

Realizing Climate-Resilient MSMEs through Sustainable Accounting

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ABSTRACT

This study examines the level of understanding and awareness of climate change risks among agricultural Micro, Small, and Medium Enterprises (MSMEs) in Merauke Regency, South Papua, and its implications for sustainable accounting practices. A qualitative approach was employed through interviews, observation, and documentation involving 12 agricultural MSMEs in Semangga, Tanah Miring, and Kurik Districts. The findings show that MSME actors have experienced the impacts of climate change, such as floods, droughts, and uncertain seasonal patterns; however, their understanding remains limited and has not been integrated into financial management practices. Most MSMEs still use simple bookkeeping and do not record climate-related losses as business risks. Despite these limitations, MSMEs demonstrate adaptive strategies through planting adjustments, commodity diversification, and social cooperation. This study contributes by highlighting the importance of climate risk awareness and sustainable accounting practices to strengthen the resilience of agricultural MSMEs in vulnerable rural areas.

Keywords: Agricultural MSMEs; Resilience; Climate change; Sustainable accounting; South Papua.

INTRODUCTION

Climate change has become a global challenge with a significant impact on various economic sectors, particularly the agricultural sector, which is highly dependent on natural conditions. Phenomena such as uncertain rainfall, increased frequency of floods and droughts, and changes in planting season patterns have impacted the productivity and sustainability of agricultural businesses. These impacts are felt more intensely in vulnerable areas, including Merauke Regency in South Papua Province, known as one of the nation's food barns. The geographical conditions and vast land characteristics make the agricultural sector the backbone of the community's economy, so disruptions due to climate change have the potential to pose significant economic risks, especially for micro, small, and medium enterprises (MSMEs).

Agricultural MSMEs in Merauke are generally traditional, with limited access to capital, technology, and financial management. Based on field conditions, most MSMEs lack a structured financial recording system and continue to mix business finances with household finances. Furthermore, the impacts of climate change, such as crop failure, increased production costs, and income fluctuations, have not been identified and recorded as business risks. This situation indicates that MSMEs lack the ability to systematically manage climate risks, resulting in reactive and experience-based business decision-making. In this context, sustainable accounting is crucial as a tool to integrate economic, social, and environmental aspects into business management, thereby supporting the resilience and sustainability of MSMEs.

Several previous studies have examined the application of sustainable accounting in MSMEs, but most have focused on conceptual aspects or the urban context. Research by Marfo et al. (2022) shows that accounting practices in MSMEs are still limited to simple record-keeping and do not adequately integrate environmental dimensions. Research by Agyemang et al. (2020) also confirms that low financial literacy and environmental awareness are major obstacles to the implementation of sustainable accounting. Meanwhile, studies related to MSME resilience to climate change generally emphasize technical aspects of adaptation, such as business diversification and production adjustments, without directly linking them to accounting systems and financial management. This indicates that studies integrating climate change risks and accounting practices in MSMEs are still relatively limited.

Based on the above description, there is a research gap: there are not many studies that specifically examine the relationship between understanding climate change risks and sustainable accounting practices in agricultural MSMEs in rural areas, particularly in South Papua. This study differs from previous studies because it not only examines general accounting practices but also integrates the climate risk dimension as part of the MSME financial management system. Furthermore, this study uses a contextual approach based on local conditions in Merauke, thus depicting a more specific empirical reality than previous studies, which tend to be general or focused on urban area. this research is expected to contribute to the development of a simple, applicable, and relevant sustainable accounting model to increase the resilience of MSMEs in facing the risks of climate change.

This study aims to analyze the level of understanding and awareness of agricultural MSMEs in Merauke Regency regarding the risks of physical climate change, such as flooding, drought, changes in seasonal patterns, and rainfall distribution that affect the sustainability of agricultural businesses. The main focus of the study is aimed at how MSME actors understand the impact of climate change on production activities, income, and business management, and how this awareness is manifested in the financial

management and accounting practices applied. This study also seeks to identify the extent to which climate change risks have been considered as part of business decision-making and business sustainability. The main contribution of this study is to provide an empirical picture of the level of awareness of MSMEs regarding climate change risks in rural areas of South Papua, strengthen the study of risk-based sustainable accounting, and serve as a basis for developing mentoring and policy models that support increasing the resilience of agricultural MSMEs in facing the impacts of climate change in a sustainable manner. Based on this description, the problem formulation in this study is: What is the level of understanding and awareness of agricultural MSMEs in Merauke regarding the physical risks of climate change?

