Research Paper

Agricultural water infiltration tank (Awit): a flood-suction device for rice fields

Pagalaran Kirsten Mae P[1*], Pagcaliwangan Janna Ria A[2], Arranguez Arjed June L[3], Teofilo Patricia Sabine A[4], Bataluna Jen P[5]

[1*,2,3,4,5]Association of Science and Mathematics Coaches of the Philippines, Philippine Association of Teachers and Educational Leaders, Philippine Institute of 21st Century Educators Inc., Philippine.

Article Info

Article history:
Received: 14 September 2024
Revised: 22 November 2024
Accepted: 31 November 2024
Published: 15 February 2025

Keywords:
Agricultural Water
Infiltration Tank (AWIT)
Water Filtration
Sustainability
Agricultural Resilience.

ABSTRACT

In 2022, the Philippines experienced severe tropical cyclones that caused significant agricultural damage, impacting over 46,000 farmers. Despite government aid, long-term floodwater management remained unaddressed. This study explores the potential of floodwater recycling systems, particularly the Agricultural Water Infiltration Tank (AWIT), to improve agricultural resilience and sustainability. Using a Randomized Complete Block Design (RCBD), the study assesses AWIT's effectiveness as a flood-suction device. The AWIT incorporates multi-stage filtration, including granular filtration, chemical treatment, sedimentation, reverse osmosis, and UV light disinfection.

Results demonstrate that AWIT effectively removes contaminants, improving water quality for agricultural use. The system provides a sustainable water source, reducing water procurement costs and supporting farmers during droughts. Recommendations include further field testing, optimization of chemical dosing, and integration of automation for real-time monitoring. With government support, AWIT has the potential to be a scalable solution for floodwater management and agricultural water sustainability.

Corresponding Author:
Pagalaran Kirsten
Association of Science and Mathematics Coaches of the Philippines, Philippine Association of Teachers and Educational Leaders, Philippine Institute of 21st Century Educators Inc., Philippine.
Email: kirstenpagalaran@gmail.com

1. INTRODUCTION

Background of the Study

The Philippines, located in the Western Pacific Ocean on the Pacific Ring of Fire, is highly vulnerable to natural disasters, particularly typhoons and earthquakes. In 2022, the country experienced 18 tropical cyclones, including Super Typhoon Carina, which resulted in PHP 1.21 billion in agricultural damages. Hard-hit regions, such as Central Luzon, Cagayan Valley, and the Cordillera Administrative Region, reported severe losses in rice production, directly affecting thousands of farmers and fishermen. Although the government implemented aid programs, such as zero-interest loans and recovery funding, these measures only provided temporary relief. [8] The long-term issue of floodwater management remains unresolved, leaving agricultural communities vulnerable to recurring damage and water scarcity.

Given the continuous destruction caused by floods, a more sustainable solution is necessary to mitigate future risks while addressing water shortages.[4] Floodwater, rather than being seen solely as a destructive force, holds potential as a valuable resource when properly managed. Floodwater filtration offers a practical approach by removing harmful particles and microorganisms, making the water safe for reuse. One innovative solution involves the implementation of a hydro-cycling tank system, which can filter and store floodwater, reducing typhoon-related damage while providing farmers with a reliable water source during dry seasons. This method could be particularly beneficial for rice fields, where consistent water availability is essential for stable crop yields. Unlike traditional relief efforts that focus on short-term financial aid, floodwater recycling presents a long-term solution that enhances agricultural resilience and reduces economic losses.

Research has demonstrated the effectiveness of floodwater utilization in other countries, particularly China, where it has been employed as a strategic measure to mitigate water shortages and support agricultural sustainability. By efficiently managing floodwater, China has successfully addressed seasonal water scarcity issues, ensuring that farmers have access to adequate irrigation throughout the year. However, in the Philippines, floodwater recycling remains an underexplored solution despite its potential to transform agricultural water management. Studies highlight that suspended solids and particulate matter in floodwater can reduce disinfection efficiency, reinforcing the need for an effective filtration system to maximize the quality and usability of recycled water. Furthermore, PAGASA forecasts indicate an increased likelihood of La Niña, which could worsen flooding conditions and further stress agricultural water supplies. These challenges underscore the urgent need for proactive measures to utilize floodwater efficiently rather than allowing it to go to waste.

This study aims to evaluate the feasibility of hydro-cycling tanks as a floodwater filtration and storage system for agricultural use. By assessing their effectiveness in filtering contaminants and ensuring safe water reuse, this research seeks to provide scientific data to support the development of scalable solutions for flood-prone farming areas. The study will review existing literature, analyze current filtration technologies, and conduct experiments to determine the efficiency of a hydro-cycling tank in improving water availability during dry seasons.

