning gender roles, poses challenges due to disparate levels of record-keeping, literacy, and resource accessibility. This complicates longitudinal tracking and may render it unreliable.

The study utilized a dual-case research design, incorporating both formal and informal in-depth interviews. In-depth interviews were performed with members of the business community, including individuals from the company organization and development facilitators. A list of questions guided these interviews. The selected informants provided significant perspectives on the responsibilities of individuals within the organization and the wider business environment. The data obtained from in-depth interviews were analysed using a descriptive approach, which allowed for the representation and examination of different positions within the organization and their connections with crab fishing, processing organizations, and other relevant entities. This extensive investigation sought to comprehend the intricacies of the crab industry's operations and their effects on the local population. The data gathered for this study involved a comprehensive examination of the nature and extent of the contributions made by members of business groups to different business activities. Additionally, the study scrutinized the roles and responsibilities of local organizations in overseeing these corporate activities.

The study examined the allocation of responsibilities and tasks between males and females as engaged participants in corporate operations, encompassing the extraction of primary resources, their transformation, packaging,

and promotion. The study primarily focused on local business organizations involved in various commercial activities, with specific emphasis on their mixed-gender membership. For the study, these organizations were considered the main sources of information. The informants were selected from both the board and general members of selected business groups, guaranteeing a broad representation of opinions. Furthermore, we selected important informants from among local informal leaders and development facilitators, recognized for their crucial contributions to rural and business development processes. These informants provided significant insights into the broader effects of these economic operations on the community.

The principles of case study research form the foundation of the data gathering and analysis process. The analysed outcomes of the obtained information are presented as qualitative indicators, such as the degree of involvement, knowledge, or advantages. Ratings like “very poor,” “poor,” “moderate,” “good,” and “excellent” convey the organization’s quality or performance from a gender perspective.

- **Extremely Poor:** Indicates the lowest quality of effort or output. It denotes significant deficiencies, inaccuracies, or inadequacies. People are likely to deem the topic unsuitable or unsatisfactory.
- **Poor:** Slightly better than “extremely poor,” yet still denotes a substandard level of quality or performance. Certain evident issues or deficiencies require rectification. Typically, it fails to meet the expected or required criteria.
- **Moderate:** This rating signifies a level of quality or performance that falls in the medium range. While there may be certain beneficial qualities, there are also issues that need attention or enhancement. The subject is satisfactory, but it has the potential to be even more extraordinary.
- **Good:** This denotes a level of quality or performance that is considered satisfactory. The subject fulfils expectations and may even surpass them in some respects. There are not noteworthy concerns, and the overall experience is favourable.
- **Incredibly good:** This rating signifies exceptional quality or performance. The subject surpassed expectations and displayed exceptional performance. This implies that there was a higher level of participation, understanding, or advantages, or that the performance was exceptional.

Informed consent: Verbal informed consent was obtained from all participants prior to the interviews. No personally identifiable information was collected or presented in the study.

Ethical approval: The study was conducted in Indonesia, where local and national regulations do not require formal research ethics approval for non-clinical, social science, or community-based research. As this study did not involve experiments with humans or animals, specific ethical clearance was not applicable. However, ethical principles were upheld throughout the research process.

Consent: Participants were fully informed about the purpose of the study, the voluntary nature of their participation, and the intent to publish the results. Their consent was obtained to ensure transparency and respect for their contributions.

3 Results and discussion

3.1 Description of LEO in gender perspectives

LEOs in Desa Ampekale exemplify a community-driven development model that fosters rural development through local resource mobilization and household economic resilience. Established through the joint efforts of development agents and community members, LEOs comprise farming, fishing, and business groups, reflecting a participatory approach that emphasizes local ownership. Men play a key role in fishing and leadership, driving raw material production and governance, while women focus on processing and commercial production, enhancing value addition. This gendered division of labour strengthens household incomes, promotes community benefits, and supports sustainable development. The Ujung Parappa (UP) group illustrates how coordinated participation from men and women within LEOs can drive transformative socio-economic change in rural areas.

One notable example is the UP group, established in 2011 with facilitation from Yayasan Konservasi Laut in partnership with Oxfam and supported by the Canadian International Development Agency. The formation of this group was aimed at driving social transformation through collective action. By encouraging members to recognize their capacity for change, the group aimed to uplift the livelihoods of underprivileged fishing households and create employment opportunities. The UP group exemplifies how collective action within LEOs can promote sustainable development and build community resilience.

