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Household-Scale Hydroponic Farming to Improve Food Security Among Fishing Communities in Lagaruda Village, Takalar Regency

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Artikel info

Abstract. Keterbatasan lahan produktif dan tingginya ketergantungan masyarakat pesisir terhadap sektor perikanan menyebabkan rendahnya diversifikasi sumber pangan dan pendapatan rumah tangga di Desa Laguruda, Kecamatan Sanrobone, Kabupaten Takalar. Program Kemitraan Masyarakat (PKM) ini bertujuan untuk meningkatkan pengetahuan dan keterampilan masyarakat dalam budidaya hidroponik sebagai alternatif pemanfaatan lahan pekarangan. Metode pelaksanaan menggunakan pendekatan partisipatif melalui tahapan sosialisasi, pelatihan berbasis praktik *(hands-on training),* dan pendampingan. Kegiatan dilaksanakan selama lima bulan dengan melibatkan Kelompok Usaha Bersama (KUBE) sebagai mitra utama. Hasil kegiatan menunjukkan adanya peningkatan pemahaman dan keterampilan mitra dalam teknik budidaya hidroponik, mulai dari penyemaian, perakitan instalasi, hingga pemeliharaan tanaman. Selain itu, penerapan hidroponik mampu mengoptimalkan pemanfaatan lahan sempit, mendukung ketahanan pangan rumah tangga, serta membuka peluang usaha produktif berbasis pertanian skala rumah tangga. Tingginya partisipasi mitra menjadi faktor penting dalam keberhasilan program, meskipun masih diperlukan pendampingan lanjutan untuk memperkuat keberlanjutan usaha.

Abstract. *Limited land availability and high dependence of coastal communities on the fisheries sector have led to low diversification of food sources and household income in Laguruda Village, Sanrobone District, Takalar Regency. This Community Partnership Program (PKM) aims to improve community knowledge and skills in hydroponic cultivation as an alternative for utilizing home yard spaces. The implementation method employed a participatory approach through socialization, hands-on training, and mentoring stages. The program was conducted over five months involving a community business group (KUBE) as the main partner. The results indicated a significant improvement in participants'*

knowledge and technical skills in hydroponic practices, including seedling preparation, installation setup, and plant maintenance. Furthermore, hydroponic application optimized the use of limited land, supported household food security, and created opportunities for small-scale income-generating activities. High participant involvement contributed to the program's success; however, further assistance is needed to ensure long-term sustainability.

Keywords:
Hidroponik, Masyarakat pesisir; Ketahanan pangan; Pemberdayaan masyarakat; Lahan pekarangan

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INTRODUCTION

Laguruda Village is a coastal village located in Sanrobone Subdistrict, Takalar Regency, South Sulawesi, which possesses significant natural resource potential in the aquaculture sector. This coastal and island region is an area with unique and complex characteristics, where land and sea meet and interact, marked by limited productive land, environmental pressures, and the community's economic dependence on primary sectors such as fisheries. The population of Sanrobone Subdistrict stands at 17,236 people with an annual population growth rate of 2.45%, and the area of Lagaruda Village spans 3.84 km², divided into several hamlets (Takalar Regency BPS, 2025). The village's environmental conditions are characterized by high settlement density and limited space for conventional agricultural cultivation (Rappe et al., 2018; Ronald et al., 2024).

Socioeconomically, the community of Lagaruda Village is dominated by seaweed farmers, fishermen, fish farmers, and micro-entrepreneurs. Aquaculture activities include the farming of shrimp, milkfish, and the seaweed species Gracilaria sp. In addition, the community also catches mangrove crabs (Scylla serrata) in the mangrove areas. However, the characteristics of the coastal area, which is dominated by sandy soil, result in low productivity of land-based agriculture, particularly for vegetables and fruits (Desmiyawati et al., 2015; Kristiyanti, 2016; Wamnebo and Abdul Rauf, 2021). The adoption of hydroponic technology, particularly simple systems that can utilize limited space or backyard plots (Roidah, 2014; Rahardjo et al., 2024).

These conditions result in high community dependence on food supplies from outside the region and limited diversification of household income sources. According to the Central Statistics Agency (2025), coastal communities generally face higher levels of economic vulnerability due to fluctuations in catch yields and seasonal factors. Additionally, the low utilization of backyard gardens as a food source is one of the primary challenges in strengthening household food security (Bonaventura and Murdaningsih, 2025).

These conditions have led communities to seek business alternatives that are easy, inexpensive, and do not require large tracts of land on a household scale. One potential solution is the development of household-scale hydroponic systems. Hydroponics is a soil-less plant cultivation technique that

utilizes nutrient solutions, and has proven to be efficient in terms of land, water, and production inputs (Suyanto et al., 2025). This system is highly suitable for implementation in areas with limited land, such as coastal regions, as it can be developed in small backyards or even in non-productive areas (Ekawati et al., 2021; Surindra et al., 2024).

