

Participatory Forest Resource Management: A Strategy Based on Local Knowledge At Forest Management Unit Kulawi

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Abstract: Forests play a vital role in supporting the livelihoods of surrounding communities and have the potential to significantly boost local economies. However, this dependence can sometimes threaten the sustainability of forest ecosystems. To address this, sustainable management should be at the forefront of utilizing existing forest resources. A study focusing on community empowerment in managing forestry commodities is essential to optimize the sustainable use of natural resources in Central Sulawesi Province. This research aims to identify factors influencing community empowerment in managing and utilizing these resources, which will inform strategies to strengthen such empowerment. The S-O-A-R (Strengths, Opportunities, Aspirations, Results) approach has been employed to enhance qualitative analysis across three operational areas of KPH Kulawi. Findings indicate that community capacity to manage forest areas is bolstered by elements of local wisdom. This approach is recognized as an effective strategy for safeguarding forest areas while simultaneously improving the community's economic well-being.

Keywords: Forest Management Unit; Local Knowledge; Participatory

Introduction

One of the most pressing and widely recognized environmental issues is the disruption and degradation of forest ecosystems. The causes are diverse, ranging from deliberate human activities such as logging to natural factors beyond human control (Allen et al., 2020; Kumeh et al., 2021; Ramieri et al., 2011). The emergence of issues such as forest area encroachment, conflicts, and biophysical degradation indicates that the participatory forest management practices implemented thus far have not yielded optimal results (Moral-pajares et al., 2022; Musakwa et al., 2020; Prihatinro et al., 2023)

The causes of forest disturbances include poverty among communities living in and around forested areas. It is often believed that there is a causal relationship

between poverty and forest degradation. This perspective assumes that poor communities are responsible for forest damage, perpetuating a narrative that tends to place the blame on them (Arsyad et al., 2020; Golar et al., 2024; Miyamoto, 2020). This situation is further aggravated by the erosion of legal authority, including customary law, and the diminishing significance of local or traditional wisdom. These conceptual societal values, which have historically grown and evolved within community consciousness to guide and regulate social life, are increasingly fading (Brychko & Semenoh, 2018; Helmi et al., 2021; Vitasurya, 2016).

Several research results prove that to achieve sustainability in forest management, namely through optimizing the role and participation of the community

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and other parties (Addison et al., 2019; Miah et al., 2021). The complexity of formulating an effective forest management system, coupled with the need for involvement from various stakeholders, necessitates careful consideration and thorough study in developing a sustainable forest management model (Asteria et al., 2021; Ford et al., 2020).

The concept of sustainable development emphasizes community participation in forest development processes, aiming to enhance the welfare of rural residents, including those living in and around forest areas. This approach encourages community involvement in decision-making and empowers them to transform their livelihoods. Furthermore, sustainable development efforts strive to synchronize and integrate the three pillars of development—economic, socio-cultural, and environmental (ecological) aspects—ensuring they are interconnected and mutually supportive rather than conflicting (Baumgartner, 2019; Ehrhart & Schraml, 2018).

Several studies have stated that to achieve sustainability in forest management, local roles are also needed. The local wisdom possessed by the community is used as a reference in the management and conservation of forest areas, both in the form of myths and taboos (Helmi et al., 2021). This local knowledge and wisdom should be utilized by conservation area managers to support area conservation activities. In several forestry policies, there are several activities that may involve communities around the forest, such as conservation area rehabilitation activities, conservation area restoration, utilization of environmental services, utilization of non-timber forest products, conservation area security, and habitat development (Brychko & Semenoh, 2018; Mutaqin et al., 2021). Local wisdom applied in several areas has been proven to be able to maintain the sustainability and sustainability of resources. This local wisdom, if practiced correctly and seriously, will become norms, ethics, and morals that can guide the community to be more concerned and responsible for the environment (Hakim et al., 2018; Handoko & Yumantoko, 2015).

The concept of sustainable development, which involves community participation in the forest development process, aims to improve the welfare of rural residents—especially those living in and around forest areas—by enabling them to participate in decision-making and transform their livelihoods. Additionally, sustainable development efforts seek to synchronize, integrate, and balance three key aspects of development: economic, socio-cultural, and environmental (ecological). These aspects must be interconnected and complementary, without contradicting each other (Baumgartner, 2019).

