FOSTERING WOMEN'S WELFARE IN VEGETABLE FARMING: SUSTAINABLE WASTE MANAGEMENT STRATEGIES AND DIGITAL FINANCIAL INCLUSION IN BATURITI VILLAGES

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ABSTRACT

This research emphasizes the significance of processing and utilizing vegetable waste to promote both economic and environmental sustainability for women farmers in Baturiti Village. Vegetable waste, often underutilized, can be transformed into value-added products such as compost or organic matter, creating new opportunities within the circular economy. This approach not only minimizes environmental impact but also generates significant additional income streams for farmers. Through qualitative research using semi-structured interviews, this study found that most women farmers are unaware of the economic potential of the vegetable waste they produce. They also encounter challenges in accessing information and technology to effectively manage the waste. Integrated waste management can enhance agricultural efficiency, reduce waste, and boost crop yields. Additionally, this study emphasizes the role of digital financial inclusion in facilitating access to both information and capital to support innovations in waste management. Digital financial literacy empowers women farmers to access financial services that support investments in waste management technologies and the marketing of processed products. The novelty of this research lies in integrating vegetable waste management strategies with digital financial inclusion, creating a model that simultaneously promotes women's empowerment and environmental sustainability. This approach provides a practical solution to improve the welfare of women farmers in agrarian communities while contributing to more sustainable local economic development.

Keywords: Vegetable waste, Economic sustainability, Women farmers, Digital financial inclusion, waste management

1. INTRODUCTION

The Sustainable Development Goals (SDGs), formulated and designed by the United Nations (UN) in 2015, serve as a global framework aimed at fostering inclusive, equitable, and sustainable development. These goals are built upon three fundamental pillars: economic, social, and environmental. Among the key priorities of the SDGs are the eradication of poverty and hunger, particularly through initiatives that enhance the well-being of agrarian communities. The SDGs also emphasize the importance of women's empowerment, responsible waste management, and addressing climate change through community-based solutions.

As an agrarian country, Indonesia faces unresolved challenges in agricultural waste management, leading to environmental pollution. Data indicates that 44% of food waste originates from grains, 20% from fruits, and 16% from vegetables, amounting to a total of 23–48 million tons per year between 2000 and 2019. This waste holds immense potential for conversion into valuable products, such as compost, which can enhance soil quality and provide economic benefits for farmers (Ahdiat, 2023).

The involvement of women in the agricultural sector has long been regarded as customary. As a result, their participation as agricultural laborers often places them in a dual role both as homemakers and as part of the workforce, contributing to the

family's income. Given that farming remains the primary livelihood for rural communities, many women work alongside their husbands in agriculture, balancing domestic responsibilities with economic contributions (Aliffianti & Rachma, 2023). Baturiti, as a vegetable farming hub in Tabanan Regency, thrives with the active involvement of women farmers who play a crucial role in sustaining agriculture and the local economy. However, these women face challenges such as limited access to information, technology, and financial services, which hinders the economic potential of agricultural waste. Sustainable farming also faces environmental risks, particularly from the excessive use of inorganic fertilizers that degrade soil nutrients. Women farmers are thus challenged to adopt eco-friendly farming practices and optimize agricultural waste, which is often discarded or burned, leading to environmental harm instead of generating added value.

Baturiti, a prominent vegetable farming hub in Bali, involves women farmers in agricultural waste management, where the solution to this issue lies in technology-driven innovation and digital financial services. Digital financial literacy, for instance, can assist women farmers in accessing the capital and technology needed to better manage waste. Furthermore, digital technology can be utilized to market processed waste products, such as compost, which hold significant market value. This research is highly relevant as it connects two key elements: vegetable waste management and women's empowerment through digital financial technology. Through this in-depth approach, women farmers not only gain additional income but also contribute to environmental sustainability.

2. RESEARCH METODOLOGY

The aim of this study is to analyze the utilization of vegetable waste to support economic and environmental sustainability for women farmers in Baturiti Village. This research seeks to uncover the potential of vegetable waste as a value-added product, such as compost, to reduce environmental impact and enhance farmers' income. Additionally, the study aims to identify the challenges faced by women farmers in accessing information and waste management technology, while exploring the role of digital financial inclusion in facilitating access to financial services to support innovation in waste management. The method employed in this study is a descriptive qualitative approach with analytical induction, which is a qualitative procedure aimed at deeply exploring the underlying factors or reasons behind a phenomenon or case study (Mahyuni, 2021). Interviews were conducted with 20 respondents, including representatives from the Tabanan Regency Agriculture Office, heads of Subak (pekaseh), and farmers aged 30 and above with a minimum of five years of experience in the agricultural sector. By posing several key questions: 1) How can the potential of vegetable waste in Baturiti Village be utilized to support economic and environmental sustainability?, 2) What challenges do female farmers in Baturiti Village face in managing vegetable waste and accessing the technology and information related to waste management?, 3) How can digital financial literacy play a role in empowering female farmers in Baturiti Village to access financial services that support waste management and the marketing of processed vegetable waste products, 4) How can the implementation of an integrated vegetable waste management strategy increase female farmers' income and support the sustainability of agriculture in Baturiti Village?