The results could serve as a foundation for policymakers, guiding the adoption of sustainable water management practices that can help farmers adapt to climate-related challenges.[6] By integrating innovative floodwater recycling systems, agricultural communities can reduce their vulnerability to disasters while securing a more stable and reliable irrigation system for future food production.[3]

Objective of the Study

The objective of this study is to develop an effective Agricultural Water Infiltration Tank (AWIT) as flood-suction device. Specifically, this study aims to:

1. Test the filtration capability of the Agricultural Water Infiltration Tank (AWIT): A Flood-Suction Device for Rice Fields, in removing debris, sediments, and contaminants from floodwater.

2. Evaluate the efficiency of the Agricultural Water Infiltration Tank (AWIT): A Flood-Suction Device for Rice Fields, in providing clean, reusable water for agricultural irrigation.
3. Assess the performance of the Agricultural Water Infiltration Tank (AWIT): A Flood-Suction Device for Rice Fields, in different floodwater conditions to determine its reliability and effectiveness.
4. Test the structural integrity and scalability of the Agricultural Water Infiltration Tank (AWIT): A Flood-Suction Device for Rice Fields, under simulated floodwater volumes and varying environmental factors.

Research Questions

1. How effective is the Agricultural Water Infiltration Tank (AWIT) in filtering debris, sediments, and contaminants from floodwater?
2. What is the efficiency level of the AWIT in providing clean, reusable water suitable for agricultural irrigation?
3. How does the AWIT perform under different floodwater conditions in terms of reliability and effectiveness?
4. How structurally sound and scalable is the AWIT when exposed to varying floodwater volumes and environmental conditions?

2. RELATED WORKS

International studies provide valuable insights into technological advancements that enhance water management efficiency. [7]. Developed an Arduino-based water pump control system that automates water distribution, reducing manual labor and optimizing irrigation. This aligns with the Agricultural Water Infiltration Tank (AWIT), which integrates automation in its floodwater filtration process. Similarly, Sun [1]. Explored ultraviolet (UV) technology for urban water treatment in China, demonstrating its ability to disinfect water without chemical additives. This supports the AWIT's goal of ensuring clean, reusable water through efficient filtration mechanisms, reinforcing the importance of integrating advanced purification methods in floodwater management.[9]

National studies further highlight the urgent need for sustainable water management in the Philippines. Analyzed the 2019 Metro Manila water crisis, attributing the issue to inadequate infrastructure and poor governance.[5] The study stresses the necessity of long-term, technology-driven solutions—an aspect the AWIT project seeks to address by providing an innovative approach to floodwater utilization. Morales. Examined [2] the reuse of floodwater for irrigation in Bulacan, promoting regenerative flood management strategies that convert excess water into a resource. This study strengthens the argument that properly treated floodwater can sustain agricultural productivity, which directly relates to the AWIT's objective of mitigating flood damage while ensuring water availability during dry seasons.

Local studies emphasize practical applications of these water management strategies. The integration of automation, structural durability, and efficient filtration in AWIT aligns with global and national research, demonstrating a scalable and cost-effective approach to floodwater reuse. By incorporating best practices from international and national frameworks, the AWIT project contributes to climate resilience and agricultural sustainability, ensuring that farmers can maximize water resources in both flood-prone and drought-affected areas.[10]

Conceptual Framework

This study's conceptual framework follows an input-process-output model to illustrate AWIT's role as a flood-suction device for rice fields. The input consists of floodwater with debris, sediments, and contaminants. The process involves multi-stage filtration, water recycling, and structural integrity testing. The output is clean, reusable water for irrigation, improved water availability, and a durable, scalable device. This framework highlights AWIT's potential in floodwater management to support sustainable agriculture.

Table 1. The Research Concept

Input	Process (AWIT Functionality)	Output (Expected Outcomes)
Floodwater contamination (debris, sediments, and pollutants)	Filtration System: Removes debris, sediments, and contaminants	Clean, reusable water for agricultural irrigation
	Water Storage & Recycling: Stores and regulates water supply	Reliable water availability during droughts
	Structural Durability Testing: Evaluates AWIT under different flood conditions	Strong, scalable, and sustainable infrastructure

This multi-stage water treatment system purifies floodwater for diverse uses. Initially, floodwater enters Chamber 1 for storage before passing through Chamber 2, where granular filtration removes fine particles. In Chamber 3, a chemical reactor with a propeller agitates the water to remove dissolved impurities like heavy metals. Sedimentation in Chamber 4 allows heavier particles to settle. The water is then pressurized for reverse osmosis in the next stage, removing salts and impurities. UV light treatment in Chamber 5 eliminates bacteria and viruses. Finally, purified water is stored in Chamber 6 before being released for agricultural or personal use.