In the context of the Kulawi Forest Management Unit (KPH), this concept manifests as the creative economy of forest resources, driven by the local community. This is closely tied to the existing state of community empowerment, which involves a range of challenges and issues that need to be addressed in order to improve both welfare and forest preservation. Forest management in the Kulawi KPH largely focuses on the development and optimization of social forestry patterns, which include thirteen village forests, one community forest, and five customary forests.

Common challenges in community empowerment aimed at optimizing forest management include issues related to community involvement, access to natural resources, knowledge and skills, conflicts of interest, and environmental conservation. Forests play a critical role in the livelihoods of communities living nearby, contributing to the local economy. However, this dependency can also threaten the sustainability of forest ecosystems. Therefore, the utilization of forest resources must be directed toward sustainable management practices.

A study on community empowerment in forestry commodity management is essential for optimizing the management and utilization of natural resources in Central Sulawesi Province. This research aims to identify the factors influencing community empowerment in resource management, which will provide the basis for developing strategies to enhance community involvement in managing forestry commodities in the region.

Method

This research uses a qualitative descriptive method, namely research that is directed to find facts in the field based on the potential and factual symptoms at the research location. The selection of research locations in the KPH Kulawi working area (Marena Village; Salua Village and Rogo Village) was carried out purposively, by considering the existence of communities that carry out participatory forest management based on local wisdom, as well as empowerment schemes that have been implemented, both through the Social Forestry program and independently in forest farmer groups. Then, the last step is to carry out SOAR analysis. SOAR is used to create strategic thinking and design that involves all stakeholders in the thinking process (Stavros and Cole 2015). SOAR's emphasis is on internal strengths (Anam, 2020; Hati et al., 2021), but it also has a broader perspective than SWOT analysis because it can predict the future of external points and elements. The factors analyzed using SOAR were obtained from various information, literature, interviews and direct findings in the field so that a number of factors were

obtained which were again presented as questions in the questionnaire which had to be answered by respondents and key informants so that variables that influenced the development of forest management were obtained.

