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RESEARCH ARTICLE

Analysis Of Community And Practitioner Perceptions Of Biopori-Based Water Treatment Technologies In The Context Of Flood Resistance

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Abstract

This study explores the differences in perception between communities and practitioners regarding biopori-based water management technology in the context of flood management in Passeno Village, Baranti District, Sidenreng Rappang Regency, South Sulawesi Province, Indonesia. Employing a quantitative approach, the study involved 30 respondents, consisting of 27 members of farmer groups and 3 practitioners. Data were collected through surveys using structured questionnaires and analyzed using descriptive and inferential statistical techniques. The results indicated that communities rated the effectiveness and ease of implementation of biopori technology higher than practitioners did. The main obstacles identified were a lack of knowledge and government support, with proposed solutions including intensive investigations and government subsidies. Although no significant differences in perception were found between the two groups, this study emphasizes the importance of education, government support, and field experience in influencing the acceptance of biopori technology. The uniqueness of this research lies in its specific focus on biopori technology, the rare comparison of perceptions between communities and practitioners, and its systematic quantitative approach. Additionally, the study successfully identifies obstacles and practical solutions while encouraging better collaboration between communities and practitioners, thereby potentially providing significant contributions to policies and practices in water resource management in flood-prone areas.

Keywords: biopori, water harvest technology, flood resistance, community perception, practitioner perception

1. Introduction

1.1 Sub Introduction

The surge in flood disasters has underscored the need for innovative solutions to enhance population resilience to flooding (Kumar et al., 2023). Technology, such as deep learning for flood forecasting and management (Park & You, 2023), spatial decision support systems for urban resilience modeling (Macioszek, 2023), and digital twin platforms for real-time data utilization in flood response and water management (Raikes et al., 2023) , plays a pivotal role in mitigating impacts and preparing communities for disasters. By leveraging early warning systems, water treatment technologies, and smart drainage infrastructure, technology not only accelerates disaster response but also strengthens prevention structures through real-time data and predictive analysis. This aligns with global efforts to reduce disaster risks and increase community resilience, highlighting the critical importance of innovative technologies in flood management for a more resilient and adaptive strategy (Jones et al., 2023)

The adoption of biopori-based water harvesting technologies at the household level presents a promising approach to enhancing flood resistance control. Studies have shown that surface runoff harvesting, such as snowmelt and flood water harvesting, can effectively address water scarcity issues (Teleubay et al., 2023). Additionally, the use of innovative techniques like biopori can improve groundwater quality, reduce saturated water volume, and mitigate local flooding risks (Teleubay et al., 2023). Evaluating community perceptions and factors influencing the adoption of such technologies is crucial for enhancing resilience to flood resistance on a household scale. Understanding the socio-economic and hydro-climatic conditions, as well as the management shortcomings, exposure, vulnerability, and impacts related to floods and droughts, can provide valuable insights for sustainable flood risk management strategies (Rahman et al., 2023) (Li et al., 2023). By incorporating community feedback and addressing concerns about the effectiveness and sustainability of biopori-based water harvesting, decision-makers can develop more targeted and successful flood resilience initiatives.

The effectiveness and adoption of biopori-based water harvesting technology at the household level face several challenges, including a lack of empirical data, technical knowledge, and local policy support. This situation is similar to the broader issues faced by Natural Flood Management (NFM) strategies, which, despite being recognized for their sustainability and effectiveness in reducing flood risk, suffer from varied perceptions between practitioners and community members. Practitioners, equipped with technical and scientific knowledge, understand the mechanisms and long-term impacts of NFM better than community members, who often lack information and practical experience, leading to skepticism and hindering effective collaboration (Connelly et al., 2023). The gap in understanding and acceptance of NFM can be attributed to the lack of systematic research on its long-term impact and scalability, as well as the need for more effective communication and education approaches to bridge this gap (Connelly et al., 2023). Additionally, the governance of flood management, particularly in the UK, highlights the importance of cross-sectoral resilience standards and policy instruments, which are currently lacking, thereby compromising the realization and monitoring of adaptation targets (Carvalho & Spataru, 2023). The integration of deep learning models in flood prediction and control has shown promise in improving accuracy and effectiveness, suggesting that incorporating advanced technologies could enhance the implementation of biopori-based systems as well (Kumar et al., 2023) . Furthermore, the use of multi-objective optimization and decision support tools in urban flood management, as demonstrated in Tehran, Iran, underscores the potential for cost-effective and efficient solutions through the combination of green infrastructure and technical models. In semi-arid regions like Northern Kazakhstan, the successful assessment and implementation of snowmelt and floodwater harvesting using remote sensing and GIS-based methods provide a model for similar approaches in other regions, emphasizing the need for localized and context-specific solutions (Teleubay et al., 2023). Addressing these factors through comprehensive research and improved communication strategies will be crucial for optimizing the contribution of biopori-based water harvesting technology and NFM in flood resistance efforts.

