

Community empowerment through catfish farming in water gallons to strengthen household food security

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Abstract

Limited productive land and growing food needs require food-security strategies that extend beyond production and strengthen community capacity and self-reliance. However, catfish farming in restricted containers is often viewed primarily as a technical solution, while its potential as a means of group empowerment remains less explored. This activity aimed to develop the knowledge and skills of members of the “NAMAMU” Women Farmers’ Group while strengthening group self-reliance through catfish farming in water gallons. The activity employed a Participatory Rural Appraisal (PRA) approach through group discussions, in-depth interviews, observation, hands-on farming practice, and descriptive qualitative analysis. The activity strengthened practical capacity, local resource utilization, participation and cooperation, and members’ commitment to continue the activity collectively and consistently. Its contribution lies in positioning catfish farming as an empowerment instrument that connects group capacity, social capital, self-reliance, and the potential to support household food security.

Keywords: Food security; Women farmers’ group; Women’s empowerment; Catfish farming; Group self-reliance.

Abstrak

Keterbatasan lahan dan meningkatnya kebutuhan pangan menuntut strategi ketahanan pangan yang tidak hanya berorientasi pada produksi, tetapi juga mampu memperkuat kapasitas dan kemandirian masyarakat. Namun, budidaya lele dalam wadah terbatas masih lebih sering dipandang sebagai solusi teknis, sementara potensinya sebagai sarana pemberdayaan kelompok belum banyak dikaji. Kegiatan ini bertujuan mengembangkan pengetahuan dan keterampilan anggota KWT “NAMAMU” sekaligus memperkuat kemandirian kelompok melalui budidaya lele dalam galon. Kegiatan menggunakan pendekatan *Participatory Rural Appraisal* (PRA) melalui diskusi kelompok, wawancara mendalam, observasi, praktik budidaya, dan analisis deskriptif kualitatif. Kegiatan menghasilkan penguatan kapasitas praktis, pemanfaatan sumber daya lokal, partisipasi dan kerja sama, serta komitmen anggota untuk melanjutkan kegiatan secara kolektif dan konsisten. Kontribusi kegiatan terletak pada pengembangan budidaya lele sebagai instrumen pemberdayaan yang menghubungkan kapasitas kelompok, modal sosial, kemandirian, dan potensi ketahanan pangan keluarga.

Kata Kunci: Ketahanan pangan; KWT; Pemberdayaan perempuan; Budidaya lele; Kemandirian kelompok.

Introduction

Food security is not simply a matter of producing more food; it also concerns whether households can access, utilize, and sustain adequate food from the resources available to them. The Food and Agriculture Organization of the United Nations (2006) defines food security in terms of the availability of sufficient, safe, and nutritious food and people's ability to access it, while its basic concepts further emphasize the dimensions of availability, access, utilization, and stability. In Indonesia, food security is also framed as a shared responsibility that requires the utilization of local resources to meet community needs, as reflected in Law No. 18 of 2012 on Food. Pujiyanto et al. (2025) emphasize that community participation is essential for translating available resources into practical food-security initiatives. Swastika et al. (2020) further highlight the importance of community-based approaches that strengthen local capacity in developing food security. Patel (2009) also emphasizes the importance of communities' capacity to exercise greater control over food systems and utilize local resources according to their needs. Food security therefore needs to be addressed not only through large-scale production but also through household and community initiatives that can utilize available resources sustainably.

Ensuring food security is a key measure for anticipating future food crises. According to the UN Population Fund (2000), by 2050, climate change is expected to pose a serious threat to food security, while approximately 2.32 billion people worldwide will need their food needs to be met. At the same time, land available for food production continues to decline as agricultural areas are converted for buildings, housing, and other development purposes. This situation affects not only food availability but also environmental quality and community well-being. Wahyuni and Shaliza (2026) emphasize that these pressures require community-based responses that mobilize local resources and participation. Community-based food production can therefore provide an adaptive response to spatial constraints, particularly when local groups are able to organize available resources around household needs (Sa'diyah & Nursaman, 2026). Various approaches, including backyard gardens, urban farming, and community-group empowerment, provide practical alternatives for food production under spatial constraints. Harani et al. (2025) demonstrate that micro-scale food farming can maximize limited residential space, reinforcing the relevance of small-scale production where productive land is increasingly constrained. The central challenge is therefore not simply the declining availability of productive land, but how communities can transform limited spaces and underutilized resources into sustainable food-producing activities.