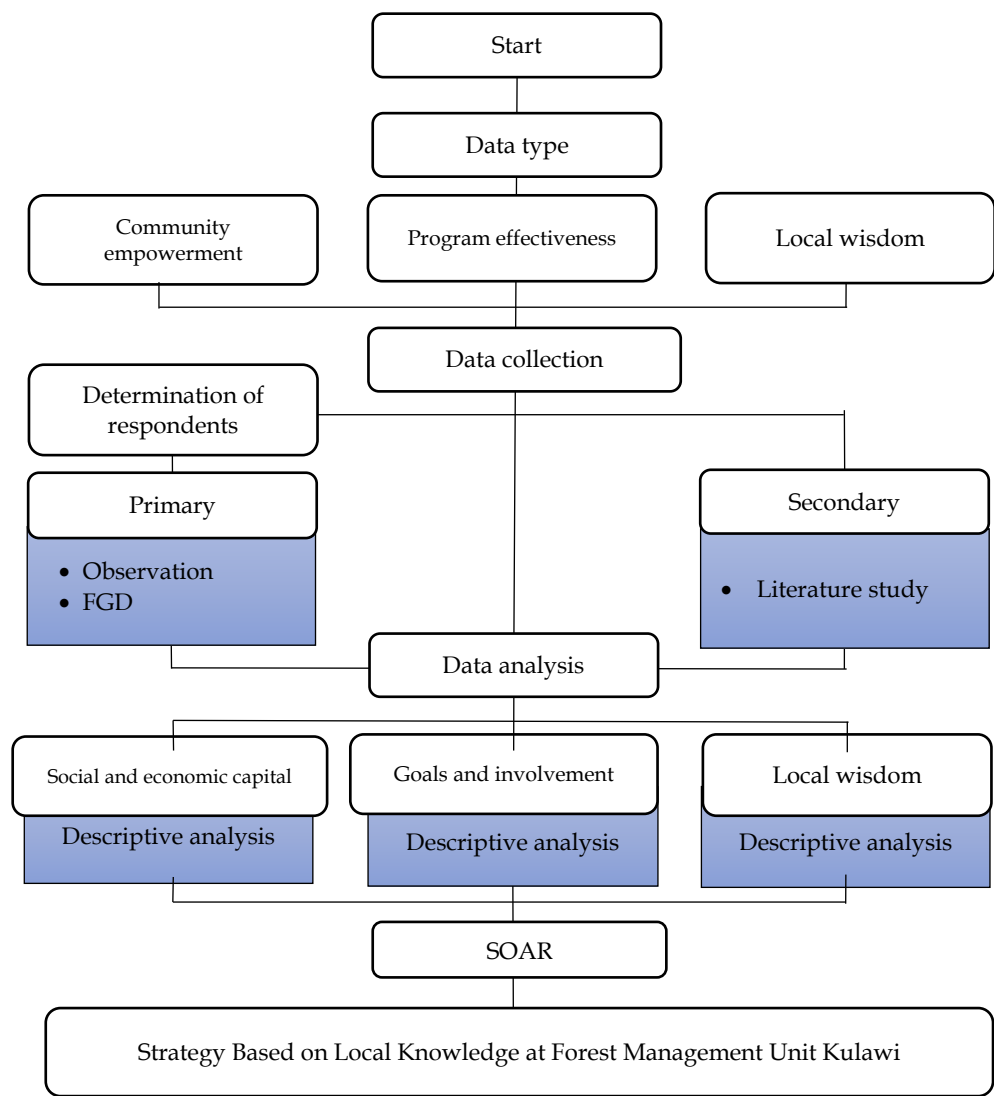


Figure 1. Research flow

Table 1. Details of types and sources of research data

Objective	Data Types	Methods and Data Sources
Analyzing the effectiveness of community empowerment	- List of Community Empowerment Programs - Exchange and transfer of information related to forest utilization in empowerment programs - Motivation and perception of respondents towards empowerment activities	Interview results, observation results and literature studies
Forms of local community wisdom and their relationship to government regulations	- Customary spatial division rules - Rules on the utilization of forest resources - Rules on limitations on the utilization of forest resources - Rules on sanctions for the utilization of forest resources - Formal rules of law that apply to the utilization of forest resources	Interview results, observation results and literature studies

Result and Discussion

Community Empowerment in Forestry Commodity Management

Community empowerment is an important concept in sustainable development, especially in the context of managing natural resources such as forests. (Arifah et al., 2023; Cao et al., 2023; Golar et al., 2021). This concept focuses on enhancing the capacity of individuals and groups within society to actively and effectively participate in decision-making and resource management that directly impacts their lives (Handayani, 2022; Jameaba., 2022). The study's findings revealed that, among the three different forms of forest management, the majority of participants were of productive age. This allowed members of the forest farmer groups to perform more effectively, demonstrating enthusiasm and high motivation in their roles.

This age group also plays a crucial role in understanding how traditional knowledge and practices are transferred across generations. Such insights are valuable in assessing the success of empowerment programs in preserving and promoting local wisdom. By gathering this information, empowerment programs can be designed to be more effective and tailored to the specific needs and potential of different age groups within the community (Figure 1-3).

