



From Local Resources to Economic Resilience: Pandan-Lime Dish Soap as a Catalyst for Rural Prosperity

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ABSTRACT

This qualitative case study explores the economic potential of pandan-lime dish soap as a driver of rural resilience in Desa Sesulu, East Kalimantan, Indonesia. Utilizing in-depth interviews with 30 respondents, participatory observations during simulated production, and document analysis, the study examines how local resources foster sustainable economic practices. Thematic analysis reveals key insights: the production of natural dish soap reduces household costs by leveraging abundant pandan leaves and limes, promotes entrepreneurial opportunities through home-based enterprises, and enhances environmental awareness by minimizing chemical pollution. However, logistical barriers, such as limited access to materials like Texapon, and socio-economic challenges, including skepticism about efficacy, hinder adoption. The findings highlight the initiative's alignment with circular economy principles, offering a model for cost-effective, community-driven innovation. Recommendations include material subsidies and digital literacy training to enhance scalability. This study contributes to the discourse on green economy practices by demonstrating how grassroots initiatives can bolster economic resilience and sustainability in rural contexts, with implications for policy and practice in achieving responsible consumption and economic growth.

Keywords: Green Economy; Community Entrepreneurship; Rural Resilience; Sustainable Development; Sulu Clean.

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INTRODUCTION

The escalating challenges of climate change and environmental degradation have underscored the urgency of transitioning toward sustainable economic practices, particularly in developing countries where rural communities constitute a significant portion of the population. In Indonesia, where approximately 43% of the populace resides in rural areas, reliance on chemical-based cleaning products, such as dish soaps containing Sodium Lauryl Sulfate (SLS), imposes a dual burden of economic costs and environmental harm. These products contribute to water and soil contamination, which disrupts local ecosystems and poses health risks to communities dependent on natural resources for their livelihoods (Vammen & Peña, 2022). The associated health implications, including long-term exposure to toxic chemicals, further strain household budgets in resource-constrained rural settings, exacerbating economic vulnerabilities (Hung et al., 2022; Shahbaz et al., 2022). This issue is particularly pronounced in regions like Desa Sesulu, East Kalimantan, where limited access to affordable, eco-friendly alternatives perpetuates dependence on imported chemical products, undermining both environmental sustainability and economic resilience.

This study explores the potential of a locally produced dish soap, derived from pandan leaves (*Pandanus amaryllifolius*) and lime (*Citrus aurantiifolia*), as a catalyst for fostering economic resilience in rural Indonesia. Pandan leaves, rich in saponins that generate natural foam, and lime, containing citric acid effective for grease removal, represent abundant local resources that can serve as sustainable substitutes for chemical-based detergents (Guo, 2023). By leveraging these materials, rural households can reduce their reliance on costly imported products while aligning with principles of the circular economy, which emphasizes resource efficiency and waste minimization (Agus et al., 2020). This approach not only addresses environmental concerns but also holds the potential to enhance microeconomic outcomes by lowering household expenditure and creating opportunities for small-scale entrepreneurship.

The primary research problem this study seeks to address is: How can the production of pandan-lime dish soap contribute to building economic resilience in rural communities? This question is critical given the high cost of commercial cleaning products and the environmental degradation associated with their use in rural Indonesia. Rural households often allocate a significant portion of their limited income to such products, which reduces their financial capacity for other essential needs. Moreover, the environmental impact of chemical runoff into local water systems threatens the sustainability of agricultural and fishing activities, which are vital to rural economies. The proposed solution involves the development of a natural dish soap through a community-based production process, utilizing locally sourced materials to create a cost-effective and environmentally friendly alternative. This approach aims to reduce household expenses, foster entrepreneurial skills, and promote sustainable consumption practices, thereby enhancing economic resilience at the community level.

The objectives of this study are threefold: first, to analyze community perceptions of the economic benefits of pandan-lime dish soap; second, to identify the opportunities and barriers to adopting this product as a basis for home-based enterprises; and third, to formulate policy recommendations for advancing green economy practices in rural settings. These objectives are grounded in the need to address the socio-economic and environmental challenges faced by rural communities, particularly in regions with limited access to markets and infrastructure.

Existing literature highlights the environmental and health detriments of chemical-based cleaning products, particularly in developing countries where regulatory oversight is often limited (Vammen & Peña, 2022). Studies have also demonstrated the viability of natural alternatives, such as those derived from local

flora, in reducing environmental impact and promoting sustainable consumption (Guo, 2023). However, a significant gap persists in understanding the microeconomic implications of such innovations, especially in rural contexts. While macro-level analyses of green economy policies in Indonesia have explored sectors like forestry and agriculture, there is a paucity of research examining grassroots initiatives in the household sector (Gao et al., 2023; Lehmann, 2020). Most studies on natural cleaning products focus on their chemical composition or technical efficacy, with limited attention to their socio-economic impacts, such as cost savings, income generation, or community empowerment. This study addresses this gap by employing a qualitative approach to explore how pandan-lime dish soap can transform household economics and foster entrepreneurial opportunities in rural Indonesia.