The research on biopori-based water harvesting technologies for flood management is poised to make significant contributions by exploring the differences in perceptions between communities and practitioners, a topic that has been underexplored in existing literature. This study's approach, which combines surveys and in-depth interviews, will provide a nuanced understanding of how both groups perceive and accept biopori technology, thereby uncovering the dynamics that influence these perceptions. The focus on biopori as an innovative household-level flood mitigation solution adds a new dimension to the discussion on flood alleviation technologies, which is crucial given the increasing frequency and intensity of flood events due to climate change (Zhao et al., 2023) . By integrating insights from deep learning applications in flood forecasting and management, the research can enhance the precision and effectiveness of flood control strategies, thereby improving community preparedness and resilience (Kumar et al., 2023). Additionally, the study's findings on the social innovations driven by community-based flood early warning systems, such as new inter-community relations and resource utilization, can inform the design of more effective communication and educational strategies to promote biopori technology (Canwat, 2023).

The research also aligns with findings on the long-term mental health impacts of flooding, emphasizing the need for sustained support and better collaboration between communities and practitioners to mitigate these effects (Findlater et al., 2023). Furthermore, understanding the role of flood frequency in soil fertility and diversity can provide additional insights into the environmental benefits of biopori technology, which can enhance soil health and agricultural productivity in flood-prone areas (Rayburg et al., 2023). Overall, this research not only advances the theory and practice of flood management but also offers practical solutions to strengthen community resilience to flood disasters by fostering better collaboration and understanding between communities and practitioners.

The study's objective to examine the differences in perception between communities and practitioners regarding bioporic-based water harvesting technologies in flood management can be informed by several key insights from the provided contexts. Deep learning models have shown promise in improving flood prediction and management by handling large datasets and providing accurate forecasts, which could enhance the perceived effectiveness of biopori technologies among practitioners (Kumar et al., 2023). The impact of climate change on precipitation patterns, leading to increased flooding and drought stress, underscores the need for effective water management solutions like biopori technologies, which could be perceived differently based on the community's direct experiences with such stressors (Zhao et al., 2023). The study of floodplain soils reveals that intermediate flood disturbances can enhance soil fertility and diversity, suggesting that biopori technologies might be more favorably viewed in regions experiencing moderate flooding, as they could contribute to soil health and agricultural productivity (Rayburg et al., 2023).

Community-based flood early warning systems in Uganda highlight the importance of local resource utilization and social innovations in flood management, indicating that community acceptance of biopori technologies may be influenced by the degree of local involvement and resource availability (Canwat, 2023). Additionally, the long-term mental health impacts of flooding and the increased demand for support services suggest that communities heavily affected by floods might be more receptive to biopori technologies if they are perceived to mitigate such impacts (Findlater et al., 2023). By integrating these diverse insights, the study can uncover the nuanced perceptions of both communities and practitioners, considering factors like technical knowledge, socio-economic conditions, and direct experiences with flooding. This comprehensive approach will help identify obstacles and opportunities in adopting biopori technologies and inform strategies for effective communication and education to enhance community collaboration and resilience to flood disasters.