3. LITERATUR REVIEW

Converting vegetable waste into value-added products is a crucial approach to enhancing the economic well-being of women farmers. Studies show that participation in agricultural value chains significantly boosts household consumption expenditure among vegetable farmers, particularly those utilizing irrigation (Ma et al., 2022). This implies that women who implement sustainable waste management

strategies can enhance both their productivity and income. The circular economy model, which promotes the reuse of agricultural waste as compost or organic material, not only mitigates environmental harm but also generates additional revenue streams for women farmers (Liu & Jin, 2017). By processing vegetable waste, women contribute to a more sustainable agricultural system while simultaneously elevating their financial standing.

Although sustainable agricultural practices offer numerous advantages, women farmers often encounter substantial obstacles that hinder their participation. Research indicates that rural women frequently face limited access to agricultural knowledge, technological advancements, and financial support, restricting their ability to adopt innovative methods (Nwaiwu & Udenwa, 2022). Furthermore, traditional labor divisions place an excessive burden on women, who must balance both household responsibilities and farming activities (Jabeen et al.,2020). Overcoming these challenges is crucial for improving women's well-being in vegetable farming, as it allows them to actively engage in sustainable practices and capitalize on the economic opportunities they provide.

The inclusion of digital financial services plays a crucial role in improving women's well-being in agriculture. By gaining access to these services, women can better manage their finances, invest in sustainable practices, and connect with markets more efficiently (Jabeen et al., 2020). Digital platforms also support micro-financing opportunities, allowing women to fund processing technologies for vegetable waste and other eco-friendly initiatives. This financial empowerment is essential for breaking traditional barriers and enabling women to participate more actively in the agricultural economy.

The social dynamics within rural communities also influence women's welfare in vegetable farming. Empowering women through sustainable practices can lead to broader community benefits, including improved food security and enhanced social cohesion (Jabeen et al., 2020). As women take on more significant roles in sustainable agriculture, they can serve as role models and advocates for environmental stewardship within their communities. This social influence can further drive collective action towards sustainability, creating a ripple effect that benefits not only individual women but also their families and communities at large.

4. RESULTS AND DISCUSSION

This study gathers data through in depth interviews on the well being of female farmers, focusing on strategic waste management for sustainability and the implementation of digital financial inclusion, involving a total of 20 respondents. The respondents comprise two pekaseh (heads of Subak), two individuals directly associated with the Tabanan Regency Agriculture Office, and 16 female vegetable farmers aged over 30 with more than five years of experience in vegetable farming. The interview findings are then synthesized based on the research questions requiring analysis. A summary of the findings from interviews with the 20 respondents is presented in Table 1.

Table 1. Summary of Interview Findings

Aspect	Digest of Interview Results
Vegetable waste in Baturiti Village can support economic and environmental sustainability	Vegetable waste in Baturiti Village holds significant potential for fostering both economic and environmental sustainability. Transforming waste into compost enhances soil fertility, reduces reliance on chemical fertilizers, and mitigates pollution. Additionally, waste can be repurposed as livestock feed, alternative fuel, or value-added products, providing supplementary income for farmers. Training in waste management empowers farmers economically while simultaneously contributing to environmental conservation and the long-term sustainability of agriculture.
Challenges faced by women farmers in Baturiti Village in managing	Women farmers in Baturiti Village face numerous challenges in managing vegetable waste, including limited knowledge and skills, restricted access to appropriate technology, and difficulties in

vegetable waste and accessing related technology and information.	obtaining essential information. Additionally, their responsibilities in both farming and household duties leave little time for waste management. Existing technology often fails to meet their specific needs, while waste processing facilities remain scarce. Therefore, training programs and support to enhance their knowledge and facilitate access to simpler, more practical technology are crucial in promoting sustainable waste management.
The role of financial literacy in empowering female farmers in Baturiti Village to access financial services that support vegetable waste management.	Digital financial literacy plays a vital role in empowering women farmers in Baturiti Village. With a solid understanding of digital finance, they can access financial services such as business capital loans, which support vegetable waste management and the marketing of processed products. Furthermore, digital technology enables them to expand their market reach efficiently, boost their income, and manage their business finances independently. By enhancing digital financial literacy, women farmers gain new opportunities to improve their economic well-being and broaden their market access.
An integrated vegetable waste management strategy can boost female farmers' income and support agricultural sustainability in Baturiti Village.	The implementation of an integrated vegetable waste management strategy in Baturiti Village can enhance the income of women farmers by converting waste into compost or animal feed, which can be sold for additional revenue. Moreover, this waste management approach supports agricultural sustainability by reducing the use of chemical fertilizers and improving soil quality. Therefore, this strategy not only benefits the farmers' economy but also preserves the environment and ensures the long-term viability of agriculture in the village.