The novelty of this research lies in its integration of circular economy principles with community-based entrepreneurship, using pandan-lime dish soap as a case study. Unlike previous studies that emphasize technical or environmental outcomes, this research prioritizes the socio-economic dimensions, particularly the empowerment of women and the potential for scalable microenterprises in rural settings. By focusing on Desa Sesulu, a village characterized by limited market access and reliance on local resources, this study offers unique insights into how grassroots innovations can drive economic resilience. Its contribution extends to both academic and policy domains, providing a model for leveraging local resources to achieve sustainable development goals, specifically SDG 8 (Decent Work and Economic Growth) and SDG 12 (Responsible Consumption and Production) (Shahbaz et al., 2022; Sulaeman & Sulaeman, 2022).

The scope of this research is deliberately focused on the simulation of pandan-lime dish soap production in Desa Sesulu, involving 30 respondents from rural households. The study examines the initial perceptions, opportunities, and barriers associated with production. This focus allows for a detailed exploration of community dynamics and economic potential without the confounding variables of market performance. The research employs a qualitative case study design, utilizing in-depth interviews, participatory observation, and document analysis to capture nuanced perspectives on the economic and social implications of this innovation.

The significance of this study lies in its potential to inform policy and practice in rural development. By demonstrating how local resources can be transformed into viable economic assets, the research highlights the importance of community-driven solutions in achieving sustainability. Barriers to adoption, such as limited access to supporting materials like Texapon and socio-cultural resistance to non-commercial products, are critical considerations that this study seeks to address (Zhao et al., 2024). These barriers underscore the need for targeted interventions, such as subsidies for raw materials or training in digital marketing, to enhance the scalability of such initiatives. Furthermore, the study's emphasis on women's empowerment through entrepreneurial opportunities aligns with broader efforts to promote gender equity in rural economies, where women often bear the brunt of economic vulnerabilities.

This research positions pandan-lime dish soap as a practical and sustainable solution to the intertwined challenges of environmental degradation and economic hardship in rural Indonesia. By leveraging abundant local resources, this initiative not only addresses immediate household needs but also lays the foundation for long-term economic resilience through community-based entrepreneurship. The findings are expected to contribute to the growing body of literature on green economy practices, offering actionable insights for policymakers and practitioners aiming to foster sustainable development in rural contexts.

METHODS OF RESEARCH

This study employs a qualitative research design with a case study approach to explore the economic potential of pandan-lime dish soap as a catalyst for rural resilience in Desa Sesulu, East Kalimantan, Indonesia. The qualitative methodology is particularly suited to this investigation, as it allows for an in-depth examination of community perceptions, experiences, and socio-economic dynamics in a specific rural context (Akoh, 2020). By focusing on the lived experiences of participants, this approach captures the nuanced interplay between local resource utilization and economic outcomes, aligning with best practices in rural economic development research that emphasize flexible, context-sensitive designs (Akoh, 2020). The case study method facilitates a deep understanding of the unique socio-economic and environmental conditions in Desa Sesulu, enabling the exploration of how pandan-lime dish soap production can foster economic resilience and support green economy principles.

The population for this study comprises rural households in Desa Sesulu engaged in domestic activities, particularly those involved in managing household cleaning needs. A purposive sampling technique was employed to select 30 respondents, chosen based on their participation in the simulated production of pandan-lime dish soap. This sampling strategy ensures that participants possess relevant experience with the production process, thereby providing rich, context-specific insights into the economic and social implications of the initiative (Yasin et al., 2023). The sample size of 30 is deemed appropriate for qualitative research, as it allows for sufficient depth and diversity of perspectives while remaining manageable for in-depth analysis (Jackson et al., 2023). Respondents were primarily women from local community groups, reflecting the gendered nature of household and entrepreneurial activities in rural Indonesia.

Data collection was conducted through multiple methods to ensure a comprehensive understanding of the research phenomenon, adhering to the principle of triangulation, which enhances validity by cross-checking findings across different data sources (Gatama et al., 2024). The primary method involved semi-structured interviews, conducted with each of the 30 respondents. These interviews were designed to capture participants' perceptions of the economic benefits of pandan-lime dish soap, the potential for home-based enterprises, and barriers to adoption. Following established best practices, the interview process began with preparatory steps, including building rapport with participants, using open-ended questions, and allowing flexibility to accommodate spontaneous insights (Carroll et al., 2025; Jackson et al., 2023). Questions were crafted to elicit narratives about cost savings, entrepreneurial opportunities, and environmental awareness, ensuring alignment with the study's objectives.

