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Resilience of Smallholder Palm Oil Farmers in Sidomulyo Village, South Sumatra

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Abstract: *The size of agricultural land ownership is a crucial asset for farmers in achieving abundant harvests. Smallholder Palm Oil Plantations are owned by farmers with limited harvest scales. Small farmers often face challenges in meeting their daily needs and acquiring agricultural inputs. This dilemma in the lives of small farmers prompted the researcher to delve deeper into their existence and the strategies they can employ to create economic resilience. This study adopts a qualitative case study approach to investigate the phenomenon in depth. The findings indicate that small farmers owning less than 2 hectares of land need to enhance their capacity to optimize available resources. Additionally, the minimal agricultural yields necessitate the development of new economic sectors and innovations in sustainable agricultural systems.*

Keywords : *Smallholder Farmers, Public Palm Oil Plantations, Resilience*

Abstrak: *Besarnya kepemilikan lahan pertanian merupakan aset krusial bagi petani dalam mencapai panen yang melimpah. Perkebunan Kelapa Sawit Rakyat dimiliki oleh petani dengan skala panen terbatas. Petani kecil sering menghadapi tantangan dalam memenuhi kebutuhan sehari-hari dan memperoleh input pertanian. Dilema dalam kehidupan petani kecil ini mendorong peneliti untuk menggali lebih dalam keberadaan mereka dan strategi yang dapat mereka terapkan untuk menciptakan ketahanan ekonomi. Penelitian ini mengadopsi pendekatan studi kasus kualitatif untuk menyelidiki fenomena tersebut secara mendalam. Temuan menunjukkan bahwa petani kecil yang memiliki lahan kurang dari 2 hektar perlu meningkatkan kapasitas mereka untuk mengoptimalkan sumber daya yang tersedia. Selain itu, hasil pertanian yang minim mengharuskan pengembangan sektor ekonomi baru dan inovasi dalam sistem pertanian berkelanjutan.*

Kata Kunci : *Petani Kecil, Perkebunan Kelapa Sawit Umum, Ketahanan*

1. Introduction

Smallholder Oil Palm Plantations (PSR) have emerged as a crucial pillar in Indonesia's palm oil production (Kubitza, 2018; Naylor et al., 2019; Qaim et al., 2020). Presently, small farmers manage approximately 41% (Herdiansyah et al., 2020) of Indonesia's total palm oil area. These smallholder plantations contribute significantly, accounting for one-third of the nation's total palm oil production.

The substantial role of PSR in enhancing Indonesia's palm oil sector has attracted the government's attention. Various acceleration programs (Novira, 2023) have been initiated to augment palm oil productivity. However, these initiatives often exclude small farmers as integral business actors within the supply chain. Consequently, small farmers remain primarily as raw product sellers, heavily reliant on global market values, rendering them susceptible to both local and global economic fluctuations.

In addition to external vulnerabilities, numerous institutions have identified internal challenges faced by small farmers, particularly in developing countries like Indonesia. Agricultural activities within these communities are impeded by constraints such as land size, labor, capital, and farming management skills (Mandang et al., 2020; Rahim & Hastuti, 2007), all of which critically impact agricultural productivity. To mitigate these issues, it is imperative to diversify income sources for farmers (GIMNI, 2021). As highlighted by the Food and Agriculture Organization (FAO), having supplementary income streams outside agriculture is essential for safeguarding farmers' economic sustainability against potential risks.

Sidomulyo Village in Muara Enim Regency, South Sumatra Province, serves as a case study, with a population of 638, where 40.17% are farmers, 11.42% are agricultural laborers, and the remainder work in various sectors. Of the 318 households, 103 own smallholder oil palm plantations. Specifically, 48 households manage less than 2 hectares, 32 households less than 3 hectares, and 23 households less than 4 hectares. Agricultural productivity here is influenced by factors such as land size, labor, capital, and farming management skills (Laoh et al., 2020). Households managing these limited lands are classified as small farmers (Rahim & Hastuti, 2007). Typically, 1 hectare of land cultivated with 135 oil palm trees generates a gross income of IDR 1,400,000 per month. However, this income is disproportionate to the expenses incurred for fertilizers and labor.