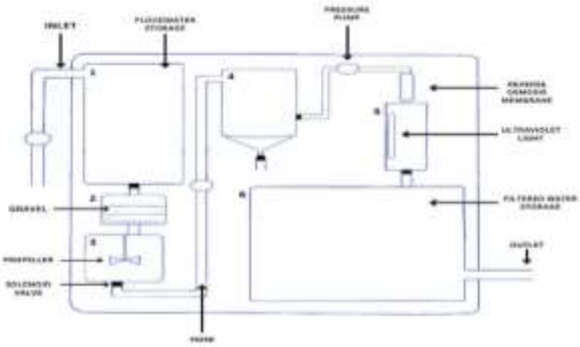


Figure 1. The Conceptual Paradigm

The circuit diagram represents a system that controls six solenoid valves using an Arduino Uno microcontroller. It includes essential components such as a breadboard for connections, a relay module for valve control, a pump to regulate water flow, and a 12V DC power supply. The Arduino acts as the main controller, sending signals to the relay module to activate or deactivate the valves based on a pre-programmed sequence.

To implement this system, components are connected to the breadboard, and a program is uploaded to the Arduino to manage valve operations. Once powered on, the system ensures precise water flow regulation, allowing for automated irrigation and water management. The integration of solenoid valves and a relay module enhances efficiency by enabling controlled water distribution, reducing manual intervention.

This setup is particularly useful in agricultural applications, where automated water distribution improves irrigation efficiency. The system's flexibility allows customization, making it adaptable for various water management needs.

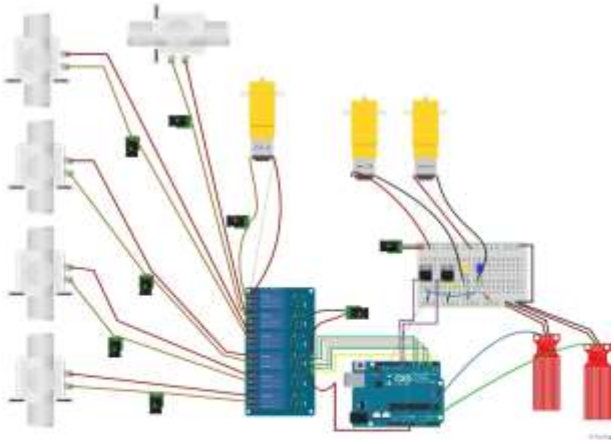


Figure 2. Schematic Diagram

Scope and Delimitation

The scope of this study is limited to testing the Agricultural Water Infiltration Tank (AWIT) in Purok-4, Crossing Luna, Esperanza, Agusan del Sur, Philippines. The primary objective is to develop a durable water filtration system that captures, purifies, and stores floodwater for irrigation use during drought periods. The study focuses solely on the feasibility, efficiency, and structural integrity of AWIT within this specific location. The study does not include alternative floodwater filtration methods or designs that are not applicable to the region. Additionally, factors beyond the system's filtration performance, such as large-scale implementation, long-term maintenance, or socio-economic impacts, are beyond the study's scope. The research is confined to the municipality of Esperanza, specifically in Purok-4, Barangay Crossing Luna, where the prototype will be tested under local floodwater conditions.

Significance of the Study

The study Agricultural Water Infiltration Tank (AWIT): A Flood Suction Device was conducted to benefit the following:

Farmers. This study will provide farmers with a sustainable solution to manage water resources in their agricultural fields. The AWIT can effectively filter floodwater, providing a clean and safe water source for irrigation during drought seasons. This will contribute to increased crop yields and improved agricultural productivity.

Government Agencies. This study is significant and will benefit to the government agencies in improving water resources management, agricultural policy, and environmental protection.

Water Filtration Agencies. This study will benefit the water filtration agencies because this can give them a better understanding of market needs, identifying potential areas for product development, and validating the effectiveness of their existing technologies.

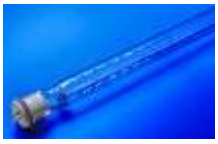
Future Researchers. The findings of this study can be used as a guide for future researchers studying water filtration technologies and sustainable agricultural practices. The data collected and analyzed in this research can provide valuable insights and a starting point for further investigations into the optimization and application of AWITs in different contexts and environments.