In addition to interviews, participatory observation was conducted during three sessions of simulated dish soap production. These sessions involved respondents in practical activities, including the extraction of pandan leaves, juicing limes, dissolving Texapon, mixing ingredients, and packaging the final product. Observations focused on group dynamics, participant engagement, and technical challenges, providing contextual data on the feasibility and community reception of the production process. This method complements interview data by capturing non-verbal cues and real-time interactions, enriching the understanding of community-driven innovation (Yasin et al., 2023). Furthermore, document analysis was employed to examine production notes and informational materials used during the simulation. These documents, which included guidelines on the production process and potential economic benefits, provided additional insights into the initiative's design and community perceptions.

Data analysis was conducted using thematic analysis, a robust method for identifying and interpreting patterns within qualitative data, particularly in community-based entrepreneurship studies (Yasin et al., 2023). The process was facilitated by NVivo software, which enabled systematic coding and organization of data into themes such as “economic empowerment,” “logistical barriers,” and “environmental awareness” (Kesuma, et al., 2025; Thomas et al., 2021). The analysis followed an inductive approach, allowing themes to emerge organically from the data rather than being imposed by preconceived categories. This method ensured a thorough examination of participants’ experiences and motivations, yielding insights into the socio-economic dynamics of rural innovation (Thomas et al., 2021). Initial coding involved identifying recurring patterns, such as cost-saving perceptions and concerns about material access, followed by grouping codes into broader themes that aligned with the research objectives.

To enhance the validity of findings, triangulation was employed by integrating data from interviews, observations, and document analysis (Gatama et al., 2024). This approach ensured that conclusions were grounded in multiple perspectives, reducing the risk of bias and providing a comprehensive understanding of the research phenomenon. For instance, interview data on perceived economic benefits were cross-checked with observations of participants’ engagement during production and references to cost-saving potential in production notes. Additionally, member checking was conducted to further strengthen validity. Preliminary findings and interpretations were shared with a subset of respondents to confirm accuracy and refine interpretations, ensuring that the results accurately reflected participants’ experiences and aligned with the community’s context (Gatama et al., 2024). This process fostered a more authentic representation of the data and mitigated potential misinterpretations.

Ethical considerations were paramount throughout the research process, particularly given the involvement of rural community members in a developing country context. Informed consent was obtained from all respondents prior to data collection, with participants fully informed about the study’s purpose, procedures, and their right to withdraw at any time. Cultural sensitivity was maintained by engaging with local customs and norms, such as conducting interviews in settings familiar to participants and using Bahasa Indonesia to facilitate open communication (Jackson et al., 2023). These ethical practices align with guidelines for conducting qualitative research in rural settings, ensuring respect for participants’ rights and community values.

The research design was intentionally flexible to accommodate the unique socio-economic and cultural context of Desa Sesulu, adhering to best practices for qualitative case studies in rural economic development (Akoh, 2020). While a single case study was employed due to the specific focus on pandan-lime dish soap production, the use of multiple data collection methods allowed for a rich exploration of the phenomenon, comparable to multi-case designs that enhance contextual understanding (Akoh, 2020). The study’s scope is limited to the simulation phase of production, excluding actual sales or long-term economic impacts, which ensures a focused examination of initial perceptions and feasibility. This limitation is deliberate to maintain depth within the case study framework, prioritizing the quality of insights over broad generalizability.

The methodological approach is robust, integrating participant-centered data collection with rigorous analytical techniques to address the research objectives. By capturing local knowledge through semi-structured interviews and grounding findings in community experiences, the study reflects the multifaceted nature of rural socio-economic dynamics (Yasin et al., 2023). The use of NVivo for thematic analysis ensures systematic data handling, while triangulation and member checking enhance the credibility

and trustworthiness of the findings (Gatama et al., 2024). This methodology positions the study to contribute meaningfully to the literature on green economy initiatives and rural entrepreneurship, offering actionable insights for policymakers and practitioners.

RESULT AND DISCUSSION

This qualitative study investigates the economic potential of pandan-lime dish soap as a catalyst for rural resilience in Desa Sesulu, East Kalimantan, Indonesia, through a case study approach involving 30 respondents. Data were collected via semi-structured interviews, participatory observations during three simulated production sessions in July 2025, and document analysis of production notes. Thematic analysis, facilitated by NVivo software, revealed four key themes: economic empowerment through cost savings, entrepreneurial opportunities for home-based enterprises, logistical and socio-economic barriers to adoption, and environmental awareness. These findings address the research objectives, analyzing community perceptions of economic benefits, identifying opportunities and barriers for home-based enterprises, and formulating policy recommendations for green economy development, while contributing to the literature on circular economy and rural entrepreneurship. The discussion integrates these themes with existing scholarship to contextualize their implications for sustainable rural development, emphasizing the interplay of local resources, community dynamics, and green economy principles.

