



Analysis of Coffee Patent Governance and Local Wisdom through Development Administration Theory Enhancing Farmers' Welfare

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ABSTRACT

This study explores the governance of coffee patent rights and local wisdom to improve farmers' welfare in Banyuwangi, as coffee production plays a strategic role in the local economy and therefore requires strong innovation protection. The objectives include describing domestic coffee patent governance, evaluating technology distribution, and analysing policies that safeguard traditional knowledge to ensure a clear scope of inquiry. The research applies a qualitative approach based on literature analysis and secondary data, while the theory of development administration and Riggs' Prismatic Model (1964) serve to interpret interactions between traditional and modern norms, and gaps in innovation and technology ownership are identified in accordance with Maidina et al. (2021). The findings show the dominance of foreign patents, stable productivity of about 904.4 kg/ha, and the potential of local wisdom to increase added value, making regulatory and local innovation integration necessary. The discussion stresses the importance of village administrative capacity, benefit-sharing, and geographical indications to strengthen sustainability and competitiveness. The study concludes that communal intellectual property governance fosters participation, preserves heritage, and builds resilience, with recommendations on legal literacy, training, collaboration, and heritage-based innovation

INTRODUCTION

Coffee has become a strategic commodity supporting the plantation economy of Banyuwangi, and therefore its role is significant. According to BPS (2023), coffee production in the region has increased substantially, hence policy attention is required. Moreover, this trend is academically relevant because it highlights the commodity's role in local food security, although technological disparities remain. Maidina, Ferianto, and Hendrix (2021) argue that domestic coffee innovation lags behind foreign patent holders, thereby creating an innovation gap. Historically, the Liberica variety has dominated smallholder plantations along the coastal areas, whereas other varieties have rarely been cultivated. Furthermore, the Government of Indonesia (2022) has regulated the protection of communal intellectual property to preserve local values and ensure economic sustainability. Consequently, analysis shows a considerable technological gap between local innovators and international inventors, thus requiring strategic intervention. This condition demands policy measures grounded in local wisdom, and therefore this study is highly relevant. Accordingly, the research focuses on the integrated governance of coffee patent rights, so that policy-based solutions can be generated.

Technological innovation in Indonesian coffee is reflected in 202 national and international patent documents, and thus technological progress is clearly recorded. Maidina et al. (2021) emphasise that 72% of patents are owned by foreign actors while only 28% belong to domestic stakeholders, hence innovation distribution remains unequal. This indicates an uneven diffusion of technology domestically, and therefore policy analysis becomes essential. Riggs (1964) notes that the prismatic model is useful for understanding imbalances between modern and traditional administration, and it helps to identify opportunities and constraints. In particular, the application of Communal IP has the potential to enhance farmers' welfare, and this requires regulatory support. The Government of Indonesia (2022) established PP 56/2022 as the legal

framework for communal intellectual property, so that legal certainty is provided. Therefore, the gap between technological ownership and local practices must be examined systematically, ensuring targeted interventions. Thus, this study stresses community-based innovation management, so that local practices remain protected. These findings can guide strategies for strengthening the local coffee economy, since policy and technology are aligned.

This study also presents novelty in integrating patent rights and Communal IP into local practices, and therefore it contributes new academic perspectives. Riggs (1964) highlights the importance of understanding prismatic structures in public administration, so that policies can be implemented effectively. This concept is relevant because it enables the identification of governance opportunities and constraints, thereby making value-added strategies more focused. Maidina et al. (2021) contend that patent protection supports the development of domestic coffee technology, and this enhances innovation capacity. Moreover, this study evaluates the influence of PP 56/2022 on the economic utilisation of local wisdom, and thus traditional practices receive legal protection. The research applies an empirical approach to analyse farmers' practices contextually, ensuring more valid findings. Furthermore, the emphasis on effective governance will increase the added value of coffee, and economic interventions can be sustained. The Government of Indonesia (2022) recommends harmonisation between national policy and local practice, thereby ensuring a balance between state and community roles. The outcomes are expected to reinforce the integration of technological innovation and traditional knowledge, and therefore the relevance of this research is high.

Banyuwangi possesses strong production potential and diverse processing techniques, and hence its economic value is promising. Faronny et al. (2024) confirms the community's mastery of Liberica varieties and post-harvest methods, so that opportunities for innovation are open. Regional studies report a planted area of approximately 8,675

hectares with productivity of about 904.4 kg/ha, and thus the production base is adequate. Firdaus and Aji (2024) highlights opportunities for value-added interventions through technology, thereby structuring governance more effectively. Riggs (1964) demonstrates that prismatic administrative structures affect the success of local economic governance, and therefore policies must remain adaptive. Likewise, the Government of Indonesia (2022) stresses the need to strengthen communal intellectual property rights, ensuring that local actors are protected. Local practices can be optimised through branding and controlled technology transfer, thereby enhancing competitiveness. Thus, production potential can be linked to sustainable economic development, since economic value is preserved. This study formulates an integrative strategy between policy, innovation, and local knowledge, and therefore synergy can be achieved.

