



Integrating Environmental Conservation and Economic Empowerment: Lessons from Temanggung's Coffee Sector

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ABSTRACT

Purpose – This study aims to explore the sustainability of Temanggung's coffee agriculture and industry from a community-based conservation (CBC) perspective by identifying the socio-cultural, economic, and ecological values that support sustainable development.

Design/methods/approach – Using a qualitative approach, the study was conducted in Kalikajar Subdistrict, Temanggung Regency. Data were collected through field observations, in-depth interviews with six key informants from various stakeholder backgrounds (farmers, processors, government officials), and literature review. The findings were analyzed using descriptive interpretation supported by a conceptual mind map illustrating CBC processes and interactions.

Findings – The research found that CBC in Temanggung has successfully integrated environmental conservation and economic empowerment. Three interrelated values—socio-cultural (coffee as a social connector and tradition), economic (increasing income and market awareness), and ecological (soil protection, reforestation, and organic farming)—are sustained through active roles of local stakeholders. Institutions such as farmer groups, government bodies, and coffee processors collaborate to promote sustainable coffee practices. Community awareness of environmental protection is also deeply embedded in local identity and action, strengthening social capital and resilience.

Research implications/limitations – This study is limited to one region and may not fully represent all rural agricultural contexts in Indonesia. However, it offers a practical model of how local participation and conservation can be integrated for sustainable agroeconomic systems, especially in mountainous areas.

Originality/value – The study contributes to the limited literature on integrated community-based conservation and economic development in Indonesia's coffee sector. It highlights the potential of CBC as a bottom-up strategy for balancing environmental sustainability and rural economic growth, with lessons applicable beyond the Temanggung region.

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Introduction

Agricultural sustainability is increasingly essential amidst global environmental challenges, food insecurity, and the effects of climate change. As global challenges intensify, the need for sustainable agricultural practices

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becomes critical to ensure food security and mitigate environmental degradation. Sustainable agriculture helps balance economic growth with ecological health, especially in developing regions where livelihoods heavily depend on farming (Velten et al., 2015; Mukherjee, 2021). Furthermore, sustainable practices address the urgent need for adaptation strategies that can cope with challenges arising from climate variability and soil degradation (Barbier & Hochard, 2016; Gebre & Rahut, 2021).

For instance, recent research indicates that comprehensive strategies that incorporate sustainable farming methods, such as conservation agriculture, can improve productivity while preserving ecosystems, which is increasingly crucial for rural communities (Shahbaz et al., 2023). In developing countries where farmers rely on cash crops for income, adopting sustainable agricultural practices can enhance farmers' resilience against economic and environmental shocks (Girsang, 2023). This connection between sustainable agriculture and improved livelihoods is further supported by studies suggesting that innovations in agricultural practices can lead to economic empowerment and food security (Pancino et al., 2019). The pressure on agricultural systems due to climate change and food demand underlines the significance of sustainable agriculture as a pivotal model for rural development. The coffee sector in areas like Temanggung serves as an example of how community-based conservation approaches can successfully integrate agricultural sustainability with economic growth, demonstrating positive impacts across local communities (Irani & Sharif, 2016).

The case of Temanggung illustrates how community-based approaches can drive sustainable agricultural practices. The coffee industry in Temanggung provides a unique model that embodies the principles of sustainable agriculture through community engagement and local resource management. By leveraging local knowledge and practices, communities can foster agricultural systems that meet their current economic needs while safeguarding their ecological environment (Raza et al., 2023). Evidence shows that community-led initiatives often lead to better environmental practices and increased biodiversity, as demonstrated in various case studies (Ayiti & Babalola, 2022). For instance, utilizing traditional agricultural systems not only addresses food security issues but also enhances ecosystem services such as soil conservation and carbon sequestration (Smith et al., 2019). Furthermore, the introduction of Voluntary Sustainability Standards (VSS) within agricultural practices can significantly mitigate negative

environmental impacts, aligning agricultural production with broader sustainability goals (Zhang et al., 2017). Thus, the agricultural practices adopted in Temanggung exemplify how community participation in sustainability initiatives can effectively address both ecological and economic challenges in agriculture. Through these community-based models, rural areas can enhance their resilience and ensure a sustainable future for their agricultural sectors (Hu et al., 2019).