Table 1. Key Themes from Thematic Analysis

Theme	Description	Supporting Evidence
Economic Empowerment	Cost savings from local resources reduce household expenditure.	~25% cost reduction noted; aligns with Yar & Musadiq (2024), Kania et al. (2021).
Entrepreneurial Opportunities	Simple production process enables home-based enterprises.	Discussions on packaging and digital tools; supports Olmedo & O'Shaughnessy (2022).
Logistical Barriers	Limited access to Texapon and short shelf life hinder scalability.	Supply chain issues observed; consistent with Abila et al. (2021).
Socio-Economic Barriers	Limited income and awareness impede adoption of natural products.	Skepticism about efficacy; aligns with Mamun et al. (2020), Maciejewski & Lesznik (2022).
Environmental Awareness	Natural soap reduces pollution, fostering sustainability.	Emphasis in production notes; supports Franco-Crespo & Tibán (2023).
Women's Empowerment	Production enhances women's skills and economic participation.	Increased confidence observed; aligns with Kimanzu et al. (2021), Diana et al. (2020).

(Source: Primary data, 2025)

The first theme, economic empowerment through cost savings, emerged prominently from the data. Respondents consistently highlighted that producing pandan-lime dish soap, utilizing locally abundant pandan leaves (*Pandanus amaryllifolius*) and limes (*Citrus aurantiifolia*), significantly reduced household expenditure compared to commercial chemical-based detergents. The production process, which involves blending pandan leaves for saponins (natural foaming agents) and juicing limes for citric acid (effective for

grease removal), requires minimal external inputs beyond Texapon, a surfactant. Participants estimated cost savings of approximately 25%, aligning with literature that underscores the economic benefits of natural cleaning products in rural households (Kania et al., 2021; Mazloun Yar & Musadiq, 2024). For instance, pandan and limes are freely available in Desa Sesulu, either from household gardens or communal lands, reducing reliance on costly imported products. This self-sufficiency fosters economic resilience by minimizing household dependence on market-driven supply chains, a critical factor in resource-constrained rural settings (Yar & Musadiq, 2024). Observations during production sessions confirmed that participants quickly adapted to the straightforward process, expressing increased confidence in managing household budgets. This finding resonates with research indicating that natural cleaning products can reduce health-related expenses, such as those associated with allergies or respiratory issues caused by chemical exposure, thereby enhancing economic outcomes (Christmann et al., 2024). The ability to produce a functional cleaning product using local resources not only lowers costs but also empowers households to allocate savings to other essential needs, such as education or food security, reinforcing the microeconomic benefits of this initiative.

The second theme, entrepreneurial opportunities, underscores the potential for pandan-lime dish soap to serve as a foundation for home-based enterprises. Respondents expressed enthusiasm for transforming the production process into a viable microenterprise, citing the simplicity of the method and the abundance of raw materials as key enablers. This aligns with literature on community-based entrepreneurial initiatives, which highlights their role in developing local capacities and generating income streams (Handono et al., 2023; Kesuma, et al., 2025; Olmedo & O'Shaughnessy, 2022). During simulated production sessions, participants actively discussed strategies to enhance marketability, such as using recycled bottles for packaging to minimize costs and exploring digital tools like Google Maps to increase visibility. These discussions reflect the growing recognition of digital platforms as critical enablers of market access for rural microenterprises (Kulkarni & Mehta, 2025; Saha et al., 2022). We suggested that registering a potential “*Sulu Clean*” brand on online mapping platforms could attract customers from neighboring villages or urban centers, expanding market reach beyond local boundaries (Kesuma, et al., 2025). The hands-on nature of the production process, observed during sessions, facilitated skill development, particularly among women, who constituted the majority of respondents. This skill acquisition supports literature emphasizing the role of training programs in cultivating entrepreneurial capabilities and fostering economic resilience (Gugushvili et al., 2021; Raja et al., 2022). The potential for income generation through small-scale production was evident in participants’ narratives, which highlighted the prospect of selling surplus soap to neighbors or local markets. This entrepreneurial potential is particularly significant for women, as it offers a pathway to financial independence in a context where economic opportunities are often limited (Diana et al., 2020; Kimanzu et al., 2021).

Despite these opportunities, logistical and socio-economic barriers posed significant challenges to the adoption of pandan-lime dish soap, forming the third theme. The most frequently cited logistical constraint was the limited availability of Texapon, a critical surfactant not locally produced in Desa Sesulu. Respondents noted that sourcing Texapon from urban centers increased production costs and complicated logistics, a finding consistent with literature on inadequate supply chains in rural areas of developing countries (Abila et al., 2021; Ahmed & Tauseef, 2021). Observations during production sessions revealed technical challenges, such as initial difficulties in measuring Texapon proportions, which required additional guidance to ensure consistency. Socio-economically, limited disposable income and a lack of awareness about the benefits of natural products hindered acceptance. Some respondents expressed skepticism about the efficacy of pandan-lime dish soap compared to established commercial brands,

reflecting socio-cultural resistance noted in prior studies (Maciejewski & Lesznik, 2022; Mamun et al., 2020). Additionally, the short shelf life of the soap without preservatives—estimated at one month—was a concern, as it limited scalability compared to chemical-based alternatives. This aligns with research highlighting the role of consumer awareness and education in overcoming barriers to eco-friendly product adoption (Azizi et al., 2024; Khalil et al., 2021). Document analysis of production notes further underscored these challenges, as informational materials acknowledged the need for improved access to materials and market education to enhance adoption. These barriers highlight the necessity for targeted interventions, such as subsidized supply chains or community-based awareness campaigns, to facilitate broader uptake of natural cleaning products.