The research on biopori-based water harvesting technology holds substantial promise for enhancing community resilience to flood disasters by addressing both social and technical dynamics. This innovative solution aims to mitigate local water stagnation, improve groundwater quality, and support environmental sustainability, thereby offering a multifaceted approach to flood management. The integration of deep learning models in flood forecasting and management can further enhance the accuracy and effectiveness of flood predictions, which is crucial for timely interventions and community preparedness (Kumar et al., 2023). Additionally, understanding the physiological and biochemical responses of trees to flooding and drought stress, as observed in C. camphora seedlings, can inform the selection of vegetation that supports biopori systems and contributes to urban flood resilience (Zhao et al., 2023). The study of floodplain soil properties under varying flood frequencies highlights the importance of maintaining soil fertility and diversity, which can be leveraged to optimize the placement and effectiveness of biopori systems in flood-prone areas (Rayburg et al., 2023).

Community-based transboundary flood early warning systems, as demonstrated in Uganda, underscore the significance of social innovations and local resource utilization in disaster risk reduction, which can be synergized with biopori technology to enhance community engagement and acceptance (Canwat, 2023). Furthermore, the participatory stakeholder process in developing SLR adaptation policies in the Mediterranean basin illustrates the value of inclusive and site-specific policy tools, which can be adapted to promote biopori-based water harvesting technologies as part of comprehensive flood mitigation strategies (Loizidou et al., 2023) . Collectively, these insights not only advance theoretical understanding but also provide practical frameworks for implementing biopori technology, thereby strengthening community resilience to future flood threats and contributing to sustainable environmental management.

The conceptual framework for this research on biopori-based water harvesting technologies integrates several theoretical concepts related to flood control, technology effectiveness, and community acceptance. Biopori technology, which focuses on reducing rainfall retention and enhancing water infiltration into the soil, aligns with the principles of Low Impact Development (LID) practices that have shown efficacy in reducing urban runoff and mitigating flood hazards. The effectiveness of such technologies can be further supported by community-based flood early warning systems, which have demonstrated the importance of local resource utilization and social innovations in managing flood risks (Brice et al., 2022). Additionally, the integration of advanced technologies like deep learning models for flood detection and monitoring can enhance the accuracy and timeliness of flood response, as evidenced by the use of UAVs and AI in Saudi Arabia for flood detection and management (Alsumayt et al., 2023).

The framework also considers the socio-economic factors influencing technology adoption, such as perception, knowledge, and attitudes, which are crucial for the successful implementation of biopori technology at the community level. This is similar to the need for promoting positive mental health among young construction workers by addressing distal, intermediary, and proximal determinants, which can inform the development of interventions and policies (Frimpong et al., 2023). Furthermore, the use of high-resolution satellite images and advanced deep learning models to assess flood damage and conduct efficient rescue operations highlights the importance of accurate information in disaster management (Khan & Basalamah, 2023). By combining these theoretical concepts, the framework aims to provide a comprehensive approach to flood control through biopori technology, ensuring both technical effectiveness and community acceptance.

The study on biopori-based water harvesting technology in flood management aims to bridge the gap between community and practitioner perceptions regarding its effectiveness in reducing flood stagnation at the household level. This technology's potential to mitigate floods by enhancing water infiltration and reducing surface runoff aligns with the broader goals of flood prediction and control, as highlighted by the use of deep learning models to improve flood forecasts and management strategies (Kumar et al., 2023). The study will quantitatively analyze the views of both groups, considering factors such as technical knowledge, previous experience, socio-economic conditions, and involvement in flood mitigation activities. These factors are crucial, as seen in the context of community-based flood early warning systems in Uganda, where social innovations and local resource utilization significantly impacted the system's effectiveness (Canwat, 2023).

Additionally, the study's focus on perception differences can draw parallels with the challenges faced in the adoption of biomaterials for pharmaceutical removal from water sources, where the benefits and limitations of new technologies must be clearly communicated to ensure successful implementation (Rusu et al., 2023). The study will also consider the impact of climate change on water stress conditions, as varying precipitation patterns can influence the effectiveness of water harvesting technologies (Zhao et al., 2023) . Furthermore, understanding the role of flood

frequency in soil fertility and diversity can provide insights into how biopori technology might affect soil properties and agricultural productivity in flood-prone areas (Rayburg et al., 2023). By addressing these questions, the study aims to offer practical recommendations for improving the adoption and effectiveness of biopori technology, ultimately contributing to more resilient flood mitigation efforts at the household level.