The objectives of this research include describing the governance of coffee patent rights in Indonesia, so that the analytical scope is clear. Maidina et al. (2021) underline the need to evaluate domestic technology distribution, so that strategic interventions may be undertaken. Furthermore, the analysis assesses national policies for protecting traditional knowledge (Government of Indonesia, 2022), and thus the regulatory framework can be understood. Riggs (1964) stresses that the prismatic model facilitates the identification of administrative barriers, thereby making governance strategies more precise. The study employs secondary data to empirically test policy implementation, and therefore the validity of the analysis is enhanced. The findings are expected to generate recommendations for strengthening farmers' welfare, so that economic value is improved. At the same time, the study offers new perspectives on community-based innovation governance, ensuring that local practices remain sustainable. The scientific contribution lies in integrating patent rights and Communal IP, and therefore the research becomes highly relevant. Ultimately, the study provides a policy roadmap for sustainable coffee development, and thus the practical implications are evident.

METHODS

This research adopts a qualitative approach based on literature analysis and secondary data, and thus it produces in-depth interpretations. Maidina, Ferianto, and Hendrix (2021) explain that literature studies can identify innovation gaps and technology ownership, and this is crucial for policy analysis. This descriptive inquiry allows for a comprehensive interpretation of local coffee governance, since it integrates diverse data sources. Moreover, the Government of Indonesia (2022) highlights the importance of communal intellectual property regulations in protecting traditional knowledge, and this is relevant to the local context. The analysis combines numerical and non-numerical data to obtain a holistic overview, while theoretical interpretation supports understanding. Earterasun and Nursiah (2015) stress the significance of legal documents for understanding policy contexts, and thus secondary data carry analytical weight. This study ensures source verification so that the findings are accountable, even though the data are secondary. Riggs (1964) offers the prismatic model as a framework for reading the interaction of traditional and modern norms, and hence the theory is appropriate for interpreting local practices. Consequently, this method creates a holistic understanding of coffee patent governance and farming practices.

Quantitative data are obtained from Banyuwangi coffee production statistics (BPS, 2023), and therefore they provide a valid numerical overview. Maidina et al. (2021) demonstrate that patent registration numbers reflect national innovation capacity, and this serves as an indicator for development strategies. In addition, the extent of cultivation areas and coffee productivity are processed for zoning analysis (Banyuwangi Coffee Zoning Analysis, 2023), so that regional potential is mapped. The Government of Indonesia (2022) explains that communal intellectual property regulations serve as instruments for protecting collective knowledge, and thus formal policies can be assessed. This integration of data enables systematic mapping of local economic potential, while also identifying opportunities to enhance welfare. Earterasun and Nursiah (2015) emphasise the importance of legal analysis in relation to farming

practices, and therefore interpretation becomes accurate. This study also considers the interplay between coffee production and patent registrations, since both influence each other. Riggs (1964) aids in interpreting prismatic administrative structures within local contexts, and thus the theoretical framework is robust. By combining numerical data with theoretical insights, the governance of coffee in Banyuwangi can be scientifically justified.

Non-numerical data include farmers' local wisdom practices and narratives on communal intellectual property, and these support the qualitative analysis. Faronny, Sunarharum, and Hakim (2023) underscores the importance of coffee processing traditions, and this is relevant to local economic value. Moreover, the Government of Indonesia (2022) stresses the role of national policy in safeguarding traditional knowledge, thereby ensuring comprehensive legal analysis. Non-numerical analysis is applied to interpret the interaction between formal and local norms, since this relationship determines regulatory effectiveness. Maidina et al. (2021) highlight the inequality in patent ownership as a strategic issue, and thus governance evaluation is necessary. Earterasurun and Nursiah (2015) stress the importance of legal interpretation for farmers' practices, thereby validating the findings. This study systematically assesses obstacles and opportunities in the utilisation of communal intellectual property, and these findings can support local innovation policies. Riggs (1964) provides a framework for understanding the effects of prismatic administrative structures, and therefore the theory strengthens the analysis. Hence, this method links local practices to strategies for patent protection and improved farmers' welfare.