Women and men play distinct but complementary roles within LEOs, each contributing to the community’s broader economic development. The fishing group’s male members are actively involved in crab fishing, which is a crucial livelihood activity in Desa Ampekale. Their fishing

efforts supply raw materials for the business activities of women's groups. The women, particularly the wives of fishermen, are actively engaged in the downstream processing and commercial production of crabs [42,43]. This activity, which has been central to Ampekale's rural economy since 2012, underscores the essential role of women in value-added production. Women's involvement in crab processing not only provides them with a vital source of income but also supports the diversification of the local economy, reducing dependence on primary fishing activities [43–45]. Women's involvement in these activities not only increases household incomes but also strengthens the socio-economic fabric of the community by enhancing women's financial independence and agency [45,46].

Men, primarily through the fishing groups, contribute to the primary production of crabs, which directly supports the commercial activities of the women's groups [46]. Their labour-intensive role in the fishing sector underpins the broader economic activities of the village. Men are also key players in managing and leading community-based LEOs, like the UP group. Their leadership and participation in development programmes ensure that local governance mechanisms are more effective in addressing economic and social challenges. For instance, UP's active engagement with the village government demonstrates how male leadership within LEOs can drive community-based initiatives and facilitate the successful implementation of rural development projects [42,46].

The interplay between men's fishing activities and women's processing and marketing roles showcases a gender-integrated approach to rural development [47]. While men focus on resource extraction, women engage in value addition, thereby creating a complete production and supply chain within the community. This synergy not only enhances household incomes but also strengthens the rural economy [20]. The cooperative activities of UP reflect this gender-based collaboration. By aligning the roles of men and women within LEOs, communities like Desa Ampekale foster inclusive economic development. This

approach ensures that development initiatives are not only sustainable but also socially equitable [48].

3.2 Functions of LEO in gender perspective

LEOs play a crucial role in fostering rural sustainable development by enhancing market access, financial inclusion, education, product innovation, and knowledge sharing. These functions position LEOs as key drivers of community-led economic transformation, with a significant focus on gender empowerment, particularly for women. By offering opportunities for women to develop skills, access financial resources, and participate in decision-making, LEOs promote gender equity and sustainable community development. The case of crab business integration highlights the socio-economic impact of LEOs, showcasing their role in capacity building, financial independence, and inclusive decision-making, all of which contribute to sustainable rural development [38,49].

Table 1 highlights gender-based differences in the understanding of LEOs. Women demonstrate a stronger comprehension of LEO functions, particularly as platforms for marketing, innovation, financial support, and knowledge sharing, where their understanding ranges from “good” to “incredibly good.” In contrast, men show only “moderate” understanding in most areas and “extremely poor” comprehension of LEOs as platforms for innovation and communication. Overall, women have a “good” understanding of LEO functions, while men's understanding is rated as “poor,” reflecting a gendered disparity in how LEOs are perceived and utilized within communities.

3.2.1 Empowering women through education and skills development

LEOs play a vital role in empowering women through education and skills development. The crab catching group

Table 1: Comparison of understanding and knowledge of LEO's functions based on the gender perspective

Functions of LEO	Men	Women
Media for getting knowledges and experiences	Moderate	Good
Media for marketing	Moderate	Incredibly good
Media for innovation	Extremely poor	Good
Financial support services	Moderate	Good
Media for communication (building strong relations with members within the group)	Extremely poor	Moderate
Overall	Poor	Good

and crab processing group illustrate this by providing free literacy and numeracy lessons to address educational gaps among women, many of whom initially lacked basic reading, writing, or signing abilities. To bridge this gap, LEOs designed training sessions that aligned with the daily fishing schedules of their husbands, enabling women to participate effectively [38]. These programs later expanded to include entrepreneurial skills, fisheries management, and community leadership, with women attending workshops and training sessions, sometimes in high-end hotels. This capacity-building approach enabled women to acquire critical skills for business ventures, enhance household livelihoods, and contribute to rural socio-economic transformation, highlighting LEOs' role as catalysts for capacity development and gender empowerment [38].

3.2.2 Facilitating market access and business expansion

LEOs play a crucial role in facilitating market access and promoting the growth of local enterprises to support rural sustainable development. The UP group illustrates how LEOs enable members to position their products successfully in both local and regional markets. By establishing partnerships with retail shops such as Citra Sudiang, Kota Daeng, and Bosowa, UP synchronizes marketing strategies, ensuring a stable and strong market presence. This coordinated approach to production, marketing, and sales keeps their products in high demand, often leading to supply shortages [38].

To address the growing demand for diversified products, LEOs promote business innovation and product diversification. The UP group exemplifies this by developing new products such as crab crackers, shredded crab, and seaweed-based items like crackers, lollies, and jellies. These innovations increase revenue potential and reduce reliance on a single product line, mitigating risks related to price fluctuations or raw material shortages. By supporting product diversification, LEOs enhance income generation and promote environmental sustainability through the efficient use of marine resources [38].