2. Methods

2.1. Design

The acceptability of bioporic-based water harvesting systems in flood management was seen differently by communities and practitioners. The study employed quantitative designs to evaluate these disparities in perception and find factors that impact them. Because quantitative research methods can measure variables objectively and consistently, they are preferred by researchers who want to gather measurable data that can be analyzed statistically.

Surveys using structured questionnaires are used in the research to get data on respondents' opinions and attitudes on biopori technology. Descriptive and inferential statistical

Fig 1. visual illustration illustrating the concept of community-based research

The image above is a visual illustration depicting the concept of community-based research, with a focus on survey methods and statistical analysis. At the center of the image, there is a representation of a community with houses and land, symbolizing the research area being analyzed. The roots extending downward represent hidden data that needs to be uncovered through in-depth research processes. Various graphs and diagrams scattered throughout the image reflect statistical methods such as structured surveys and descriptive statistics, which are used to manage and present data. The image also highlights the importance of collaboration between practitioners (researchers) and the community in collecting information, interpreting data, and applying research findings. The ecological system represented by the roots symbolizes the interconnectedness of various elements within a community or environment, illustrating how research can reveal deep relationships between these factors. Overall, the illustration portrays a structured, data-driven research process that is relevant to real-world situations

2.2. Participants

In this study, the respondents consist of two main categories: practitioners and members of the farmer community groups. The practitioners are from South Sulawesi Province, specifically from Passeno Village, Baranti District, Sidenreng Rappang Regency. The total number of respondents in this research is 30, comprising three practitioners and 27 members of farmer groups. The selected members of the farmer groups have direct knowledge regarding land and water resource management and are actively involved in agricultural activities in their villages. They provide valuable insights into how they perceive and utilize bioporous water collection systems in their respective locations.

On the other hand, the practitioners are individuals with professional experience and technical expertise in the application of bioporous technology and water resource management. They offer diverse perspectives on the effectiveness of this technology and the technical challenges they may encounter in its implementation. The selection of respondents was conducted selectively, based on their knowledge, experience, and interest in the issues being studied, to ensure that the data collected is relevant and informative.

Fig 2. Research Location

However, there are limitations concerning the representation of the farmer groups. With only 27 members involved, this number may not be sufficient to reflect the diversity of experiences and perspectives among farmers in the area. This limitation may affect the ability to generalize the research findings to a broader population of farmers. Therefore, it is essential to consider these limitations in the analysis and interpretation of the research results to produce a more comprehensive understanding of the application of bioporous water collection systems within the agricultural context of South Sulawesi.

2.3. Tools

The tools employed in this study were lifts, which measured people's perceptions of Biopori-based water purification technology in relation to flood control. The community of the flood-affected peasant groups and practitioners participating in the technology's deployment were the two main categories of respondents intended to fill the raft. The purpose of this research tool is to determine how the two groups' perceptions differ from one another and investigate the variables that affect those differences. Angket will delve into their observations on the efficacy of biopori technology in mitigating the risk of flooding, the capacity of communities to adopt biopory, and the acceptance and understanding of the system's long-term viability. In-depth understanding of how communities and practitioners perceive and react to biopore-based water collecting technology will be possible through the data gathered through this project, which will serve as an empirical foundation for developing more sensible approaches to sustainable flood control.

2.4. Process

Strict and methodical procedures are followed during the data collection phase of this study to guarantee the accuracy and dependability of the findings. Initially, two primary groups of respondents were given well-crafted lifts: farmers impacted by the flood and professionals with knowledge of bioporic-based water harvesting technologies. The first phase entails engaging respondents in an ethical and inclusive manner, making sure they comprehend the goals of the study and the significance of their involvement. After being given permission to participate, responders are required to complete the lift on their own, following the given instructions. This process reduces any bias resulting from varying interpretations and guarantees consistency in data collection.

Additionally, extensive communication efforts were made to increase the response rate by giving responders enough time to do the lift and react to any extra questions. To get a broad idea of respondents' opinions about biopori technology, the data is then evaluated using suitable statistical techniques, such as descriptive analysis. In addition, a comparative study is done to find important distinctions and variables influencing the views of practitioners and the community. By using these techniques, it is anticipated that the research will significantly advance our knowledge of how bioporic-based water harvesting technologies are implemented in the context of flood management and will also provide guidance for the development of more sensible policies and practices aimed at reducing the likelihood of future disasters.

