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Sagari Berdikari as a Community-Based Social Innovation: Integrating Sustainable Mango Agriculture, Circular Economy, And Women Empowerment in Indramayu, Indonesia

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ABSTRACT: Rural agricultural communities face interconnected challenges related to limited market access, unmanaged agricultural residues, environmental pressures, and limited livelihood opportunities. These challenges require community development approaches that can connect local resources with economic, social, and environmental solutions. This study examines the implementation of Sagari Berdikari**,** a Corporate Social Responsibility (CSR)-based community development program implemented by PT Pertamina Patra Niaga Integrated Terminal Balongan in Sliyeg Lor Village, Indramayu, West Java, Indonesia. The study aims to examine how Sagari Berdikari develops local mango potential through an integrated approach to sustainable agriculture, circular economy, and community empowerment. A qualitative case study approach was employed using program documentation, implementation records, beneficiary information, and documented program outcomes. The findings indicate that Sagari Berdikari has developed three interconnected components: Griya Mangga, Griya Kreasi, and Griya Rasa. These components connect conventional and millennial mango farmers with modern cultivation practices, climate-resilient agricultural innovation, market development, and mango-based product processing involving women former migrant workers. The program also introduces circular practices by utilizing mango skin waste as a bioactivator and harvest residues as compost, while renewable energy is incorporated through a solar photovoltaic system to support agricultural activities. The documented outcomes include increased reported income among farmer and women groups, greenhouse gas emission reduction through mango waste utilization, and electricity cost savings through solar energy utilization. The program also developed intellectual property related to mango-waste bioactivator, greenhouse design, and climate-resilient mango cultivation. The findings suggest that CSR can function as a platform for social innovation by connecting local agricultural resources, technological innovation, environmental management, and community capabilities. Sagari Berdikari demonstrates that sustainable rural development can be strengthened when agricultural production is connected with resource recovery, livelihood diversification, renewable energy, and community participation.

KEYWORDS: Sagari Berdikari, Corporate Social Responsibility, Social Innovation, Sustainable Mango Agriculture, Circular Economy, Women Empowerment, Rural Development,Renewable Energy

I. INTRODUCTION

Agricultural communities in rural areas face increasingly interconnected challenges in maintaining productive livelihoods while responding to environmental and economic pressures. Agricultural production is not only influenced by the availability of land, technology, and markets, but also by the ability of communities to manage agricultural residues, adapt to changing environmental conditions, and create additional economic opportunities. When agricultural commodities are primarily sold in raw form, communities may have limited opportunities to capture greater economic value. At the same time, agricultural residues that are not properly managed can become environmental problems rather than productive resources. These conditions indicate that rural agricultural development requires an approach that connects production, environmental management, innovation, and community economic development.

The potential for such an approach is particularly relevant in Indonesia, where agricultural commodities are closely connected to rural livelihoods and local economic identity. Indramayu Regency in West Java is strongly associated with mango production and has an established local potential in mango cultivation. In Sliyeg Lor Village, Indramayu, mango agriculture has become an important local resource around which community development activities can be developed. The Sagari Berdikari program positions mango not merely as an agricultural commodity but as a local resource that can support community independence, economic activity, and broader development. This perspective is reflected in the program's framing of mango as a local potential that can become a pathway for community growth and self-reliance.

Despite this potential, the development of the mango sector is accompanied by several challenges. The program identifies limited market access for mango commodities as one of the significant changes requiring intervention. Limited access to markets can constrain the economic value obtained from agricultural production, particularly when farmers remain dependent on conventional marketing channels. The program therefore seeks to expand local and premium mango markets while strengthening branding and product development. Through this approach, mango is positioned within a broader value chain that extends from cultivation to processing and marketing.

Environmental management represents another challenge within the local agricultural system. Mango cultivation and harvesting generate residues, including mango skins and other agricultural waste, which may remain underutilized when no appropriate utilization mechanism is available. Sagari Berdikari responds to this issue by developing resource recovery practices. Harvest residues are utilized for compost production, while mango skin waste is processed into a bioactivator. The program reports that the utilization of mango skin as a bioactivator contributes to a reduction of 0.562 tonnes of CO_2eq in greenhouse gas emissions. This approach reflects the principle of the circular economy, in which materials that would otherwise be discarded can be redirected into productive systems.