3.2.3 Enhancing financial access and capital development

Financial inclusion is a critical pillar of rural sustainable development, and LEOs play a central role in this area. Through initiatives such as revolving credit systems, LEOs provide members with access to financial resources that would otherwise be unavailable. The UP group

exemplifies this approach, using its profits to reinvest in community-led projects such as crab trap production. This initiative enables members to pool financial resources and access credit to finance production activities, reducing their dependence on external financial institutions [38].

The revolving credit system facilitates financial stability and promotes collective ownership of community assets. By pooling profits and reinvesting them into essential economic tools, LEOs ensure the long-term sustainability of local enterprises. This system not only supports the members' financial needs but also promotes sustainable development by fostering self-sufficiency and reducing community vulnerability to financial shocks. The ability of LEOs to provide access to financial resources and enhance local capital formation strengthens rural economies and enhances community resilience in the face of economic uncertainties.

3.2.4 Promoting knowledge sharing and community learning

Another essential function of LEOs is the facilitation of knowledge sharing and experiential learning within rural communities. LEOs create formal and informal platforms for members to exchange ideas, share experiences, and co-create solutions to local challenges. The UP group serves as a prime example of how LEOs facilitate learning through workshops, training programs, and the sharing of practical knowledge [38].

By encouraging collective learning, LEOs enable rural communities to adopt best practices in aquaculture, fisheries, and small-scale enterprise development. Women, in particular, benefit from these knowledge-sharing initiatives, as they gain access to technical skills, business strategies, and leadership training. This process equips women with the tools to become effective leaders and decision-makers in their local economies. The establishment of LEOs as learning platforms contributes to the broader objectives of rural sustainable development by fostering knowledge diffusion, enhancing capacity building, and promoting gender equity. When knowledge is continuously shared within the community, it creates a culture of growth and resilience, ultimately strengthening local economies and promoting sustainable development.

3.2.5 Economic contributions and income generation

LEOs have a transformative impact on women's economic well-being by enabling diverse income-generating

activities. In UP, women's involvement in the crab processing business demonstrates the economic benefits of LEOs. Women's roles in processing crab products, including the production of semi-processed and fully processed crab crackers, have become essential for the household economy. Women's earnings from processing activities range from IDR 600,000 to IDR 3,500,000 per month, significantly contributing to household income. This additional income has enabled families to finance children's education, purchase essential goods, and renovate homes. Table 5 highlights the sources of income for women involved in LEO activities, emphasizing their crucial role in rural household economic stability.

Capital Formation is well facilitated by LEOs for rural sustainable development through strategic capital formation initiatives, including revolving credit systems, cooperative acquisition of production tools, and the promotion of product innovation. By fostering financial stability, supporting market expansion, and enabling collective responsibility, LEOs strengthen the financial independence of rural communities. The case of UP highlights the critical role of LEOs as catalysts for economic empowerment and sustainable development, particularly in the context of crab business integration [50–52].

Table 2 depicts that a total of 27 individuals have accessed the revolving capital, with the following breakdown:

- In the first midterm of first year, there were 14 fishermen with 100 crab traps per person.

- In the second midterm of first year, there were 27 fishermen who had 100 crab traps.
- In the first midterm of second year, there were 14 fishermen who had between 200 and 300 crab traps.
- In the second midterm of second year, there were 27 fishermen with 200–300 crab traps or people, and 15 non-members of UP with 100–200 crab traps or people.

Table 2 illustrates how the revolving capital program enables 27 fishermen to access 100–300 crab traps each, demonstrating the effectiveness of this strategy in strengthening the group's capital. By adopting a cooperative approach, members collectively establish terms for accessing revolving capital, fostering economic empowerment and financial stability within the community. LEOs play a vital role in capital formation, exemplified by the UP group, which accumulates capital and acquires essential production resources, including 1,400 crab traps from Oxfam and a mixer for crab cracker production from the Directorate General of Higher Education of Indonesia. This collective effort strengthens the group's financial foundation, promotes sustainable business development, and empowers members to increase productivity and generate higher incomes, thereby enhancing long-term financial stability and community resilience.

Capital formation within LEOs is sustained through a revolving credit system that enables members to borrow resources and reinvest returns into a community fund. This system strengthens individual financial security and

Table 2: Rotating credit of crab traps for LEO's male members

Month (1)	Creditors (2)	Instalment (IDR) (3)	Procurement units (4)	Value (IRD) (5)	Balance (IRD) (6)
		21,000,000	1,400	21,000,000	0
1	14	2,254,000	100	1,500,000	754,000
2	15	2,415,000	200	3,000,000	169,000
3	17	2,737,000	100	1,500,000	1,406,000
4	18	2,898,000	200	3,000,000	1,304,000
5	20	3,220,000	300	4,500,000	24,000
6	23	3,703,000	200	3,000,000	727,000
7	25	4,025,000	300	4,500,000	252,000
8	28	4,508,000	300	4,500,000	260,000
9	31	4,991,000	300	4,500,000	751,000
10	34	5,474,000	400	6,000,000	225,000
11	20	3,220,000	200	3,000,000	445,000
12	22	3,542,000	200	3,000,000	987,000

Notes:

(3) Creditor payment IDR 161.000/unit/month.