LITERATURE REVIEW

Climate change is a global phenomenon that has a significant impact on the agricultural sector, especially in areas highly dependent on natural conditions. The impacts of climate change are characterized by increased frequency of floods and droughts, changes in seasonal patterns, and uncertainty in rainfall, which impact the productivity and sustainability of agricultural businesses. According to Folke's resilience theory, a business's ability to withstand external pressures is influenced by the business actor's adaptive capacity. This adaptive capacity includes the ability to understand risks, recognize environmental changes, and make appropriate decisions in the face of uncertainty. In the context of agricultural MSMEs, understanding and awareness of climate change risks are crucial factors in supporting business sustainability, particularly in vulnerable areas such as Merauke Regency, South Papua.

On the other hand, the concept of sustainability accounting emphasizes the importance of integrating economic, social, and environmental aspects in business management. John Elkington, through the Triple Bottom Line concept, explains that business sustainability is not only oriented towards economic gain (profit), but also considers social (people) and environmental (planet) aspects. In practice, MSMEs still face various limitations, such as low financial literacy, simple business record keeping, and a lack of awareness of environmental risks. These conditions mean that climate change risks are not yet understood as a crucial part of business management and economic decision-making.

Several previous studies have shown that the implementation of sustainable accounting in MSMEs is still suboptimal. Research by Marfo et al. (2022) found that MSME financial recording practices still focus on short-term economic needs and do not integrate environmental aspects. Research by Agyemang et al. (2020) also showed that low environmental awareness and limited capacity are major obstacles to the implementation of sustainable accounting. Furthermore, research on climate change in the MSME sector generally focuses more on technical adaptation strategies, such as business diversification and production adjustments, without examining the level of understanding and awareness of business actors regarding the physical risks of climate change itself. In the context of rural areas like Merauke, these conditions are further complicated by limited access to information, low financial education, and the community's high dependence on the agricultural sector.

Based on this description, a research gap exists due to the limited number of studies specifically analyzing the level of understanding and awareness of agricultural MSMEs regarding the physical risks of climate change in rural areas, particularly in South Papua. Therefore, this research is crucial to provide an empirical overview of how agricultural MSMEs in Merauke perceive the risks of climate change and how this awareness can support the sustainability and resilience of their businesses

RESEARCH METHOD

This study uses a qualitative approach with a descriptive design to analyze the level of understanding and awareness of agricultural MSMEs regarding climate change risks and their implications for sustainable accounting practices. This approach was chosen because it allows for in-depth and contextual exploration of the phenomenon, reflecting real-world conditions. The unit of analysis in this study is agricultural MSMEs.

The research was conducted in Semangga, Tanah Miring, and Kurik Districts, Merauke Regency, which were purposively selected because they are agricultural centers vulnerable to the impacts of climate change. The data used consisted of primary data obtained through interviews and observations, as well as secondary data from supporting documents. The research informants consisted of 12 MSMEs selected using a purposive sampling technique with the criteria of being active business actors for at least two years and directly impacted by climate change. The number of informants was determined based on the principle of saturation, which occurs when the data obtained has been repeated and no significant new information is found.

Data collection techniques included in-depth interviews, observation, and documentation. Data analysis employed the Miles and Huberman interactive model, which includes data reduction, data presentation, and conclusion drawing. To ensure data validity, source triangulation and member checking techniques were used, ensuring the research results have a level of validity and credibility that can be accounted for.

RESULT

Based on the findings from research conducted on 12 MSMEs in the agricultural sector across Semangga, Tanah Miring, and Kurik Districts in Merauke Regency, it was identified that the understanding and awareness of climate change risks among MSME actors remain at an empirical level and have not yet been adequately conceptualized. Ten out of the 12 informants acknowledged experiencing significant environmental changes, particularly erratic seasonal patterns characterized by prolonged rainfall, flooding of agricultural land, and extended dry periods that disrupted planting schedules and crop productivity. However, only three informants recognized these phenomena as manifestations of broader climate change processes.

One informant explained: "Now the rain is unpredictable, sometimes we plant but there is too much water, so the rice is damaged. We think it is just the weather" (Farmer informant, Kurik). This finding demonstrates a substantial gap between direct environmental experience and conceptual climate literacy. Although MSME actors are directly affected by climate variability, most of them still perceive such occurrences as ordinary weather fluctuations rather than systemic environmental changes requiring strategic adaptation. The data saturation principle was achieved in this study, as information obtained from the informants became repetitive and no significant variations emerged in later interviews.

