p–ISSN: 2723 – 6609 e-ISSN: 2745-5254
Vol. 6, No. 7, July 2025 http://jist.publikasiindonesia.id/

KWT Resilience in Dealing with Climate Disasters Through Agricultural Innovation: A Case Study of KWT Bougenville Assisted by PT Pertamina Patra Niaga AFT Babullah

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Keywords
Agricultural Innovation, Bougainvillea, Climate Disaster, KWT, Resilience

ABSTRACT

Women Farmers Groups (KWT) play an important role in maintaining local food security, especially amidst the increasing threat of climate disasters. Climate change causes various problems such as decreased agricultural land productivity, drought, flooding, and weather uncertainty. This encourages the need for agricultural innovations that can increase the resilience of farmer groups, including KWT Bougenville which is under the guidance of PT Pertamina Patra Niaga AFT Babullah. This study aims to understand how KWT Bougenville deals with the impacts of climate change through the application of appropriate and sustainable agricultural innovations. This study uses a qualitative research method. The data collection technique in this study is through literature studies. The data that has been collected is then analyzed in three stages, namely data reduction, data presentation and drawing conclusions. The results of the study show that KWT Bougenville has succeeded in increasing resilience in dealing with climate disasters through various agricultural innovations, such as the use of efficient irrigation technology, the application of more adaptive planting patterns, and sustainable land management. The guidance of PT Pertamina Patra Niaga AFT Babullah also plays a significant role in providing support, both in terms of training and technological assistance. However, there are still challenges in terms of resources and technological limitations that need to be overcome to achieve more optimal resilience. These findings are not only relevant for direct stakeholders, but also contribute to the development of sustainable agriculture at the national level.

INTRODUCTION

Women Farmers Group (*KWT/Kelompok Wanita Tani*) is an organizational group consisting of women in rural communities who focus on agricultural activities (Afifah & Ilyas, 2021). *KWT* aims to empower its members by improving skills and knowledge in agriculture, including land management, crop cultivation, animal husbandry, and other agricultural innovations. In addition, *KWT* often becomes a forum for its members to develop small businesses in the agricultural sector, strengthen local food security, and contribute to the economic welfare of families and surrounding communities (Ardiani & Dibyorini, 2021).

KWT plays an important role in maintaining local food security, especially amidst the increasing threat of climate disasters (Khan et al., 2025). Climate change causes various serious challenges, such as decreased land productivity, drought, flooding, and weather uncertainty that affect agricultural yields. According to the United Nations, climate change refers to

changes in temperature and weather patterns in the long term. This process can occur naturally, such as due to solar activity or large volcanic eruptions—for example, the eruption of Mount Krakatoa in August 1883, which caused a decrease in global temperatures due to volcanic dust covering the atmosphere (DLHK, 2023).

Women Farmers Groups (*KWT*) usually operate at the village level and utilize natural potential, such as dry land or agricultural land. The presence of *KWT* is a driving force in increasing awareness and innovation among farmers, as well as encouraging increased land and crop yields for its members and the surrounding community. In addition, *KWT* also acts as an effective forum to support the management and marketing of agricultural products resulting from innovation or the latest developments (Susilowati et al., 2022). The existence of *KWT* is very important, especially because there are still many farmers who have to sell their crops at low prices. Therefore, the development of more innovative and profitable plant varieties for farmers is something that needs to be considered (Rusli et al., 2022).

The increasingly uncertain climate change encourages the need for innovation in the agricultural sector to increase the resilience of farmer groups, including the Bougenville Women Farmers Group (*KWT*) which is under the guidance of PT Pertamina Patra Niaga AFT Babullah. Threats such as drought, floods, and changes in weather patterns require the implementation of adaptive strategies that can maintain agricultural productivity. Through innovations such as the use of more efficient irrigation technology, the implementation of cropping patterns that are in accordance with weather changes, and sustainable management of natural resources, *KWT Bougenville* is able to strengthen their resilience to the impacts of climate change. The support provided by PT Pertamina also helps them access the technology and knowledge needed to survive and continue to thrive in increasingly challenging conditions.