The social organization of food production is equally important because physical resources alone do not guarantee sustainable collective action. Kusuma et al. (2017) emphasize that trust, social networks, cooperation, social norms, and participation can

strengthen communities' capacity to pursue shared objectives. Women Farmers' Groups provide a strategic setting for this process because women can participate directly in managing local resources, diversifying food sources, and developing productive household activities. Hasan et al. (2022) demonstrate that KWT-based empowerment can strengthen community participation in efforts to support household food security, while Windiasih et al. (2023) highlight the importance of women farmers' participation in empowering local food security. Khusna and Sari (2024) further show that the utilization of household food-producing spaces can expand women's productive roles. Yanfika et al. (2019) demonstrate that fish-farming activities can also be incorporated into women's empowerment programs through community-based aquaculture. Within this context, catfish farming in water gallons offers a practical innovation for limited spaces because it combines food production with opportunities for learning, participation, cooperation, and collective management. The activity therefore has relevance not only as a farming practice but also as a potential mechanism for strengthening women's roles within community-based food initiatives.

Research on community-based food security, women's empowerment, and small-scale aquaculture has been conducted through various approaches. Research by Dupuis et al. (2022) shows that empowering Women Farmers' Groups can strengthen household food security through the productive use of available resources, but its emphasis remains largely on the benefits generated by agricultural activities. Research by Intania et al. (2024) demonstrates that Budikdamlon, which combines catfish and water spinach cultivation in gallons, can provide a practical response to household food and economic needs, while Research by Wicaksana et al. (2026) similarly illustrates the potential of simple aquaponic systems using discarded gallons to support food production and economic empowerment. Research by Kusnadi (2014) indicates that household-scale catfish farming can function as a strategy for community empowerment. Research by Hudaya et al. (2021) likewise demonstrates the potential of fishery-based activities to support community empowerment, although its focus is directed toward fish-processing communities rather than the development of KWT group capacity. Abbas et al. (2023) further highlight the broader environmental and economic dimensions of fish-food production systems, while Azkiyah (2026) shows that integrated agricultural programs can strengthen the role of Women Farmers' Groups in household food security. These studies establish the practical relevance of small-scale food production and community-based empowerment, but the interaction among practical capacity, participation, social capital, and group self-reliance remains less explicitly examined. This gap highlights the need to understand how a simple aquaculture innovation can become part of a broader process of collective empowerment rather than functioning solely as a means of producing food.

Against this gap, this study aims to explore the development of knowledge and practical skills among members of the “NAMAMU” Women Farmers’ Group and examine the process of strengthening group self-reliance through catfish farming in water gallons in Ngurak-Urak Hamlet, Petir Village, Rongkop Subdistrict. The urgency of this activity lies in connecting a simple, space-efficient food-production innovation with women’s participation and collective resource management. Quisumbing et al. (1996) position women as important actors in household food security, particularly because women’s roles influence how food and productive resources are managed. Chambers (1997) emphasizes the importance of placing communities at the center of development processes by recognizing their knowledge, capacities, and realities as essential foundations for change. This perspective is particularly relevant to a KWT-based intervention because the value of the program depends on how members interpret, adopt, and collectively sustain the activity. Rather than treating catfish farming solely as a technique for producing household protein, this study positions it as a practical medium for strengthening group capacity, cooperation, and local initiative while creating a potential pathway toward community-based household food security.

Method

This study employed a Participatory Rural Appraisal (PRA) approach, which positions community members as active participants in identifying needs, planning, implementing, and evaluating activities (Chambers, 1994). The approach was selected to explore the experiences and circumstances of members of the “NAMAMU” Women Farmers’ Group (KWT), particularly regarding group activities, household food security needs, and the development of catfish farming in plastic containers. The activity involved 21 participants, comprising one village head, 14 KWT members, three students, and three faculty members from the Faculty of Social Development at Gunung Kidul University. The participatory process consisted of identifying the group’s needs and existing conditions, providing education on household food security, demonstrating and practicing catfish farming in plastic containers, and conducting discussions and evaluations with KWT members. The activity was conducted on November 13, 2025, at Ngurak-Urak Village Hall, Petir Village, Rongkop Subdistrict, with KWT members serving as the primary community participants.