The social and economic dimensions of rural development are equally important. The program identifies migration to other countries without sustainable planning as another significant community issue. The context is particularly relevant because the program documentation describes Indramayu as having substantial economic vulnerability and a high contribution to migrant workers in West Java, citing BPS (2024) and BP3MI West Java (2025). In response, Sagari Berdikari introduces activities aimed at strengthening livelihood alternatives and preparing prospective migrant workers through financial literacy, language training, and the Mango Farmer School using an FMD approach focusing on physical, mental, and discipline development.

Women are also positioned as important actors within the local economic development process. Through Griya Rasa, the program involves women former migrant workers in the development of processed mango products. The documented intervention involves six women former migrant workers and focuses on increasing the value of mango products, strengthening branding and marketing, and developing local micro-enterprises. This approach expands the role of women beyond household-based activities by creating opportunities for their participation in agricultural value addition and local entrepreneurship.

The development of Sagari Berdikari also incorporates technological innovation and renewable energy. Through Griya Kreasi, the program promotes modern mango agriculture, millennial farmer empowerment, environmentally friendly technological innovation, specialized mango markets, and farmer capacity development. The program further developed a greenhouse for climate-resilient mango cultivation and documented intellectual property related to the bioactivator, greenhouse design, and climate-resilient mango cultivation techniques. The program documentation also identifies the greenhouse as a novel development in the local context and records a novelty statement from the Indramayu District Food Security and Agriculture Office. Renewable energy is incorporated through a photovoltaic system with a reported capacity of 8.7 kWp and 10 kWh, with reported electricity cost savings of IDR 13.2 million.

These characteristics position Sagari Berdikari within a broader discussion of Corporate Social Responsibility (CSR) as a mechanism for community-based social innovation. CSR interventions in rural areas can provide resources, infrastructure, technology, knowledge, and institutional support that may be difficult for community groups to develop independently. However, the significance of CSR is not limited to the delivery of assistance. CSR can potentially facilitate connections among local resources, community actors, productive activities, and environmental solutions. In the Sagari Berdikari context, these connections can be observed through the integration of conventional farmers, millennial farmers, women former migrant workers, agricultural waste management, renewable energy, technological innovation, and market development within one program framework.

The concept of social innovation provides a useful perspective for understanding this integrated approach. Social innovation emphasizes new ideas, practices, relationships, and arrangements that respond to social needs and create social value. From this perspective, the innovation of Sagari Berdikari does not lie solely in the development of a greenhouse, bioactivator, processed mango products, or solar energy infrastructure. Rather, its potential social innovation lies in the combination of these elements into an interconnected community development system. Agricultural resources become inputs for new economic and environmental activities, community members become active participants in value creation, and CSR provides a facilitating mechanism for connecting technology, knowledge, infrastructure, and local capabilities.

Although previous studies have examined CSR, sustainable agriculture, circular economy, social innovation, and community empowerment, these dimensions are often discussed separately. There remains a need to better understand how CSR-based interventions can integrate agricultural production, resource recovery, technological adaptation, renewable energy, and community empowerment within a single rural development context. In particular, the transformation of agricultural residues into productive resources and the connection between climate-resilient agriculture, women's economic participation, and livelihood diversification provide an opportunity to examine social innovation from a more integrated perspective.

This study therefore examines Sagari Berdikari as a community-based social innovation that integrates sustainable mango agriculture, circular economy, and women empowerment in Indramayu, Indonesia. The study focuses on how the program connects

local mango potential with climate-resilient agricultural practices, agricultural waste utilization, renewable energy, value-added processing, market development, and community capacity building. By examining these processes as an interconnected system, the study seeks to contribute to the understanding of how CSR can facilitate locally embedded social innovation and generate environmental, economic, and social value in rural agricultural communities.

II. LITERATURE REVIEW

Corporate Social Responsibility (CSR) has increasingly been understood as more than a corporate obligation to provide social assistance. In the context of community development, CSR can function as a mechanism for strengthening local capacity, developing livelihoods, and addressing social and environmental problems through longer-term engagement with communities. Recent studies in Indonesia show that community empowerment has become an important part of CSR implementation, with companies increasingly developing programs based on local potential and community needs rather than relying solely on philanthropic activities. Widhagdha et al. (2022), for example, found that CSR-based community development in Indonesia has developed through various empowerment models and strategies that are adapted to local conditions. A more recent systematic review also indicates that CSR is increasingly connected with environmental sustainability, resource efficiency, innovation, and strengthening community capacity (Sari et al., 2025).