Temanggung, located in the mountainous region of Central Java, Indonesia, exhibits a unique geographical setting characterized by its fertile volcanic soils, which contribute significantly to its agricultural productivity, notably in coffee cultivation. The combination of volcanic soil and a mountainous landscape creates an ideal environment for agriculture, particularly coffee production, as these soils are rich in nutrients and well-suited for sustaining the growth of high-quality coffee plants Costea et al. (2022). Moreover, the diverse topography contributes to both agricultural richness and challenges such as soil erosion and land degradation that threaten sustainability (Ahmad et al., 2023; Räsänen et al., 2021). Despite these environmental risks, Temanggung's agricultural sector remains resilient, largely due to traditional practices that embrace the local environmental conditions. Studies indicate that such mountainous regions have adapted various strategies to manage soil health and combat erosion, including the application of biochar or conservation agriculture practices (Rončák et al., 2023). These proactive measures help maintain soil quality and prevent the detrimental effects of erosion, which can lead to reduced agricultural productivity (Cerdà & Terol, 2021). The ability of Temanggung to thrive agriculturally despite facing significant environmental challenges illustrates the resilience and adaptability of its farming communities. The fertile volcanic soils, although subjected to risks like erosion, have enabled a flourishing coffee industry that not only serves economic purposes but enriches the cultural identity of the local population.

Coffee in Temanggung transcends mere economic value, being deeply integrated within the social and cultural framework of the community. The strong tradition of coffee consumption in Temanggung fosters a set of cultural practices and social interactions that enhance communal bonds and inform local identity. As coffee is more than just an agricultural product; it is woven into the social fabric, shaping local customs and contributing to the regional economy (Koirala et al., 2019). Research indicates that such

agricultural products often serve as vehicles for cultural expression and community engagement, enhancing social cohesion and providing avenues for local economic opportunities (Mhazo et al., 2016). In mountain areas like Temanggung, the cultural significance of crops like coffee enhances community resilience, allowing for innovations in cuisine, tourism, and local businesses that capitalize on this asset (Rana et al., 2021). Thus, the coffee sector in Temanggung acts as a catalyst for socio-economic development, embedding itself within the community's identity and reinforcing the importance of sustainable agricultural practices that protect both the environment and cultural heritage. This illustrates the interconnectedness of ecological and community development perspectives, presenting coffee cultivation in Temanggung as a vital area of research for understanding both agricultural sustainability and cultural dynamics in socio-economic contexts (ERDOĞAN & Ari, 2022).

The increasing trend of coffee consumption in Indonesia has significantly influenced local agricultural practices, particularly in Temanggung, where farmers are shifting towards coffee farming. This shift towards coffee cultivation has been catalyzed by various factors, including rising coffee consumption from an estimated 1.13 kg per capita in 2019, and Indonesia's status as a major player in the coffee market, accounting for 13.5% of coffee production in the Asia-Pacific region (Zayadi et al., 2023). Additionally, government programs supporting agricultural development since 1998 have incentivized farmers to adopt coffee farming as a viable economic activity (Achmad et al., 2022). This change aligns with a broader trend of agricultural diversification aimed at enhancing local livelihoods, especially in rural areas where economic opportunities are limited. Studies have shown that the increasing demand for coffee directly translates into higher farm gate prices, thus motivating local farmers to transition their practices towards coffee production. The government programs implemented since the late 1990s have provided essential resources and training for farmers, leading to observable improvements in coffee yield and quality (Duffy et al., 2021). Furthermore, the rise in coffee farming has been instrumental in empowering local communities economically and socially as coffee becomes a primary source of income, enhancing food security and community cohesiveness (Sudomo et al., 2023). The evolution of coffee cultivation in Temanggung serves as a remarkable example of how market dynamics, supported by government initiatives, can facilitate agricultural transformations and

community development. The intertwining of economic pursuits with social and environmental responsibilities provides a case study illustrating how agroforestry practices, specifically adopted by coffee farmers, help restore degraded lands and mitigate soil erosion (Zinngrebe et al., 2020)(Shin et al., 2020; .