Information was collected through group discussions and in-depth interviews to explore members’ experiences, perceived needs, responses to the program, and views regarding its continuation (Ningrum et al., 2026). The process was complemented by observations of participant engagement and interactions during practical activities. Educational sessions addressed household food security and the utilization of available local resources, followed by technical explanations and demonstrations of catfish farming in plastic containers, including container preparation, water

management, fry selection and stocking, feeding, and fish care. Participants were given opportunities to practice directly so that learning occurred through both material delivery and hands-on experience. The data were analyzed using a descriptive-qualitative approach, examining information from group discussions, in-depth interviews, participant responses, engagement during practical activities, and observed interactions. The analysis focused on participants' understanding of catfish farming, their responses to the activity, the suitability of the innovation to the group's conditions, and its potential for continuation in relation to household food security.

Activity achievement was assessed using four indicators: (1) members' engagement and participation during the activity; (2) participants' understanding of household food security and basic catfish-farming techniques; (3) the perceived suitability of the innovation to the needs and conditions of the Women Farmers' Group; and (4) the emergence of members' commitment and ideas to continue the activity collectively and consistently. Participant engagement was identified through observations and responses during the activity, while understanding, perceived suitability, and commitment were identified primarily through discussions and interviews. Documentation served as supporting evidence of the implementation process and participant engagement, consisting of activity photographs, a participant list, and administrative records. This combination of participatory observation, discussions, interviews, and documentation enabled the activity to be examined not only in terms of its technical implementation but also in terms of participant responses, group interaction, and the emerging potential for collective continuation of the program.

Results and Discussion

Implementation of activities and participation of the Women Farmers' Group

The community service activity was conducted on Thursday, November 13, 2025, at the Ngurak-Urak Village Hall, involving 21 participants: one village representative, 14 members of the "NAMAMU" Women Farmers' Group (KWT), three students, and three faculty members from Gunung Kidul University. The activity began with an opening address by representatives of Gunung Kidul University and a welcome speech from the village representative. It was followed by a session on the responsible use of social media, an introduction to the concept of household food security, and a technical explanation of catfish farming using used water gallons.

The implementation of the activity positioned members of the "NAMAMU" KWT as active participants throughout the process. Participants took part in discussions, received explanations regarding household food security, and were introduced to the practical aspects of catfish farming using plastic containers. The technical explanation covered container preparation, water management, fry selection and stocking, feeding, and fish maintenance. Participants were also given opportunities to engage directly in practical activities, allowing the learning process to take place not only through the

delivery of information but also through hands-on experience. The implementation process and participants' involvement in the program are presented in Figure 1.



Figure 1. Implementation of the community service activity with the “NAMAMU” Women Farmers’ Group

Source: Documentation of the community service activity, 2025.

The participation of KWT members was reflected in their enthusiasm for the program. The catfish farming program using used water gallons was considered relevant to the group’s previous activities. The use of used water gallons was also considered appropriate for community conditions characterized by limited land availability. In addition to producing catfish, the containers can also be utilized for hydroponic vegetable cultivation. Thus, limited space and containers can potentially be utilized for several activities related to household food provision.

The suitability of the program to the group’s conditions and needs was also expressed by the community representative, who stated:

“Catfish farming in plastic jugs is a program that can be utilized by Women Farmers’ Group members because it involves not only catfish but also hydroponic vegetables that can be grown in those jugs.”

A positive response was also expressed by members of the “NAMAMU” KWT. Participants expressed their hope that the activity could be implemented collectively and consistently. One member stated:

“Yes, that’s right – we hope this program can be carried out collectively and consistently, and it can also serve as a positive activity by sharing our efforts on social media, just as Ms. Ayik mentioned.”