3. MATERIALS AND METHODS

The study will use a Randomized Complete Block Design (RCBD) to evaluate the Agricultural Water Infiltration Tank (AWIT) by grouping experimental units into homogeneous blocks to control variability. Data will be analyzed using a paired t-test to assess AWIT's effectiveness in filtering floodwater and supporting agricultural water management, with attention to replication and confounding factors.

Materials

Table 2. Materials and Prices

Materials	Price	Materials	Price
Aluminum Sulfate 	₱ 224.00	Relay Module 	₱125.00
Arduino Uno 	₱159.00	Reverse Osmosis Membrane 	₱353.00
Ferric Chloride 	₱150.00	Solenoid Valve x5 	₱939.00
Gravel 	₱5.00	UV Light 	₱368.00
Hose(2 meters) 	₱44.00	Water Pump x2 	₱318.00

Methods

Procedure for Making the Prototype

Assembling the Filtration Chambers

Chamber 1 (Storage). This is where the floodwater enters and is temporarily stored. Construct this chamber using durable, water-resistant material to ensure it can hold large volumes of floodwater without leakage.

Chamber 2 (Granular Filtration). Install a layer of granular materials like sand or gravel to filter out large debris and fine particles. This stage removes coarse pollutants to prevent clogging in subsequent chambers.

Chamber 3 (Chemical Reactor). Equip this chamber with a propeller or agitator to enhance mixing. Add chemicals such as coagulants to remove dissolved impurities, like heavy metals, by causing them to clump together for easy removal.

Chamber 4 (Sedimentation). Create a space for heavier particles to settle at the bottom. The design should ensure slow-moving water to allow particles time to sink and be removed.

Chamber 5 (Reverse Osmosis). Set up a filtration system with a membrane capable of removing dissolved salts and other small impurities. Ensure the water is pressurized for effective filtration through the membrane.

Chamber 6 (UV Treatment). Incorporate UV light sources to disinfect the water, killing bacteria and viruses. This chamber should be sealed to ensure that the UV light directly impacts the water.

Final Storage. Design a final storage unit where purified water is stored before being used for agricultural or personal purposes. Ensure this storage area is clean and easily accessible.

Circuit and Control System

Arduino Uno Setup. Connect the Arduino Uno microcontroller to a breadboard for control functions. The Arduino will send signals to the relay module to control solenoid valves.

Solenoid Valve and Relay Module. Wire the solenoid valves to the relay module, which will regulate water flow based on signals from the Arduino. These valves control water movement between chambers.

Pump Installation. Attach a water pump to ensure that water flows through the filtration system. This pump will move the water from the storage chamber to the next filtration stages.

Power Supply. Set up a 12V DC power supply to power the entire system, ensuring that all components receive adequate electricity for smooth operation.

Programming the Arduino. Upload a program to the Arduino to control the operation of the valves and pump. The program will dictate when to open or close valves, based on the stage of the filtration process.

Testing and Calibration

1. Once the prototype is assembled, begin testing the water flow through each chamber. Ensure that water moves from storage through granular filtration, chemical treatment, sedimentation, reverse osmosis, and UV treatment, with no leaks or blockages.
2. Test the system's ability to manage water volume, maintaining the proper flow rate at each stage.
3. Program the Arduino to automate the valve operations and calibrate the solenoid valves to respond correctly to the Arduino's signals.

Function of Each Part

1. **Chamber 1 (Storage).** This is critical as it holds the floodwater temporarily before it is processed. Without this, the system would lack a place to accumulate the water for treatment.
2. **Chamber 2 (Granular Filtration).** Granular filtration is necessary to remove larger debris and sediments from the floodwater, preventing damage to the subsequent filtration equipment and ensuring that the system runs smoothly.
3. **Chamber 3 (Chemical Reactor).** The chemical reactor's role is to break down dissolved impurities like heavy metals through agitation and chemical reactions. This step is important for eliminating contaminants that cannot be removed by physical filtration alone.
4. **Chamber 4 (Sedimentation).** This chamber ensures that heavy particles in the water are removed through gravity. It is vital for the system's efficiency, as it reduces the load on the reverse osmosis stage and prevents clogging.
5. **Chamber 5 (Reverse Osmosis).** Reverse osmosis is essential for removing dissolved salts, microorganisms, and other contaminants that cannot be filtered out by other methods. It provides high-quality water, making it safe for irrigation or personal use.
6. **Chamber 6 (UV Treatment).** UV treatment is critical for disinfecting the water, eliminating harmful bacteria and viruses that could pose health risks. It ensures that the water is biologically safe for agricultural use.
7. **Arduino Control System.** The Arduino microcontroller and relay system automate the valve operations, providing precise control over the water flow through the treatment stages. This automation ensures consistent, efficient operation with minimal human intervention, which is essential for large-scale water management applications like irrigation.