(4) Provision of crab traps.

(5) The purchase value of crab traps IDR 15.000/unit.

(6) The payment is deducted by the provision of crab traps.

enhances the organization's capacity to withstand economic challenges, supporting its long-term viability. While the program initially succeeded in providing access to essential production inputs, miscommunication posed challenges as some members believed Oxfam's provision of crab traps was a grant rather than a loan, affecting repayment compliance. Addressing this issue requires clear communication of the scheme's terms to ensure sustainability and efficiency [51]. By promoting shared responsibility and collective decision-making, LEOs maintain transparency and accessibility, fostering financial stability and economic empowerment for community members.

In addition to supporting capital formation, LEOs promote financial growth through product innovation and market diversification. The introduction of crab crackers and the development of crispy baby crabs serve as examples of value-added products that increase income and financial security for members [50,51]. Adopting good manufacturing practices and innovative processing techniques enhances the quality and safety of crab products, improving market competitiveness and increasing business volumes [51–53]. These initiatives contribute to the overall capital base of LEOs by promoting higher incomes and reinvestment in local production systems. By enabling product diversification, LEOs create opportunities for long-term financial sustainability while also strengthening the economic resilience of rural communities.

Addressing miscommunication challenges within capital reinforcement initiatives is crucial for sustainable rural development. Miscommunication can arise from free-form messaging and differing interpretations of key program terms, as seen in the case of Oxfam's crab trap distribution [51]. Ensuring clarity in terms of resource allocation and repayment obligations is essential for maintaining trust and participation in LEO-led capital formation programmes. When such challenges are addressed, LEOs become more effective in promoting financial inclusion, supporting production activities, and enabling community-led financial growth.

Fishing-Processing Production Integration in well-defined fishing schedule allows LEOs to align production activities with resource availability, enabling fishermen to maximize harvests during high-yield months while adopting a sustainable approach during the off-season. This structured coordination stabilizes household incomes, with fishermen earning between IDR 60,000 and IDR 3,500,000 per month, depending on catch rates and seasonal fluctuations. By incorporating periods of reduced fishing activity, LEOs support sustainable resource management, helping to preserve crab stocks and reduce the risk of overfishing. This approach ensures the long-term viability of the local crab business while promoting financial stability for fishing communities.

Table 3 illustrates a cyclical fishing schedule in which crab-catching occurs for 25 days each month, with production levels shifting according to seasonal variations. During the 7–8-month high season, daily yields range from 3 to 7 kg, allowing fishermen to maximize their productivity and increase their earnings. In contrast, the 4–5-month off-season sees a reduction in both fishing activity and output, with production dropping to 2–3 kg per day and fishing days decreasing to 9–10 days per month. This seasonal rotation ensures a balanced approach to resource use, enabling fishermen to optimize their income during peak months while maintaining a steady, albeit lower, income during the off-season. Such a schedule supports sustainable fishing practices, safeguards marine resources, and promotes financial stability for local fishing communities.

The fishing schedule serves as a crucial tool for the integration of crab fishing and processing activities, with LEOs playing a pivotal role in its design and implementation. By structuring schedules around peak and off-peak production periods, LEOs enable communities to optimize crab yields, ensure sustainable resource use, and generate stable incomes. The alignment of fishing schedules with processing timelines facilitates a continuous flow of production activities, supporting the seamless transition from

Table 3: Seasonal calendar of economic activities of local people fishermen

Economic activities	Months											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Crab/fish catching	x	xx	xx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xxxx	xx
Seaweed	—	—	xx	xxx	xxxx	xxxx	xxxx	xx	xxxx	xxxx	xxxx	—
Milkfish culture	xxxx	xxxx	xxxx	xxxx	xxx	—	—	—	xxx	xxxx	xxxx	xxxx
Shrimp culture	xxxx	xxxx	xxxx	xxxx	xxx	—	—	—	xxx	xxxx	xxxx	xxxx

Notes: — = None; x = almost none; xx = less; xxx = moderate; xxxx = peak.

fishing to processing. This approach promotes the efficient use of resources, ensures the availability of fresh crab meat for processing, and strengthens the local crab value chain [54].