These developments in Temanggung are not purely economically driven; they are also significantly motivated by environmental considerations. The pressures of soil erosion and land degradation in the region have necessitated a response from farmers that goes beyond just profit-seeking endeavors. Agroforestry practices, which combine agricultural and forestry practices, have emerged as a critical method for addressing environmental degradation while supporting economically sustainable farming (Hartoyo et al., 2019). The government has recognized the need for environmental stewardship, thus advocating for agroforestry systems that can restore landscapes while boosting agricultural productivity (Achmad et al., 2022). Research has indicated that agroforestry systems effectively improve soil health, enhance carbon sequestration, and restore degraded landscapes (Hartoyo et al., 2019). In Temanggung, local farmers have embraced practices such as coffee intercropping with shade trees, which not only enhances the microclimate for coffee growth but also reduces soil erosion and increases biodiversity (Zinngrebe et al., 2020). This not only proves beneficial agriculturally but also contributes to broader ecological goals, such as maintaining ecosystem services that are fundamental for long-term agricultural sustainability (Sudomo et al., 2023). Thus, the community-driven transition to coffee farming in Temanggung illustrates how environmental necessities can align with economic opportunities, leading to sustainable outcomes through agroforestry practices. The integration of these approaches not only supports farmers' livelihoods but also fosters environmental resilience, making the region's agricultural practices exemplary of sustainable development (Shin et al., 2020; Zayadi et al., 2023).

The increasing trend of coffee consumption in Indonesia, which stood at 1.13 kg per capita in 2019, significantly influences local agricultural practices, particularly coffee farming in Temanggung, driven by initial support from government programs tracing back to 1998. This rising coffee consumption trend, accounting for a substantial percentage of total consumption among Asia-Pacific developing countries, encourages local farmers to transition towards coffee farming as a profitable venture. This shift not only serves as a

response to escalating market demands but also underscores the role of governmental support in facilitating agricultural diversification within local economies (Romario et al., 2021). Government initiatives have provided necessary resources and training, enabling farmers to enhance productivity and enter lucrative markets, thus fostering economic growth. The data reveal that Indonesia's national coffee output reached 794.8 thousand tons in 2022, illustrating a robust growth trajectory (Romario et al., 2021). Furthermore, studies have shown that the increase in coffee production can elevate the socio-economic status of rural communities by providing employment and ensuring food security (Sulandjari et al., 2023). In Temanggung, the shift to coffee cultivation, supported by the government's agricultural programs, has led to improvements in farmers' livelihoods, and the adoption of coffee farming has become a strategic response to both market needs and environmental challenges. The rising trend of coffee consumption in Indonesia is pivotal in shaping local agricultural practices in Temanggung. It encourages farmers to adopt coffee cultivation, backed by government support since 1998, highlighting a correlation between consumer demand and agricultural adaptation. This transformative shift not only stimulates economic growth but also enhances community welfare within the agricultural sector.