Previous research by (Hidyat, 2023) shows that adaptation strategies implemented by farmers need to be adjusted to local characteristics and the specific needs of each region. By combining these various adaptation strategies, farmers can strengthen the resilience of their agricultural sector and reduce the negative impacts of climate change on crop production. Another study by (Masturi et al., 2021) showed that tolerance to temperature fluctuations and increased rainfall can help ensure increased agricultural production. This can be achieved by improving the ability of surface water to transport and distribute nutrients from the soil. This goal can be realized by increasing the absorption of groundwater, for example by returning crop waste to fertile soil or introducing flexibility in crop rotation. The synergy between mitigation and adaptation efforts in the agricultural sector also offers great potential.

This research has a high urgency given the increasing threat of climate change to agricultural productivity and food security, especially for vulnerable groups such as the Women Farmers Group (*KWT*). Climate disasters such as droughts, floods, and extreme weather are becoming more frequent and severely impacting small-scale farmers with limited adaptation resources. *KWT Bougenville*, as one of the backbones of local food security, faces serious challenges due to climate change, such as declining crop yields and dependence on vegetable supplies from outside the region. Women in the agricultural sector often have limited access to technology, training, and funding, making them more vulnerable to climate shocks. Sustainable agricultural innovations, such as efficient irrigation technology and adaptive planting patterns, are an urgent solution to ensure long-term productivity. In addition, the collaboration with PT Pertamina Patra Niaga offers a partnership model that can be replicated to support climate adaptation. This research is also relevant to Indonesia's Sustainable Development Goals (*SDGs*) and the global climate resilience framework, so that the findings can be the basis for the development of similar policies and programs at the national level. As such, this research is not only urgent to be conducted, but also has a strategic impact in strengthening food security, empowering women, and advancing sustainable agriculture amid increasingly complex climate challenges.

This research contributes to the literature on agricultural resilience and innovation by emphasizing the importance of using irrigation technology, adaptive cropping patterns, and sustainable land management as climate disaster mitigation strategies. In addition, the role of companies such as PT Pertamina Patra Niaga in providing support in the form of training and technology also strengthens the concept of collaboration between the private sector and local communities to increase resilience to climate change. This study aims to understand how *KWT Bougenville* deals with the impacts of climate change through the application of appropriate and sustainable agricultural innovations.

This research provides practical and theoretical benefits. For farmers, the results of the research help *KWT Bougenville* and other farmer groups adopt adaptive agricultural innovations. For the company, the research strengthens PT Pertamina's partnership model with local communities that can be applied in other regions. For the government, the findings of the research can be the basis for policies for empowering women farmers and climate adaptation. Academically, the research enriches the literature on agricultural innovation and climate resilience. Socially, research increases the capacity of women farmers and community food security. Thus, this research benefits various stakeholders and supports sustainable development.

RESEARCH METHODS

This research uses a qualitative research method. Qualitative research methods are research approaches that aim to understand social phenomena, behaviors, or certain problems by exploring the views, experiences, and meanings given by individuals or groups. This study focuses more on in-depth understanding than data quantification (Kusumastuti & Khoiron, 2019). The case study in this study is *KWT Bougenville* fostered by PT Pertamina Patra Niaga AFT Babullah. The data collection technique in this study was carried out through literature studies, namely by collecting information from various sources such as books, journals, and relevant documents related to the research topic. The collected data were then analyzed through three main stages, namely data reduction (filtering and simplifying relevant data), data presentation (arranging data systematically so that it is easy to understand), and drawing conclusions (evaluating and making conclusions based on the data that has been analyzed).

RESULTS AND DISCUSSION

Innovation is an effort to increase efficiency and effectiveness in producing better products and services. This is done through improving production, processing, or distribution methods, with the aim of reducing costs, time, and resources required. Process innovation often involves the use of new technologies, workflow optimization, and improving workforce skills (Al Aidhi et al., 2023; Wiyono et al., 2022). Innovation in agriculture plays a vital role in increasing agricultural productivity by introducing new, more efficient technologies and practices. The use of modern tools such as tractors and automated machines, as well as the application of data-based precision farming techniques, allows farmers to optimize crop yields with fewer resources. In addition, innovation in the development of superior plant varieties that are more resistant to disease and climate change also helps improve food security. With this innovation, the agricultural sector can be more productive, sustainable, and able to meet the needs of a growing population (Sihombing, 2022).