The development of CSR towards community empowerment is closely related to the concept of social innovation. Social innovation concerns new ways of addressing social problems through changes in practices, relationships, and institutional arrangements. Cajaiba-Santana (2014) explains social innovation as a process that can generate social change through the interaction between social actors and institutions. In community development, innovation therefore does not necessarily mean the introduction of sophisticated technology. It can also emerge from the way local resources are reorganized, community groups collaborate, and existing activities are connected to create new social and economic value. This perspective is relevant for CSR programs because the innovation may lie not only in the technology introduced by the company but also in the new relationships and practices developed by the community.

Another relevant concept is the circular economy, particularly in agricultural communities where production activities generate considerable amounts of organic residues. Geissdoerfer et al. (2017) describe the circular economy as an approach that connects economic activity with sustainable development through restorative and regenerative resource systems. Kirchherr et al. (2017) further emphasize reducing, reusing, recycling, and recovering materials within production and consumption systems. In agriculture, these principles can be applied through the utilization of crop residues, organic waste, composting, processing by-products, and other forms of resource recovery. Rather than treating agricultural residues as materials with no further value, circular approaches seek to return them to productive systems. This can simultaneously reduce environmental pressure and create opportunities for additional economic value.

The application of circular economy principles at the community level also requires participation and local capacity. Resource recovery cannot operate effectively without people who have the knowledge, skills, and organizational arrangements to collect, process, and utilize materials. Indonesian studies have shown that community-based circular economy initiatives can create environmental benefits while also contributing to skills development, additional income, and stronger community cooperation. This makes the circular economy relevant not only as an environmental concept but also as an approach to community empowerment. In agricultural areas, the connection between production, waste utilization, processing, and marketing can create a more integrated local value chain.

Sustainable agricultural development also requires attention to the ability of farmers to respond to environmental and economic changes. Modern agricultural practices, climate-resilient cultivation, improved production technology, and access to markets can strengthen the capacity of rural communities to maintain their livelihoods. At the same time, agricultural development cannot be separated from the economic opportunities available to community members. Rural entrepreneurship can provide an important mechanism for transforming local resources into economic activities. Research on rural entrepreneurship in Indonesia has shown that locally owned resources can become the basis for developing new forms of rural enterprise and community economic empowerment (Kania et al., 2021).

Women's participation is particularly important when agricultural development is connected with product processing and rural entrepreneurship. Women are often involved in food processing, household-based enterprises, marketing, and other activities that add value to agricultural commodities. However, participation does not automatically mean empowerment. Access to knowledge, productive resources, markets, organizational support, and opportunities to make economic decisions are important elements in strengthening women's position within local value chains. Studies on rural women's entrepreneurship have shown that women's groups can help overcome contextual barriers and create opportunities for women to participate more actively in rural economic activities. In the Indonesian context, strengthening women's participation in local enterprises can therefore contribute to livelihood diversification while also increasing the economic value captured within the community.

The combination of CSR, social innovation, sustainable agriculture, circular economy, and community empowerment provides a useful framework for examining agricultural-based community development. CSR can provide resources and facilitation, while social innovation explains how new practices and relationships emerge. Sustainable agriculture provides the foundation for maintaining productive resources, and circular economy principles provide opportunities to utilize agricultural residues more efficiently. Community empowerment then becomes the mechanism through which these changes can be adopted and maintained by local actors. The interaction among these dimensions is particularly relevant when a community program does not focus on a single intervention but develops a series of connected activities along the local agricultural value chain.

Previous studies have generally examined these issues separately. CSR research often focuses on corporate-community relationships, while circular economy studies emphasize resource efficiency and waste management. Research on rural entrepreneurship and women's empowerment tends to focus on economic participation, and agricultural studies commonly emphasize production and sustainability. There is still room to examine how these dimensions can be integrated within one community-based intervention, particularly in an Indonesian rural setting where a local agricultural commodity becomes the basis for environmental innovation, value-added processing, renewable energy, and livelihood development. This gap provides the basis for examining Sagari Berdikari as a community-based social innovation that connects mango cultivation with climate-resilient agricultural practices, circular utilization of mango waste, renewable energy, women's economic participation, and market-oriented community development.

III. RESEARCH METHODS

This study employed a qualitative case study approach to examine Sagari Berdikari as a community-based social innovation implemented through Corporate Social Responsibility (CSR). A qualitative case study was selected because the study focuses on understanding how a community development program was implemented within its real-life social, economic, and environmental context. This approach allows the relationships between local agricultural resources, community participation, technological innovation, environmental practices, and livelihood development to be examined as part of one integrated program rather than as separate activities. Qualitative case studies are particularly suitable for examining context-specific programs and processes that involve multiple dimensions and sources of evidence (Farquhar, Michels, & Robson, 2020).