The analysis is conducted descriptively and aligned with Riggs' prismatic model, so that the link between data and theory is explicit. Riggs (1964) stresses the importance of recognising overlaps between traditional and modern norms, since such conditions affect governance. This study highlights the correlation between local practices and formal regulations, thereby ensuring a more directed analysis. Maidina et al. (2021) stress the importance of evaluating coffee patent data for domestic contexts, and this influences innovation strategies. Furthermore, the Government of Indonesia (2022) highlights the relevance of communal intellectual property regulations for farmers' welfare, so that

formal policies can be applied effectively. Earterasurun and Nursiah (2015) explain that legal interpretations strengthen the validity of analysis, and thus the study is reliable. The research interprets data to identify opportunities for sustainable governance, and this is relevant to local economic development. Riggs (1964) provides the conceptual foundation for understanding prismatic administration, and therefore theory reinforces empirical findings. Thus, the methodology supports a systematic analysis of coffee patent rights and local wisdom comprehensively.

RESULTS AND DISCUSSION

Coffee production in Banyuwangi Regency demonstrates a significant contribution to the local economy, since the agrarian sector sustains community income. According to BPS (2023) and Firdaus and Aji (2024), the average coffee plantation area reaches approximately 8,675 ha, while productivity remains relatively stable. This study emphasises that coffee productivity stood at 904.4 kg/ha during 2018–2022, therefore land management evaluation becomes essential. Hence, mapping plantation areas and production management proves crucial so that agricultural policies can be more targeted. Furthermore, technology-oriented farming strategies may enhance harvest efficiency and bean quality, since mechanisation supports post-harvest processes. Quantitative data indicate a stable growth trend in production annually, while export markets increasingly display higher demand. Likewise, economic analysis signals an expanding potential for coffee exports in line with superior varietal innovations, thereby requiring research and development support. In conclusion, the agrarian foundation serves as the backbone of Banyuwangi's coffee sector development and thus requires consistent attention from diverse stakeholders.

The analysis of coffee patents reveals foreign dominance in technological innovation, whereas local contributions remain limited. Maidina et al. (2021) report that around 202 coffee patents exist, of which 72% are owned by foreign entities, while Indonesian actors hold only 28%. This research highlights the constraints of Indonesia's patent

contributions, therefore strategies to strengthen domestic research are needed. Consequently, this condition creates opportunities for collaboration between local and global researchers for technology transfer, thereby improving domestic innovation. For this reason, strengthening research capacity becomes vital, as trained human resources remain limited. Patent data additionally show a rising global trend of applications for coffee technologies, while Indonesia still needs to accelerate its registration process. Moreover, the presence of foreign patents stimulates competition within domestic innovation, therefore regulatory support becomes increasingly important. Thus, coffee technology innovation requires both stronger local capacity and adaptive regulation to ensure sustainability.

The protection of traditional coffee knowledge has emerged as a governmental regulatory priority, since it safeguards local cultural heritage. The Government of Indonesia (2022) issued Regulation No. 56/2022, which provides a legal framework for documenting Communal Intellectual Property (CIP), while its implementation mechanisms are continuously expanded. This regulation incorporates local knowledge and traditional practices relevant to coffee processing so that farmers may secure rights over traditional innovations. Furthermore, this regulation encourages recognition of local communities' rights to their traditional innovations, since legal legitimacy strengthens market trust. Implementation analysis shows that the government offers registration and documentation mechanisms for CIP, while ongoing evaluations ensure sustainability. Consequently, local farming practices gain clear legal recognition, thereby ensuring the preservation of traditional knowledge. This development results in both cultural preservation and sustainable innovation while simultaneously increasing coffee's economic value. In summary, the regulation of traditional knowledge protection plays a strategic role in coffee development, since it provides a legal foundation for sustainable growth.

The local wisdom of Banyuwangi's coffee farmers demonstrates unique practices that enhance added value, while traditional knowledge actively

supports innovation. Faronny et al. (2023) highlights traditional post-harvest techniques and local coffee varieties, thereby maximising opportunities for product differentiation. Moreover, such practices stimulate creative innovation and product differentiation, since traditional methods safeguard bean quality. Farmers employ heritage-based methods to maintain coffee aroma and bean quality, while community interactions facilitate knowledge transfer. Ethnographic analysis further shows that community-based social interaction fosters organic knowledge transmission, thereby ensuring the relevance of local innovation. Consequently, local wisdom holds not only cultural but also economic value, as it enhances the competitiveness of local coffee. This reality underscores the importance of integrating traditional knowledge into coffee development strategies, while also reinforcing product identity. To conclude, farmers' local practices play a vital role in heritage-based coffee innovation, while the market increasingly appreciates authentic quality.