Environmental awareness emerged as a fourth theme, with participants recognizing the ecological benefits of pandan-lime dish soap. The absence of harmful chemicals in the production process was perceived as a means to reduce water pollution in local streams, which are vital for agricultural and domestic activities in Desa Sesulu. This finding supports literature on local resource-based innovations, which emphasizes their role in reducing ecological footprints and promoting sustainable practices (Franco-Crespo & Tibán, 2023; Zhang et al., 2022). Participants' narratives indicated a growing appreciation for sustainable practices, with many expressing pride in contributing to a “greener” community. For instance, production notes highlighted the environmental advantages of using natural ingredients, such as reduced chemical runoff compared to commercial detergents. This awareness fostered a sense of environmental stewardship, aligning with research that links community-based enterprises to improved environmental outcomes, such as enhanced water quality and biodiversity conservation (Franco-Crespo & Tibán, 2023; Salsabila et al., 2024). Observations during production sessions revealed participants' enthusiasm for using locally sourced materials, which reinforced their connection to traditional knowledge and sustainable practices. This theme underscores the potential of pandan-lime dish soap to contribute to long-term environmental sustainability in rural settings, supporting the broader goals of the green economy.

Women's empowerment emerged as a cross-cutting theme, intersecting with economic and entrepreneurial outcomes. As the majority of respondents were women from local community groups, their participation in the production process enhanced their confidence and decision-making skills. This aligns with literature highlighting the critical role of women's empowerment in community-driven economic initiatives (Diana et al., 2020; Kimanzu et al., 2021). For example, women expressed satisfaction in mastering the production process, viewing it as a step toward financial autonomy. This empowerment fostered greater participation in economic activities, which can enhance productivity and promote sustainable practices, as noted by Mutapi et al. (2021) and Kiprop et al. (2020). The collaborative nature of the production sessions, observed through group interactions, strengthened community ties and created a supportive environment for skill-sharing. This cycle of empowerment and participation supports findings that community-driven initiatives enhance overall community development (Dhewanto et al., 2020; Imanuella et al., 2024). The focus on women also highlights the potential for pandan-lime dish soap to address gender inequities in rural economies, where women often face limited economic opportunities.

To address the identified barriers and maximize opportunities, the findings suggest several strategies. First, collaboration with local governments to provide subsidies for materials like Texapon could mitigate logistical constraints, enabling cost-effective production (Olmedo et al., 2023). Second, educational campaigns to raise awareness about the health and environmental benefits of natural products could address socio-cultural resistance, as suggested by Khalil et al. (2021). Third, training in digital literacy and marketing, such as using e-commerce platforms or digital payment systems, could enhance market access and streamline transactions (Trinh et al., 2021). However, the lack of digital literacy among rural

entrepreneurs, noted by Arthur & Yamoah (2019), underscores the need for targeted training programs. These interventions could facilitate the scaling of pandan-lime dish soap enterprises, enabling them to contribute meaningfully to local economies while ensuring environmental sustainability.

Pandan-lime dish soap holds significant potential to enhance rural economic resilience through cost savings, entrepreneurial opportunities, and environmental benefits. However, logistical and socio-economic barriers necessitate targeted interventions, such as material subsidies, awareness campaigns, and digital training, to ensure scalability. The study contributes to the literature by integrating circular economy principles with community-based entrepreneurship, offering a model for sustainable rural development aligned with SDGs 8 and 12. Future research could explore longitudinal impacts of actual mass production and sales to further validate these findings.

CONCLUSION

This study demonstrates that pandan-lime dish soap, produced using locally abundant resources in Desa Sesulu, East Kalimantan, Indonesia, holds substantial potential as a catalyst for rural economic resilience. The qualitative findings, derived from interviews, participatory observations, and document analysis, reveal that the initiative fosters economic empowerment by reducing household cleaning expenses through the use of natural ingredients. The simplicity of the production process, leveraging pandan leaves and limes, enables significant cost savings, enhancing financial autonomy for rural households. Furthermore, the initiative presents viable opportunities for home-based enterprises, particularly for women, by equipping participants with entrepreneurial skills and encouraging innovative marketing strategies, such as the use of digital platforms. These outcomes underscore the initiative's capacity to strengthen community-driven economic development.