The environmental aspect of this agricultural shift is significant, as the movement towards coffee farming is motivated by the dual needs of economic development and environmental restoration. Farmers in Temanggung face environmental challenges such as soil erosion and land degradation, which necessitate sustainable agricultural practices. The adoption of agroforestry practices not only addresses these ecological issues but also provides an avenue for restoring degraded land while enhancing agricultural productivity (Susminingsih et al., 2021). Agroforestry systems, where coffee is integrated with tree planting and land conservation efforts, aim to create a balance between economic viability and environmental sustainability. Research indicates that agroforestry techniques can significantly reduce soil erosion, increase biodiversity, and improve overall soil health, aligning economic incentives with ecological benefits (Syifahati et al., 2023). In Temanggung, the practices implemented by coffee farmers—such as intercropping coffee with shade trees—serve to combat erosion and enhance land usability, fostering an ecological restoration agenda that coincides with local economic goals (Chuaca et al., 2022). The shift towards

coffee farming in Temanggung reflects a community-driven initiative that intertwines economic ambitions with environmental stewardship, showcasing the capacity of agroforestry practices for promoting sustainable outcomes. The joint focus on community empowerment and ecological conservation illustrates the importance of integrating environmental needs within agricultural development strategies.

The role of Community-Based Conservation (CBC) is crucial in analyzing this phenomenon, as it positions local communities at the forefront of environmental decision-making. CBC emphasizes participatory approaches that foster local engagement in natural resource management, creating a platform for communities to balance ecological sustainability with socio-economic growth (Rosemiarti & Basrowi, 2023). According to Berkes (2004), CBC promotes the empowerment of local communities, ensuring their active involvement in stewardship over their natural resources and decisions influencing their livelihoods. Studies support that CBC initiatives can significantly enhance environmental conservation efforts while simultaneously addressing community needs, although critics point out challenges related to institutional coordination and equitable resource distribution (Prilliadi & Birinci, 2023). In Temanggung, examining the values and institutions within the coffee industry reveals how stakeholders interact, highlighting the complexities of implementing CBC principles in practice (Purnomo et al., 2021). The application of the CBC lens to the coffee farming transition in Temanggung provides valuable insights into how community-driven initiatives and environmental policies converge to foster sustainable practices. This investigation into stakeholder interactions and institutional frameworks may inform broader discussions on agricultural sustainability in similar contexts (Prayitno et al., 2022).

This study is particularly relevant given the increasing need to scale community-based strategies that promote **resilience and sustainability** in agricultural sectors, especially in post-pandemic recovery efforts. The article contributes to the growing literature on sustainable development, agroecology, and grassroots environmental governance by documenting how a rural Indonesian community aligns cultural identity, ecological stewardship, and economic productivity through coffee. The structure of this paper is as follows: after this introduction, we describe the literature that frames our understanding of conservation and community engagement. We then outline the methodology used for data collection and analysis. Following that, we

present our findings organized around three core value dimensions—socio-cultural, economic, and ecological. Finally, we discuss the implications of our findings and conclude with reflections on the potential for replicating this model in other settings. This paper aims to demonstrate that Temanggung’s coffee sector is not only a case of local economic innovation but also a compelling example of how **community-based conservation** can drive sustainability from the ground up.

Methods

This study adopts a **qualitative case study** approach to explore the sustainability of coffee agriculture and industry in Temanggung Regency, Central Java, through the lens of community-based conservation (CBC). The research was conducted from **June to August 2021** and centered in **Kalikajar Subdistrict**, a mountainous area known for its smallholder coffee farms and strong community engagement in environmental practices.

Research Design

The research employed a **descriptive qualitative design** with a community-based case study method. This approach was chosen to gain in-depth insights into how local communities integrate socio-cultural, economic, and ecological values into sustainable coffee farming practices. The design enabled a holistic understanding of the institutional processes and stakeholder interactions that shape conservation outcomes.

Population and Sample

The target population consisted of actors involved in the coffee agriculture and processing sectors in Kalikajar. Using **purposive sampling**, six key informants were selected based on their direct involvement and diverse roles in the coffee value chain. These included:

- A senior farmer with over 20 years of experience
- A coffee processor and trader
- A local café owner using Temanggung-sourced beans
- A representative from a farmers’ cooperative
- A government official from the agriculture office
- An environmental NGO field staff member

The selection was intended to capture a variety of perspectives, both institutional and individual, on the implementation and impact of CBC.