Agricultural innovation is an important key in building the resilience of Women Farmers Groups (KWT) in facing increasingly intense climate disasters. Resilience is the ability of individuals, groups, or systems to adapt and recover quickly from adversity, challenges, or significant changes (Datola, 2023). In the social, economic, or environmental context, resilience includes the capacity to survive, bounce back, and even thrive in the face of stress, disaster, or disruption, such as climate change, economic crises, or natural disasters

(Praptika & Yusuf, 2023). Resilience is not just about surviving, but also about the ability to learn from experience and strengthen the ability to face similar situations in the future.

Climate change brings various challenges to the agricultural sector, such as temperature fluctuations, erratic rainfall, and increased risk of drought and flooding (Harahap et al., 2024). Through agricultural innovation, KWT can adapt to these conditions and increase their resilience to threats posed by climate change. Innovations such as more efficient irrigation technology, the implementation of more adaptive planting patterns, and sustainable land management are solutions that can maintain agricultural productivity even in the midst of uncertain weather conditions (Rusmayadi et al., 2024).

The resilience of KWT Bougenville, which is fostered by PT Pertamina Patra Niaga AFT Babullah, is a real example of how farmer groups can adapt to climate change through agricultural innovation. The Women's Farmers Group (KWT) Bougenville received training on solutions to increase food security productivity from Pertamina Patra Niaga Regional Papua Maluku, in collaboration with the Aviation Fuel Terminal (AFT) Babullah and the Ternate City Agricultural Extension Center (BPP). The Compost Fertilizer Making Training was held in Tubo Village, North Ternate City District, on Monday, August 5, 2024. Edi Mangun, Area Manager Comm, Rel & CSR Pertamina Patra Niaga Regional Papua Maluku, explained that this activity began with complaints from KWT Bougenville who wanted to increase food security productivity but faced obstacles in the availability of fertilizer in Tubo Village (Autana, 2024).

It is important to note that the need for vegetables in Ternate City is mostly supplied from outside the region, such as Halmahera and Manado, due to land conditions and the culture of the community which is more directed at nutmeg and clove plantations. As a result, local vegetable production is not sufficient for market demand. KWT Bougenville, which has been active in agriculture since 2020, grows various types of vegetables, including tomatoes, chilies, mustard greens, lettuce, pak choy, celery, kale, and spinach. Therefore, Edi emphasized that compost fertilizer has a crucial role in agriculture, especially in producing quality vegetables.

Figure 1. KWT Bougenville
Source: (Autana, 2024)

In facing various climate challenges, KWT Bougenville has implemented a number of strategies, such as the use of efficient irrigation technology, planting patterns that are more

adaptive to weather changes, and sustainable land management. Support from PT Pertamina Patra Niaga AFT Babullah is very significant, both in the form of training and technological assistance, which allows this farmer group to continue to innovate. So with this assistance, KWT Bougenville has succeeded in increasing resilience to the impacts of climate disasters, while maintaining their agricultural productivity. This shows that collaboration between farmer groups and the industrial sector can produce concrete steps in facing global challenges such as climate change. KWT Bougenville has succeeded in increasing resilience in facing climate disasters through various agricultural innovations, including:

1. Efficient Use of Irrigation Technology
   Utilizing water-saving irrigation technology, such as drip irrigation or sprinklers, to ensure adequate water supply even in extreme or dry weather conditions. This technology helps optimize water use, so that plants still get enough water without wasting resources.
2. More Adaptive Cropping Patterns
   a. Changing cropping patterns to better suit changing climate conditions, such as choosing crop varieties that are more resistant to drought or temperature fluctuations.
   b. Setting a more flexible planting schedule based on weather predictions and climate change to avoid losses due to unpredictable weather.
3. Sustainable Land Management:
   a. Adopting agricultural practices that maintain soil fertility, such as the use of organic fertilizers and crop rotation, to ensure stable agricultural yields in the long term.
   b. Reducing the use of hazardous chemicals that can damage the soil and environment, and improving the health of agricultural ecosystems.