This statement indicates participants’ acceptance of the program and their willingness to develop the activity collectively. The expectation that the activity would be implemented collectively also indicates elements of cooperation and division of roles within the group. Interactions during the activity demonstrated elements of social capital, including social networks, mutual trust, mutual assistance, and cooperation among KWT members. These elements are important in supporting the sustainability

of group activities because program continuity depends not only on technical skills in catfish farming but also on members' ability to cooperate and maintain the activity consistently.

From the perspective of women's empowerment, the activity provided KWT members with opportunities to participate in learning, discussions, practical activities, and the development of productive activities related to household food needs. Such involvement strengthens women's roles in managing household resources and food. Through catfish farming activities, KWT members were provided with opportunities to learn, interact, cooperate, and develop activities that could be applied within their household environments.

Catfish farming using used water gallons also has the potential to support household food security, particularly through the utilization of available resources under conditions of limited land. Simple fish production can serve as an alternative means of providing food for the household. In addition, the possibility of integrating fish farming with hydroponic vegetable cultivation provides an opportunity to optimize the use of limited space. In this context, the activity can be viewed not only as an introduction to fish farming techniques but also as an effort to utilize the natural, human, and social resources available within the community.

Overall, the implementation of the activity demonstrated active participation, positive acceptance, and interest among members of the "NAMAMU" KWT in the catfish farming program using used water gallons. The compatibility of the program with the group's previous activities, together with members' willingness to implement the activity collectively, provides a basis for further program development. Future implementation can focus on collective management, division of responsibilities, routine maintenance, strengthening members' technical capacity, and gradual development of catfish farming activities.

Strengthening group capacity and self-reliance through catfish farming

Catfish farming in water gallons may initially appear to be a simple technical activity: preparing containers, managing water, stocking fish, providing feed, and maintaining the fish. However, if empowerment is measured only by participants' ability to understand farming techniques, the social dimension of the activity is easily overlooked. The more important question is whether such a simple innovation can transform limited resources into opportunities for learning, cooperation, and collective action. In the context of the "NAMAMU" Women Farmers' Group (KWT), catfish farming is not merely a production activity separated from the group's social life; rather, it intersects with household food needs, the utilization of available resources, and members' willingness to sustain the activity collectively. Therefore, the relationship among capacity, participation, social capital, group self-reliance, and

household food security needs to be understood as an interconnected process, as illustrated in Figure 2.

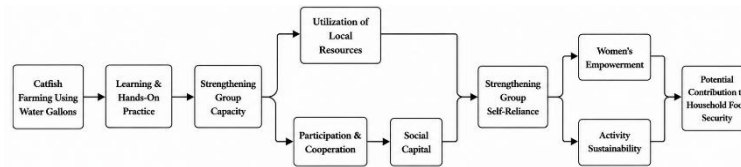


Figure 2. Community empowerment pathway through catfish farming

Source: Developed by the authors based on the findings of the community service activity.

Figure 2 is presented to illustrate that catfish farming in water gallons does not generate a single, isolated outcome but opens several interconnected pathways of change at the group level. The process begins with Catfish Farming Using Water Gallons as a medium for learning and hands-on practice, leading to Strengthening Group Capacity. This capacity then develops through two complementary pathways: Utilization of Local Resources and Participation & Cooperation, with the latter developing into Social Capital. These pathways converge in Strengthening Group Self-Reliance, which is subsequently associated with Women's Empowerment and Activity Sustainability, before leading to the Potential Contribution to Household Food Security. The figure does not position household food security as an automatic outcome because the activity did not measure changes in household consumption, income, fish production, or food security indicators quantitatively. Thus, Figure 2 serves as a conceptual synthesis of the relationships among the findings emerging from the activity rather than as a statistically tested causal model.