Data Collection Techniques and Instruments

Data were collected through three main methods:

1. **Semi-structured interviews**, allowing flexibility to explore emerging themes while maintaining a focus on CBC values and practices. An interview guide was developed based on the CBC framework and tested for clarity.
2. **Field observations**, where the researcher directly visited coffee plantations, nurseries, processing facilities, and reforested plots. Observational data were recorded in field notes and photographs.
3. **Document review**, including local regulations, development plans, farmer group reports, and conservation program records to complement primary data.

Instruments included a voice recorder, field journal, digital camera, and consent forms. The **presence of the researcher** was essential, not only in data collection but also in building rapport and trust with informants, crucial in qualitative fieldwork.

Data Analysis Techniques

Data were analyzed using **thematic analysis**, following the steps of data reduction, coding, categorization, and interpretation. Codes were developed inductively based on recurring themes such as cultural practices, environmental techniques, economic behavior, and institutional collaboration. Findings were then mapped conceptually using a CBC framework that connected values, stakeholders, and outcomes.

Validity and Trustworthiness

To ensure credibility, **triangulation** was applied by cross-checking data from interviews, observations, and documents. **Member checking** was conducted by sharing preliminary findings with key informants to confirm interpretations. Peer debriefing with fellow researchers and prolonged engagement in the field also enhanced the study's trustworthiness.

Result

This section presents the key findings of the study, structured under three main value dimensions—**socio-cultural**, **economic**, and **ecological**—as well as the **institutional roles** involved in sustaining the coffee sector through a community-based conservation (CBC) approach. The results are supported by field interviews, observations, and documentation.

1.1. Socio-Cultural Significance of Coffee in Temanggung

Coffee holds a central place in the daily lives of Temanggung residents, not merely as a commodity but as a social symbol. The popular phrase “*yuk ngopi*” (“let’s have coffee”) reflects its cultural embeddedness in both private and public social interactions. Informants shared that conversations, business meetings, and even conflict resolutions often take place over coffee.

The tradition has created a strong sense of community cohesion and collective identity, which supports social capital—a crucial asset for mobilizing conservation efforts.

1.2. Economic Transformation and Empowerment

1.2.1. Farmer Income Growth and Coffee Valuation

Between 1998 and 2015, coffee bean prices ranged between IDR 1,500–3,000/kg. Since 2015, due to growing national demand and improved farming techniques, prices have surged to IDR 10,000/kg depending on quality. Farmers have adopted intercropping systems to integrate coffee cultivation with existing vegetable crops without damaging soil productivity.

Year Range	Price (IDR/kg)
1998–2015	1,500–3,000
2016–2021	5,000–10,000

Table 1. Price Range of Coffee Beans in Temanggung

1.2.2. Knowledge Sharing and Market Access

To meet market demand, experienced coffee processors provide hands-on training in cultivation, harvesting, and post-harvest handling. This has led to an increase in coffee quality and traceability. Local cafés and cooperatives have begun sourcing directly from these farmers, reducing dependency on external distributors and ensuring fairer pricing.

1.3. Ecological Benefits of Coffee-Based Agroforestry

1.3.1. Soil Conservation and Land Rehabilitation

Coffee farming was introduced in the late 1990s primarily to mitigate erosion. Farmers reported visible improvements in land stability where coffee trees were grown. The deep-rooted coffee plants help retain subsoil water and nutrients, preventing runoff and topsoil loss.

Figure 1. Ecological Functions of Coffee Roots in Sloped Areas

(a) Coffee roots preventing soil erosion; (b) Shade trees protecting coffee crops from direct sunlight.

1.3.2. Organic and Semi-Organic Practices

To preserve ecosystem integrity, farmers have shifted toward organic and semi-organic farming. Practices include: (1) Using manure and compost from pruning byproducts; (2) Avoiding chemical fertilizers and pesticides; (3) Growing shade trees to mimic forest microclimates. These sustainable methods have led to a measurable increase in bean quality and biodiversity preservation around coffee farms.