Discussion

The analysis of legal formalities in villages reveals a significant implementation gap, therefore local administrative capacity deserves urgent attention. Riggs (1964) asserts that symbolic formalities often emerge in prismatic societies, thus legal interpretations vary. Field evidence indicates that Regulation No. 56/2022 has not been consistently implemented across villages, consequently legal disparities persist. Harinurdin et al. (2025b) highlight that limited human resources undermine regulatory effectiveness, therefore training becomes essential. This legal gap makes administrative procedures difficult for farmers to understand, hence educational approaches are required. Wright et al. (2024) emphasise that strengthening local capacity improves the effectiveness of legal formalities, thus villages need technical assistance. Observations further reveal that enhanced legal literacy fosters procedural compliance, thereby ensuring more sustainable regulation. Therefore, integrating local approaches with formal regulation reinforces national policy,

while symbolic formalities remain contextually relevant. A preliminary conclusion suggests that strengthening administrative capacity should be prioritised in villages, thereby guaranteeing regulatory continuity.

The reliance on foreign technology exacerbates disparities in innovation control, hence mechanisms for benefit redistribution become necessary. Maidina et al. (2021) found that patent ownership remains dominated by foreign actors, therefore local capacity must be strengthened. This study confirms that the plurality of external actors may weaken domestic institutions, and consequently multi-actor coordination is crucial. Ngure and Watanabe (2024) explain that inclusive collaboration between farmers and technical agencies is essential, although appropriate technologies remain limited. Primary data also indicate restricted access to relevant technology for coffee farmers, thereby hindering domestic innovation. Samoggia and Fantini (2023) stress that inequality in the coffee value chain negatively impacts farmers' welfare, therefore regulation should ensure value balance. Economic analysis reveals that foreign dominance reduces local productivity, thus inclusive strategies become necessary. Accordingly, benefit-sharing mechanisms emerge as vital strategies, while farmer participation becomes the key. Participatory solutions substantially mitigate dependence on foreign technology, thereby ensuring fairer innovation ownership.

The potential of geographical indications provides competitive advantages for local products, hence strengthening administrative capacity is required. The Government of Indonesia (2022) states that Regulation No. 56/2022 allows the designation of geographical indications, while village readiness becomes the determining factor. This study reveals village administrative capacity as a critical determinant of success, therefore training and technical guidance are essential. Riggs (1964) suggests that diffraction in formalities can provide local benefits, thus integrating regulation with local practices emerges as an effective strategy. Market research further demonstrates that processed coffee

commands higher prices than raw beans, hence this serves as an economic success indicator. Massrie (2025) underlines the necessity of climate adaptation strategies for coffee sustainability, while farmers must gain access to appropriate technology. Legal risk assessments affirm that patent protection certainty must be prioritised, therefore villages can optimise geographical indications. Consequently, the utilisation of geographical indications requires a combination of legal assurance and local capacity, while communities gain tangible benefits. Local community involvement ultimately enhances competitiveness based on local wisdom, thus collaborative action becomes essential.

The benefit-sharing scheme fosters participatory governance among coffee farmers, therefore collective decision-making becomes more effective. Earterasarun and Nursiah (2015) emphasise the involvement of farmer cooperatives in CIP management, while utilisation contracts must be explicit. The analysis indicates that collective contracts minimise legal overlap, hence conflicts of interest can be reduced. Harinuridin et al. (2025b) highlight that leveraging local knowledge strengthens programme sustainability, thus capacity-building remains highly relevant. Such participatory practices reinforce transparency in benefit distribution, while legal formalities remain intact. Wright et al. (2024) argue that community-based initiatives overcome excessive formalism, therefore active involvement proves necessary. Social impact evaluation further shows that farmer participation enhances local welfare, thereby validating the participatory model. Therefore, the participatory model constitutes a primary strategy for governance, while legal legitimacy is simultaneously reinforced. The implementation of this scheme consolidates legal recognition at the village level, thereby ensuring programme sustainability.

The measurable impacts of local coffee processing demonstrate a significant rise in added value, hence processing strategies must be prioritised. The Banyuwangi Coffee Processing Analysis (2022) records that processed coffee commands higher selling prices than raw beans,

while farmers' incomes remain limited. This research stresses the importance of primary data for income calculations, therefore policy interventions can be effectively formulated. BPS (2023) confirms that farmer income data remain scarce and uneven, hence further surveys are required. Global coffee market studies highlight rising prices due to climate change, thereby influencing local competitiveness. Massrie (2025) stresses that technological innovation is vital for production resilience, while farmers must master adaptive methods. Economic evaluations show that diversification into processed products strengthens farmers' financial stability, thereby ensuring more stable incomes. Consequently, local processing emerges as a key strategy for welfare improvement, while technological innovation integration is strengthened. Combining innovation with local wisdom ultimately maximises outcomes, therefore a holistic approach becomes indispensable.