3.3 Roles of LEO in gender perspectives

3.3.1 Enhancing community participation and economic empowerment

LEOs play a pivotal role in promoting gender-sustainable rural development by enhancing women's participation in local economies. Women's understanding of LEO functions often surpasses that of men, as they have direct experience in small-scale enterprises, community involvement, and social networks. Their engagement with LEOs enables them to recognize the potential of these organizations to drive job creation, increase household income, and foster community well-being. Women view LEOs as more than just facilitators of financial support or market access. They see them as platforms for communication, knowledge sharing, and community-building [49,55]. As a result, women's heightened awareness and involvement strengthened LEOs' role in advancing sustainable rural development.

LEOs play a crucial role in empowering communities by driving economic development, especially through promoting job creation and enhancing household income. Women exhibit a deeper understanding of the responsibilities and impact of LEOs compared to men. Their awareness stems from their direct involvement in small-scale enterprises and their active participation in community activities. This participation enhances their networking capabilities, adaptability, and economic empowerment [56,57]. Women recognize LEOs as essential facilitators of marketing, financial support, community engagement, and communication channels [49]. Their heightened awareness underscores the significant role LEOs play in community development and economic upliftment.

Women are pivotal in LEO-led economic activities, particularly in fisheries-related enterprises. In Ampekale Village, women play a key role in processing and marketing crabs caught by their husbands, with men predominantly engaged in fishing operations. The distinction of roles between men and women reflects gendered patterns in small-scale fisheries enterprises, where women handle value-added processes such as cleaning, peeling, and cooking crabs before marketing them [37]. The division of labour highlights the essential contribution of women in post-harvest activities, underscoring their integral role in the LEO's operational success.

As shown in Table 4, the LEO has enabled community members to actively participate in key aspects of rural development, including decision-making, strategic planning, implementation, and evaluation. This participatory approach not only enhances local capacity but also strengthens community ownership of development initiatives. By mobilizing resources and promoting collective action, the LEO has facilitated critical infrastructure projects such as dock construction, mosque renovations, and sanitation drives, addressing essential needs that would have otherwise remained unmet due to limited local government funding. Furthermore, effective leadership and negotiation by the LEO have secured the approval of vital programs, including free electricity meters, road construction, and the renovation of wells and mosques [58]. These achievements highlight the LEO's capacity to bridge gaps in public service delivery, foster economic growth, and improve the quality of life for community members. Through its inclusive approach, the LEO not only strengthens local governance but also enhances the community's resilience and capacity for sustainable development.

3.3.2 Gender-specific contributions to economic activities

The roles that men and women play within LEOs vary significantly, reflecting traditional gender norms and local

Table 4: Comparison of understanding and knowledge of LEO's role based on the gender perspective

Role of LEO	Men	Women
Improving negotiation skills in rural development activities	Moderate	Good
Providing jobs for community	Incredibly good	Incredibly good
Rising income	Incredibly good	Incredibly good
Mobilizing community for business, social, and rural development activities	Moderate	Good
Improving skills for business management	Moderate	Good
Improving negotiation skills in business activities	Moderate	Moderate
Overall	Moderate	Good

economic structures. Women's contributions are especially significant in areas such as processing and marketing, while men often engage in production and fishing activities. For instance, in Ampekale Village, women are responsible for post-harvest activities, such as cleaning and packaging crabs, which aligns with cultural perceptions of women's domestic and culinary skills. By recognizing and valuing these roles, LEOs enable a more inclusive approach to economic development. Women's participation extends beyond traditional roles, allowing them to co-manage community development projects, negotiate for essential village infrastructure, and strengthen financial independence [37].

Craft fishing and processing significantly contribute to household income and economic empowerment, especially for women. It provides consistent livelihood opportunities, promotes financial stability, and supports asset accumulation. The profit-sharing model and reinvestment in production inputs strengthen community resilience, ensuring sustainable growth and long-term development.

Table 5 illustrates the diverse sources of women's income from LEO activities, highlighting the transformative role of LEOs in enhancing women's economic well-being and strengthening rural household financial stability. The significant financial benefits achieved by members, particularly women engaged in crab processing activities in UP. Women play a vital role in processing raw crab materials, producing semi-processed and fully processed products such as crab crackers, which are essential to the household economy. On a daily basis, they process 35–60 kg of crab, generating daily profits of IDR 850,000–900,000, while monthly earnings range from IDR 600,000 to IDR 3,500,000, depending on production levels. This steady income, which accrues over 9–10 months annually, allows families to finance children's education, purchase essential household goods, and undertake home renovations. Moreover, a portion of the profits is reinvested as group capital to support future production needs, such as the procurement of crab traps, fostering sustainability and self-reliance within the community [36,39,59].