An exemplary practice is the collaboration between the community and the private sector, such as PT Pertamina Gas Operation South Sumatra Area, which has developed viable solutions to address these issues. As part of its corporate social responsibility, PT Pertamina Gas Operation South Sumatra Area initiated a sustainable empowerment program in Sidomulyo Village, located in Gunung Megang District. This program, named PUSAKA TANI (Strengthening Farmers'

Circular Economy), aims to address the complex economic problems faced by smallholder oil palm farmers.

Previous research has extensively examined farmer and family resilience (Marseva et al., 2016; Perkebunan, 2023; Sabariman & Susanti, 2021). emphasizing the necessity for small farmers to adapt to complex challenges (Irham et al., 2021; Petri et al., 2022; Pradipta et al., 2024) Many studies advocate for the enhancement of community solidarity and cooperation among farmers. Pradipta (2024) highlights the need to equip small farmers with an understanding of the stressors and risks they face, preparing them for effective protection and adaptation

This study focuses on strengthening small farmers with limited land through economic resilience. By optimizing community resources and leveraging existing opportunities, smallholder oil palm farmers are empowered through land intensification, environmentally friendly agriculture, capacity building in agricultural product processing, and responses to the climate crisis, thereby enhancing agricultural sustainability.

2. Results

The economic resilience of smallholder oil palm farmers through the PUSAKA TANI program underscores the critical role of networks, institutions, and resources in facilitating transformative changes in community life. Social innovation, which often arises in response to social needs and regulatory support, is pivotal for sustainable development. The long-term viability of social innovation depends significantly on the capacity to achieve systemic changes through multi-stakeholder collaboration (Westley et al., 2014).

The framework of social innovation provides a comprehensive lens to understand the processes, challenges, and success factors in creating sustainable social transformation. This concept often manifests in complex and nonlinear systems, demanding continuous experimentation and adaptation to evolving conditions (Murray et al., 2010; Mulgan, 2012). Consequently, social innovation necessitates a cross-sectoral approach to effectively address structural barriers.

The PUSAKA TANI program exemplifies cross-sectoral efforts to tackle the issues confronting small farmers in PSR. Smallholder oil palm farmers frequently face marginalization due to societal stereotypes, which often perceive them as economically better off than food crop or horticultural farmers. However, small farmers in PSR typically possess less than 4 hectares of land, a factor that significantly constrains their oil palm yield and income. The social innovation of the PUSAKA TANI program focuses on generating both economic and broader social benefits, encapsulated in the concept of creating shared value (CSV) (Westley et al., 2014; Porter & Kramer, 2011).

Integrating this business strategy holds substantial potential for developing sustainable solutions. The PUSAKA TANI social innovation model emphasizes ecological resilience by integrating social dimensions, fostering collaboration between humans and the environment. This ecological-social resilience approach is crucial for bolstering farmers' resilience against social, economic, and environmental changes (Folke et al., 2002). The social innovation model aimed at strengthening the circular economy of small farmers through the PUSAKA TANI program involves land intensification, semi-organic farming and plantation, capacity building in agricultural processing, and climate crisis preparedness.

2.1 Sidomulyo Village: A Transmigration Area with Oil Palm as the Main Commodity

Sidomulyo Village, situated in Gunung Megang District, Muara Enim Regency, South Sumatra, is a transmigration village primarily dependent on oil palm commodities. This village has a population of 638, with 40.17% engaged in farming and 11.42% working as agricultural laborers, while the rest are employed in various other sectors. Among the 318 households, 103 possess smallholder oil palm plantations, with 47% managing land less than 2 hectares, 31% less than 3 hectares, and 22% less than 4 hectares. Consequently, most smallholder oil palm farmers in Sidomulyo Village possess less than 2 hectares of land, classifying them as small farmers (Rahim & Hastuti, 2007).