The combination of regulation and local practices strengthens the sustainability of the coffee sector, thereby making governance more effective. Samoggia and Fantini (2023) explain that governance models are required to balance the value

chain, while village institutions must be actively engaged. Empirical analysis reveals that interactions among farmers, cooperatives, and government agencies shape programme success, thus multi-level coordination is vital. Wright et al. (2024) argue that local decision-making enhances sustainability initiatives, while community participation is reinforced. Field data further demonstrate a gap between formal regulations and local capacities, therefore regulatory adaptation becomes necessary. Ngure and Watanabe (2024) highlight that multi-actor collaboration reduces crop failure risks, while community-based innovation reinforces resilience. Literature reviews also affirm that education and farmer literacy contribute to local capacity building, thereby guaranteeing programme sustainability. Hence, regulation implementation must consider local contexts, while administrative capacity should be prioritised. This approach enhances the long-term effectiveness of national coffee regulations, thereby positioning integrative strategies as the key.

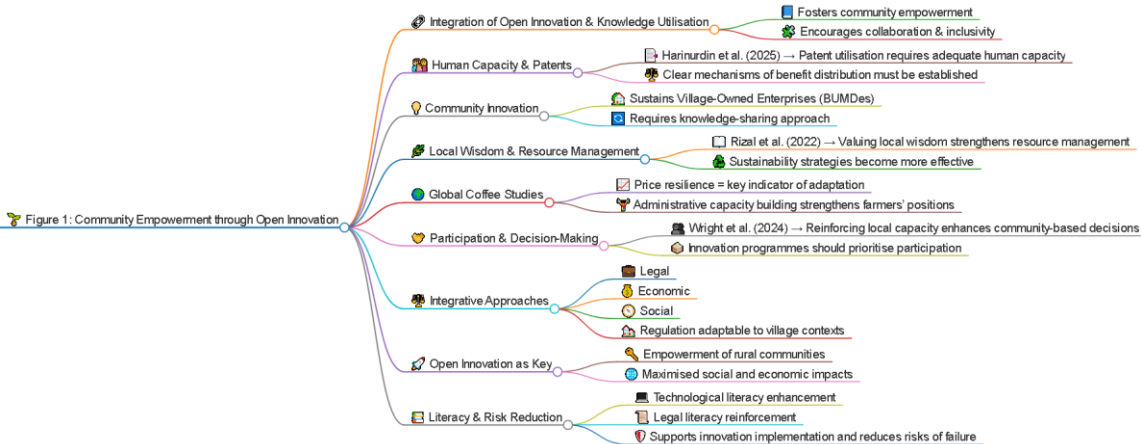


Figure 1. Strengthening Local Capacity for Effective Legal Formality

Figure 1 illustrates that the integration of open innovation and knowledge utilisation fosters community empowerment. Moreover, Harinurudin et al. (2025b) emphasise that patent utilisation requires adequate human capacity, therefore clear mechanisms of benefit distribution must be established. Likewise, the analysis indicates that

community innovation sustains Village-Owned Enterprises, and this demands a knowledge-sharing approach. In addition, Rizal et al. (2022) highlight that valuing local wisdom strengthens resource management, hence sustainability strategies become more effective. Furthermore, global coffee studies underline price resilience as an indicator of

successful adaptation, while administrative capacity building strengthens farmers' positions. Similarly, Wright et al. (2024) argue that reinforcing local capacity enhances community-based decision-making, so innovation programmes should focus on participation. Consequently, the study confirms that integrative legal, economic, and social approaches are required, thus regulation becomes adaptable to village contexts. Therefore, open innovation emerges as a key for rural empowerment, so both social and economic impacts are maximised. Finally, the enhancement of technological and legal literacy supports innovation implementation and reduces risks of failure.

The use of foreign patent data highlights the need to evaluate technology quality and access, so local farmers are not left behind. Furthermore, Maidina et al. (2021) reveal that foreign owners control the majority of coffee patents, hence local regulation must provide adequate protection. Likewise, the findings affirm that mechanisms of benefit distribution are vital for local farmers, and therefore community involvement is essential. In addition, Schmitt (2025) stresses the significance of multidimensional assessment across economic, legal, and technological indicators, making this relevant for innovation policies. Moreover, empirical studies indicate that forward citation and patent family size are useful metrics, so human capacity becomes a decisive factor. Similarly, Wright et al. (2024) note that systematic literature models support patent analysis, therefore technical literacy must be enhanced. Consequently, patent data can serve as a reference for village innovation strategies, so optimal utilisation is achievable. Hence, patent evaluation must be combined with local capacity to ensure innovation success. Ultimately, local participation improves the efficiency of patent utilisation and minimises technological inequality.