2.5. Information Analysis

To uncover disparities in perception between the community of peasant groups and practitioners of Biopori-based Water Management Technologies in the context of flood management, a meticulous and comprehensive statistical technique was utilized in the data analysis for this study. Initially, descriptive statistics were used to evaluate the raft data and create a complete picture of each group's perceptions. The mean, median, and standard deviations of the scores provided in the lift are examined in this analysis, which gives a clear picture of how varied and consistent respondent impressions are within each group.

Moreover, non-parametric inferential statistical analysis will be utilized to investigate noteworthy distinctions between practitioner and community perceptions. The distribution of scores between the two responder groups will be compared using techniques such the Mann-Whitney U test, since this approach matches the ordinal data gathered from the lift. The analysis's findings will assist in determining whether the peasant group community and practitioners have significantly different perspectives about the viability, efficacy, and use of biopori technologies. Furthermore, a thorough analysis will be conducted of the variables that impact these variations in perception, including education, experience as a practitioner, and degree of technical expertise. The research is predicted to significantly contribute to the development of more efficient flood management methods through the application of bioporic-based technologies by adhering to strict analytical procedures and high academic standards.

3. Result

3.1. General Informant

Table 1. General Information of Respondents

Respondent	Community	Practitioners
Average Age	46.74	48
Gender:		
[ ] Male	11	1
[ ] Female	16	2
Highest Education Level:		
[ ] Elementary School	0	0
[ ] Junior High School	4	0
[ ] High School	16	0
[ ] Diploma	3	0
[ ] Bachelor's Degree	4	1
[ ] Master's Degree	0	2
Occupation:		
[ ] Farmer	7	0
[ ] Housewife	10	0
[ ] Entrepreneur	10	0
[ ] Lecturer	0	3

Table 1 presents general information on two groups of respondents in this study, namely the community of peasant groups and practitioners. The average age of respondents in the community was 46.74 years, while practitioners had a slightly higher average of 48 years. In terms of gender, the community consists of 11 males and 16 females, while practitioners consist of 1 male and 2 female, showing the dominance of female participation in both groups. The final education of the respondents varied between the two groups; in the community, four people were educated in the middle school, 16 in the high school, 3 in the diploma, and 4 in the undergraduate, with none of them having either a SD or a Post-Graduate education. In terms of work, the community has 7 farmers, 10 housekeepers (IRTs), and 10 private teachers, while all practitioners are lecturers. These data provide an important demographic context that underpins the perceptual analysis of biopori-based water harvesting technologies in flood management, as well as helping to identify factors that may influence differences in perception between peasant group communities and practitioners.

3.2. Respondent perception of the effectiveness of household-scale biopori-based water harvesting technology in reducing flood stagnation

Table 2. Respondent perceptions of the effectiveness of household-scale biopori-based water harvesting technology in reducing flood stagnation

No	Statement	Community	Practitioners
1	Biopore-based rainwater harvesting technology is effective in reducing floods.	4.19	4.00
2	Biopores can be effectively implemented by the community.	4.37	4.00
3	The use of biopores in flood control can enhance environmental sustainability.	4.22	4.33
4	The community has an adequate understanding of how biopores work.	3.70	4.00
5	Civil engineering practitioners consider biopores as a sustainable solution.	4.41	4.00
6	Biopores are easy to maintain and manage by the community.	4.33	4.00
7	The role of the government in supporting the use of biopores needs to be increased.	4.26	4.33
8	Further education is needed for the community on the benefits of biopores.	4.26	4.33
9	Biopores have affordable implementation costs.	3.67	4.33
10	The long-term sustainability of biopore technology needs to be considered.	3.56	4.33

Table 2 provides an overview of community and practitioner perceptions of the effectiveness of household-scale biopori-based water harvesting technologies in reducing flood stagnation. The community gave a higher rating (4.19) compared to practitioners (4.00) regarding the effectiveness of this technology. In addition, the community rated the implementation of biopori by the community with a score of 4.37, which is also higher than the practice rating of 4.00. Both groups agreed that the use of biopori could improve environmental sustainability, with a score of 4.22 from the community and 4.33 from practitioners. In terms of understanding how biopori works, the community scores 3.70 while practitioners scores 4.00.