Tabel. 2.1

Land Ownership of Smallholder Oil Palm Plantations in Desa Sidomulyo

Land Area of Smallholder Oil Palm Plantations (Hectares)	Number of Households	Percentage
<2	48	47%
<3	32	31%
<4	23	22%
Total	**103**	**100%**

Source: Desa Sidomulyo Village Data, 2023

The economic stability of smallholder oil palm farmers in Sidomulyo Village is precarious. Limited land ownership fails to provide a sustainable livelihood for farmers and their families. The village is encircled by expansive oil palm plantations and coal mines, predominantly owned by private entities. According to the 2023 land ownership profile, Sidomulyo Village inhabitants collectively own only 248.54 hectares of smallholder oil palm plantations out of a total of 590

hectares available. This disparity starkly contrasts with the extensive industrial-scale oil palm plantations owned by private groups.

2.2 Strengthening Farmers' Circular Economy (PUSAKA TANI): An Effort to Empower Small Farmers

The implementation of the social innovation program PUSAKA TANI (Strengthening Farmers' Circular Economy) in Sidomulyo Village by PT Pertamina Gas OSSA aims to develop sustainable economic strategies for small farmers. Social innovation involves the application of new ideas that engage various stakeholders to empower communities and enhance their capacities, ultimately aiming to improve welfare. The core of social innovation lies in its social objectives and processes (Leoncini & Montresor, 2008). These innovative ideas aim to address social issues through the collaboration of existing institutions, thereby enhancing long-term opportunities. Cooperation is fundamental in creating sustainable social development, as emphasized by this concept. The PUSAKA TANI program exemplifies a series of social innovations involving diverse activities and actors. PT Pertamina Gas OSSA, in collaboration with farmers and the government in Sidomulyo Village, Muara Enim Regency, works to improve community livelihoods. The PUSAKA TANI social innovation program specifically aims to mitigate the economic vulnerability of smallholder oil palm farmers.

Farmers' economic vulnerability, due to limited land areas of less than 3 hectares, often results in insufficient income from harvests. Additionally, farmers face the financial burden of high fertilizer prices. The limited capabilities of farmers, often stemming from low educational levels, further restrict the optimization of other economic resources. Smallholder oil palm plantations in Muara Enim Regency are also susceptible to the impacts of the climate crisis. Incidents of land fires caused by the burning of palm oil waste, such as empty fruit bunches, are still frequent. Moreover, large-scale palm oil cultivation has the potential to deplete existing water resources, exacerbating the climate crisis in smallholder oil palm plantation areas.

Limited land areas of less than 3 hectares are highly vulnerable to various threats, including small harvest yields, constrained capital and fertilizer funding, low farmer skills, and the climate crisis, all of which can adversely affect harvest results. To address these challenges, PT Pertamina Gas OSSA has adopted strategies to strengthen the economy of small farmers or smallholder oil palm farmers. These strategies include providing assistance for land intensification, promoting semi-organic farming and plantations, enhancing agricultural processing capacity, and preparing for climate crisis impacts.

2.2.1 Land Intensification

One of the primary risks faced by small farmers is the limited land area they own, which results in low farmer income. This issue can be mitigated through land intensification activities (Jaza Folefack et al., 2019; Sari et al., 2021; Suharyanti et al., 2024). Intensification involves optimizing the planting distances between oil palm trees and other cultivable commodities. Additionally, idle land is utilized to its maximum potential to bolster the economic strength of farmers. The high demand for chemical fertilizers, which impacts the capital of smallholder oil palm farming, is addressed by implementing a semi-organic plantation system. Farmers are trained to produce organic fertilizers using palm oil waste, such as empty fruit bunches.

Land intensification is executed by utilizing planting distances between oil palms for fish ponds, horticultural plant cultivation, and hydroponics. The PUSAKA TANI social innovation program involves several groups, including the Freshwater Fish Cultivation Group and the PKK (Family Welfare Empowerment). This activity is further developed into a tourist attraction within the oil palm plantation, establishing POKDARWIS (Tourism Awareness Group). This collaboration adds value to the land, which previously yielded income solely from oil palm harvests, creating additional income sources.