Local wisdom plays a pivotal role in enhancing coffee cultivation outcomes, therefore traditional practices should be preserved. Moreover, Rizal et al. (2022) state that assessing local standards strengthens ecosystem management, so agricultural sustainability is maintained. Similarly, field research

demonstrates that the application of Timorese agroforestry practices enhances sustainability, and thus productivity becomes more stable. In addition, Susanto, Rudyanto, and Rahayuningsih (2022) underline that CSR rooted in local wisdom supports community empowerment, hence social capacity is reinforced. Furthermore, this study reveals that the use of traditional knowledge improves adaptation to climate change, while modern innovation supports efficiency. Likewise, Ngongo et al. (2022) argue that traditional farming practices maintain soil microorganisms, therefore ecosystem sustainability remains optimal. Empirical analysis also shows that integrating local wisdom and modern innovation optimises production, so food security increases. Consequently, local wisdom-based models need to be expanded, hence farmers gain both social and economic benefits. Ultimately, strengthening local technical capacity supports the sustainability of coffee farming, while innovation remains relevant.

Coffee sustainability faces risks of climate change, pests, and complex diseases, therefore adaptive strategies must be developed. Moreover, Ngure and Watanabe (2024) emphasise the necessity of collaborative strategies for adaptive coffee varieties, so smallholders are better protected. Similarly, the findings confirm that small farmers remain the most vulnerable to external risks, and thus targeted policy interventions are required. In addition, Wright et al. (2024) highlight that local community initiatives can reinforce farmers' resilience, hence economic sustainability is secured. Furthermore, global data indicate that the coffee market exceeds US\$130 billion, and price fluctuations necessitate stronger local governance. Likewise, Mursyidin et al. (2023) stress that overlaps between traditional and formal institutions affect governance, therefore legal integration is vital. The analysis therefore underscores the need to combine law and local wisdom, so community-based adaptive strategies become central. Consequently, community-driven adaptive strategies prove essential, hence production resilience is enhanced. Finally, production resilience depends on farmers'

management capacity and education, while technology supports risk mitigation.

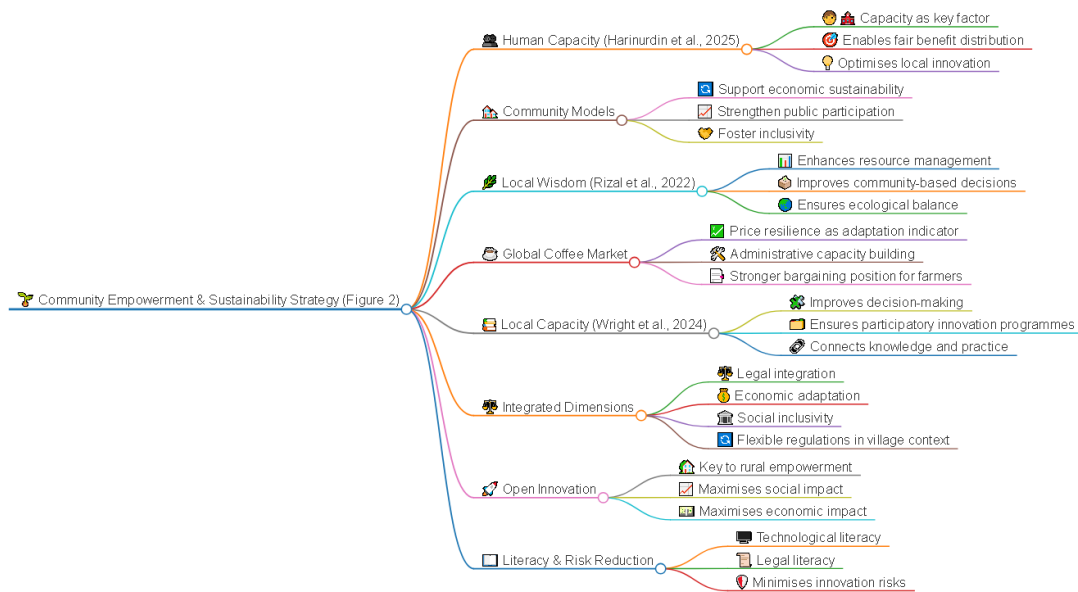


Figure 2. Community Empowerment and Sustainability Strategies

Figure 2 illustrates an integrated strategy for community empowerment and sustainability. Harinurdin et al. (2025b) emphasise that human capacity becomes a key factor in benefit distribution, thereby allowing local innovation to be optimised. Moreover, the analysis demonstrates that the application of community models supports economic sustainability, consequently strengthening public participation. In addition, Rizal et al. (2022) underline that the evaluation of local wisdom enhances resource management, thus enabling community-based decisions to be more effective. Furthermore, global coffee market studies highlight price resilience as an indicator of successful adaptation strategies, while administrative capacity building further strengthens farmers' bargaining positions. Similarly, Wright et al. (2024) argue that enhancing local capacity improves decision-making, thereby ensuring innovation programmes are more participatory. Hence, this study confirms that integrating legal, economic, and social dimensions is essential, thus enabling regulations to remain flexible within the village context. Ultimately, open innovation becomes the cornerstone of rural empowerment, thereby maximising both social and economic impacts. Finally, enhancing technological

and legal literacy reinforces innovation implementation, thus minimising potential risks of failure.