Source: data is processed by interviewed,2024

The Theory of Sustainable Development underscores the importance of balancing economic needs, environmental protection, and socio-cultural values to achieve equitable and enduring progress (Hopwood et al., 2005). In relation to this study, it aims to foster inclusive and long-lasting development by empowering female farmers in Baturiti Village through sustainable vegetable waste management. This approach not only enhances economic well-being but also safeguards environmental sustainability, ensuring a harmonious integration of prosperity and ecological responsibility.

a) Vegetable waste in Baturiti Village can support economic and environmental sustainability

Baturiti Village, Bali, is renowned for its intensive vegetable farming, producing a variety of crops such as cabbage, onions, tomatoes, and chili peppers. While this agricultural sector is vital to the local economy, vegetable waste management remains a significant challenge. The waste primarily consists of damaged leaves, roots, stems, and produce that fail to meet market standards. During peak harvest seasons, the volume of waste generated is substantial and often discarded indiscriminately, posing environmental risks. Waste management is hindered by inadequate infrastructure, a lack of proper facilities and equipment, and the absence of systematic handling practices. Additionally, limited public awareness regarding the importance of sustainable waste management exacerbates the issue.

To support both economic and environmental sustainability, one of the most effective measures is converting this waste into compost, which offers dual benefits. Firstly, compost enhances soil structure, increases organic matter content, and improves water retention, ultimately boosting soil fertility. This, in turn, enables farmers to reduce their dependence on chemical fertilizers, which are not only costly but also pose environmental hazards.

Beyond its benefits for soil health, proper vegetable waste management can significantly mitigate pollution caused by burning or indiscriminate disposal of organic waste. Processing waste into valuable products such as compost and animal feed helps reduce greenhouse gas emissions and other harmful pollutants associated with improper waste disposal.

The utilization of vegetable waste also presents new economic opportunities for the local community. A promising alternative is repurposing waste as livestock feed,

which can lower feed costs for farmers. Additionally, processed waste can be transformed into alternative fuel sources, offering an environmentally friendly substitute for fossil fuels. By diversifying income streams through these sustainable practices, farmers in Baturiti Village can generate substantial additional revenue.

Furthermore, training programs on waste management play a crucial role in economically empowering farmers and livestock breeders. These programs not only equip them with practical skills in waste processing but also introduce broader sustainability concepts within agriculture. By enabling farmers to manage waste productively, they not only enhance their livelihoods but also contribute to environmental preservation and long-term agricultural sustainability, ensuring the responsible use of natural resources for future generations.

Vegetable waste can be transformed into valuable resources such as organic fertilizers or growing media. For instance, the management of baglog waste from oyster mushroom cultivation has shown potential for producing organic vegetables, which can increase farmers' incomes through better market prices for organic produce (Widhiantara, 2018).

b) Challenges faced by women farmers in Baturiti Village in managing vegetable waste and accessing related technology and information

Female farmers in Baturiti Village face significant challenges in managing vegetable waste, primarily due to a lack of knowledge and skills in efficient waste processing. Many are unfamiliar with sustainable waste management practices that could benefit both the environment and the economy. Additionally, access to appropriate technology is severely limited, and existing solutions are often ill-suited to their specific needs, particularly in terms of simplicity and efficiency. This issue is further compounded by the lack of adequate waste processing facilities, leading to most vegetable waste being either discarded or burned, which contributes to environmental pollution.

The demanding nature of farm work, coupled with household responsibilities, further exacerbates the situation, as female farmers have little time to dedicate to waste management. Traditional village obligations and cultural duties add to their workload, causing waste processing to be neglected. To address these challenges, targeted training programs are essential to enhance their knowledge and skills in waste management. Moreover, the introduction of simpler, more accessible technology would significantly facilitate the waste processing efforts. Providing adequate training and infrastructure support would not only improve waste management practices but also unlock the economic potential of vegetable waste—transforming it into valuable products such as compost or livestock feed. Ultimately, these efforts would contribute to enhancing farmers' livelihoods while promoting environmental sustainability.

Women farmers frequently face information asymmetry regarding agricultural practices, including waste management techniques. Traditional agricultural training programs are often male-dominated, failing to address the specific needs of women. This lack of tailored information hampers their ability to implement effective waste management strategies (Arintyas, 2024).