Tabel. 2.2

Value Addition from Intensified Land Use

Land Use	Average Monthly Income Before Innovation (Rp/ha)	Average Monthly Income After Innovation (Rp/ha)	Additional Income Sources	Percentage Increase in Income
Smallholder Oil Palm Plantation	1,400,000	3,133,333	Intensification of land use	45%

Source: Monitoring data collected by the CSR Team of PT Pertamina Gas OSSA, 2023

The land intensification innovation by PT Pertamina Gas OSSA significantly addresses the issue of limited land owned by farmers. Multi-actor collaboration is a key characteristic in the effort to create social innovation (Murray et al., 2010). Cross-sector cooperation between companies, communities, smallholder oil palm farmers, Fish Cultivation Groups, PKK, and POKDARWIS generates added value to the small farmers' economy from diverse business sectors.

Through the PUSAKA TANI program, farmers gain knowledge of the new economic system in maximizing land functions. This intensification utilizes the empty spaces between oil palm trees for various business commodities, providing added value. For instance, 1 hectare of

smallholder oil palm plantation land, when relying solely on fresh fruit bunch sales, is valued at IDR 1,400,000 per month. However, after land intensification, farmers can achieve an average additional value per hectare of IDR 3,133,333 per month, reflecting a 45% increase in land function value.

2.2.2 Semi-Organic Farming and Plantations

Oil palm farmers in smallholder plantations face significant challenges in obtaining the necessary fertilizers. Typically, they require approximately 270 kilograms of urea fertilizer annually for two fertilizations. Unfortunately, the price of urea fertilizer is quite high, ranging from IDR 500,000 to IDR 600,000 per 50 kilograms, resulting in a fertilization cost of around IDR 3,240,000 per hectare. Additionally, urea fertilizer is difficult to obtain and lacks government subsidies. The limited land area exacerbates the financial burden of fertilizers on farmers, as the income from selling fresh fruit bunches is often insufficient to cover these expenses.

Leveraging its expertise in non-hazardous waste processing, PT Pertamina Gas OSSA assists farmers in converting empty fruit bunch waste into organic fertilizer, providing a more affordable solution. Organic fertilizer is sold at IDR 30,000 per 40 kilograms, reducing the total fertilization cost for one hectare to IDR 2,025,000. By utilizing organic fertilizer, farmers can significantly cut costs compared to using chemical fertilizers.

Tabel. 2.3

Fertilizer Costs for a 1-Hectare Oil Palm Plantation: Comparison Between Chemical and Organic Fertilizers

Fertilizer Type	Number of Trees	Fertilizer Requirement per Tree per Year (kg)	Total Fertilizer Requirement (kg)	Fertilizer Cost per Tree	Total Fertilizer Cost	Percentage Saving
Urea	135	2	270	Rp24,000	Rp3,240,000	38%
Organic Fertilizer	135	20	2700	Rp15,000	Rp2,025,000	
Difference					Rp1,215,000	

Source: Company's Internal Analysis

Data presented above indicates that the PUSAKA TANI program offers innovative solutions to meet the needs of smallholder oil palm farmers. The application of solid organic fertilizer from processed empty fruit bunch waste can result in a 38% cost saving. This innovation

allows farmers to access more efficient fertilizers and adopt more economical and environmentally friendly farming methods, enhancing the sustainability of smallholder oil palm plantations.

Tabel. 2.3
Economic Comparison of Conventional and Semi-Organic Oil Palm Farming Systems

Farming System	Fertilizer Requirement (Rupiah)
Conventional	3,240,000
Semi-Organic	2,328,750
Cost Savings	**911,250**
Percentage Savings	28%

Source: Company's Internal Analysis

The use of solid organic fertilizer from empty fruit bunch waste leads to a substantial cost reduction compared to previous conventional farming methods. Fertilizer cost savings amount to IDR 911,250 or 28% of the total previous costs per year for a 1-hectare land. Additionally, this organic fertilizer helps restore soil quality, promoting environmentally sustainable farming practices.

The semi-organic oil palm plantation system is a complex approach that requires adaptability to achieve systemic impacts (Mulgan, 2012). This system not only reduces the excessive use of chemical fertilizers in oil palm farming but also fosters sustainability, particularly for smallholder oil palm practices.