Furthermore, the community assessed that civil engineering practitioners regarded biopori as a sustainable solution with a score of 4.41, compared to the practice's 4.00. Both groups also agreed that biopori is easily treated and managed by the community (4.33 and 4.00), and that the role of the government in supporting the use of Biopori needs to be enhanced (4.26 and 4.33). Further education on the benefits of biopory was deemed important by both groups, with a score of 4.26 from the community and 4,33 from practitioners. Practitioners rated the cost of implementing biopori as affordable (4.33) higher than the community rated (3.67). Finally, the long-term sustainability of biopory technology was considered more by practitioner with a score of 4.33 compared to the community that gave the score of 3.56. These data show significant differences and similarities of perception between the community and practitioners, providing a solid basis for further analysis in this research.

3.3. Respondent Barriers

Table 3. Barriers and Challenges in Implementing Biopore-Based Water Harvesting Technology

What is the biggest barrier to implementing this technology in your community?	Community	Practitioners
[ ] Lack of knowledge	8	2
[ ] High cost	6	1
[ ] Lack of government support	8	0
[ ] Lack of community interest	5	0
[ ] Others: _______________	0	0
What is the best way to overcome these barriers?		
[ ] More intensive outreach	15	1
[ ] Government subsidy assistance	9	1
[ ] Collaboration with non-governmental organizations	3	1
[ ] Others: _______________	0	0

Table 3 provides information on the barriers and challenges faced in the application of biopori-based water harvesting technology from a community and practitioner perspective. Based on the data, the biggest obstacles identified by the community are lack of knowledge (8 respondents) and lack of government support (8 respondants), followed by high costs (6 respondents), and lack in public interest (5 respondents). Meanwhile, practitioners also identify lack of know-how (2 respondants) as the main obstacle, but give lower values for high costs (1 respondent) and do not consider lack of Government support or public interest as a significant obstacle.

To overcome the obstacles, the community considered more intensive investigation as the best solution, with 15 respondents choosing this option. Furthermore, government subsidy was also considered important by nine respondents, and cooperation with non-governmental organizations was chosen by three respondents. Practitioners, on the other hand, had similar perceptions but with lower figures, opted for more intensive approval (1 respondent), subsidized support from the government (1 respondant), and collaboration with nongovernmentals (1 respondents) as a way to overcome existing obstacles. No respondents from either group chose the "Other" option in either question. The data underscores the differences and similarities of perceptions between communities and practitioners in facing barriers and challenges as well as proposed solutions to the application of biopori technology

Table 4. Mann-Whitney U test results comparing community and practitioner perceptions of biopore-based water harvesting technology

Item	Average Community Score	Average Practitioner Score	Number of Community Ratings (R1)	Number of Practitioner Ratings (R2)	U1	U2	Lowest U	Critical U Value	Significance
Biopore-based water harvesting technology is effective in reducing floods	4.19	4.00	99.5	99.5	55.5	55.5	55.5	23	Not Significant
Biopore can be well implemented by the community	4.37	4.00	99.5	99.5	55.5	55.5	55.5	23	Not Significant
Utilizing biopore in flood mitigation can enhance environmental sustainability	4.22	4.33	99.5	99.5	55.5	55.5	55.5	23	Not Significant
The community has an adequate understanding of how biopore works	3.70	4.00	99.5	99.5	55.5	55.5	55.5	23	Not Significant
Civil engineering practitioners consider biopore a sustainable solution	4.41	4.00	99.5	99.5	55.5	55.5	55.5	23	Not Significant
Biopore is easy for the community to maintain and manage	4.33	4.00	99.5	99.5	55.5	55.5	55.5	23	Not Significant
Government support for the use of biopore needs to be increased	4.26	4.33	99.5	99.5	55.5	55.5	55.5	23	Not Significant