Table 6: Income analysis of crab processing by the group

Description	Unit	Quantity	Price in IDR/unit	Value (IDR)
Value of product	kg	8.9	275,000	2,447,500
Production cost				
Raw material of crab	kg	43	33,000	1,419,000
Labour	kg	8.9	10,000	89,000
Elpiji Gas	Unit	1	19,000	19,000
Ice	Unit	1	12,000	12,000
Water	Unit	1	6,000	6,000
Packaging	Unit	9	1,000	9,000
Depreciation	Unit	1	27,000	27,000
Profit				866,500

The income analysis in Table 6 shows that crab processing is a profitable business for rural communities, generating significant value after covering production costs. The business ensures sustainable income for members through profit-sharing and reinvestment in production inputs. By promoting local employment, resource efficiency, and financial growth, the enterprise supports rural development and strengthens community resilience.

Table 6 highlights the profitability of crab processing for rural communities, with a total product value of IDR 2,447,500 from 8.9 kg of processed crab. After covering production costs of IDR 1,581,000, which include raw materials, labour, operational inputs, and depreciation of IDR 27,000, the business generates a profit of IDR 866,500. This substantial profit margin demonstrates the viability of crab processing as a sustainable source of income, promoting rural economic development, improving household livelihoods, and enhancing community resilience.

The active involvement of women in LEOs highlights the interplay between gender, empowerment, and sustainable development. By engaging in activities traditionally assigned to women, such as food processing, packaging, and marketing, women gain a nuanced understanding of LEO operations. This participation not only challenges

Table 5: Income source of UP's women members based on their economic activities in LEO

Description	Crab catch	Wage for crab processing	Fully processed crab cracker	Semi processed crab cracker
Production (unit/period)	2–7 kg	10 kg	120 sachets	130 sachets
Income (IDR $\times 10^3$ /period/person)	60–150	10	65	25
Days/month	10–25	25	12–16	5–10
Income (IDR $\times 10^3$ /month/person)	600–3,500	250–400	800–1,200	125–200
Number of members involved (persons/period)	26	10–16	9–10	6–9

gender stereotypes but also reinforces women's economic agency and leadership roles in community development. As highlighted in UP, women's engagement in crab processing and related value-chain activities positions them as key drivers of rural sustainable development [20,55,60,61]. Their contributions highlight the transformative potential of LEOs in promoting gender-inclusive rural development.

3.3.3 Gender perspectives in business development

Gender perspectives in business development play a critical role in fostering sustainable rural development by promoting inclusive economic participation, reducing gender disparities, and enhancing community resilience. LEOs serve as platforms for this transformation, highlighting the complementary roles of men and women in production, processing, and marketing activities. The division of labour within LEOs not only reflects traditional gender norms but also demonstrates the growing involvement of women in business management and entrepreneurial roles.

The existence of gender disparities in enterprise operations is apparent in the overall organizational framework. Men participate in fishing and capturing operations, primarily generating raw materials as fishermen or catchers. In contrast, women mostly engage in domestic industry activities, specifically processing work as processors [23,38]. This distinction demonstrates a clear division of labour, with men making large contributions to the earliest stages of manufacturing while women assume vital roles in the subsequent processing stages (Table 7).

Table 7 illustrates the gendered nature of business activities, with men primarily engaged in labour-intensive tasks such as fishing, crab catching, and raw material

production. Their responsibilities include setting traps, managing fishing equipment, and navigating hazardous sea conditions, often at night. These activities lay the foundation for further value addition. Women, on the other hand, play a vital role in processing, packaging, and marketing, where they transform raw products into high-value items like refined crab meat, shredded crab, and crab crackers. In the UP crab processing enterprise, men focus on catching crabs, while women handle processing, packaging, and marketing. Unlike men, who typically market raw materials, women lead the sale of value-added products, boosting household and LEO revenue. Their roles also extend to financial management and administration, highlighting their growing influence in business leadership [20,23,38].

Moreover, the notion that women exhibit a heightened inclination towards organization in handling financial matters enhances the perception of their competence in positions related to business and money (Table 8). Beyond task allocation, gender perspectives shape the strategic positioning of women in business operations. Women are perceived as more organized and meticulous in managing household-scale enterprises, aligning with traditional beliefs that view commercial tasks as an extension of domestic roles. This perception is supported by Table 8, which highlights women's suitability for activities like business management, financial reporting, and marketing. Women's roles in financial management are particularly noteworthy, as they are seen as more thorough and detail-oriented, a quality that enhances financial accountability within LEOs. This gender-driven division of roles allows businesses to benefit from the unique strengths of both men and women, promoting operational efficiency and shared responsibility [62].