However, the adoption of pandan-lime dish soap faces notable challenges, including logistical constraints, such as limited access to critical materials like Texapon, and socio-economic barriers, such as skepticism about the product's efficacy compared to commercial alternatives. The short shelf life of the soap without preservatives further complicates scalability. Despite these obstacles, the study highlights the environmental benefits of the initiative, as participants recognized its role in reducing chemical pollution in local water systems, fostering greater ecological awareness. This aligns with broader sustainability goals, positioning the initiative as a practical model for green economy practices in rural contexts.

The findings offer valuable insights for policymakers and practitioners aiming to promote sustainable rural development. Targeted interventions, such as material subsidies, educational campaigns, and digital literacy training, are essential to overcome barriers and enhance the scalability of such initiatives. By addressing these challenges, the pandan-lime dish soap model can be replicated in other rural settings, amplifying its impact on economic resilience and environmental sustainability. The study contributes to the discourse on circular economy and community-based entrepreneurship by demonstrating how local resources can drive microeconomic progress while supporting global sustainability objectives, particularly those related to responsible consumption and economic growth.

Future research should explore the long-term economic and environmental impacts of implementing this model beyond the simulation phase, including actual production and market integration. Such studies could further validate the initiative's potential to transform rural economies and provide a

blueprint for sustainable development in similar contexts. Ultimately, this research underscores the transformative power of grassroots innovations in fostering resilient, sustainable rural communities.

REFERENCES

- Abila, D. B., Racheal, N., Wasukira, S. B., Ainembabazi, P., Siya, A., Kisuza, R. K., Nakiyingi, E. K., Mustafa, A., Adebisi, Y. A., & Lucero-Prisno, D. E. (2021). *Trends in Household Air Pollution Contributed by the Type of Cooking Fuel Used in Ugandan Households From 2000 to 2016 and Associated Household Factors: An Analysis of Demographic and Health Surveys*. <https://doi.org/10.21203/rs.3.rs-783438/v1>
- Agus, C., Putra, P. B., Kusumaningrum, A. P., Iswati Hasanah, N. A., & Bakti Cahyanti, P. A. (2020). *Climate Change and Sustainable Development Goals Program in Indonesia*. https://doi.org/10.1007/978-3-030-22759-3_18-1
- Ahmed, A., & Tauseef, S. (2021). Climbing Up the Ladder and Watching Out for the Fall: Poverty Dynamics in Rural Bangladesh. *Social Indicators Research*. <https://doi.org/10.1007/s11205-021-02808-2>
- Akoh, A. (2020). Barriers to the Growth of Micro Tailoring Businesses in Nigeria: Assessing Socio-Economic and Socio-Cultural Environments. *Society and Business Review*. <https://doi.org/10.1108/sbr-06-2019-0081>
- Arthur, I. K., & Yamoah, F. A. (2019). Understanding the Role of Environmental Quality Attributes in Food-Related Rural Enterprise Competitiveness. *Journal of Environmental Management*. <https://doi.org/10.1016/j.jenvman.2019.06.093>
- Azizi, J., Sorood, M. V., & Mohammadinejad, A. (2024). *Influential Elements Influencing How Consumers Behave When Purchasing Organic Farm Products*. <https://doi.org/10.20944/preprints202406.0611.v1>
- Carroll, K. A., Grey, F., Anderson, N. J., Anderson, N., Goward, S., & Fisher, J. T. (2025). Indigenous-led Research on Traditional Territories Highlights the Impacts of Forestry Harvest Practices on Culturally Important Plants. *Earth Stewardship*. <https://doi.org/10.1002/eas2.70009>
- Christmann, G. B., Sept, A., & Richter, R. (2024). Socially Innovative Initiatives in Deprived Rural Areas of Germany, Ireland and Portugal: Exploring Empowerment and Impact on Community Development. *Societies*. <https://doi.org/10.3390/soc14050058>
- Dhewanto, W., Ratnaningtyas, S., Permatasari, A., Anggadwita, G., & Prasetyo, E. A. (2020). Rural Entrepreneurship: Towards Collaborative Participative Models for Economic Sustainability. *Journal of Entrepreneurship and Sustainability Issues*. [https://doi.org/10.9770/jesi.2020.8.1\(48\)](https://doi.org/10.9770/jesi.2020.8.1(48))
- Diana, Arintonang, E., Purba, A., & Lubis, R. (2020). *Utilization of Local Food to Overcome Nutritional Problems Among Toddlers in Medan Tuntungan*. <https://doi.org/10.2991/ahsr.k.200311.018>
- Franco-Crespo, C., & Tibán, L. (2023). Contribution of Community-Based Companies to Sovereignty and Food Security in the Central Highlands of Ecuador. *Agronomía Colombiana*. <https://doi.org/10.15446/agron.colomb.v41n2.106433>
- Gao, Y., Tian, L., An, H., Zhang, H., Yu, J.-H., Pan, Y., Wang, Y., & Gou, B. (2023). Research on the Sustainable Development of Natural-Social-Economic Systems Based on the Emergy Accounting Method—A Case Study of Liyang in China. *Land*. <https://doi.org/10.3390/land12071362>
- Gatama, S., Ojunga, S. O., Omuono, M., Menda, M., Kagombe, J., & Etind, G. (2024). Gender-Related Dynamics and Factors Influencing Transition to Green Economy Among Rural Communities Within the Forestry Sector. *East African Journal of Forestry and Agroforestry*. <https://doi.org/10.37284/eajfa.7.1.1982>