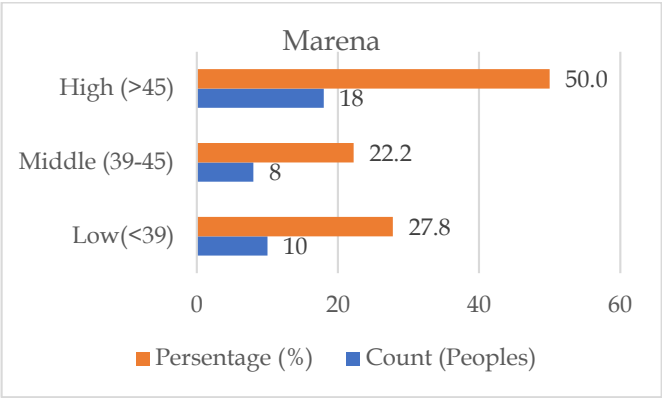


Figure 1. Respondents' age characteristics at Marena

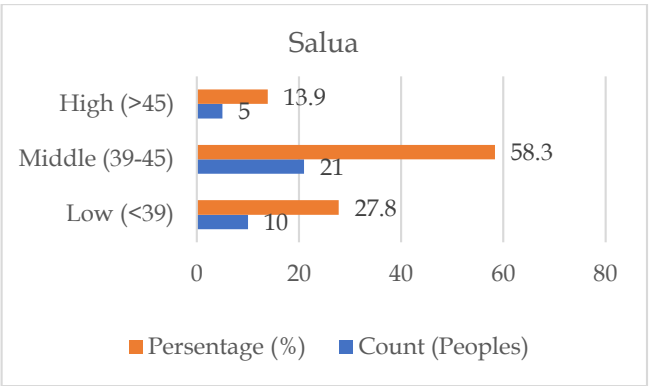


Figure 2. Respondents' age characteristics at Salua

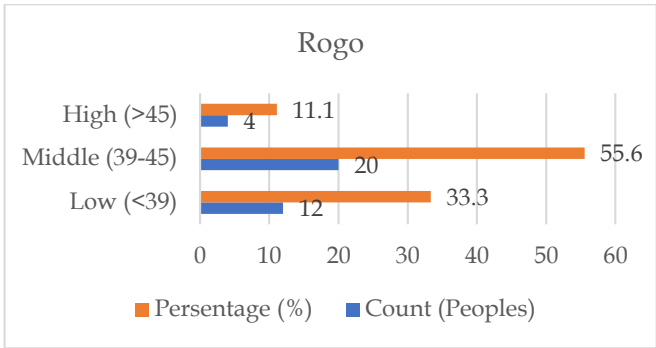


Figure 3. Respondents' age characteristics at Rogo

Understanding the education level of respondents is a key foundation for designing more targeted and effective empowerment programs. It ensures that these programs are accessible to and usable by all community members, regardless of their educational background. Education levels help identify the specific needs and potential contributions of individuals in forest management, thereby supporting the overall empowerment of the community.

Education shapes and increases a person's knowledge to be able to do things more quickly and accurately, so the higher a person's level of education, the greater the performance achieved. (Muncharaz et al., 2015; Schröter & Dingeldey, 2016). In this study, education levels are categorized into three, namely low, medium, and high. The low level of education includes: Elementary and Middle School, for the medium category includes: High School, while for the high category includes: Diploma, and College.

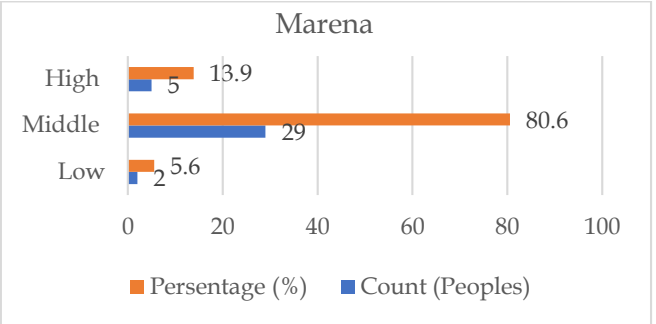


Figure 4. Respondents' Education Characteristics at Marena

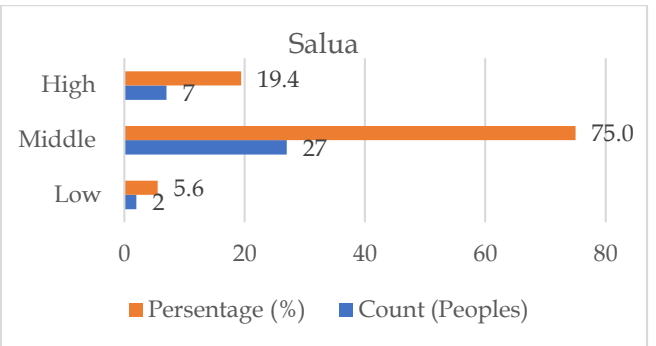


Figure 5. Respondents' Education Characteristics at Salua

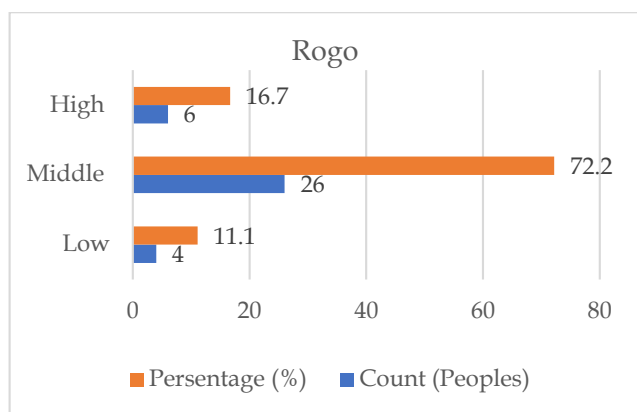


Figure 6. Respondents' Education Characteristics at Rogo

The picture above shows that the level of education of respondents in several forms of forest management is classified as moderate. This can indicate one of the tendencies of inhibiting factors in the development of forest farming businesses that are carried out. So that education greatly influences a person's mindset, especially in terms of decision making and management in managing a business.