The management of vegetable waste presents a significant challenge due to inadequate infrastructure for processing or recycling organic materials. Women often lack the knowledge or resources needed to implement effective waste reduction strategies, leading to environmental degradation (Herlyani & Astaman, 2024)

c) The role of financial literacy in empowering female farmers in Baturiti Village to access financial services that support vegetable waste management

Digital financial literacy plays a crucial role in empowering female farmers in Baturiti Village, particularly in improving vegetable waste management and expanding market opportunities for processed products. A solid understanding of digital finance enables these farmers to access financial services that were previously out of reach, such as business loans—an essential factor in supporting the transformation of vegetable waste into high-value products like compost or livestock feed. With greater access to financing, farmers can scale up production, expand their businesses, and ultimately increase their income while creating new economic opportunities.

Digital technology also allows female farmers to market their products more effectively and efficiently. Through online platforms, they can reach a wider customer base, reduce dependence on intermediaries, and secure more competitive prices. This not only enhances their earnings but also empowers them to manage transactions independently and transparently. By tapping into broader markets, female farmers in Baturiti Village can promote and sell their processed vegetable waste products, fostering a sustainable and profitable market ecosystem.

Furthermore, digital financial literacy equips female farmers with the skills to manage their business finances more efficiently. They can easily track income and expenses, plan investments for business growth, and maintain a structured and transparent financial system. This ability enables them to make more informed financial decisions and reduces reliance on traditional financial systems, which are often restrictive and inflexible.

The ultimate goal of digital financial literacy is to empower female farmers by equipping them with the necessary knowledge and skills to manage their finances and businesses independently. It enhances their competitiveness, expands market access, and unlocks greater economic benefits. Additionally, digital financial literacy contributes to bridging economic disparities, reducing gender inequality, and fostering the active participation of female farmers in sustainable economic development. By embracing these digital tools, female farmers in Baturiti Village not only improve their personal livelihoods but also play a vital role in building a more inclusive and sustainable local economy.

Implementing community-based training programs focused on financial literacy can equip female farmers with the necessary skills to manage their finances effectively. These programs should cover topics such as budgeting, loan applications, and investment strategies specific to agriculture. Establishing support networks among female farmers can facilitate knowledge sharing and mentorship opportunities. These networks can help women learn from each other’s experiences and build confidence in managing their finances (Ayu Sasmita et al., 2022; Safitri, 2021).

d) An integrated vegetable waste management strategy can boost female farmers' income and support agricultural sustainability in Baturiti Village

The implementation of an integrated vegetable waste management strategy in Baturiti Village holds substantial potential for enhancing the income of female farmers while simultaneously supporting agricultural and environmental sustainability. By processing vegetable waste into compost or livestock feed, female farmers can create alternative income streams, reducing their dependence on a single market or revenue source. Value-added products such as organic compost not only command a high market value but also serve as livestock feed, directly benefiting the village’s livestock sector. The additional income generated from these

processed products enables female farmers to improve their economic well-being and expand their enterprises beyond vegetable cultivation alone.

Beyond its economic advantages, vegetable waste management also plays a crucial role in fostering sustainable agriculture. By decreasing reliance on expensive chemical fertilizers that may harm ecosystems, compost derived from vegetable waste naturally enhances soil quality. Rich in essential nutrients, compost improves soil structure and water retention capacity, thereby mitigating soil degradation and boosting long-term agricultural productivity. This, in turn, establishes a more resilient and environmentally friendly farming system.

Moreover, this integrated waste management strategy presents a mutually beneficial solution, empowering female farmers economically while reinforcing environmental and agricultural sustainability within the village. Efficient waste management mitigates the adverse effects of discarded waste, which often contributes to pollution and resource inefficiency. Consequently, this strategy not only delivers significant financial benefits to female farmers but also contributes to environmental conservation and the long-term viability of agriculture in Baturiti Village.

The implementation of an integrated vegetable waste management strategy in Baturiti Village can enhance the income of women farmers by converting waste into compost or animal feed, which can be sold for additional revenue. Moreover, this waste management approach supports agricultural sustainability by reducing the use of chemical fertilizers and improving soil quality. Therefore, this strategy not only benefits the farmers' economy but also preserves the environment and ensures the long-term viability of agriculture in the village. Certainly, supporting this initiative is closely tied to government assistance to ensure the successful implementation of the strategy.

5. CONCLUSION

This study underscores the significance of implementing sustainable vegetable waste management strategies in Baturiti Village to enhance the well-being of female farmers and promote agricultural sustainability. By converting waste into compost or livestock feed, female farmers can generate additional income, reduce dependence on chemical fertilizers, and improve soil quality while simultaneously mitigating pollution. Key challenges include limited knowledge, technology, and infrastructure, necessitating targeted training and appropriate technological support. Digital financial literacy also plays a crucial role in empowering female farmers by facilitating access to financial services and expanding market opportunities for processed waste products. Ultimately, the integration of waste management, training, and digital financial literacy can foster economic prosperity, preserve the environment, and support sustainable agriculture in Baturiti Village.

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