These innovations enable KWT Bougenville to increase resilience in facing the challenges of climate change, while maintaining sustainable agricultural productivity. Support from PT Pertamina Patra Niaga AFT Babullah is very significant for KWT Bougenville in facing climate disasters and increasing agricultural innovation. This support includes training starting with participant socialization, followed by material explanation, and continued with practice in using machines and making compost. This activity was attended by all members of KWT Bougenville, representatives from the Ternate City Agricultural Extension Center, and representatives of Pertamina Patra Niaga AFT Babullah. In addition to being able to produce compost independently, KWT Bougenville is now starting a fertilizer sales initiative because production has exceeded the group's needs, so that the economic benefits obtained can be maximized. Pertamina Patra Niaga Regional Papua Maluku continues to support activities that are in line with the principles of Environmental, Social, and Governance (ESG) and help achieve Indonesia's Sustainable Development Goals (SDGs) by 2030.

This support from PT Pertamina Patra Niaga not only helps KWT Bougenville survive, but also thrive, by increasing their agricultural resilience amidst increasingly frequent climate disasters. Although various innovations have been implemented and support from PT Pertamina Patra Niaga AFT Babullah has helped increase the resilience of KWT Bougenville in dealing with climate disasters, there are still challenges that need to be overcome. Limited resources, both in terms of finance and infrastructure, are one of the main obstacles that hinder the wider application of innovation. In addition, access to more sophisticated and sustainable agricultural technology is still limited, so that several efforts to increase land productivity cannot be optimized. Therefore, strategic steps and further collaboration are needed so that the resilience of KWT Bougenville can be improved more optimally in the future.

The results show that KWT Bougenville has succeeded in increasing resilience to climate disasters through agricultural innovations, such as efficient irrigation technology, adaptive planting patterns, and sustainable land management. These findings are in line with previous research by Hidyat (2023) which emphasized the importance of adaptation strategies based on local characteristics to reduce the impact of climate change on agricultural production. In

addition, the study of Masturi et al. (2021) supports the use of climate-resistant crop varieties and crop rotation to improve food security, which is also implemented by KWT Bougenville.

PT Pertamina Patra Niaga's support in the form of training and technology strengthens the findings of Rusli et al. (2022) on the role of private sector collaboration in empowering farmer groups. However, challenges such as limited resources and technology faced by KWT Bougenville were also observed in Sihombing's (2022) research, which highlighted the need for an innovation approach based on local wisdom to overcome these obstacles.

Thus, the results of this study not only reinforce the findings of previous studies, but also make a practical contribution through adaptation models that can be replicated in other regions with similar conditions.

CONCLUSION

KWT Bougenville has succeeded in increasing resilience in facing climate disasters through the implementation of various agricultural innovations. These innovations include the use of more efficient irrigation technology, planting patterns that are more adaptive to climate change, and sustainable land management. Support from PT Pertamina Patra Niaga AFT Babullah is also very significant, both in the form of training and technological assistance provided to farmer groups. However, there are still several challenges that need to be overcome, especially in terms of limited resources and technology, to increase resilience more optimally in the future.

Suggestions for further research related to *KWT* resilience in facing climate disasters through agricultural innovation include the following aspects: first, the development of local-based technology. Further research can explore the development and application of agricultural technology based on local wisdom, so that the resulting innovation is more relevant and easily accepted by farmers at the regional level. Second, a comparative study between *KWT*. Further research can conduct comparative research between *KWT Bougenville* and other farmer groups in different regions that are also facing climate disaster challenges, to determine the effectiveness of the innovations carried out and find more comprehensive solutions. Third, stakeholder involvement analysis. Further research can focus on the role of various stakeholders, such as local governments, the private sector, and local communities, in supporting the resilience of farmer groups through agricultural innovation.

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