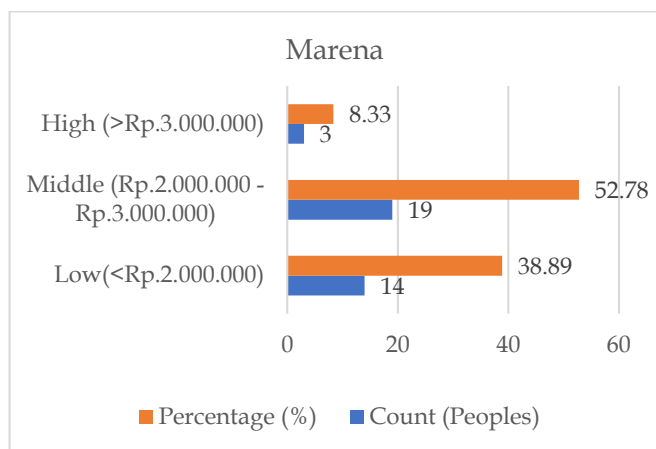


Figure 7. Level income of respondents at Marena

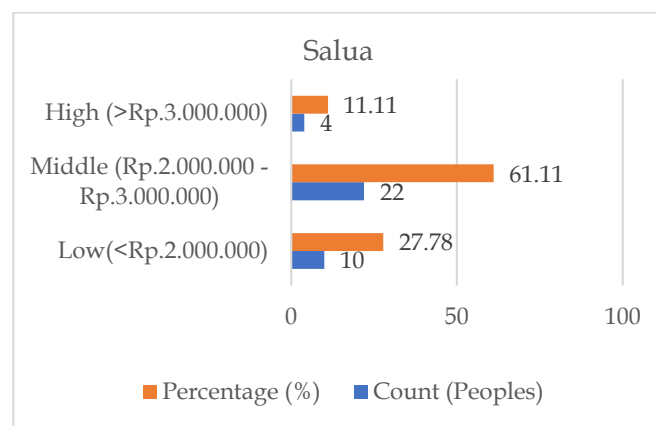


Figure 8. Level income of respondents at Salua

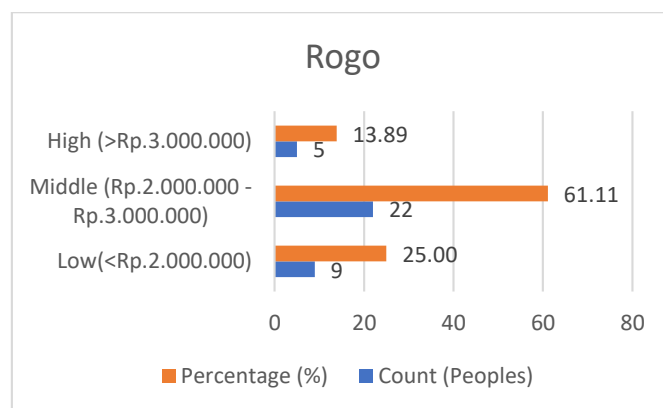


Figure 9. Level income of respondents at Rogo

The relationship between respondents' income and community participation in various forest management models is dynamic and context-dependent. In some cases, respondents have diversified their income through activities such as managing non-timber forest products (NTFPs) and implementing agroforestry systems. Active participation in these activities enables local communities to utilize forest resources sustainably while improving their economic well-being.

The study suggests that when communities have a direct economic stake in preserving forests and their resources, they are more likely to engage in sustainable forest management efforts. Additionally, the economic benefits derived from forest resources provide stronger incentives for communities to adopt and advocate for environmentally friendly management practices.

The exploitation of forest commodities, such as NTFPs and agroforestry, not only increases community income but also raises awareness of the importance of forest conservation. This demonstrates how enhancing community income can positively influence participation in forest management while fostering a stronger connection between economic development and environmental sustainability.

Effectiveness of Community Empowerment

Community empowerment in forest management necessitates a comprehensive approach involving the implementation of relevant and measurable programs (Yalcin & Leroux, 2018). These programs should focus on building capacity, diversifying economic opportunities, and enhancing community participation in decision-making processes. Regular evaluation of these programs' effectiveness is crucial to ensure that empowerment objectives are met successfully. Additionally, such evaluations should consider the sustainability of forest resources and the overall well-being of local communities, ensuring a balanced and long-lasting impact (Henriksen et al., 2023).