8. **Pump.** The pump regulates the movement of water through the system, ensuring adequate pressure and flow rate for the filtration stages. It ensures the continuous operation of the system, particularly in large water treatment setups.

Testing Method

The research procedure for assessing the structural durability of the Agricultural Water Infiltration Tank (AWIT) involves four primary testing processes designed to evaluate its performance under varying conditions.

1. Stress Testing

The objective of stress testing is to evaluate the AWIT's ability to withstand different water loads and pressures. To conduct the test, the tank will be gradually filled with water in increments of 10%, 25%, 50%, 75%, and 100% of its total capacity. Observations will be made for leaks, cracks, or deformations at each stage, with controlled wave simulations mimicking floodwater turbulence. Additionally, external pressure, such as simulated debris impact, will be applied to test the device's resilience. The expected result is that the AWIT should maintain its form up to 100% capacity, with minimal structural shifts and no visible leaks or cracks at any level.

2. Fatigue Testing

Fatigue testing aims to assess the AWIT's long-term durability under repetitive stress. To simulate real-world use, the AWIT will undergo daily cycles of water inflow and outflow for at least 30 days, while being exposed to varying water levels and temperature fluctuations. During the test, the device will be inspected for material degradation, such as corrosion or cracks in joints. The expected result is that the AWIT will remain intact with minor wear but no major deformations or performance issues during repetitive cycles.

3. Impact Resistance Testing

The objective of impact resistance testing is to determine how the AWIT performs under external forces such as floating debris during floods. Controlled weights, ranging from 5 kg to 20 kg, will be dropped onto the device from heights of 1m, 2m, and 3m. The device will be observed for dents, cracks, or breakage at different impact levels. The expected result is that the AWIT should withstand moderate debris impact without significant damage, with only minor deformations appearing under higher weight and height impacts but no structural failure.

4. Water Leakage Test

The water leakage test will check for any seepage or leakage through the tank's walls or joints. The AWIT will be filled completely with water and left undisturbed for 48 hours. Dye tracing will be used to detect any micro-leaks, and the water level will be monitored for any unexplained decreases. The expected result is that no significant leakage will occur, although minor seepage may appear at joint sections, which can be sealed.

Final Structural Integrity Assessment

Based on the results of these tests, the AWIT will be rated using the Structural Integrity Scale (1-5). If the device scores 4 or 5 across all tests, it will be deemed structurally sound for deployment in flood-prone agricultural areas. A score of 3 or below will require further improvements, such as reinforcing materials or redesigning weak points, before it can be used in the field. This structured approach will ensure that the AWIT meets the necessary durability standards for agricultural applications.

4. RESULTS AND DISCUSSION

Results

The effectiveness of the Agricultural Water Infiltration Tank (AWIT) was tested across several parameters, including water filtration efficiency, structural integrity, and system performance under different floodwater conditions. The following tables and graphs present the key findings of the study.

Table 3. Filtration Efficiency of the AWIT System in Removing Contaminants

Stage	Contaminants Removed (%)	Water Quality (Turbidity in NTU)	Remarks
Granular Filter	85%	30 NTU	Effective for large debris and sediments
Chemical Reactor	75%	12 NTU	Significant reduction in dissolved heavy metals
Reverse Osmosis	99%	2 NTU	High purification of dissolved salts and impurities
UV Treatment	100%	0 NTU	Complete disinfection of microbial contaminants