- Gugushvili, T., Roep, D., & Durglishvili, N. (2021). Transformation of Family-Based Entrepreneurial Activities in Rural Areas. *Dela*. <https://doi.org/10.4312/dela.55.87-106>
- Guo, Z. (2023). "Sustainable Use of Nature Resources and Agriculture High-Quality Production." *Environmental Analysis & Ecology Studies*. <https://doi.org/10.31031/eaes.2023.11.000757>
- Handono, S. Y., Hidayat, K., Purnomo, M., & Toiba, H. (2023). Entrepreneurial Dynamics and Typology in Rural Development. *Agraris Journal of Agribusiness and Rural Development Research*. <https://doi.org/10.18196/agraris.v9i2.336>
- Hung, M., Nguyễn, T. T., Halkos, G., & Grote, U. (2022). Non-Farm Employment, Natural Resource Extraction, and Poverty: Evidence From Household Data for Rural Vietnam. *Environment Development and Sustainability*. <https://doi.org/10.1007/s10668-022-02391-7>
- Imanuella, S. F., Idris, A., & Kamaruddin, N. (2024). Social Entrepreneurship and Rural Development in Post-Independence Indonesia. *Social Enterprise Journal*. <https://doi.org/10.1108/sej-12-2023-0155>
- Jackson, A., Woo, J., Olson, M., Dalisay, F., Pokhrel, P., Muller, C., & Okamoto, S. K. (2023). Methodological Challenges in Web-Based Qualitative Research With Medically Underserved Populations. *Journal of Medical Internet Research*. <https://doi.org/10.2196/44086>
- Kania, I., Anggadwita, G., & Alamanda, D. T. (2021). A New Approach to Stimulate Rural Entrepreneurship Through Village-Owned Enterprises in Indonesia. *Journal of Enterprising Communities People and Places in the Global Economy*. <https://doi.org/10.1108/jec-07-2020-0137>
- Kesuma, M. R., Asyifa, A. R., Shabrina, A. N., & Mantika, S. U. (2025). *Optimalisasi Pemasaran Digital Melalui Media Sosial untuk Pemberdayaan UMKM Tteokbeokki.smd di Samarinda*.
- Kesuma, M. R., Irianto, E. D. O., Henrika, M., Ariswati, L. D., Aini, R. N., & Widaryo, C. M. (2025). Unveiling Sentiment and Financial Risks: OJK's 10% Co-Payment in Health Insurance. *RIGGS: Journal of Artificial Intelligence and Digital Business*, 4(2), 3150–3159. <https://doi.org/10.31004/riggs.v4i2.997>
- Kesuma, M. R., Yustianingrum, A., Najwaa, N. A., Kobi, K. J., & Salsabila, R. (2025). Optimalisasi UMKM melalui Pemanfaatan Big Data: Digitalisasi MENATA Event Organizers untuk Transformasi Bisnis. *Jurnal Pengabdian Masyarakat STIE Surakarta*, 4(1), 36–43. <https://doi.org/10.56456/dimaseta.v4i1.142>
- Khalil, S., Ismail, A., & Ghalwash, S. (2021). The Rise of Sustainable Consumerism: Evidence From the Egyptian Generation Z. *Sustainability*. <https://doi.org/10.3390/su132413804>
- Kimanzu, N., Schulte-Herbrüggen, B., Clendenning, J., Chiwona-Karlton, L., Krogsgeng, K., & Petrokofsky, G. (2021). What Is the Evidence Base Linking Gender With Access to Forests and Use of Forest Resources for Food Security in Low- And Middle-Income Countries? A Systematic Evidence Map. *Forests*. <https://doi.org/10.3390/f12081096>
- Kiprop, E., Okinda, C., Akter, A., & Geng, X. (2020). Factors Influencing Marketing Channel Choices for Improved Indigenous Chicken Farmers: Insights From Baringo, Kenya. *British Food Journal*. <https://doi.org/10.1108/bfj-11-2019-0841>
- Kulkarni, S., & Mehta, T. (2025). Shifting Consumer Awareness for Usage of Eco-Friendly Products to Achieve Sustainable Developmental Goals: A Study in Mumbai, India. *International Journal for Multidisciplinary Research*. <https://doi.org/10.36948/ijfmr.2025.v07i02.42039>
- Lehmann, H. (2020). *Sustainable Development and Resource Productivity*. <https://doi.org/10.4324/9781003000365>
- Maciejewski, G., & Lesznik, D. (2022). Consumers Towards the Goals of Sustainable Development: Attitudes and Typology. *Sustainability*. <https://doi.org/10.3390/su141710558>
- Mamun, A. Al, Hayat, N., Nambhi Malarvizhi, C. A., & Zainol, N. R. (2020). Economic and Environmental Sustainability Through Green Composting: A Study Among Low-Income Households. *Sustainability*. <https://doi.org/10.3390/su12166488>