To assess the effectiveness of community empowerment initiatives based on relevant programs, several key aspects can be evaluated as focal points of community empowerment (Luisi & Hämel, 2021; Mardhiah et al., 2018). A matrix can be used to visualize the relationship between these programs and their effectiveness in achieving predefined goals. This matrix serves as a valuable tool for identifying strengths and gaps in community empowerment efforts.

By considering all elements outlined in the matrix, village forest management institutions can systematically evaluate and refine their approaches. This iterative process ensures that programs are more effective in enhancing community capacity, promoting active participation, and maintaining environmental sustainability in a holistic manner.

Table 2. The Relationship between the Effectiveness of Community Empowerment and Relevant Programs at the Marena Customary Forest Institution

Empowerment Program / Aspect	Program Objectives	Community Involvement	Program Achievement
Strengthening Customary Institutions	Strengthening customary institutions in managing customary forests and ensuring the sustainability of customary values.	- Participation in customary decision making. - Involvement in institutional training and workshops.	- Decisions consistent with customary values. - Increasing the capacity of customary institutions.
Indigenous Education and Training	Improving the knowledge and skills of indigenous communities in sustainable forest management and cultural preservation.	- Training in sustainable forest management techniques. - Education on the importance of indigenous and natural conservation.	- Implementation of sustainable forest management practices. - Preservation of indigenous knowledge and practices.
Custom-Based Economic Development	Encourage economic diversification of indigenous communities through sustainable and customary-based use of forest resources.	- Development of small and medium enterprises based on customary forests. - Marketing of customary products and non-timber forest products.	- Increasing the income of indigenous peoples. - Diversification of income sources based on local wisdom.
Monitoring and Evaluation(M&E)	Ensuring transparency and accountability in the management of customary forests and the impact of programs on the welfare of indigenous communities.	- Indigenous community participation in M&E systems. - Participatory data collection and program evaluation.	- Accurate and relevant impact evaluation. - Data-based decision making and indigenous community feedback.

Table 3. Relationship between the Effectiveness of Community Empowerment and Relevant Programs in the Singganipura Forest Farmer Group

Empowerment Program / Aspect	Program Objectives	Community Involvement	Program Achievement
Agroforestry Development	Integration of agriculture and forestry, increasing land productivity and conserving forest resources.	- Agroforestry technique training. - Participation in planning and implementation. - Application of agroforestry practices in agricultural land.	- Increased agricultural and forestry yields. - Conservation of land and water resources.
education and training	Increasing knowledge about sustainable agricultural practices, forest management, and climate change adaptation.	- Regular training on agroforestry techniques. - Education on sustainable forest management.	- Improved skills in managing forest resources. - Implementation of sustainable agricultural practices.
Non-Timber Forest Business Management	Diversification of income from non-timber forest products such as fruits, hardwoods, and medicinal materials.	- Development of non-timber forestry businesses. - Marketing of non-timber forestry products.	- Increasing income from non-timber forest products - Diversification of community income sources.
Participation in Decision Making	Ensuring active participation in decision-making related to forest resource management.	- Participatory forums and public consultation.- Involvement in program planning and evaluation.	- Policies that reflect the interests of the community. - Increased public acceptance and satisfaction with the decisions taken.

Table 4. Relationship between the Effectiveness of Community Empowerment and Relevant Programs at the Rogo Village Forest Management Institution

Empowerment Program / Aspect	Program Objectives	Community Involvement	Program Achievement
Participation in Decision Making	Ensuring active community participation in decision-making related to village forest management.	- Participatory forums and public consultation. - Participation in policy planning and evaluation. - Democratic election and appointment of institutional administrator.	- More inclusive and representative decisions of the community. - Policies that are more accommodating to local needs.
education and training	Improving community knowledge and skills in sustainable forest management and agricultural practices.	- Technical training on forest and agricultural management. - Education on the importance of natural resource conservation.	- Implementation of sustainable practices in people's daily lives. - Increasing independence in managing natural resources.
Sustainable Economic Development	Supporting community economic diversification through sustainable management of forest resources.	- Development of local economic enterprises. - Effective marketing of forest products. - Training in business and financial management.	- Increased income and welfare of rural communities. - Reduced pressure on forest resources.
Monitoring and Evaluation (M&E)	Ensuring transparency and accountability in the management of village forest resources and the impact of programs on communities.	- Structured and participatory M&E system. - Involve communities in data collection and program evaluation. - Provide feedback mechanisms for communities.	- Accurate and reliable impact evaluation. - Decision making that is more evidence and data-driven.