The most concrete initial process can be seen in the participants' learning and hands-on practice. Participants did not merely receive information about household food security and catfish farming but were also involved in demonstrations and practical activities covering container preparation, water management, fry selection and stocking, feeding, and fish care. This process indicates that group capacity was developed through direct experience rather than through information transfer alone. Within the resources–agency–achievements framework, Kabeer (1999) positions knowledge, skills, and resources as foundations that enable individuals or groups to expand their capacity to act. From this perspective, farming practice becomes significant not because participants simply “know how to raise catfish,” but because such knowledge is translated into action. Rowlands (1997) similarly views empowerment as a dynamic process involving both personal capacity and the ability to act collectively. This pattern is consistent with Research South et al. (2024), which demonstrates that practice-based learning can strengthen community capacity when knowledge is translated into direct experience. In the “NAMAMU” KWT, however, this dimension becomes more meaningful because the learning process is situated

within the group's existing needs and household context, allowing technical capacity to function as an initial resource for collective activity.

The capacity developed through the activity becomes more meaningful when the group is able to recognize and utilize resources available in its immediate environment. Used water gallons are positioned as cultivation containers that can be applied under conditions of limited land, while the same containers are also considered capable of being integrated with hydroponic vegetable cultivation. The hamlet head specifically viewed the model as relevant to KWT members because it could produce not only catfish but also vegetables using the same type of container. This situation can be interpreted through Sen's (1981) perspective, which does not equate food security simply with aggregate food availability but emphasizes people's ability to obtain and command food through their available entitlements. When households utilize previously unproductive resources to produce food, an additional pathway for accessing food through self-production becomes available. Maxwell (1996) extends this perspective by placing household food security within a livelihood framework, suggesting that food strategies should not necessarily be understood through large-scale agricultural production alone. Consistent with Research Lakhier et al. (2025), the use of simple containers can function as a household food-production strategy under conditions of limited space. The "NAMAMU" case, however, adds another dimension by demonstrating that resource utilization can simultaneously become a collective learning process through which group members identify and mobilize local potential.

Resource utilization alone does not fully explain why the activity received a positive response from members. What moves the innovation from a simple technology toward a group-based activity is participation and cooperation. Fourteen KWT members were among the 21 participants, and their involvement was reflected in their enthusiasm toward a program they considered consistent with the group's previous activities. Participants also expressed the hope that the program could be implemented collectively and consistently. At this point, Putnam's (2000) concept of social capital becomes relevant because social networks, trust, reciprocity, and cooperation provide an important foundation for collective action. Participation, therefore, should not be reduced to the number of people attending an activity. More importantly, participation can develop into relationships that enable members to coordinate and sustain collective activities. Research Zainuri and Huda (2023) similarly found that cooperation and interpersonal relationships contribute to the sustainability of group-based programs. The "NAMAMU" case indicates that social capital can emerge even at an early stage, particularly through members' willingness to carry out the activity collectively and consistently. Social capital, therefore, is not merely a social background to the activity but begins to function as a mechanism connecting participation with sustainability.

This relationship becomes increasingly important when the discussion turns to group self-reliance. Members' desire to continue the activity collectively and consistently indicates an orientation toward maintaining the program beyond the initial community service intervention. At the same time, the manuscript identifies collective management, division of roles, routine maintenance, and gradual expansion of production as important directions for sustaining the program. From Ostrom's (1990) perspective, a group's ability to organize collective action and develop mechanisms for shared management constitutes an important component of collective action and self-governance. This perspective helps clarify that self-reliance does not necessarily mean that a group must immediately become economically independent from external support. In this context, self-reliance is more appropriately understood as the group's emerging capacity to organize, divide responsibilities, and maintain activities collectively. Research Sutomo et al. (2024) emphasizes group self-reliance primarily in terms of the ability to sustain activities independently. The "NAMAMU" findings extend this understanding by showing that collective commitment and ideas concerning role distribution can represent an initial stage in developing self-management capacity. Since the long-term continuation of the program was not yet measured, strengthening group self-reliance is therefore more appropriate than claiming that the group has already achieved complete independence.