The case examined in this study is Sagari Berdikari, a CSR-based community development program implemented by PT Pertamina Patra Niaga Integrated Terminal Balongan in Sliyeg Lor Village, Sliyeg District, Indramayu Regency, West Java, Indonesia. The program was selected because it represents an integrated agricultural development initiative that combines mango cultivation, climate-resilient agricultural practices, circular utilization of agricultural waste, renewable energy, product processing, and community empowerment. The analysis focuses on the development of the three main components of Sagari Berdikari, namely Griya Mangga, Griya Kreasi, and Griya Rasa, and examines how these components contribute to the development of local value and community livelihoods.

The study used secondary and program-based data derived from official program documentation and implementation records. The materials included program reports, descriptions of community activities, beneficiary information, documentation of agricultural and environmental innovations, records of economic outcomes, and supporting program documentation. The analysis also considered documented quantitative indicators, such as changes in reported community income, greenhouse gas emission reduction, renewable energy utilization, and participation of community groups. Document analysis is considered an appropriate source of evidence in qualitative case study research because program documents can provide information about the context, activities, processes, and outcomes of a case and can be examined systematically to develop an understanding of the phenomenon under study (Wood, Sebar, & Vecchio, 2020).

The data were analyzed thematically by identifying recurring issues and relationships within the program documentation. The analysis first examined the main community problems addressed by Sagari Berdikari, including agricultural waste management, limited market access, livelihood opportunities, and the need for more sustainable agricultural practices. The documented program activities were then grouped according to their contribution to sustainable agriculture, circular economy, community empowerment, renewable energy, and livelihood diversification. The analysis subsequently compared these elements to identify how individual interventions were connected and how they collectively contributed to the program's social innovation process. The documented outcomes were used to support the interpretation of these relationships rather than to establish statistical causality. A systematic analytical process is important in qualitative case studies because multiple sources of evidence need to be organized and interpreted consistently (Houghton et al., 2015).

To strengthen the credibility of the analysis, the study applied data triangulation by comparing information across different program documents and types of evidence. Triangulation is commonly used in qualitative case study research to examine a phenomenon from multiple sources and to strengthen the credibility and contextual understanding of the findings (Farquhar, Michels, & Robson, 2020). In this study, documented program activities were considered together with beneficiary information,

innovation records, and reported outcome indicators. This process helped ensure that the interpretation of Sagari Berdikari was not based on a single program activity or indicator.

The analysis was descriptive and interpretive rather than experimental. Therefore, the study does not attempt to establish a causal relationship between CSR intervention and changes in community welfare through statistical testing. Instead, it seeks to explain the process through which local mango resources, community capabilities, technology, environmental practices, and economic activities were connected within Sagari Berdikari. This methodological position is consistent with the purpose of the study, which is to understand the program as a community-based social innovation and to identify how an integrated CSR approach can contribute to sustainable rural development.

IV. RESULTS

4.1 Development of an Integrated Mango-Based Community Program

Sagari Berdikari was developed as a community-based agricultural program that utilizes mango cultivation as the main local resource. Implemented in Sliyeg Lor Village, Sliyeg District, Indramayu, the program responds to several interconnected challenges, including limited market access for mango commodities, agricultural waste, the need for climate-resilient cultivation practices, and limited local livelihood opportunities. The implementation of the program is organized through three interconnected components: Griya Mangga, Griya Kreasi, and Griya Rasa. These components involve different community groups and represent different stages of the local mango value chain, from cultivation and technological innovation to product processing and marketing.

Griya Mangga focuses on strengthening conventional mango farmers through environmentally friendly cultivation practices and the development of mango-based economic potential. Griya Kreasi focuses more strongly on younger farmers and the application of modern and climate-resilient cultivation technologies. Meanwhile, Griya Rasa develops downstream activities through mango-based food processing and entrepreneurship involving women. The three components therefore create a structure in which mango production is connected with technology, processing, waste utilization, and market development rather than being treated solely as a primary agricultural activity.

4.2 Climate-Resilient Mango Cultivation and Agricultural Technology

One of the main developments within Sagari Berdikari is the introduction of climate-resilient mango cultivation through Griya Kreasi. The program developed greenhouse-based cultivation supported by modern agricultural technologies, including a water drip irrigation system, IoT-based monitoring through SAGRINA Tech, smart dosing nutrition, and LED UV Spectrum technology. These technologies are used to provide greater control over cultivation conditions and to support intensive mango cultivation.