The limited understanding of climate change was also reflected in the financial management practices of MSMEs. Of the 12 informants, only four business owners maintained simple financial records, while the remaining eight did not conduct any form of bookkeeping. Furthermore, all informants admitted that business finances were still mixed with household finances, making it difficult to distinguish operational costs, household expenditures, and actual business profits or losses.

Climate-related impacts such as crop failures, increased fertilizer and pesticide costs, declining yields, and unstable incomes were not systematically documented in financial records. One informant stated: "If the crop fails, it is just a loss, I never calculate the amount. I usually borrow again for the next planting" (Farmer informant, Tanah Miring). This condition indicates that financial decision-making among MSMEs remains highly reactive and survival-oriented rather than strategic and data-driven. Losses caused by environmental disturbances are perceived as unavoidable risks rather than measurable business variables that require mitigation planning.

Despite these limitations, several adaptive practices were identified among MSME actors. Nine out of 12 informants reported adjusting planting schedules according to changing weather patterns, while seven informants diversified agricultural commodities to reduce the risk of total crop failure. Social solidarity practices, particularly mutual cooperation among family members and neighboring farmers, also functioned as informal resilience mechanisms during periods of economic hardship.

One informant noted: "If there is a crop failure, family or neighbors usually help, so the business can continue" (Informant, Semangga). These adaptive practices indicate that MSMEs possess practical resilience capacities rooted in local knowledge and social relationships. However, these adaptation strategies remain informal, undocumented, and unsupported by structured financial systems.

Overall, the findings reveal that MSMEs in the agricultural sector of Merauke face multiple interconnected challenges, including low climate literacy, weak accounting practices, limited financial planning, and the absence of environmental risk integration within business management systems.

DISCUSSION

The findings of this study reveal that climate change has become a tangible reality for MSMEs in the agricultural sector in Merauke, although the understanding of climate risks among business actors remains largely experiential rather than conceptual. From the perspective of organizational behavior theory, this condition reflects the influence of individual perception and cognitive limitations on organizational responses to external environmental threats. MSME actors tend to interpret climate disturbances only within the scope of immediate operational problems, such as failed harvests or delayed planting seasons, without recognizing climate change as a structural and long-term business risk. Consequently, strategic adaptation and long-term business planning remain limited.

The absence of conceptual climate awareness directly influences the quality of financial management practices. Most MSMEs in this study continue to operate without proper bookkeeping systems, indicating that financial management remains informal and highly dependent on memory-based decision-making. The integration of household and business finances further weakens the ability of MSMEs to evaluate actual business performance, calculate climate-related losses, or prepare financial mitigation strategies. This finding demonstrates that low climate literacy not only affects agricultural productivity but also reduces the quality of managerial and accounting practices within MSMEs.

These findings support the argument of Marfo et al. (2022), which states that accounting practices among MSMEs are generally limited to basic financial recording and rarely integrate environmental dimensions. However, this study extends previous findings by showing that in vulnerable rural areas such as Merauke, climate risk intensifies the weaknesses of traditional accounting practices. Climate uncertainty increases

operational costs, production instability, and income fluctuations, yet these impacts remain unrecorded in formal accounting systems. As a result, MSMEs experience difficulties in evaluating business sustainability and making evidence-based decisions. From the perspective of sustainable accounting theory proposed by Bebbington et al. (2007), the findings indicate the absence of integration between economic, social, and environmental information within MSME reporting systems. Existing accounting practices focus solely on short-term cash flows and daily operational survival, while environmental costs and climate-related risks are ignored. In practice, this means that flood damage, drought-related losses, rising fertilizer prices, and declining productivity are not recognized as environmental accounting components that influence business sustainability. Consequently, MSMEs are unable to identify the real economic consequences of environmental degradation and climate variability.

Furthermore, the findings can also be analyzed through the lens of resilience theory proposed by Folke (2006). MSMEs in Merauke have demonstrated adaptive capacities through traditional and community-based mechanisms. Adjustments in planting schedules, commodity diversification, and mutual cooperation among community members indicate the existence of social resilience rooted in local culture and collective solidarity. These adaptive strategies are essential survival mechanisms in contexts where institutional support, technological access, and financial resources remain limited. However, the resilience observed in this study remains predominantly informal and undocumented. Without structured financial records, MSMEs cannot accurately measure the effectiveness of adaptation strategies, compare productivity across planting periods, or evaluate the economic impacts of climate-related decisions. In the long term, reliance solely on informal adaptation may reduce sustainability because business actors cannot systematically learn from previous losses or improve future planning processes.