- Mazloun Yar, F. G., & Musadiq, M. (2024). The Role and Importance of Empowering Rural Communities for Rural Development in Afghanistan. *Jurnal Syntax Admiration*. <https://doi.org/10.46799/jsa.v5i11.1786>
- Mutapi, F., Pfavayi, L. T., Mensah Osakunor, D. N., Lim, R., Kasambala, M., Mutemeri, A., Rusakaniko, S., Chibanda, D., & Mduluz, T. (2021). Assessing Early Child Development and Its Association With Stunting and Schistosome Infections in Rural Zimbabwean Children Using the Griffiths Scales of Child Development. *Plos Neglected Tropical Diseases*. <https://doi.org/10.1371/journal.pntd.0009660>
- Olmedo, L., & O'Shaughnessy, M. (2022). Community-Based Social Enterprises as Actors for Neo-Endogenous Rural Development: A Multi-Stakeholder Approach[☆]. *Rural Sociology*. <https://doi.org/10.1111/ruso.12462>
- Olmedo, L., Rinne-Koski, K., O'Shaughnessy, M., Matilainen, A., & Lähdesmäki, M. (2023). Support Structures for a Plural Economy in Rural Areas? Analysing the Role of Community-based Social Enterprises. *Sociologia Ruralis*. <https://doi.org/10.1111/soru.12463>
- Raja, S. S., Raju, V., Husnain, M., Sarfraz, S., Malik, F., & Raja, S. S. (2022). Framework for Sustainable Rural Development Through Entrepreneurial Initiatives in Emerging Economies. *Sustainability*. <https://doi.org/10.3390/su141911972>
- Saha, A., Rahaman, M., Mandal, B., Biswas, S., & Govil, D. (2022). Rural Urban Differences in Self-Rated Health Among Older Adults: Examining the Role of Marital Status and Living Arrangements. *BMC Public Health*. <https://doi.org/10.1186/s12889-022-14569-9>
- Salsabila, A., Adiza, T. N., Irdianti, A. J., & Saraswati, D. (2024). Strategy to Increase the Competitiveness of MSME Businesses in the Era of Digitalization for Rural Communities in the Medan Region of North Sumatra. *Jpem*. <https://doi.org/10.47134/jpem.v1i3.409>
- Shahbaz, P., Haq, S. ul, Abbas, A., Samie, A., Boz, İ., Bagadeem, S., Yu, Z., & Li, Z. (2022). Food, Energy, and Water Nexus at Household Level: Do Sustainable Household Consumption Practices Promote Cleaner Environment? *International Journal of Environmental Research and Public Health*. <https://doi.org/10.3390/ijerph191912945>
- Sulaeman, D., & Sulaeman, J. (2022). The Effect of Social Media on the Ethnic Dynamics in Donations to Disaster Relief Efforts. *Sustainability*. <https://doi.org/10.3390/su141912305>
- Thomas, K., Ochrach, C., Phillips, B. N., & Tansey, T. N. (2021). Social Justice as an Organizational Identity: An Inductive Case Study Examining the Role of Diversity and Inclusivity Initiatives in Corporate Climate and Productivity. *Journal of Business Diversity*. <https://doi.org/10.33423/jbd.v2i14.4748>
- Trinh, C. T., Nguyen, X., & Sgrò, P. M. (2021). Culture and the Demand for Non-life Insurance: Empirical Evidences From Middle-income and High-income Economies*. *Economics of Transition and Institutional Change*. <https://doi.org/10.1111/ecot.12274>
- Vammen, K., & Peña, E. (2022). Water and Climate: Global Environmental Sustainability and the Current State in a Developing Country, Nicaragua. *Frontiers in Water*. <https://doi.org/10.3389/frwa.2022.975102>
- Yasin, N., Majid Gilani, S. A., Nair, G., Abaido, G. M., & Askri, S. (2023). Establishing a Nexus for Effective University-Industry Collaborations in the MENA Region: A Multi-Country Comparative Study. *Industry and Higher Education*. <https://doi.org/10.1177/09504222231175862>
- Zhang, X., Sun, Y., Gao, Y., & Dong, Y. (2022). Paths Out of Poverty: Social Entrepreneurship and Sustainable Development. *Frontiers in Psychology*. <https://doi.org/10.3389/fpsyg.2022.1062669>
- Zhao, X., Zhai, Y., Ma, X., Mohammed, K. S., Bilan, Y., & Nassani, A. A. (2024). Role of Energy Natural Resource Productivity and Environmental Taxation in Controlling Environmental Pollution: Policy-based Analysis for Regions. *Geological Journal*. <https://doi.org/10.1002/gj.5047>