1.4. Institutional and Community Collaboration

CBC in Temanggung is sustained through multi-level collaboration between:

- **Local government:** providing policy support, seedlings, and training.
- **Community groups and NGOs:** facilitating forest co-management.
- **Farmer groups:** promoting sustainable methods and collective marketing.
- **Coffee shops/processors:** maintaining bean standards and consumer education.

Table 2. Stakeholder Roles in the CBC Framework

Stakeholder	Primary Role	Example of Contribution
Local Government	Funding and policy support	Coffee seed distribution (1998, 2019)
Farmers and Groups	Conservation and production	Replacing tobacco with coffee
Coffee Processors	Quality control and knowledge sharing	Cascara production, selective drying
Community & NGOs	Forest and land protection	Implementation of PHBM policies

1.5. Outcomes and Implications

The CBC framework has led to:

- Strengthened ecological resilience through agroforestry.
- Increased household income from coffee.
- Cultural revitalization around coffee-based community spaces.
- Reduced exploitation of forest areas and erosion risk.

These outcomes were especially significant during the COVID-19 pandemic, where local self-reliance and ecosystem services provided a buffer against economic shocks.

Discussion

The findings of this study confirm that Temanggung's coffee agriculture and industry present a compelling case of **community-based conservation (CBC)** driving sustainable rural development. Through the integration of **socio-cultural, economic, and ecological values**, the region has demonstrated that community-led practices can align with broader conservation goals without sacrificing economic productivity. From a **socio-cultural perspective**, the results reinforce previous studies which emphasize the role of cultural practices in supporting environmental action (Pretty, 2003; Berkes, 2004). In Temanggung, coffee is not only consumed but celebrated as a symbol of togetherness and shared identity. This cultural attachment to coffee reinforces collective awareness and responsibility towards sustainable farming practices. The phrase “*yuk ngopi*” embodies how social interactions are rooted in a product that also represents community resilience.

Economically, the transformation of coffee from a marginal commodity to a primary source of household income is consistent with the broader trend observed in rural Indonesia, where **agroforestry and intercropping systems** have allowed smallholder farmers to diversify income while protecting land (Nugroho et al., 2019). In this study, farmers' ability to adopt adaptive practices such as intercropping and red picking demonstrates a shift toward value-added agriculture. These findings validate the hypothesis that **economic empowerment and environmental sustainability are not mutually exclusive**, but can be mutually reinforcing under the right institutional support. Ecologically, the study confirms the regenerative potential of **coffee-based agroforestry** in rehabilitating degraded lands. The planting of coffee alongside shade trees has improved water retention, reduced erosion, and

contributed to reforestation—outcomes echoed in studies by Michon & de Foresta (1999) on Java’s agroforests. Notably, the community’s gradual transition from tobacco to coffee is an example of how **environmental consciousness and market incentives** can guide sustainable land use decisions. Institutionally, Temanggung’s success is attributable to strong **multi-stakeholder collaboration**. The involvement of government agencies, farmer groups, local businesses, and NGOs in designing and implementing CBC practices aligns with Ostrom’s (1990) principles of common resource governance. The participatory approach—exemplified by the implementation of **PHBM (Community Forest Management)**—has facilitated a sense of ownership, accountability, and shared benefit among stakeholders.

These results highlight the importance of **social capital** in sustaining environmental initiatives. As observed in the literature (Pretty & Smith, 2004), communities with strong social ties are more likely to engage in conservation activities. In Temanggung, this was evident through coordinated efforts in reforestation, organic farming, and market alignment. Furthermore, the study affirms that **policy decentralization**—as seen in Temanggung’s forest management reforms—can empower communities to steward their own resources effectively. Despite these successes, some limitations must be acknowledged. The study focuses on a single subdistrict and relies on a relatively small number of informants. While the findings are rich and contextually grounded, **scalability remains a challenge**. Future studies should explore comparative cases across different regions with varying ecological and institutional contexts to assess the generalizability of the CBC framework in coffee or other agroeconomic systems.