Optimizing Local Wisdom in Forestry Management

Local wisdom refers to the knowledge, norms, values, and practices that develop in a particular region or community. Its relationship with government regulations is very important because it can affect various aspects of community life. Accommodating local wisdom in forest management regulations is important because it involves aspects of ecological balance, social sustainability, and cultural preservation. Local wisdom, which is reflected in local community knowledge about forest ecosystems and sustainable ways of utilizing natural resources, can be a valuable foundation in supporting ecological balance (Hasmira et al., 2021; Sari et al., 2022; Susanti et al., 2020).

Understanding and recognizing traditional practices in government regulations can help protect forest ecosystems from damage that may arise from policies that are not in accordance with local conditions (Taylor & Cheng, 2012). In addition, integrating local wisdom into forest management can increase community participation in environmental conservation, because communities have a direct interest in the sustainability of the ecosystems where they live.

Based on the result of study, Marena Customary Forest revealed that the majority of individuals involved

in forest management are indigenous people from the Kulawi ethnic group, who have lived in and inhabited Boya Marena for generations. A smaller portion of participants are migrants from the Rampi and Seko ethnic groups of Luwu Regency, South Sulawesi Province. This cultural composition is reflected not only in daily life but also in the management of natural resources. Philosophically, the To Kulawi Uma customary law community is guided by the principles of hintuwu and katuwua. Hintuwu governs relationships between humans, promoting harmony and mutual respect within the community, while katuwua regulates the relationship between humans and nature, emphasizing sustainable and respectful interactions with the environment.

Meanwhile, in the Singganipura farmer group, the concept of local wisdom in the community in the Singganipura forest farmer group is a cultural aspect that must be considered in forest management activities, because forests often have deep symbolic and ritualistic values for local communities. By incorporating local wisdom, government regulations can provide a legal basis that respects and involves local communities, thus creating a more sustainable, equitable, and culturally diverse forest management model. Slightly different from forest management in forest management carried

out by customary forest institutions, forest management carried out by the Singganipura farmer group does not only focus on forests but also leads to the division of agricultural and plantation land. This is possible because the focus of Kelola is not only on forest areas but also forestry efforts outside forest areas.

Then Based on the results of the study on the Forest Management Model in Rogo, it was found that the average community involved in forest management is mostly indigenous people from the Kaili ethnic group. Slightly different from the other two forms of forest management. The local wisdom of the Kaili community which has a correlation with the culture of togetherness sintuvu has the meaning of mutual cooperation in the concept of forest management with the community.



Figure 10. A local wisdom at research location

The wisdom of sintuvu in the Kaili community can be divided into three large parts, namely nosarara nosabatutu, ada nosibolai, and libu ntodea, these three things are considered to be values in society that are able to express values about togetherness in sustainable forest management. These values are relevant to be studied in order to find values that originate from the community to become social capital in forestry development in Central Sulawesi.

Strategy to increase community participation through local wisdom potentiall

Community empowerment in sustainable forest management focuses on increasing the capacity of communities to be actively involved in maintaining and utilizing forests sustainably (Anam, 2020; Elysi et al., 2018). Local wisdom-based management prioritizes the use of time-tested traditional knowledge and practices in managing natural resources, especially forests. The following is a SOAR analysis in matrix form related to strategies for increasing community participation through the potential of local wisdom in sustainable forest management (Hati et al., 2021; Hong et al., 2020).

