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Budikdamber (Fish-in-Bucket Culture) Mentoring as an Urban Fish Farming Innovation for the Youth of GMIST Eben Haezer Manganitu Congregation

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A R T I C L E I N F O

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A B S T R A C T

This community service program aimed to introduce budikdamber (fish-in-bucket culture) as an urban fish farming innovation for limited land and strengthen youth understanding of food security and water quality management. The activity involved 20 participants aged 17–30 years from the Youth Fellowship of GMIST Eben Haezer Manganitu Congregation, Indonesia. A participatory approach combining educational presentations, hands-on practice, and discussion was implemented on October 6, 2026. Three topics were delivered, and five 80-liter budikdamber units were established, each stocked with five catfish and planted with water spinach using locally available arang and puning media. Periodic monitoring was planned to assess cultivation performance. The program provided a practical foundation for youth engagement in household food production, although long-term outcomes require further evaluation.

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INTRODUCTION

Urbanization, land conversion and population growth are reducing the space available for conventional food production. In urban and peri-urban areas of Indonesia, farmland is shrinking because of residential and industrial expansion, which limits the ability of households to grow their own food (Fauziyyah, 2025). Aquaponics, which combines fish and vegetable production, has been proposed as a technological response to such pressures, including urbanization, water shortages, and land degradation (Goddek et al., 2019).

Budikdamber (budidaya ikan dalam ember, fish-in-bucket culture) is a simplified, low-cost form of aquaponics in which fish and plants share a single container. Fish waste supplies nutrients to the plants, while the plants help improve water quality and oxygenation for the fish (Fauziyyah, 2025). In the common catfish and water spinach combination, a household can harvest vegetables in about 30 days and fish in about 90 days (Fauziyyah, 2025). Community service programs using this system have reported improved knowledge, understanding, and interest among participants (Nadiro et al., 2026).

The simplicity of the system, however, should not hide its main technical risk, which is water quality. In a budikdamber experiment with stocking densities of 1–3 fish/L, dissolved oxygen fell to 1.5 mg/L and total ammonia nitrogen reached 2 mg/L, and water quality was judged suboptimal (Ilyasa et al., 2025). Commercial probiotics, including EM4, have been reported to lower ammonia in catfish aquaponic systems relative to an untreated control (Pratama et al., 2017). Training that only demonstrates how to assemble a bucket is therefore insufficient; participants also need basic water-quality literacy so that the units stay productive after the facilitators leave.

The church is a community that can serve as a platform for congregational empowerment. A church-based program at GMII Kupang Barat, for example, was reported not only to address the nutritional needs and food security of the congregation, but also to encourage youth creativity and strengthen fellowship among church members (Tari et al., 2025). Young people hold a strategic position as drivers of congregational activities, so equipping them with budikdamber skills has the potential to foster food production practices at the family and congregational levels.

Based on this, the community service activity aimed to improve the understanding of the youth of GMIST Eben Haezer Manganitu Congregation regarding the role of church youth in food security, to introduce budikdamber as an urban fish farming innovation for limited land, to equip the youth with basic knowledge of water quality in budikdamber systems, and to train their skills in assembling and starting a budikdamber through hands-on practice.

IMPLEMENTATION AND METHODS

Implementation of the Activity

The community service activity was carried out on October 6, 2026, in Manganitu, Sangihe Islands Regency, North Sulawesi Province, Indonesia. The partner was the youth fellowship of GMIST Eben Haezer Manganitu Congregation. A total of 20 young congregation members participated in the activity, ranging in age from 17 to 30 years. The participants consisted of secondary school students, university students, and young workers who were interested in expanding their knowledge and had experience or familiarity with fish farming or gardening. The implementing team consisted of lecturers, students, and laboratory technicians from the Fish Cultivation Technology Study Program, Department of Fisheries and Marine Technology, Politeknik Negeri Nusa Utara. The activity aimed to enhance the participants' knowledge and practical skills in implementing budikdamber as an innovative approach to urban fish farming and household food production.

Activity Method

The program used a participatory approach that combined counseling with hands-on practice, enabling participants to acquire knowledge and apply it directly, as demonstrated in previous budikdamber community service programs (Fauziyyah, 2025; Nadiro et al., 2026). The activity began with an opening address by the chairperson of the youth fellowship, followed by three presentations delivered by three speakers and a hands-on practice session. The activity concluded with a discussion and question-and-answer session covering the topics presented, the practical implementation of budikdamber, and strategies for ensuring the sustainability of the program. This session provided participants with an opportunity to clarify technical aspects of budikdamber cultivation and discuss potential challenges in maintaining the system. Following the activity, the implementing team planned to conduct periodic monitoring and inspections of the five budikdamber units established during the training. This follow-up was intended to assess the condition of the systems, identify potential problems, and provide further guidance to participants to support the continued operation and sustainability of the budikdamber units.

Materials Presented

The educational session consisted of three presentations delivered by members of the implementing team from the Fish Cultivation Technology Study Program, Department of Fisheries and Marine Technology, Politeknik Negeri Nusa Utara. The first presentation discussed the role of church youth in supporting food security, emphasizing youth participation in household food production, the utilization of available resources, and the development of community-based food initiatives. The second presentation introduced budikdamber as an innovative and practical solution for fish and vegetable production in areas with limited land availability. The discussion covered the basic principles of budikdamber, the integration of fish cultivation and vegetable growing in a single container, and its potential benefits for household food security. The third presentation focused on water quality management in

budikdamber systems, including the importance of maintaining suitable water conditions, monitoring fish health, and understanding the role of probiotics in supporting the cultivation environment.

RESULTS AND DISCUSSION

The program followed the sequence of preparation, opening, counseling, and practice, and ended with a closing and evaluation (Table 1). The sections below describe each step together with the materials presented, and the discussion places the results in the context of earlier work.