Hydroponics also offers advantages in enhancing crop productivity and producing cleaner, higher-quality products. Furthermore, this technology has the potential to enhance household food security and create new business opportunities based on urban and coastal agriculture (Desmiyawati et al., 2015; Jumrianah, 2024; Syaifudin, 2024). Therefore, the development of hydroponics has become one of the innovative strategies to support sustainable agriculture in regions with limited productive land resources (Susanti & Rahayu, 2021; Alwina & Amalia, 2025).

Based on the results of the needs assessment, the residents of Laguruda Village do not yet possess adequate knowledge and skills regarding hydroponic cultivation techniques, including seedling propagation, nutrient management, and pest and disease control. This low capacity is a major barrier to the adoption of modern agricultural technology (Roidah, 2014). Therefore, practice-based training and mentoring activities are needed to directly improve the community's skills. The implementation of hydroponics in coastal areas offers significant potential to support household food security while also serving as an additional income source through the sale of harvested crops and plant seedlings. Training-based community service activities have proven effective in improving the community's knowledge, skills, and economic self-reliance (Zaeni, N., Bahasoan & Haeranah, 2023; Cedaryana et al., 2023).

As a result, the potential for household food security and small business opportunities has not yet been fully realized. This business model is tailored to local conditions and is suitable for coastal communities, as it does not require high costs, is easy to maintain, and generates economic benefits, albeit on a micro scale. A defining characteristic of coastal communities is that household economic self-reliance remains low, and they lack stable alternative sources of income.

The main challenges faced by partners in this initiative include a lack of knowledge and skills, as well as limited infrastructure and resources for implementing hydroponic systems. Therefore, the objective of this activity is to enhance the community's knowledge and skills regarding the concepts and practices of hydroponic cultivation as an innovation for household-scale agricultural development in coastal areas..

This initiative is expected to benefit the community—particularly fishing groups and homemakers—by equipping them with adaptive and environmentally friendly aquaculture techniques that are more effective than traditional methods. Additionally, the program helps strengthen household food security, increase family income, and support sustainable economic empowerment programs for coastal communities. For village governments, this initiative supports coastal economic empowerment programs and encourages the adoption of environmentally friendly innovations in the agricultural sector.

Data and Methodology

This Community Partnership Program (PKM) was implemented over approximately five (5) months in the coastal area of Lagaruda Village, Sanrobone Subdistrict, Takalar Regency, South Sulawesi. The program partners were the Joint Business Group (KUBE), a community group dedicated to coastal environmental conservation consisting of fishermen and housewives.

The implementation method employed a participatory approach through a combination of outreach activities, hands-on training, and mentoring. This approach aims to ensure that the transfer of knowledge and skills is effective and can be sustainably adopted by the community (Zaeni, Bahasoan & Haeranah, 2023; Cedaryana et al., 2023).

The primary objective of this initiative is to enhance the capacity, skills, and economic self-reliance of the Community-Based Business Group (KUBE) through mastery of efficient, productive, and easily implementable hydroponic cultivation techniques in the village setting. It is anticipated that this initiative will be managed independently as an initial step toward increasing local food productivity and developing new business opportunities that can boost community income.

Stages of Activity Implementation

This Community Service (PkM) activity was carried out through several integrated stages, beginning with the preparation stage, which included coordination with the village government and KUBE partners through an initial meeting to convey the objectives, work plan, and expected outcomes of the activity, along with a needs assessment of the partners, determination of the activity location, and readiness of supporting facilities and infrastructure. This was followed by a socialization and outreach phase through the delivery of materials on the basic concepts of hydroponics, types of hydroponic systems, advantages, and opportunities for hydroponics-based business development to enhance the community's initial understanding before practical implementation. The next phase is technical training (practical sessions) conducted directly through demonstration and hands-on practice, covering the preparation of simple hydroponic tools and materials, seed sowing using rockwool as a medium, assembly of household-scale hydroponic systems, mixing of nutrient solutions, transplanting seedlings into the system, and plant maintenance until harvest. This is followed by a maintenance and mentoring phase through monitoring of hydroponic cultivation activities, with observed parameters including plant condition, nutrient solution pH (5.5–6.5), Electrical Conductivity (EC) according to plant needs, and water temperature (<30°C) to support optimal growth. The final phase, which involves an evaluation of the activities, is conducted to assess the partners' increased knowledge and skills through direct observation and discussion, as well as to evaluate the success of the hydroponic system and the potential for the sustainability of the activities.

Roles and Participation of Partners

Partners play a central role in participatory activities. Partner involvement spans all stages of the project, from planning to evaluation. Specifically, partners' contributions include: 1) Providing the project site, including the location for the hydroponic system and supporting facilities such as water and electricity. 2) Actively participating in the full range of training and practical sessions on hydroponic cultivation. 3) Providing labor for the installation assembly and plant maintenance. 4) Committing to continuing and developing the hydroponic business independently after the activity concludes. 5) Assisting with coordination with the village government and organizing activity participants.

Success Indicators

Indicators of the activity's success include: 1) Increased knowledge among partners regarding hydroponic systems. 2) Improved technical skills in hydroponic cultivation. 3) The establishment of fully functional hydroponic systems. 4) A commitment to the sustainability of the business by the partners.