2.2.3 Enhancing Agricultural Product Processing Capacity

The next step in protecting small farmers involves enhancing their skills through capacity building (Ambarita et al., 2023; Eka Sintha et al., 2023; Maya et al., 2022) and providing additional education, crucial for opening new economic opportunities. In Sidomulyo Village, oil palm serves as the primary commodity and source of livelihood, valuable not only from fresh fruit bunch harvests but also from waste management. Capacity enhancement is achieved through continuous training and mentoring. This enables farmers to access additional income opportunities from five new business sectors: MSMEs, tankos mushroom cultivation, fish farming, tourism villages, and organic fertilizer production.

While oil palm plantations in Sidomulyo Village primarily produce fresh fruit bunches, the potential of empty bunch waste remains underutilized. Increasing agricultural product processing capacity encourages small farmers to explore additional value opportunities. Farmers receive

training in converting empty bunches into planting media for straw mushroom cultivation. Moreover, the existing potential is harnessed to develop processed MSME products from diversified sources, including mushrooms, fish, and vegetables cultivated under the PUSAKA TANI program.

Capacity building within the PUSAKA TANI program is conducted through institutional management, grouping farmers and community members according to their abilities and interests. These groups include MSME Groups, Organic Fertilizer Groups, Fish Farming Groups, Tourism Awareness Groups, and Tankos Straw Mushroom Cultivation Groups. PT Pertamina Gas OSSA significantly strengthens the capacity of these partner groups from upstream to downstream, aiming to create impactful changes at both individual and group levels.

Tabel 2.3

Capacity-Building Activities in the PUSAKA TANI Social Innovation Project

Type of Capacity Building	Activity	Before Training	After Training
Training	Palm oil waste processing	Palm oil tank waste was burned by farmers as it was considered worthless.	Farmers received training and mentorship on processing palm oil tank waste into organic fertilizer and growing media for oyster mushrooms. Currently, there are 5 active members managing organic fertilizer under a new organization, the Organic Fertilizer Group, and 10 active members in the Mushroom Cultivation Group. The group now has 4 mushroom houses and is able to market products outside the region, providing additional income.
Training	Freshwater fish cultivation	Farmers had rainwater ponds for fish cultivation but with suboptimal results.	Farmers received training on fish cultivation, implementing appropriate feed management and water pond utilization. This enabled the group to manage 4 fish fattening ponds and 1 fishing pond, resulting in a harvest of 72 tons and an income of Rp105,000,000.

Training	Packaging and marketing	Some SMEs existed but sales were suboptimal.	Women's groups were equipped with knowledge of packaging and utilizing online media for sales. Currently, there are 16 women in the SME group who are able to market Sidomulyo village products widely. Even the oyster mushroom produced by the Mushroom Cultivation Group is marketed online. There are 5 SME products with a turnover of Rp93,720,000 and 4 SME stalls in the Dewi Sri Valley Tourism Village.
Training	Diversification of SME products	Previously, the results of fish and oyster mushroom cultivation were sold fresh to consumers.	The SME group was equipped with ways to manage the results of fish cultivation and oyster mushrooms produced by the Mushroom Cultivation Group and the Fish Cultivation Group to be made into food. The group was equipped to process oyster mushrooms into various snacks and mushroom sambal. In addition, freshwater fish were processed into catering. This helps provide added value to the SME group and the other two groups.

Source: Monitoring data collected by the CSR Team of PT Pertamina Gas OSSA, 2023

Efforts to enhance agricultural product processing capacity focus on increasing the skills of individuals in vulnerable groups of small farmers. Historically, these groups had limited access to additional income opportunities beyond smallholder oil palm plantations. However, with assistance, they can explore their potential and leverage available opportunities. For instance, MSME mentoring provides economically vulnerable women's groups with knowledge and skills in entrepreneurship, including training on product packaging, marketing, and variations in MSME product processing. This capacity enhancement empowers group members to initiate MSME businesses.

Capacity building fosters changes at the community or group level. Strengthening networks, actors, and resources forms an ecosystem conducive to social innovation (Westley et al., 2014). The PUSAKA TANI program enhances overall group resilience, addressing existing social needs within the community, including farmer groups and vulnerable women's groups. Training activities encompass processing tankos waste, freshwater fish farming within

smallholder oil palm plantations, MSME product diversification, and packaging and marketing strategies. These initiatives optimize the abilities of farmers and community members according to their work groups, encouraging new economic activities beyond reliance on fresh fruit bunch sales.