Table 1. Stages of the Community Service Activity, Activities, and Outputs

Stage	Activities and Materials	Outputs
Preparation	Provision of five budikdamber sets, water spinach seeds, catfish, fish feed, and EM4 probiotic.	Equipment and materials prepared for all five budikdamber units.
Opening	Welcome address by the chairper son of the youth fellowship.	The activity was officially opened by the community partner.
Counseling	Delivery of three presentations: the role of church youth in food security, budikdamber as an alternative for cultivation on limited land, and water quality management	Three educational topics delivered to participants.
Practice	Assembly of the budikdamber units, planting of water spinach seeds using arang and puning growing media, and stocking of catfish.	Five budikdamber units assembled, stocked with catfish, and planted with water spinach.
Closing and Evaluation	Discussion and question-and-answer session concerning the presentation materials, practical activities, and program sustainability	Participants had the opportunity to discuss the topics, and periodic monitoring of the five budikdamber units was planned.

The educational session consisted of three presentations addressing the role of church youth in food security, budikdamber as an alternative for fish and vegetable production on limited land, and water quality management in budikdamber systems. The first presentation emphasized the potential contribution of church youth to household food production and community food security. Engaging young people through an established religious organization provides a potential avenue for integrating food-related initiatives into existing community activities. This approach is relevant because faith-based organizations remain an underexplored perspective in community food initiatives (Ligrani & Niewolny, 2017). Similarly, a church-based food program

in Kupang reported benefits for congregational food security and nutrition while encouraging youth creativity and fellowship (Tari et al., 2025).

The second presentation introduced budikdamber (budidaya ikan dalam ember, or fish-in-bucket culture) as a practical approach to producing fish and vegetables in areas with limited land availability. The system integrates fish cultivation and vegetable growing in a single container, allowing households to use restricted spaces for food production. In this system, nutrients from fish waste can support plant growth, while plants contribute to nutrient uptake and water quality management. This principle is consistent with the integration of aquaculture and plant production in aquaponic systems (Goddek et al., 2019). Previous research reported that households using a catfish and water spinach combination could harvest vegetables in approximately 30 days and fish in approximately 90 days, although actual harvest times depend on cultivationconditions and management practices (Fauziyyah, 2025).



Figure 1. Opening



Figure 2. Presentation of the First Topic



Figure 3. Presentation of the Second Topic



Figure 4. Presentation of the Third Topic

The third presentation focused on water quality management, which is a critical technical consideration in budikdamber cultivation. Participants were introduced to the importance of monitoring water temperature, pH, dissolved oxygen, and nitrogenous waste, particularly ammonia, to maintain suitable conditions for fish growth. Reference values reported for catfish cultivation include a temperature range of 22–32 °C, pH of 6–9, dissolved oxygen above 3 mg/L, ammonia below 0.8 mg/L, nitrite below 0.05 mg/L, and nitrate below 5 mg/L (Pratama et al., 2017). However, a previous budikdamber experiment recorded dissolved oxygen concentrations ranging from 1.5 to 7.2 mg/L and total ammonia nitrogen reaching 2 mg/L, indicating that water quality may become suboptimal under certain cultivation conditions (Ilyasa et al., 2025). The reported ammonia values require careful interpretation because total ammonia nitrogen and un-ionized ammonia (NH_3) represent different measurements and cannot be compared directly without considering their chemical forms and the relevant environmental conditions. These findings highlight the importance of routine monitoring rather than relying solely on the simplicity of the cultivation system. Excessive feeding can also accelerate water quality deterioration, as reported in an earlier community service program (Nadiro et al., 2026).

Following the educational session, participants worked collaboratively with the implementation team to assemble five budikdamber units. Each unit used an 80-liter bucket, and a total of 25 catfish were stocked, with five fish in each bucket. Water spinach seeds were planted using locally available growing media known as arang and puning. The team also provided fish feed and EM4 probiotic as supporting cultivation materials. This practical session translated the concepts presented during the counseling into direct experience, enabling participants to become familiar with the basic stages of preparing the system, establishing the plant-growing component, and stocking the fish. The establishment of five units represented the immediate physical output of the program and provided a practical starting point for continued cultivation within the congregation. Nevertheless, the successful assembly and stocking of the units should be distinguished from demonstrated production outcomes, because fish survival, plant growth, water quality, and harvest yields had not yet been established at the time of implementation.



Figure 5. Budikdamber Construction



Figure 6. Budikdamber Units

The closing session consisted of a discussion and question-and-answer session concerning the topics presented, the practical activities completed, and the sustainability of the budikdamber units. Following the activity, the implementation team planned to conduct periodic monitoring and inspections to assess the condition of the five units and provide further guidance where necessary. This follow-up is important because the sustainability of budikdamber depends not only on initial construction but also on consistent daily management. A previous budikdamber experiment described feeding at 3–5% of fish biomass three times daily, siphoning and partially replacing the water every three days, and harvesting water spinach approximately 25 days after planting (Ilyasa et al., 2025).

CONCLUSIONS AND RECOMMENDATIONS

The community service program introduced budikdamber as an innovative alternative for fish and vegetable cultivation on limited land and provided the youth of GMIST Eben Haezer Manganitu Congregation with educational materials and hands-on experience in its implementation. The program resulted in the establishment of five budikdamber units using 80-liter buckets, each stocked with five catfish and planted with water spinach using locally available growing media, arang and puning. The integration of food security education, basic cultivation techniques, and water quality management provided a practical foundation for encouraging youth participation in household food production. However, further monitoring is necessary to evaluate fish survival, plant growth, water quality, and harvest yields. Therefore, periodic mentoring is recommended to ensure proper feeding practices, regular water quality monitoring, and appropriate water replacement.

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