Table 5. Community Empowerment Improvement Strategy

Component	Key points
Strengths	• Deep Knowledge of Local Ecosystems • Sustainable Traditional Practices • Sense of Collective Responsibility • Utilization of Local Resources • Acceptance of Conservation
Opportunities	• Support from Government Policy • Partnership with Academics and NGOs • Nature-Based Ecotourism Potential • Development of Local Products with High Economic Value • Access to Sustainable Funding Programs
Aspirations	• Building Sustainable and Productive Forests • Becoming an Empowered Community in Forest Management • Increasing Environmental Awareness of the Young Generation • Strengthening Cultural Identity in Conservation • Becoming a National Model for Community-Based Conservation
Results	• increasing the Level of Community Participation in Conservation • Reducing the Rate of Forest Destruction • Economic Welfare Through Non-Timber Forest Products • Raising Awareness of the Importance of Sustainable Forests • Strengthening Social and Cultural Relations in Conservation

Each of the strategies outlined above contributes to increasing community participation by focusing on local strengths and external opportunities, while maximizing desired outcomes for forest conservation. Prioritizing local wisdom is a proven approach to boosting community involvement in sustainable forest management. This strategy involves exploring traditional knowledge and integrating it with scientific principles to enhance conservation practices.

Inclusive collaboration, such as through Social Forestry, enables local communities to actively engage in environmental conservation while also benefiting economically, for example, through community-based agroforestry and ecotourism programs. This approach fosters shared decision-making, positioning communities as partners in forest management rather than passive users or guardians. Strong partnerships between government, conservation agencies, NGOs, and local communities form the foundation for creating joint action plans that combine modern technology with local wisdom.

Empowering communities in decision-making, monitoring, and implementing forest management programs is another key focus (Sharma-Wallace et al., 2018). By providing communities with the necessary technical support and resources, they can manage resources independently. This strategy, supported by education, outreach, and the development of sustainable business models, not only increases community participation in forest management but also strengthens their role in preserving the sustainability and balance of forest ecosystems.

Increasing community participation in sustainable forest management can be achieved by harnessing the potential of local wisdom held by the community. In efforts to manage forest resources participatorily and based on local knowledge, several strategies identified through SOAR analysis include steps to raise ecological awareness and strengthen the local economy through non-timber forest resources.

The first strategy, increasing ecological awareness, aims to educate the community on the positive impacts of sustainable local practices on the ecosystem. With a deeper understanding, the community is better positioned to support forest sustainability and actively engage in maintaining biodiversity. Additionally, integrating local knowledge into both formal and informal curricula ensures the transmission of traditional knowledge, which is rich in nature conservation values.

A key part of this effort is the partnership strategy for documenting local knowledge, which involves collaboration among the government, academic institutions, and NGOs to document traditional practices effective for environmental conservation. The development of community-based ecotourism is another crucial element, enabling communities to introduce sustainable forest management to tourists while bolstering the local economy.

The social solidarity strategy focuses on optimizing mutual cooperation for forest patrol activities, ensuring active community involvement in forest monitoring and maintaining ecosystem sustainability. Furthermore, the strategy of implementing sustainable traditional practices through customary rules seeks to align forest utilization with conservation principles.

To support local economic empowerment, the promotion of non-timber forest-based businesses is key, such as forming cooperatives to manage and market forest products sustainably. Government policy support programs are also vital, helping communities access resources to develop environmentally friendly, economically valuable local products. Through collaboration and active community involvement, this comprehensive approach aims to balance environmental

conservation with the economic welfare of the community.

Conclusion

Community empowerment in forestry commodity management around KPH Kulawi has shown early progress, with initial involvement in forestry activities. However, there is a pressing need to enhance their capacity, particularly in sustainable forest management skills and conservation-based practices. Strengthening these aspects will enable communities to participate more effectively in forestry activities that promote both environmental conservation and economic benefits.

Local wisdom plays a significant role in forest management, including customary practices in resource utilization and cultural values that emphasize respect for forests. Integrating these traditional practices into forest management systems can serve as a mechanism for ecosystem protection, support environmental balance, and become an essential element of participatory and sustainable forest management.

To increase community participation, several strategies can be implemented. These include strengthening local institutions such as forest farmer groups, offering continuous training programs, and developing community-based ecotourism models. By integrating the community into all stages of forest management, these approaches foster a stronger sense of ownership and responsibility, contributing to the long-term sustainability of forest ecosystems.

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Author Contributions

Conceptualization, D; methodology, D., G., N; validation, D. G., N. ; formal analysis, D. A.M., I.R; investigation, D., H.M., S.D.M., A.D., R.Y., S.M.S; resources, D., G., N; data curation, D: writing—original draft preparation, D., G., N; writing—review and editing, D., R.Y., S.M.S; visualization, D. All authors have read and agreed to the published version of the manuscript.

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Conflicts of Interest

The authors declare no conflicts of interest.

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