Results and Discussion

Implementation of Partnership Program Activities

The Community Partnership Program (PKM) activities in Laguruda Village, Takalar Regency, were carried out over a five-month period through phases of outreach, technical training, and mentoring. In the initial phase, outreach and educational activities revealed an increase in the community's basic understanding of the fundamentals of hydroponics. Before the activities began, most participants were unfamiliar with soilless cultivation techniques and their benefits for utilizing limited land.

Figure 1. *Outreach and Education on Hydroponic Systems*

Following the training session, participants began to understand the basic principles of hydroponics, the types of systems that can be implemented, and the potential for developing hydroponics-based businesses in coastal areas. This is consistent with the findings of Kristiyanti (2016) and Zaeni, Bahasoan, & Haeranah (2023), who noted that hands-on training and outreach activities can significantly enhance community knowledge in a relatively short period of time.

Technical Skills Training for Partners

Hands-on training has a tangible impact on improving partners' skills (Purbaningrum et al., 2024; Putra, 2024). Participants were able to sow seeds using rockwool, assemble simple hydroponic systems, mix nutrient solutions, and properly transplant seedlings into the systems.

During the mentoring process, partners have also been able to maintain plants independently,

including controlling the pH of the nutrient solution within the range of 5.5–6.5 and adjusting the nutrient concentration (EC) according to the plants' needs. These capabilities demonstrate that technology transfer has been successful and can be adopted by the community.

Figure 2. *Hands-On Hydroponics Training*

Improving these skills is important because the success of hydroponic systems depends heavily on the precision of nutrient management and the plant growing environment (Saputra et al. 2025). Thus, training activities are not only informative but also practical and sustainable (Praharsini et al. 2023; Safrian et al., 2024).

Utilization of Backyards and Land Efficiency

One of the key outcomes of this initiative is the conversion of previously unproductive backyard land into areas for hydroponic vegetable cultivation. The hydroponic systems installed can be set up in small spaces around the house, making them well-suited to the characteristics of coastal settlements with limited land availability (Safrian et al., 2024).

Figure 3. *Household-Scale Hydroponic Equipment and Supplies*

The implementation of hydroponics has proven to improve land and water use efficiency, as well as produce cleaner, higher-quality vegetables. This aligns with the findings of Fajri et al. (2022) in the article "Socialization of Backyard Land Utilization Through the Application of Modern Agriculture Using Hydroponics," published in the Journal of Community Service, which states that hydroponics is an effective solution for increasing food production in areas with limited land.

Furthermore, this initiative also encourages a shift in community mindset regarding the use of backyard spaces as sources of food and economic income—areas that were previously underutilized.

Impact on Food Security and Household Economies

The results of the study indicate that hydroponics has the potential to serve as an alternative food source for households, particularly in meeting their needs for fresh vegetables. Through self-sufficient production, dependence on supplies from outside the region can be reduced. In addition, some participants have begun to see business opportunities arising from hydroponic cultivation, both in the form of vegetable sales and the sale of plant seedlings. This indicates that the PKM activity not only impacts technical aspects but also contributes to improving household economic conditions. According to Rohman et al. (2025), hydroponic systems hold great potential for enhancing food security while opening new business opportunities, particularly at the household level. Thus, this activity supports efforts to empower the coastal community's economy in a sustainable manner.

Program Participation and Sustainability

Partner participation in this initiative was high, as evidenced by their active involvement in every stage of the project, from training to facility maintenance. The partners' support in providing locations and labor, as well as their commitment to continuing the activities, were key factors in the program's success. The participatory approach used has proven effective in fostering a sense of ownership toward the program, thereby promoting the sustainability of activities after the program concludes. This aligns with the principles of community empowerment, which emphasize active involvement as the key to the success of community service programs (Praharsini et al., 2023; Rohman et al., 2025).

However, several challenges were encountered during the implementation of the activities, including limited capital for business scaling and the ongoing need for continued mentoring to ensure the sustainability of production. Therefore, support from various stakeholders, including the village government and relevant institutions, is required to strengthen the program's sustainability.

Conclusion

The Community Partnership Program (PKM) on Household-Scale Hydroponic Farming in Laguruda Village, Sanrobone Subdistrict, Takalar Regency, has proven effective in enhancing the knowledge and skills of the community at the household level. This program successfully introduced cultivation innovations adapted to land constraints and reduced the community's reliance on fluctuating sea conditions.

Through a participatory approach encompassing outreach, hands-on training, and mentoring, community members were able to understand and independently implement hydroponic techniques, from the seedling stage, through system assembly, to plant maintenance. The application of this technology also contributes to the optimal utilization of backyard land and has the potential to enhance household food security by providing fresh vegetables.

Additionally, this initiative opens opportunities for the development of productive small-scale businesses, which leads to increased income and community self-reliance, while also promoting the adoption of modern agricultural technologies that are water-efficient and environmentally friendly. The high level of partner participation is a key factor in the program's success and indicates good prospects for sustainability. However, to ensure sustainability and business scaling, continued support in the form of ongoing mentoring and access to capital is required.

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