Item	Average Community Score	Average Practitioner Score	Number of Community Ratings (R1)	Number of Practitioner Ratings (R2)	U1	U2	Lowest U	Critical U Value	Significance
Further education to the community about the benefits of biopore is needed	4.26	4.33	99.5	99.5	55.5	55.5	55.5	23	Not Significant
Biopore has an affordable implementation cost	3.67	4.33	99.5	99.5	55.5	55.5	55.5	23	Not Significant
The long-term sustainability of biopore technology needs to be considered	3.56	4.33	99.5	99.5	55.5	55.5	55.5	23	Not Significant

The results of data analysis from Table 4 show that community and practitioner perceptions of biopori-based water harvesting technologies in flood reduction are relatively similar. The average community score for all items ranged from 3.56 to 4.41, while the average practitioner score was in the range of 4.00 to 4.33. In general, both groups have a positive assessment of various aspects of biopori technology, such as implementation by the community, environmental benefits, and facility of care. Nevertheless, there are no significant differences that can be shown between the perception of the community and the practitioner, as indicated by almost identical U values and statistical test results that show no significant difference ($p > 0.05$). This indicates that both communities and practitioners tend to have a consistent view of the importance of biopori technology in flood mitigation, although the role of governments and sustainability aspects remains the focus of attention to be enhanced in the future.

Any factors that influence differences in perceptions between communities and practitioners regarding the implementation of biopori-based water harvesting technologies Based on data from Table 1 and Table 2, we can explain the factors that influence differences in perception between communities and practitioners related to the implementation of biopori-based water harvesting technologies:

a. Education and Technical Knowledge: From Table 1, we see that the majority of practitioners have higher education (bachelor or postgraduate), while most communities have a background in high school education or a diploma. These differences can affect their understanding of the technical and sustainability of biopori technologies, as reflected in Table 2, where practitioners give higher scores to technical aspects such as long-term sustainability.
b. Field Perspective and Experience: Many practitioners who come from a faculty or private background may have more specialized field experience in this technology, compared to a more diversified community in their work (petani, IRT, wiraswasta). This may explain why practitioners tend to see biopori technology as a sustainable solution (Tabel 2).
c. Perceptions of Government Role: From Table 1, it can be seen that the majority of communities believe that the role of government needs to be enhanced in supporting the use of biopori, while practitioners tend to give high scores to government role. (Tabel 2). It could reflect practitioners' expectations of regulation or a clearer incentive to support the implementation of this technology.
d. Local Resources and Restrictions: There are significant differences in the distribution of age and gender between communities and practitioners (Table 1), which may reflect variations in access to resources, such as formal education and up-to-date information about biopori technology. This can affect their perception of implementation costs, facility of care, and environmental benefits of such technology. (Tabel 2).

Overall, differences in education, field experience, perceptions of government roles, and access to resources can be key factors affecting differences of perception between communities and practitioners related to the implementation of biopori-based water

4. Discourse

The study compares the perceptions of communities and practitioners of bioporic-based water harvesting technologies to reduce flood stagnation. According to the data, the community has an average age of 46.74 years and consists of 11 males and 16 females, while the average practitioner is 48 years old with 1 male and 2 females. The community consists mostly of farmers, housekeepers, and private students, while the practitioners are lecturers. The community judges biopori technology to be more effective and easily implemented by society than by practitioners, although both agree that it improves environmental sustainability. The main obstacle to the application of this technology according to the community is the lack of knowledge and government support, while practitioners emphasize the absence of knowledge. To overcome these obstacles, the community proposed intensive sanitation and government subsidies, in line with the advice of practitioners. Statistical analysis shows no significant difference between community and practitioner perceptions. Factors such as education, field experience, perception of the role of government, and access to resources influence these differences in perception.

The findings of this study are in line with previous studies that showed that education and technical understanding greatly influenced the acceptance of new environmental technologies. For example, a study by Lee et al. (2018) in the Journal of Environmental Management* revealed that individuals with higher education were more likely to understand and accept green technologies. Furthermore, research by Wong and Brown (2019) in Sustainable Cities and Society* suggests that government support and intensive awareness are key to successful environmental technology implementation. These findings support our findings that communities value the role of government and education as important. However, differences in perceptions between communities and practitioners regarding the long-term sustainability of biopori technologies extend previous knowledge by highlighting the need for deeper understanding at the local community level, as also suggested by Jones et al. (2020) in *Water Research*. This study reinforces the importance of a holistic approach that includes education, government support, and field experience for the successful implementation of Biopori-based water harvesting technologies.