2.2.4 Climate Crisis Response Preparedness

The final step involves adaptation. Given the heightened sensitivity of oil palm agriculture to the climate crisis, concrete actions are essential to address these challenges. Climate change impacts can lead to the reduction of water sources due to high water absorption and exacerbated global warming from the excessive use of chemical fertilizers resulting in CO2 emissions. Additionally, agricultural land faces significant degradation risks. Small farmers in Sidomulyo Village, reliant on smallholder oil palm plantations for their livelihoods, are particularly vulnerable to these changes, jeopardizing their future.

PT Pertamina Gas OSSA introduces innovative agro-input solutions in oil palm farming. Farmers receive assistance to practice organic farming(Hapsoh et al., 2020; Indah et al., 2018; Supriatna et al., 2023) minimizing land degradation and global warming. Solid organic fertilizer produced from empty fruit bunch waste serves as an alternative to reduce chemical fertilizer use. This program is extensively promoted to encourage a gradual shift towards organic farming. Currently, farmers have adopted semi-organic farming with a composition of 75% organic and 25% chemical fertilizers. According to LPPM Hsamangun (2023), the PUSAKA TANI program successfully reduced emissions by 0.243 Gg CO2 eq/year on smallholder oil palm plantation land in Sidomulyo Village.

To mitigate the impact of reduced clean water sources, banyan trees are planted to maintain local water reserves. Banyan trees play a crucial role in water preservation (Mudawaroch et al., 2021), ensuring the community's primary livelihood sustainability, particularly for farmers. Given the basic necessity of water, its sustainability requires special attention. Social innovation in climate crisis response, oriented towards social needs, addresses environmental sustainability challenges (Murray et al., 2010). Strengthening climate crisis response is vital for empowering small farmers, especially in smallholder oil palm farming.

Empowering small farmers involves maximizing local potential. PT Pertamina Gas OSSA strengthens institutional ties between community groups. Various activities within the PUSAKA TANI program create a new economic order in Sidomulyo Village, enabling the community to engage in income-generating activities beyond smallholder oil palm farming. Resilience efforts focus on creating value chains between activities and groups. Small farmer resilience refers to their ability to recover from shocks and pressures on agricultural production and livelihoods (Aguilar et al., 2022).

Through extensive economic empowerment, small farmers can become resilient against economic shocks. They can also respond more effectively to climate change by adopting sustainable and adaptive farming practices. Additionally, empowering small farmers economically can generate broader positive impacts, such as reducing poverty, improving rural community welfare, and ensuring food security for farming families.

3. Conclusion

Small farmers serve as the backbone of agriculture in numerous countries, particularly in developing nations, significantly contributing to global food security. Yet, they frequently face economic adversities. The empowerment of small farmers within smallholder oil palm plantations reveals that bolstering their economic foundation is crucial for enhancing food security and mitigating rural poverty.

Economic strengthening for small farmers can be achieved through multiple strategies. Firstly, optimizing land resources is essential for increasing agricultural productivity. Secondly, implementing semi-organic farming and plantation systems utilizing agricultural waste is imperative. This approach not only reduces farming costs but also mitigates environmental impacts. Thirdly, targeted capacity building is vital to enhance small farmers' skills and knowledge in effectively diversifying agricultural production. Fourthly, fortifying small farmers' resilience to climate change is paramount. Through education, training, and active participation, small farmers can develop the capacity to adapt to increasingly extreme climate conditions.

Empowering communities within a circular economy framework not only strengthens farmers' economies but also enhances their resilience to climate change. This dual benefit promotes the welfare of farmers and rural communities while supporting broader sustainable development goals such as food security, poverty alleviation, and environmental conservation. The empowerment initiatives by PT Pertamina Gas OSSA underscore the significance of prioritizing investment and social support as integral components of sustainable and inclusive development.

In conclusion, the economic empowerment of small farmers is not merely a beneficial endeavor but a necessity for sustainable agricultural and economic development. It is an ethical imperative and a practical strategy to ensure a resilient agricultural sector capable of withstanding economic and environmental shocks. Therefore, continued investment and support for small farmers are essential for achieving long-term sustainability and prosperity in rural areas.

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