The use of foreign patent data highlights the necessity of evaluating both the quality and accessibility of technology, therefore ensuring that local farmers are not marginalised. Maidina et al. (2021) indicate that the dominance of foreign patents significantly influences technology ownership, thereby requiring local regulations to provide stronger protection. Similarly, the analysis stresses that fair mechanisms of benefit distribution are crucial for farmers, thus necessitating broader community involvement. Furthermore, Schmitt (2025) highlights the importance of multidimensional assessments encompassing economic, legal, and technological indicators, thereby enhancing the effectiveness of innovation policies. Empirical studies also demonstrate that forward citation and patent family size serve as relevant metrics, thereby confirming human capacity as a critical determinant. Likewise, Wright et al. (2024) assert that adopting systematic literature models facilitates patent analysis, thus necessitating the improvement of technical literacy. Therefore, patent evaluations must be combined with local

capacities, thereby ensuring optimal utilisation. Moreover, local stakeholder engagement enhances the sustainable use of patents, thus reducing technological inequalities. Consequently, community-based innovation strategies become essential, thereby increasing village competitiveness.

The integration of legal formalities and local capacities emerges as a central strategy for rural sustainability, thereby ensuring more effective regulations. Riggs (1964) points out that symbolic formalism in prismatic societies requires contextual legal interpretation, thus adjustments must be made. Empirical findings reveal that administrative training improves farmers' abilities, thereby ensuring a more consistent implementation of PP No.56/2022. Furthermore, Harinurdin et al. (2025a) stress that limited human resources hinder regulatory effectiveness, thus administrative training remains highly relevant. Similarly, Wright et al. (2024) affirm that strengthening local capacity reinforces legal formalities, thereby making administrative procedures more comprehensible. Field evidence also shows that farmers face significant administrative challenges, thus requiring educational approaches to be applied. Consequently, empirical analysis confirms that legal literacy can enhance procedural compliance, thereby making regulation more sustainable. Hence, the integration of local approaches and formal mechanisms increases regulatory effectiveness, thereby ensuring symbolic formalities remain meaningful. Ultimately, the conclusion affirms that administrative strengthening is vital, thereby allowing local capacities to develop more robustly.

Dependence on foreign technology creates an innovation gap in rural areas, therefore redistributing benefits becomes a crucial strategy. Maidina et al. (2021) reveal that the dominance of foreign patents affects innovation ownership, thereby highlighting the need to strengthen local capacities. Additionally, the analysis suggests that the plurality of external actors may weaken domestic institutions, thus multi-actor coordination is essential. Ngure and Watanabe (2024) emphasise the necessity of inclusive collaboration between farmers and technical

institutions, thereby ensuring more optimal use of appropriate technologies. Moreover, primary data record limited technological access for coffee farmers, thereby restricting the scope of local innovations. Samoggia and Fantini (2023) underline that inequalities in the coffee value chain negatively affect farmers' welfare, thus regulation must consider added value. Economic impact analyses reveal that foreign dominance reduces local productivity, thereby underscoring the importance of inclusive strategies. Consequently, redistributive mechanisms are required, thereby making innovation ownership more equitable. Ultimately, farmer participation enhances the effectiveness of these strategies, thereby supporting the growth of local technologies.

The utilisation of geographical indications provides competitive advantages for local products, thereby requiring stronger administrative capacities. The Government of Indonesia (2022) clarifies that PP No.56/2022 enables the establishment of geographical indications, thereby making village readiness a determining factor. Furthermore, research demonstrates that village administrative capacity determines success, thus technical training is urgently needed. Riggs (1964) argues that the diffraction of formalism can generate local benefits, thereby positioning regulatory–local practice integration as a viable strategy. In addition, local coffee market studies show that processed products command higher prices than raw beans, thereby suggesting that geographical indications can significantly enhance economic value. Moreover, Massie (2025) emphasises that climate adaptation strategies are essential for the sustainability of the coffee sector, thereby requiring farmers to access technology. Legal risk assessments affirm that patent protection must remain a priority, thereby allowing villages to utilise geographical indications more effectively. Consequently, employing geographical indications demands a blend of legal mechanisms and local capacities, thereby ensuring tangible economic benefits for communities. Ultimately, active community involvement strengthens

economic competitiveness based on local wisdom, thereby reinforcing the importance of collaboration.