This emerging group self-reliance also creates a broader space for women's empowerment. KWT members were not positioned merely as recipients of information but were involved in learning, practical activities, interaction, cooperation, and the development of productive activities directly related to household food needs. Moser (1993) views gender-responsive development planning as a process that must consider women's positions and needs while strengthening their organizational capacity. From this perspective, catfish farming gains social significance because it creates a space for women to participate in resource management and group activities. Cornwall (2016) further argues that empowerment should not be treated as a final status automatically produced by a program but as a process developed through opportunities to act, negotiate, and build capacity. Research Uduji and Okolo-Obasi (2025) demonstrates that productive group-based activities can expand women's opportunities for participation. The "NAMAMU" findings reinforce this argument while adding a collective dimension: women's empowerment does not emerge solely from acquiring farming skills but also from opportunities to learn together, cooperate, and participate in decisions concerning the continuation of the activity.

Ultimately, the entire process returns to the issue of household food security, although this relationship must be interpreted carefully. Catfish farming in water gallons provides an alternative form of food production that can be implemented in limited spaces, while the use of used containers and the possibility of integrating vegetable

cultivation create opportunities to utilize a single space for multiple food-related activities. Maxwell (1996) helps explain that household food security cannot be understood solely as a matter of food availability but is also related to households' ability to access and sustain livelihood resources that support food needs. From Sen's (1981) perspective, self-production can likewise expand one pathway through which households obtain access to food. Research Hossain et al. (2024) demonstrates that household-scale fish farming can function as one strategy for supporting food security. The "NAMAMU" activity points in the same direction, but it does not provide evidence that household food security has already improved because there were no measurements of production, consumption, food expenditure, or household food security indicators before and after the activity. Therefore, the defensible contribution of the activity is not a direct claim of improved food security, but rather the creation of a household food-production mechanism with the potential to strengthen access to and utilization of food.

Overall, the principal strength of this activity lies not in the simplicity of catfish farming technology itself, but in its ability to function as a medium for social organization. The activity provided participants with practical experience, encouraged them to recognize the relevance of local resources, generated participation and willingness to work collectively, and stimulated discussion about consistency and sustainability. These processes explain why capacity, social capital, self-reliance, and women's empowerment are positioned sequentially in Figure 2. Nevertheless, a critical evaluation remains necessary: the activity does not yet demonstrate a quantitative impact on household food security and cannot confirm the long-term sustainability of production after the intervention has ended. Its primary value lies in establishing an initial foundation—knowledge, practical experience, participation, cooperation, and collective commitment—that can develop into greater group self-reliance when supported by routine management, clear division of roles, continuous technical capacity building, and periodic evaluation. In this position, catfish farming in water gallons is more appropriately understood as a group-based empowerment instrument that creates a pathway toward household food security, rather than as immediate evidence that food security has already been achieved.

Conclusion

The catfish farming activity using used water gallons generated more than a technical introduction to household aquaculture. The activity created a practical learning space in which members of the "NAMAMU" Women Farmers' Group could develop basic farming knowledge, recognize the potential of locally available resources, and participate in collective activities. The combination of hands-on practice, group interaction, and discussion encouraged members to view limited land not only as a constraint but also as a condition that could be addressed through simple and

adaptable food-production practices. The most important outcome was therefore the emergence of a process linking capacity building, resource utilization, participation, cooperation, and group self-reliance. This process matters because the value of the intervention lies not primarily in the catfish produced, but in how a simple farming innovation can provide women with a practical mechanism for learning, organizing, and managing productive activities collectively. The expressed commitment to continue the activity collectively and consistently further indicates that the program established an initial foundation for continued group action and potential support for household food security.

The activity contributes conceptually and practically by positioning simple catfish farming as a community-based empowerment instrument that connects women's participation, local resource utilization, social capital, and household food needs. Its contribution, however, should be interpreted within the limits of the available evidence. The activity did not measure changes in fish production, household income, food consumption, or standardized household food-security indicators, nor did it evaluate whether the group actually maintained production over a longer period. Consequently, the activity cannot yet establish a causal or quantitative improvement in household food security; it demonstrates instead an initial pathway toward that outcome. Future programs should therefore follow the group beyond the intervention period and evaluate production continuity, household utilization of fish and vegetables, changes in food access, technical competence, role distribution, and group-level management. Periodic evaluation, clearer division of responsibilities, continued technical assistance, and gradual expansion of production would strengthen the possibility that the initial participation and collective commitment develop into sustained group self-reliance and a more tangible contribution to household food security.

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