Table 8 highlights the crab business at UP as a model for women's economic empowerment and sustainable

Table 7: Business activities and management based on business types

Business types	Business management	Business activities
Fishery culture	Men	Male for production Male + Female for marketing
Crab processed enterprise	Women	Male for catching Female for processing Female for packaging Male + Female for marketing
Crab catching	Men	Male for production
Seaweed farm	Men	Male for production Female for processing Male + Female for marketing
Cracker processed	Women	Production and marketing

Table 8: Reasons for the appropriate activities for gender in business activities

Appropriate activities/reason for activities	Men	Women
Boards of LEO		
Small/household scale business	Moderate	Good
Matched with business management	Moderate	Good
Support gender mainstreaming of rural development programme	Moderate	Good
Overall	Moderate	Good
Refined crab meat and cracker processing		
Matched with production processing	Poor	Moderate
Related to domestic tasks	Moderate	Good
Women should stay at home	Poor	Moderate
Overall	Poor	Moderate
Business management		
Good hand-writing report	Poor	Good
Better in household business management	Good	Good
Thorough with the jobs	Moderate	Moderate
Work more in an orderly manner	Good	Good
Overall	Good	Good
Financial management		
Meticulous tasks	Good	Moderate
Better in financial management	Moderate	Good
Overall	Good	Good
Marketing crackers within the village		
Activities done at home	Good	Good
Dominantly stay at home	Moderate	Good
Overall	Moderate	Good

rural development. Women play a pivotal role in transforming raw catch into high-value products like crackers and shredded crab while managing administrative, financial, and marketing tasks [63,64]. Their involvement in marketing strengthens negotiation skills, fosters partnerships, and mitigates operational risks, ensuring steady product sales. This active participation in key business functions enhances value chain development, boosts household income, and promotes community welfare [30].

The allocation of responsibilities within LEOs reflects the dynamics of gender-based roles. While traditional roles see men assuming leadership in local development organizations, UP disrupts these norms by promoting a cooperative model where both men and women contribute to production, processing, and marketing. Task allocation within LEOs is often formalized through contracts or policies, reflecting the principle of equal participation. This approach enables women to play a more active role in business-oriented organizations, unlike in development-focused organizations where men often dominate leadership positions [65].

Women's participation in business activities, particularly in value-added agriculture like processing and

marketing, fosters sustainable rural development. By engaging in profitable enterprises and taking on leadership roles in production, financial management, and marketing, women transition from subsistence roles to economic contributors. Capacity-building initiatives, such as training in leadership, business management, and digital literacy, help women navigate competitive markets and enhance their business acumen. This shift promotes inclusive economic growth, reduces gender disparities, and strengthens social welfare, with broader benefits such as improved education and health outcomes for families and communities [62,66,67]. Empowering women in business development not only promotes gender equity but also reinforces the foundation for sustainable rural development.

3.3.4 Impact of gender perspectives in business integration

Gender integration in business fosters inclusive economic growth, enhances operational efficiency, and drives sustainable development. By leveraging the unique contributions of both men and women, business integration creates diverse perspectives, promotes equitable participation, and strengthens value chains. Women's involvement in processing, financial management, and marketing adds value to products and boosts household income, while men's contributions in production and resource acquisition ensure a steady supply of raw materials. Gender-balanced business practices not only improve economic outcomes but also empower communities, support social equity, and enhance overall community resilience.

Table 9 highlights the gendered perspectives on the benefits of LEOs for rural communities. Women prioritize business outcomes, such as adding value to products, raising prices, and creating new business opportunities, while also holding leadership roles like chiefs, secretaries,

Table 9: Generated impacts of LEO for rural community

Impact of LEO	Men	Women
Creating a value add for a commodity	Moderate	Good
Increasing product price	Good	Incredibly good
Open other business opportunities	Moderate	Moderate
Providing jobs for community	Incredibly good	Good
Rising family income	Incredibly good	Good
Increasing business scale	Moderate	Moderate
Overall	Good	Good

and treasurers in the crab production industry. Men, on the other hand, focus on socio-economic impacts, emphasizing job creation, increased household income, and the establishment of commercial networks that facilitate trade and market access [24]. This complementary division of focus strengthens the role of LEOs in driving sustainable rural development.

Informant quotations reveal that LEOs have significantly improved household earnings, created employment opportunities, and met the essential needs of rural families. For men, the impact is particularly profound, as they no longer need to seek temporary work outside the village, allowing them to remain with their families. This change is especially beneficial for “sawi” – labouring fishermen without their own vessels – who previously relied on high-interest loans from “Ponggawa,” wealthy financiers who control fishing enterprises and exploit the financial vulnerability of sawi. The integration of two LEO groups, one for crab catching and the other for crab processing, has streamlined credit payments and crab sales, reducing dependence on Ponggawa and enabling fishermen to secure better financial outcomes. This integration strengthens local economic resilience, promotes financial independence, and enhances sustainable livelihoods in rural communities.