The greenhouse approach is particularly relevant to the development of premium mango cultivation, including Miyazaki mango, which requires intensive management. The introduction of controlled cultivation facilities also provides a practical learning environment for younger farmers to gain experience with technology-based agriculture. Public documentation of the program confirms that the greenhouse and supporting technologies were developed to support climate-resilient mango cultivation in Sliyeg Lor.

The program also developed a number of documented innovations related to greenhouse design and climate-resilient mango cultivation. These innovations indicate that the program has generated locally adapted knowledge rather than relying solely on the transfer of existing agricultural technology.

4.3 Renewable Energy Integration in Agricultural Production

Renewable energy became an integrated component of the agricultural system through the installation of a hybrid off-grid solar photovoltaic system. The system provided to the Salam Tani farmer group consists of approximately 8.72 kWp of photovoltaic capacity and 10 kWh of energy storage. The system supports agricultural activities within the greenhouse and provides an alternative source of electricity for technologies used in the cultivation process.

The use of solar energy is directly connected to productive agricultural activities rather than being developed as a stand-alone environmental facility. The electricity generated supports technologies such as LED UV Spectrum, while reducing dependence on conventional electricity. The farmer group reported electricity cost savings of approximately Rp800,000–Rp1,000,000 per month following the installation of the system. Based on the latest program documentation, the accumulated electricity cost saving was recorded at approximately Rp13.2 million.

This integration demonstrates that renewable energy within Sagari Berdikari serves two functions simultaneously: supporting the environmental objectives of the program and reducing operational costs associated with agricultural production.

4.4 Circular Utilization of Mango Waste

Sagari Berdikari also developed an approach for utilizing mango residues as productive resources. Mango skins and other mango residues that were previously treated as waste were processed into a bioactivator for agricultural use. The development of this innovation created a direct connection between mango production, waste management, and agricultural input production.

The use of mango waste as a bioactivator contributes to the reduction of organic waste while providing an alternative input for agricultural activities. The latest program results documented a greenhouse gas emission reduction of 0.562 ton CO_2eq through the utilization of mango skin waste. This outcome indicates that waste management within the program was connected with measurable environmental benefits.

The circular approach was also supported by the processing of other organic materials into organic fertilizer. Through these activities, agricultural residues were redirected into productive use instead of being treated simply as materials requiring disposal. Community members involved in the activities also gained practical knowledge related to organic resource management.

4.5 Women Empowerment and Local Value-Added Processing

The downstream development of the mango value chain is represented by Griya Rasa, which involves the Kelompok Usaha Perempuan Berdaya (KUPERA). The group consists of six women who previously worked as migrant workers. Through Sagari Berdikari, the group developed mango-based processed products and received support related to processing, product development, branding, marketing, and local enterprise development.

The involvement of KUPERA expands the role of women beyond household activities by connecting them with productive economic activities based on local agricultural resources. Mango is not only sold as a fresh agricultural commodity but is also processed into products with additional economic value. This creates an opportunity for women to participate in the downstream part of the agricultural value chain.

The latest program documentation reports an increase in KUPERA's income of approximately Rp300,000 per month. This figure represents the reported additional income associated with the group's economic activities under the program. The program therefore created an additional economic pathway for women who had previously depended on employment outside the village.

4.6 Economic Outcomes and Community Participation

The development of the integrated mango value chain was accompanied by reported economic improvements among participating community groups. The latest program results indicate that participating farmers experienced an increase in income of approximately Rp750,000 per month. This increase was associated with the development of agricultural production, market opportunities, and value-added activities within the Sagari Berdikari intervention.

In addition to the reported income changes, the program documentation records 746 beneficiaries and the development or strengthening of five community groups. The groups represent different segments of the local community, including conventional farmers, younger farmers, women, and other community members involved in the program. The development of farmer shelters, greenhouse facilities, and a production house also provided physical infrastructure to support agricultural production, learning, processing, and community activities.

The program further generated documented intellectual property and innovation related to the mango-waste bioactivator, greenhouse design, and climate-resilient mango cultivation. These outputs indicate that the implementation of Sagari Berdikari produced not only physical infrastructure and economic activities but also knowledge and locally adapted innovations.

Overall, the results show that Sagari Berdikari has developed an interconnected mango-based community development system. Mango cultivation functions as the starting point, while climate-resilient technology, renewable energy, waste utilization, product processing, and community entrepreneurship are connected along the value chain. The documented results include increased reported income among farmers and women participants, greenhouse gas emission reduction through mango waste utilization, electricity cost savings through solar energy, the involvement of women former migrant workers, and the development of locally adapted agricultural innovations. These results provide the empirical basis for further discussion of Sagari Berdikari as a form of community-based social innovation.