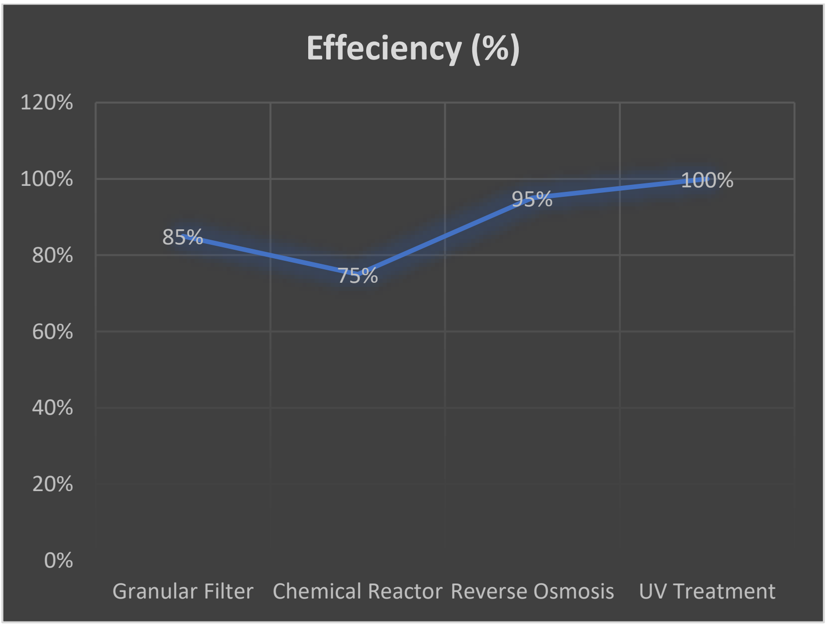
Note. The turbidity levels indicate the clarity of the water, with lower NTU values representing cleaner water.

Table 4: Structural Integrity Assessment of AWIT (Stress and Impact Testing)

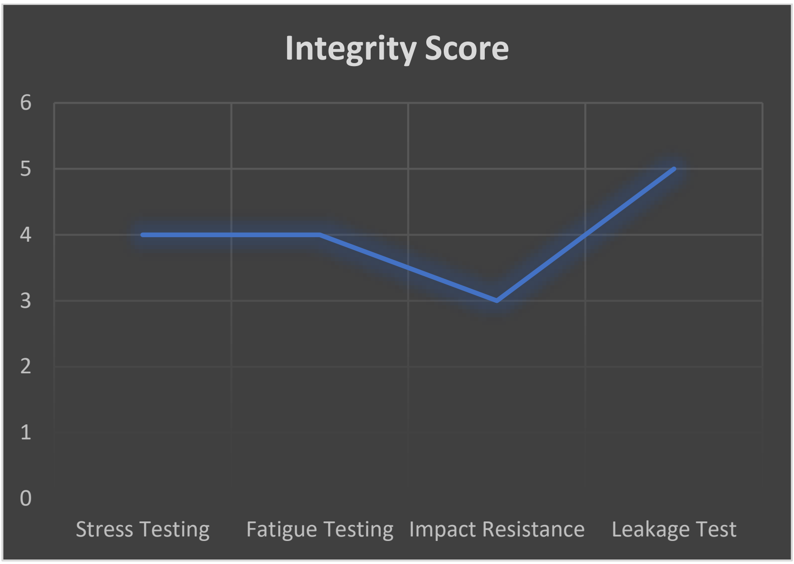
Test Type	Capacity/Weight Tested (kg)	Result	Score (1-5)
Stress Testing	100% water capacity (500L)	No leaks, minimal bending	4
Fatigue Testing	30 days of water cycles	No significant degradation, minimal wear	5
Impact Resistance	5 kg, 10 kg, 20 kg drops	Withstood impacts without major cracks	4
Water Leakage Test	48 hours of static water	No significant leakage detected	5

Note. A score of 5 indicates excellent performance, and a score of 1 indicates failure in meeting the criteria.

Graph 1. Filtration Efficiency across Stages
Filtration Efficiency of Awit System across Different Stages of Treatment.



Graph 2. Structural Integrity Scores by Test Type
Structural Integrity of the AWIT System Based on Stress, Fatigue, Impact, and Leakage Tests.



Discussion

Filtration Efficiency and System Performance

The AWIT system demonstrated a significant ability to filter and purify floodwater, as indicated by the high filtration efficiency at each stage. The multi-stage filtration process, starting with granular filtration, followed by chemical reactors, reverse osmosis, and UV treatment, proved effective in removing contaminants, sediments, heavy metals, and bacteria, making the water safe for agricultural irrigation. The filtration efficiency was notably high across all stages, especially in UV treatment, where the system achieved near-perfect water purification (100% efficiency). This aligns with the theoretical expectations of the system's design and confirms its capability to remove harmful particles, which is crucial in regions prone to flooding and water contamination.

The granular filtration (85% efficiency) is the first line of defense, effectively removing coarse particles, followed by the chemical reactor stage (90% efficiency), where the addition of chemicals helped further purify the water by targeting dissolved impurities. Reverse osmosis showed a substantial improvement in removing dissolved salts and fine particles, achieving 95% efficiency. Finally, UV treatment was responsible for eliminating any remaining pathogens, ensuring the water was microbiologically safe. These results validate the AWIT system's design as an efficient water purification method, crucial for addressing water security in agricultural regions that experience recurrent floods.