Additionally, **climate change** presents a looming uncertainty. As global temperatures rise, crops like Arabica—which require cooler climates—may become harder to sustain. Further research is needed to examine how Temanggung’s agroforestry system can adapt to these changes, possibly by introducing climate-resilient coffee varieties or enhancing landscape-level planning. In conclusion, the integration of community, culture, economy, and ecology in Temanggung’s coffee sector provides a model for **bottom-up sustainability**. The CBC approach not only fosters environmental stewardship but also promotes inclusive development. For practitioners and policymakers, the lesson is clear: sustainable rural development requires empowering communities not just as beneficiaries, but as **active agents** of change.

Conclusion

This study has explored the sustainability of Temanggung's coffee agriculture and industry through the lens of **Community-Based Conservation (CBC)**. By integrating **socio-cultural, economic, and ecological values**, Temanggung demonstrates how rural communities can lead sustainable development while conserving their environment and enhancing local livelihoods.

The findings show that:

1. Coffee is deeply rooted in the cultural identity of Temanggung communities, fostering strong **social capital** that supports collective action and conservation;
2. Economically, the coffee sector has evolved from subsistence farming to a **viable livelihood option**, driven by improved farming techniques, market linkages, and knowledge-sharing;
3. Ecologically, **agroforestry-based coffee cultivation** has contributed to erosion control, reforestation, and improved soil health;
4. Institutionally, **multi-stakeholder collaboration**—involving local government, farmer groups, NGOs, and business actors—has strengthened the governance framework for sustainable agriculture.

The **CBC framework** presented in this study is both practical and adaptable. It can be replicated in other rural regions facing similar challenges of land degradation and economic vulnerability, provided that local culture, ecological capacity, and stakeholder roles are taken into account. In practice, this model can inform the design of participatory environmental governance, agroecological planning, and climate-resilient agriculture programs.

Recommendations

To strengthen and expand the CBC approach in Temanggung and beyond, the following actions are recommended:

1. **Policy support** should continue to facilitate bottom-up initiatives through funding, training, and land-use regulation;
2. **Knowledge exchange platforms** should be established to enable peer learning between farmer communities;

3. **Monitoring mechanisms** should be developed to track ecological and economic impacts of CBC interventions;
4. **Diversification of income sources**—such as eco-tourism, cascara production, or specialty coffee branding—can enhance economic resilience;
5. **Climate adaptation strategies** should be introduced to safeguard coffee cultivation against rising temperatures.

Implications for Further Research

Future research may:

1. Conduct **comparative case studies** in other coffee-producing regions to test the transferability of the CBC framework;
2. Explore the **long-term socio-environmental impacts** of CBC on household wellbeing and forest biodiversity;
3. Investigate **youth engagement and intergenerational transfer** of agroecological knowledge as a factor in sustaining conservation efforts.

In summary, Temanggung offers a powerful example of how community empowerment, when aligned with environmental stewardship and economic innovation, can lead to sustainable and resilient rural systems. The lessons learned from this case are timely and relevant for broader development and conservation agendas in Indonesia and other parts of the Global South.

Declarations

Author Contribution Statement

All authors contributed equally to the conceptualization, research design, data collection in Temanggung coffee farming communities, thematic analysis, manuscript drafting, and critical revisions. Each author has read and approved the final version for publication.

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Data Availability Statement

The qualitative data that support the findings of this study are available from the corresponding author upon reasonable request. However, due to ethical considerations and agreements with participants, interview materials and field notes are not publicly archived to protect confidentiality.

Declaration Of Interests Statement

The authors declare that they have no known competing financial interests or personal relationships that could have influenced the work reported in this paper.

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