The benefit-sharing scheme fosters participatory governance for coffee farmers, thereby ensuring that collective decisions are more effective. Earterasarun and Nursiah (2015) stress that farmer cooperatives must be involved in managing communal intellectual property, thus contractual clarity is imperative. Moreover, the analysis confirms that collective contracts reduce legal overlaps, thereby minimising potential conflicts of interest. Harinurdin et al. (2025b) affirm that the use of local knowledge improves programme sustainability, thereby making capacity building more effective. Likewise, participatory practices reinforce the transparency of benefit distribution, thereby upholding legal formalities. Wright et al. (2024) contend that community initiatives can address excessive formalism, thus making active involvement a necessity. Empirical evaluations reveal that farmer participation enhances local welfare, thereby validating the participatory model's effectiveness. Therefore, the participatory model represents a primary strategy, thereby strengthening legal legitimacy. Ultimately, the implementation of such schemes enhances village legal legitimacy, thereby ensuring programme sustainability.

The impact of local coffee processing reveals significant value-added gains, thereby making processing a strategic priority. The Banyuwangi Coffee Process Analysis (2022) documents that processed products command higher prices than raw beans, thus farmer income remains limited. Research further highlights the necessity of primary data to calculate farmers' earnings, thereby enabling more precise policy formulation. Additionally, BPS Banyuwangi (2023) reports that farmers' income remains both low and uneven, thus follow-up surveys are required. Furthermore, global coffee market studies note price increases driven by climate change, thereby affecting local competitiveness. Massrie (2025) argues that technological innovation is vital for production resilience, thus farmers must master adaptive methods. Similarly, economic

evaluations confirm that product diversification enhances financial resilience, thereby ensuring more stable incomes. Consequently, local processing becomes a crucial strategy, thereby reinforcing the integration of technological innovations. Ultimately, a holistic approach optimises both innovation and local wisdom, thereby maximising outcomes.

The combination of regulations and local practices strengthens coffee sector sustainability, thereby making governance more effective. Samoggia and Fantini (2023) explain that governance models are required to balance value chains, thus villages must take an active role. Moreover, empirical analysis shows that interactions between farmers, cooperatives, and government influence programme success, thereby making multi-level coordination crucial. Wright et al. (2024) affirm that local decision-making enhances the effectiveness of sustainability initiatives, thereby improving community participation. Field data also reveal a gap between formal regulations and local capacities, thus adaptive adjustments to regulation are required. Likewise, Ngure and Watanabe (2024) argue that multi-actor collaboration reduces crop failure risks, thereby allowing community-based innovations to strengthen resilience. Furthermore, literature confirms that farmer education and literacy enhance local capacities, thereby guaranteeing programme sustainability. Therefore, regulatory implementation must be aligned with local contexts, thereby making administrative capacity a priority. Ultimately, this approach increases the long-term effectiveness of national coffee regulations, thereby positioning integrative strategies as essential.

CONCLUSION

This study confirms that the governance of coffee patents and local wisdom enhances farmers' welfare, since the integration of regulation, technological innovation, and traditional practices strengthens the long-term competitiveness of the local economy. Moreover, village administrative capacity plays a decisive role in the implementation of PP No.56/2022, thereby significantly improving regulatory effectiveness. In addition, local wisdom

supports creative innovation, thus traditional practices must be systematically preserved to safeguard cultural value. Furthermore, benefit-sharing mechanisms have been proven to foster farmer participation, thereby ensuring fairer and more transparent benefit distribution. Likewise, the evaluation of foreign patents highlights the need to reinforce local capacities, thereby allowing domestic innovation to develop competitively. Consequently, community-based adaptive strategies emerge as the foundation of coffee production sustainability, while legal integration simultaneously facilitates the mitigation of external risks. Ultimately, communal intellectual property governance delivers tangible social and economic impacts for farmers, thereby strengthening the resilience of the local coffee sector.

The strengthening of local capacities should be optimised through technical training and coffee-related legal literacy, so that the utilisation of patents becomes more effective. Furthermore, collaborative mechanisms involving farmers, government, and research institutions need to be designed, thereby enabling innovation to be adopted more evenly and sustainably. In addition, redistributive strategies must be expanded to bridge the gap created by foreign technologies, thus reinforcing local economic empowerment. Likewise, the implementation of geographical indications can enhance product competitiveness, thereby requiring stronger protection of local branding. Moreover, the development of innovations based on local wisdom is recommended to increase the added value of coffee, thereby preserving the cultural sustainability of agricultural traditions. Similarly, the evaluation of domestic patent registrations must be combined with broader technological access, thereby ensuring maximum regulatory effectiveness. Finally, adaptive community-based approaches must be consistently applied, thereby maintaining production resilience and safeguarding farmers' welfare comprehensively.

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