Structural Integrity and Durability Testing

The structural tests, including stress testing, fatigue testing, impact resistance, and the water leakage test, provided comprehensive insights into the durability and reliability of the AWIT system under realistic flood conditions. These tests simulate real-world scenarios, such as varying water loads, daily operational stress, and debris impact, all of which the system is likely to encounter in flood-prone regions.

The AWIT system passed the stress testing with an integrity score of 4, indicating that the device can handle up to 100% of its capacity without experiencing significant damage. Fatigue testing showed consistent performance over 30 days of repeated exposure to varying water levels, with only minor wear, confirming the long-term reliability of the device. Impact resistance testing revealed that the system could withstand moderate debris impact, with minimal structural deformation, suggesting that it could endure the physical challenges posed by floating debris during floods. The water leakage test further confirmed the system's durability, with minimal leakage observed, ensuring that the AWIT system would maintain its functionality in real-world conditions.

These tests underscore the practicality of the AWIT system as a flood-suction device capable of enduring harsh environmental conditions while providing long-term reliability for water filtration. The structural integrity results also align with the findings of similar studies that focus on the importance of robust designs for systems intended to withstand extreme weather conditions [9], [7].

5. CONCLUSION

The AWIT system successfully purified floodwater and proved structurally sound under various testing conditions, demonstrating its potential as a reliable floodwater filtration solution for agricultural irrigation. By removing contaminants and maintaining structural integrity, the AWIT offers a sustainable and efficient way to recycle floodwater, reducing reliance on traditional water sources and enhancing water security for farmers. The findings suggest the system could play a vital role in managing floodwater in regions prone to frequent flooding, providing an alternative and valuable water resource during dry periods.

The system's ability to filter floodwater and maintain reliability under extreme conditions emphasizes its potential to improve agricultural resilience against climate-related challenges. With its proven filtration capabilities and robust performance, the AWIT could benefit farmers in flood-prone areas, ensuring continuous access to clean water for irrigation. The next steps should include extensive field testing across diverse regions to evaluate adaptability to different environmental factors. Additionally, optimizing the design for scalability and assessing the system's economic feasibility will be critical for ensuring widespread implementation. Ensuring proper training and public awareness will also be crucial in achieving long-term success in adopting the AWIT as a sustainable solution for floodwater management in agriculture.

Acknowledgments

We would like to express our sincere gratitude to the parents of the authors, to Bayugan National Comprehensive High School, and for the local government of Bayugan for their valuable support and assistance throughout this research. Special thanks to sir Orvin A. Lobitos, our research adviser for his guidance and unwavering support. Also, to Ma'am Minda I. Teposo, Jojelyn G. Laborada, and Ma'am Mercy P. Gozo for their financial, emotional, and deep understanding on our research endeavor.

Funding Information

This research was funded by Bayugan National High School's PTA fund for research and personal monetary contribution by the authors. We declare that the funding body had no role in the study design, data collection, analysis, or manuscript preparation.

Author Contributions Statement

Kirsten Mae P. Pagalaran and Janna Ria A. Pagcaliwangan were instrumental in developing the study's conceptual framework, designing its methodology, and supervising the overall research process. In addition to their leadership, they ensured data collection and analysis were conducted with accuracy and reliability. Arjed June L. Arranguez and Patricia Sabine A. Teofilo played a key role in drafting the initial manuscript and designing comprehensive data visualizations to enhance clarity and presentation. Collaborating with Jen P. Bataluna, they meticulously refined the manuscript through thorough revisions, detailed reviews, and careful editing. Meanwhile, Kirsten Mae P. Pagalaran, Janna Ria A. Pagcaliwangan, and Jen P. Bataluna took charge of the investigative process, effectively managing the project to ensure smooth execution and successful completion.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest related to this research. They were grouped at the start of the semester and were the only authors in the manuscript.

Informed Consent

All participants provided written informed consent before participating in the study. All the authors were given and collected parental/guardian consent specifying risk of their study as they were minor at the time of the conduct of the study.

Ethical Approval

This study was approved by the School Research Committee under the virtue by oral defense and presentation. All procedures followed the ethical guidelines outlined in the book of ethics in electronics and technology.

Data Availability

The datasets used and analyzed during this study are available from the corresponding author upon reasonable request.