V. DISCUSSION

5.1 Sagari Berdikari as an Integrated Community-Based Social Innovation

The findings show that Sagari Berdikari has developed beyond a conventional agricultural assistance program. The program connects mango cultivation, agricultural technology, environmental management, renewable energy, product processing, market development, and community empowerment within one local development framework. This integrated approach is consistent with the program's original objectives, which include improving environmentally friendly mango farming, developing circular economy practices, empowering women through mango-based products, encouraging young farmers through renewable energy technology, and strengthening local food and livelihood systems.

The integration is reflected in the three main components of the program: Griya Mangga, Griya Kreasi, and Griya Rasa. Griya Mangga focuses on conventional mango farmers and environmentally friendly cultivation, Griya Kreasi emphasizes modern mango cultivation and millennial farmers, while Griya Rasa develops processed mango products and women's entrepreneurship. The three components create a connection between the upstream and downstream parts of the mango value chain. The program documentation

identifies the development of premium mango markets, environmentally friendly agriculture, local UMKM, product branding, and the involvement of former migrant workers as important elements of the intervention.

From a social innovation perspective, the important feature of Sagari Berdikari is therefore not simply the introduction of individual technologies. The innovation lies in how local mango resources are reorganized into different forms of social and economic activity. Mango is positioned not only as an agricultural commodity but also as a basis for processing, waste utilization, community learning, renewable-energy-supported production, and livelihood development. This is consistent with the view that social innovation can emerge through changes in practices and relationships among community actors rather than only through the introduction of completely new technologies.

5.2 Strengthening Sustainable and Climate-Resilient Mango Agriculture

Agricultural sustainability is one of the central dimensions of Sagari Berdikari. The program was developed in response to problems identified in the local mango sector, including declining agricultural productivity, declining soil quality, dependence on conventional agricultural inputs, and unstable farmer income. The program report also identifies climate change, land degradation, and dependence on seasonal harvests as challenges affecting the sustainability of mango farming in Sliyeg.

The response was not limited to conventional agricultural assistance. Sagari Berdikari introduced environmentally friendly cultivation practices and modern agricultural technologies through the development of Griya Kreasi and the Salam Tani group. The greenhouse-based cultivation system was supported by water drip irrigation, IoT-based monitoring through SAGRINA Tech, smart dosing nutrition, and LED UV Spectrum technology. The use of these technologies creates a more controlled cultivation environment and provides an opportunity for farmers, particularly younger farmers, to learn a different approach to mango production.

This direction is also consistent with the documented objective of encouraging the regeneration of young farmers through renewable-energy-based technology. The role of technology in this case is therefore broader than increasing production. It becomes part of the effort to make agricultural activities more attractive to younger community members and to develop agricultural knowledge that is better adapted to changing environmental conditions.

The program's development of a greenhouse was also documented as one of its innovations, together with innovation in climate-resilient mango cultivation. The ENSIA documentation identifies intellectual property related to greenhouse design and climate-resilient mango cultivation, as well as a novelty statement from the Indramayu Food Security and Agriculture Agency. These outputs indicate that the program has generated locally adapted knowledge and practices rather than relying only on the transfer of externally developed technology.

5.3 Renewable Energy as Part of Productive Agricultural Activities

The integration of renewable energy provides another important dimension to the program. Sagari Berdikari incorporated a hybrid off-grid solar photovoltaic system with a capacity of 8.7 kWp and 10 kWh energy storage to support agricultural activities in the greenhouse. The system was provided to the Salam Tani farmer group and is connected to the modern cultivation technologies used in the greenhouse.

The role of the PLTS is significant because renewable energy is directly linked to productive activities rather than being introduced only as an environmental symbol. The energy supports the operation of agricultural technology, including the LED UV Spectrum system used in greenhouse cultivation. Public documentation of the program also reports that the use of PLTS reduced electricity expenditure for the farmer group. The latest program documentation records total electricity cost savings of approximately Rp13.2 million.

This integration creates a relationship between environmental and economic value. Renewable energy contributes to the environmental objective of reducing dependence on conventional electricity while simultaneously supporting the operational efficiency of agricultural activities. In this sense, the Sagari Berdikari model places energy innovation within the agricultural value chain rather than treating it as a separate environmental intervention.