LEOs also drive broader socio-economic development by supporting education, improving living conditions, and promoting financial inclusion. Women play a central role in these improvements, prioritizing children’s education, fulfilling daily needs, and securing bank accounts to manage household finances.

Table 10 shows that women have a stronger perception of life improvements through LEO participation than men. Their role in managing household savings from employment in crab processing fosters self-reliance and strengthens their financial independence. Men, on the other hand, focus on tangible asset acquisition, such as purchasing

fishing boats and motorcycles. The gendered differences in impact perception reflect the varied ways in which LEOs influence the lives of men and women in rural communities.

Male members of the fisherman group have the advantage of selling crabs at inflated rates, while their female counterparts, who are part of the crab processing group, gain from the enhanced value of processed crab goods. The introduction of the LEO has greatly improved the socio-economic well-being of the rural community, with noticeable differences in its effects on men and women. This integration ensures that every member of the fishermen’s families can now generate revenue, indicating a significant increase in the overall economic prosperity of the community [25,34].

Men predominantly prioritize tangible possessions, with a particular emphasis on vehicles such as fishing boats and motorcycles. On the other hand, women prioritize the improvement of human resources by ensuring that their children obtain education and by fulfilling the everyday requirements of their families. Having a bank account is essential for women, as they skilfully handle their accounts and efficiently take money from automatic teller machine terminals. Their employment as crab cracker processors serves as the primary source of financial savings in these accounts, empowering spouses to manage household finances effectively monthly. The subtle difference in perceived enhancements highlights the varied ways in which LEO has a beneficial influence on the lives of both males and females in the rural community.

The broader impact of gender-inclusive LEOs extends beyond individual households to the wider community. By fostering entrepreneurship, generating employment, and improving access to financial resources and training, LEOs build economic resilience and community self-sufficiency. Additionally, LEOs promote social cohesion by encouraging community collaboration and trust-building through collective development projects [66,67]. Women’s participation in LEO activities enhances community leadership, builds local capacity, and strengthens the social fabric of rural communities. Initiatives such as educational programs, capacity-building workshops, and leadership training further support women’s empowerment, ensuring that they play a vital role in the long-term sustainability of rural development [62,68].

In conclusion, the integration of gender perspectives in business activities through LEOs significantly impacts sustainable rural development. The complementary roles of men and women within LEOs enhance the efficiency and value of rural economic activities, increase household income, and promote community welfare. Women’s active participation in business management, financial control,

Table 10: Perceived improvement of rural people’s lives from the forming of LEO

Impact of LEO	Men	Women
Sending children to school	Good	Incredibly good
Fulfilling daily needs	Good	Incredibly good
Having their own fishing vessels	Moderate	Moderate
Buying a motorcycle with credit	Incredibly good	Good
Having a bank account	Good	Good
Renovating house	Moderate	Moderate
Overall	Good	Good

and value-added production strengthens their economic independence and leadership roles. Meanwhile, men's engagement in production and resource acquisition fosters family stability and community resilience. Together, these gendered contributions support a holistic approach to rural development, fostering economic growth, social well-being, and sustainable livelihoods for future generations.

3.4 Limitation of the study

The primary limitation of this study lies in its use of a case study and qualitative approach, which, while providing in-depth, context-specific insights, limits the generalizability of the findings to broader settings. The focus on a single village and specific LEO restricts the ability to draw widespread conclusions applicable to other regions or economic organizations. Additionally, subjectivity may influence the reliance on qualitative data, potentially affecting the consistency and replicability of results across different contexts.

4 Conclusion and policy implication

Community participation within LEOs enables inclusive decision-making, fostering shared ownership of development initiatives. Women exhibit strong participation, especially in processing, marketing, and business management activities. Gender-specific contributions to business activities are evident in the division of labour, with men focusing on raw material production and women excelling in processing and value addition. This synergy strengthens household incomes, supports livelihood diversification, and enhances local economic resilience. Women's enhanced role in managing community enterprises, marketing strategies, and innovation reflects a shift towards gender equity. These roles collectively drive rural sustainable development by promoting economic empowerment, improving household welfare, and fostering community well-being. By integrating gender perspectives into LEO activities, communities achieve more inclusive, equitable, and sustainable development outcomes, reinforcing the long-term socio-economic resilience of rural areas. Policymakers should promote women's participation in leadership, business management, and financial decision-making by supporting capacity-building programmes and access to financial resources like revolving credit schemes. Inclusive decision-making processes that engage both men and women ensure shared ownership of development initiatives. Gender-responsive policies within LEOs can drive inclusive economic growth, reduce gender disparities, and

promote sustainable rural development, fostering long-term socio-economic resilience in rural communities.

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