The study also highlights important implications related to the Triple Bottom Line concept introduced, which emphasizes the balance between economic, social, and environmental dimensions in business sustainability. The findings demonstrate that the social dimension among MSMEs in Merauke is relatively strong, particularly through practices of cooperation, kinship support, and collective survival mechanisms. These social values contribute significantly to business continuity during periods of crisis. However, the environmental dimension remains weakly integrated into business management systems. MSMEs have not yet adopted environmentally oriented accounting practices, climate risk assessments, or sustainability-based financial planning. As a result, the balance among profit, people, and planet remains unachieved. Another important finding from this study is the strong dependence of MSMEs on reactive financial behavior. Business actors generally respond to climate-related losses through informal borrowing, delayed planting, or reliance on family support rather than through planned financial mitigation strategies such as reserve funds, agricultural insurance, or investment diversification. This reactive behavior indicates limited financial resilience and increases vulnerability to repeated climate shocks.

In this context, the study proposes a simple and contextual sustainable accounting model based on climate risk for MSMEs in rural areas. The proposed model integrates basic accounting practices with environmental risk recording, including documentation of losses caused by floods, droughts, pest attacks, and rising production costs due to climate variability. The model is designed to remain simple and practical so that it can be implemented by MSME actors with limited accounting knowledge and educational backgrounds.

Unlike previous studies that mainly focused on conceptual sustainable accounting frameworks or urban MSME contexts, this study specifically addresses rural agricultural MSMEs in South Papua, where climate vulnerability and accounting limitations intersect. Therefore, the contribution of this research lies not only in theoretical development but also in practical implementation. The proposed accounting model emphasizes community-based approaches through participatory training, mentoring programs, and local institutional support.

The study also implies that strengthening MSME resilience requires collaboration among multiple stakeholders, including local governments, universities, financial institutions, and community organizations. Training programs on climate literacy, simple bookkeeping, and sustainable accounting practices are necessary to improve MSME adaptive capacity. In addition, policies supporting environmentally oriented MSME development should prioritize accessible financial education and locally relevant adaptation strategies.

Ultimately, this study confirms that sustainable accounting is not merely a technical financial tool but also a strategic mechanism for improving resilience and sustainability among MSMEs facing climate change risks. In vulnerable regions such as Merauke, integrating environmental awareness into accounting practices is essential to ensuring long-term business sustainability, economic stability, and community resilience.

CONCLUSION

The research findings indicate that the level of understanding and awareness of climate change risks among MSMEs in the agricultural sector in Merauke remains low and empirical. Most large businesses have experienced the impacts of climate change, such as seasonal changes, floods, droughts, and increased pest attacks that affect production and revenue, but have not yet understood these phenomena as business risks that need to be systematically managed. This situation has resulted in rudimentary financial management practices, with most MSMEs lacking structured financial records, still mixing business and household finances, and not recording losses due to environmental factors as part of business management. Nevertheless, MSMEs demonstrate adaptive capacity through adjusting planting times, diversifying commodities, and strengthening social capital based on mutual cooperation. These findings indicate that the resilience of the MSME agricultural sector is influenced not only by technical production capabilities but also by the ability to understand and manage climate change risks through sustainable accounting practices.

Theoretically, this study strengthens sustainability accounting studies by integrating the climate change risk dimension into MSME financial management and strengthens resilience theory, which emphasizes the importance of adaptive capacity in facing external pressures. This study also expands the application of the Triple Bottom Line concept to the context of agricultural MSMEs in rural South Papua. Practically, the results of this study can serve as a basis for local governments and related institutions in developing financial literacy training programs and mentoring for simple climate-risk-based sustainable accounting tailored to the local conditions of MSMEs in Merauke. Therefore, MSMEs are advised to begin implementing simple financial records that cover both economic aspects and environmental risks, such as losses due to floods, droughts, and crop failures. Furthermore, further research is recommended to use a quantitative approach or mixed methods to more comprehensively measure the relationship between climate change risk and MSME financial performance, as well as to develop a sustainable accounting model based on local wisdom and simple digital technology for MSMEs in rural areas

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CONFLICTS OF INTEREST

The authors have no conflict of interest related to the research conducted and this article has not been published elsewhere.

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