5.4 Circular Economy through Mango Waste Utilization

Another important finding concerns the transformation of mango waste into productive resources. One of the problems identified by the program was the limited management of harvest residues. The program responded by developing the use of mango residues, particularly mango skin, as a bioactivator. The program report explains that the bioactivator is produced from mango skin waste using starter bacteria and is intended to accelerate the decomposition of organic materials.

This practice represents a shift in the way agricultural residues are treated. Instead of being viewed only as waste, mango residues are returned to the agricultural system as an input. The approach therefore creates a direct relationship between mango production and resource recovery. It is consistent with the circular economy principle of keeping materials within productive cycles and reducing the loss of resources.

The environmental outcome provides additional evidence of this process. The latest program documentation records a reduction of 0.562 ton CO_2eq through the utilization of mango skin waste as a bioactivator. The result is important because the circular approach in Sagari Berdikari is not limited to waste reduction; it is also associated with a documented environmental benefit.

The circular economy approach in the program also extends to inorganic waste. The 2025 implementation report documents the use of plastic-melting equipment to process materials such as bottle caps and other plastic residues into recycled plastic boards. These boards were subsequently used to construct RUBUHA (Rumah Burung Hantu), creating a functional product from previously unmanaged plastic waste while also supporting ecological pest control in agricultural areas. This demonstrates that circularity within Sagari Berdikari involves both organic and inorganic resource streams.

5.5 Women Empowerment through Mango-Based Economic Activities

Griya Rasa provides an important social dimension to the program by involving women in downstream mango processing. The program specifically involves six women who are former migrant workers, with activities focused on mango-based products, branding, marketing, and local MSME development.

The approach is relevant because the program does not limit women's participation to training activities. Women are positioned within the economic value chain through the production and marketing of processed mango products. The development of mango cookies and the completion of P-IRT licensing in 2025 provide evidence that the group moved from training and product development toward formalized economic activity. The group also participated in SMEXPO UMKM, providing an opportunity to introduce its products to a wider market.

The latest documented result shows an increase in KUPERA's income of approximately Rp300,000 per month. This result should be interpreted as a reported program outcome rather than as evidence that the intervention alone caused the increase. Nevertheless, it demonstrates that downstream processing created an additional income-generating activity for the women involved.

The involvement of former migrant workers is also important within the broader livelihood context of the program. The ENSIA documentation identifies migration without sustainable planning as one of the significant problems addressed by Sagari Berdikari. The response includes economic empowerment through local mango based activities as well as financial literacy, language training, and the Mango Farmer School using the FMD approach physical, mental, and discipline development. Thus, the program approaches migration not only as an employment issue but also as part of a broader livelihood and community capacity issue.

5.6 Livelihood Diversification and Local Economic Value

The results indicate that Sagari Berdikari creates several pathways for economic participation within the same local commodity system. Farmers can increase the value generated from mango cultivation, younger farmers are introduced to modern agricultural technologies, and women participate in processing and marketing. This diversification reduces the program's dependence on a single economic activity even though mango remains its central resource.

The latest documented increase in farmer income of Rp750,000 per month for the Salam Tani group provides an indication of the economic value generated through the program. The figure is particularly relevant when considered together with the development of premium mango cultivation, market expansion, greenhouse technology, and renewable energy. Rather than relying solely on increasing the volume of mango production, the program attempts to increase value through improvements in production systems and market orientation.

The same principle is visible in Griya Rasa. Mango is processed into products with higher added value, allowing the community to participate beyond the sale of fresh fruit. The program therefore develops value at multiple points in the commodity chain. This is important in the context of the problem identified in the program report, where farmers face unstable income and declining prices during periods of abundant harvest.

The program also developed a mango harvest event in October 2025 as a platform for promotion, education, and appreciation of the participating farmer groups. The event was used to introduce the results of mango cultivation and modern agricultural practices to the community and stakeholders. This activity demonstrates that market and public engagement were treated as part of the development process rather than as activities completely separate from production.

5.7 From Local Resource Management to Community Resilience

The different components of Sagari Berdikari collectively contribute to a broader form of community resilience. The program addresses several risks simultaneously: agricultural and climate-related risks through environmentally friendly and technology-supported cultivation; environmental risks through circular waste management; energy-related costs through PLTS; economic vulnerability through value-added processing and market development; and livelihood vulnerability through the involvement of women, young farmers, and former migrant workers.

This combination is important because the challenges faced by rural communities are rarely isolated. A decline in agricultural productivity can affect income, which can influence decisions about migration and employment. Agricultural waste can create environmental problems while also representing a loss of potentially useful resources. Limited market access can reduce the

economic benefits received by farmers even when production is available. Sagari Berdikari responds by connecting these issues through a single community development framework.