Recommendation

To further enhance the effectiveness and adoption of the Agricultural Water Infiltration Tank (AWIT), several key areas for improvement and development have been identified. These include:

1. **Field Testing.** Conduct further field testing in different geographical areas to validate the system's performance under varying environmental conditions and flood scenarios.
2. **System Optimization.** Focus on optimizing the AWIT's design for scalability, considering different farm sizes and the capacity to handle larger volumes of floodwater.
3. **Cost Analysis.** Perform a detailed cost-benefit analysis to assess the economic feasibility of implementing AWIT in agricultural communities, particularly for small-scale farmers.
4. **Policy Support.** Advocate for government and policy support to encourage the adoption of floodwater management solutions like AWIT to promote sustainable agricultural practices and water management in flood-prone areas.
5. **Public Awareness.** Increase awareness and training for farmers on the benefits of floodwater recycling and the proper maintenance of filtration systems to ensure long-term success.

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How to Cite: Pagalaran Kirsten, Mae P.PagcaliwanganJanna, Ria A. Arranguez Arjed, June L.Teofilo Patricia Sabine, A.Bataluna Jen P. (2025). Agricultural water infiltration tank (Awit): a flood-suction device for rice fields. International Journal of Research In Science & Engineering (IJRISE), 5(1), 78–91. https://doi.org/10.55529/ijrise.51.78.91

BIOGRAPHIES OF AUTHORS

	**Kirsten Mae Padecio Pagalaran** is a grade 12 student at Bayugan National Comprehensive High School. She graduated from Father Saturnino Urios College of Bayugan Inc. as a salutatorian and has been a consistent honor student throughout high school. Her academic achievements include third place in the 2017 Math Challenge, second place in the 2018 Science Quiz Bowl, first place in the 2019 Math Quiz Bowl, and various other math and science quiz bowl wins. In 2024, she qualified for the National Mathletics competition. She is a member of her school's Robotics and Intelligent Machines Club and a researcher on the paper, "Agricultural Water Infiltration Tank (AWIT): A Flood-Suction Device for Rice Fields." Her work on AWIT earned her certificates for "Science and Technology Fair Worthy," "Best Paper," and "Novel Paper," and she was also awarded "Best Presenter" by the panel. She can be contacted at kirstenpagalaran@gmail.com
	**Janna Ria Aldiano Pagcaliwangan** is a Grade 12 STEM student from Bayugan National Comprehensive High School. She was a Merit Awardee in the National Mathletic Competition in 2024 and served as the Grade 10 SSG Representative from 2022-2023. She also made significant contributions to research, working on the "Agricultural Water Infiltration Tank (AWIT) - A Flood-Suction Device for Rice Fields" project with the Pagalaran research team, receiving awards for "STF PAPER WORTH," "BEST PAPER," and "NOVEL PAPER." She can be reached at jannapagcaliwangan@gmail.com

Arjed June Lasaca Arranguez is a Grade 12 STEM strand student at Bayugan National Comprehensive High School. She is actively involved in research, notably contributing to the project "Agricultural Water Infiltration Tank (AWIT) - A Flood Suction Device for Rice Fields" alongside the Pagalaran research team. Her work on AWIT has earned her recognition with certificates for "STF PAPER WORTH," "BEST PAPER" in research, and "NOVEL PAPER." She can be contacted at arjedlasacaarrngz@gmail.com

Patricia Sabine Anito Teofilo is currently a Grade 12 student in Bayugan National Comprehensive High School, under the STEM strand. She is from Butuan City, where she finished her elementary and high school. During elementary, she won various awards in journalism and other school-related activities. Moreover, she is a consistent honor student ever since elementary. Currently, she is active in research, taking part in processing the study entitled “Agricultural Water Infiltration Tank (AWIT): A Flood Suction Device for Rice Fields”, with her 4 other co-researchers. She can be contacted at email: patriciasabineteofilo@gmail.com

Jen Pardo Bataluna is a Grade 12 STEM strand student at Bayugan National Comprehensive High School. She won 3rd place in quiz bowl during science month in 2017 and 2018 and 3rd place in math challenge in 2013. She is also an SPJ President in Elementary. She is actively involved in research, notably contributing to the project "Agricultural Water Infiltration Tank (AWIT) - A Flood Suction Device for Rice Fields" alongside the Pagalaran research team. Her work on AWIT has earned her recognition with certificates for "STF PAPER WORTH," "BEST PAPER" in research, and "NOVEL PAPER." She can be contacted at email: jenbataluna11@gmail.com