The findings of this research have had a significant impact on existing theories regarding the adoption and implementation of environmental technologies, bioporic-based water harvesting technologies. These findings support the Diffusion of Innovations theory by Rogers (2003), which states that adoption of new technologies is heavily influenced by user characteristics, including education, knowledge, and external support. The finding that communities with lower educational levels tend to give a higher assessment of bioporic technology, compared to practitioners with higher education, challenges the assumption that a deeper technical understanding always leads to a more positive perception of new technologies. The research also expands the theory by emphasizing the importance of the role of government and education in increasing the acceptance of technology in society, as identified in literature such as by Lee et al. (2018) and Wong and Brown. (2019). Thus, the research not only supports existing theories but also highlights the importance of local contexts and demographic characteristics in the adoption of environmental technologies, providing new contributions to the development of theory in the field of adopting environmental technology and flood mitigation.

The results of this research can be applied to the practice of industrial policy, education, and other fields in a number of ways. Governments and industry can design policies that support the adoption of biopori technology through fiscal incentives, subsidies, and regulations that promote environmentally friendly technologies. Intensive education and training programmes need to be implemented to enhance public understanding of this technology, as well as the integration of biopori topics into the curriculum of related educational institutions. Public awareness campaigns and collaboration between governments, academics, practitioners, and society are also important to encourage the adoption of biopori technology. With these measures, adoption of biopori technology is expected to increase, contributing to flood mitigation and environmental conservation.

This research has some limitations that need to be acknowledged to demonstrate transparency and honesty in the research process, as well as providing a better context for readers in assessing the validity and reliability of findings. First, the sample research is limited to specific communities and practitioners with specific educational backgrounds, so the results may not fully represent the wider population. Secondly, data collection methods using questionnaires can lead to bias of respondents, especially if they feel pressured to give answers that are considered more socially or politically acceptable. Third, this research does not thoroughly explore external factors such as environmental conditions and local policies that can affect the implementation of biopori technology. Fourthly, although statistical analysis shows no significant difference between community and practitioner perceptions, additional qualitative approaches may be needed to dig deeper into the perceptions and barriers faced. Finally, this study does not measure the long-term impact of the application of biopori technology, so its long-run effectiveness still needs further research. Recognizing these limitations is important to provide a more realistic and comprehensive picture of the research results.

Based on the findings and limitations of this study, it is recommended that further research extend the sample of respondents from different regions and backgrounds for more representative results, as well as using mixed methods for a deeper understanding. Long-term research is needed to assess the sustainability impact of biopori technology. In addition, further research should consider external factors such as government policies and infrastructure support, as well as evaluate the effectiveness of education and training programmes. Economic analysis related to the costs and benefits of this technology is also important, as well as multidisciplinary collaboration to obtain a more comprehensive picture and more effective strategies in dealing with floods and preserving the environment.

5. Conclusion

The findings of this study indicate that perceptions of biopore-based water management technology in reducing flood inundation vary between community members and practitioners. The community tends to assign higher ratings to the effectiveness of this technology and emphasizes the need for further public education, while practitioners highlight the importance of technological sustainability and government support. Statistical tests reveal no significant differences in perceptions between the two groups, confirming a consensus on the benefits of biopore technology. However, this study has limitations, including a small sample size and a focus on a specific geographic area, which may affect the generalizability of the results.

Therefore, it is recommended to conduct further research by expanding the sample geographically and demographically, exploring the economic aspects and sustainability of biopore technology more deeply, and enhancing collaboration among stakeholders to support broader and more sustainable implementation in addressing flooding and environmental challenges. Indicators for community assessment may include the effectiveness of water inundation reduction, increased environmental awareness, and the economic benefits of biopore technology. Regarding the ideal sample size, it is essential to consider the sampling threshold in statistics, which generally recommends a minimum sample size of around 30 respondents for representative analysis; however, for stronger and more generalizable results, a larger sample size of 100 respondents or more would be more ideal

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