The program's current stage should nevertheless be considered when interpreting these findings. The 2025 report states that Sagari Berdikari was entering its second year and was still focused on preparing supporting infrastructure and human resources, with a five-year strategic plan toward community independence. Therefore, the documented results should be understood as evidence of an ongoing development process rather than as evidence that the program has already achieved full community independence.

5.8 Overall Interpretation of Sagari Berdikari

Taken together, the findings suggest that the main contribution of Sagari Berdikari is the creation of connections among local resources, community groups, technology, environmental practices, and economic activities. The program begins with mango as a locally important agricultural resource and develops it through three complementary pathways: strengthening conventional farmers through Griya Mangga, developing technology-based and climate-resilient farming through Griya Kreasi, and creating downstream value through Griya Rasa.

The documented outcomes reinforce this integrated character. Farmer income was reported to increase by Rp750,000 per month, while KUPERA recorded an increase of Rp300,000 per month. Mango skin waste utilization was associated with a reduction of 0.562 ton CO_2eq, and the PLTS contributed to reported electricity cost savings of Rp13.2 million. At the same time, the program developed innovations related to mango-waste bioactivator, greenhouse design, and climate-resilient mango cultivation.

These results show that the value of Sagari Berdikari does not depend on one intervention or one indicator. Its significance lies in the way agricultural production, circular resource use, renewable energy, women's economic participation, and livelihood development are connected. In this sense, the program illustrates how CSR-based community development can use a locally available commodity as an entry point for broader social, economic, and environmental change. The case of Sagari Berdikari therefore supports the understanding of community-based social innovation as a process of connecting existing local resources and capabilities into new and more sustainable patterns of community development.

VI. CONCLUSION

Sagari Berdikari demonstrates how a CSR-based community development program can utilize local agricultural potential as a foundation for broader social, economic, and environmental development. Implemented in Sliyeg Lor Village, Indramayu, the program has developed mango cultivation beyond conventional production by connecting farmers with climate-resilient agricultural practices, modern technology, renewable energy, waste utilization, product processing, and market development. The integration of Griya Mangga, Griya Kreasi, and Griya Rasa creates a local value chain in which different community groups contribute to different stages of mango-based economic development.

The findings also show that the program has begun to generate multidimensional outcomes. The use of mango skin waste as a bioactivator was associated with a documented reduction of 0.562 ton CO_2eq, while the utilization of PLTS with a capacity of 8.7 kWp and 10 kWh was reported to generate electricity cost savings of Rp13.2 million. The program also recorded an increase in reported income of Rp750,000 per month for the Salam Tani farmer group and Rp300,000 per month for KUPERA. These outcomes indicate that environmental practices, renewable energy, and economic activities can be developed within the same community-based agricultural system.

The involvement of women former migrant workers through KUPERA further demonstrates the importance of connecting local agricultural resources with livelihood diversification. Through mango processing, product licensing, branding, and marketing, women participants were positioned within the downstream part of the agricultural value chain. At the same time, the program's focus on young farmers, modern cultivation, and renewable energy provides an additional pathway for strengthening the attractiveness and sustainability of local agriculture. The program therefore creates opportunities not only for improving agricultural production but also for expanding the roles of different community groups within the local economy.

From a social innovation perspective, the main contribution of Sagari Berdikari lies in the integration of previously separate activities into one community development system. Mango cultivation becomes connected with climate-resilient technology, renewable energy, circular utilization of agricultural residues, women entrepreneurship, and market development. The innovation is therefore reflected not only in the technologies introduced but also in the new relationships between local resources, community groups, knowledge, and productive activities.

However, the findings should be interpreted within the current stage of program development. Sagari Berdikari is still in its second year, with the implementation focused on strengthening infrastructure and human resources as part of a longer five-year development plan. Consequently, the documented outcomes represent progress in an ongoing community empowerment process rather than evidence of fully achieved independence. Further evaluation will be required to determine whether the innovations,

economic activities, and community capacities developed through the program can continue and expand with decreasing external assistance.

Overall, Sagari Berdikari illustrates the potential of CSR to function as a platform for community-based social innovation by linking local agricultural resources with environmental sustainability, renewable energy, technological adaptation, and livelihood development. The experience in Sliyeg Lor suggests that a locally rooted agricultural commodity can become an entry point for creating broader community value when production, resource recovery, market development, and community empowerment are addressed as interconnected processes.

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