



Community Empowerment and Economic Strengthening through Cage Fish Farming in Gredek Village

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Abstract

Purpose: This study aims to examine the role of cage system fish farming in Gredek Village, Gresik Regency, as a community empowerment strategy to enhance local welfare, economic independence, and skill development.

Research Methodology: A qualitative descriptive approach was employed. Data were collected through in-depth interviews with fish farmers, cooperative managers, and representatives from the Gresik Fisheries Department, as well as through direct observation and documentary review of program activities and outcomes.

Results: Findings indicate that 85% of participants gained basic fish farming skills, while 70% still face marketing and capital access challenges. Approximately 65% lack knowledge in water quality and fish health management, and 80% report fluctuating feed prices affecting production efficiency. Despite these constraints, the cage system program effectively enhanced community skills, income (increasing 25–30%), and economic independence, while fostering social cohesion and collective action.

Conclusions: Cage system fish farming serves as a viable empowerment strategy that strengthens both economic and social resilience in rural communities. The program's success is underpinned by participatory planning, technical training, field assistance, and institutional support through farmer groups (Pokdakan).

Limitations: Challenges remain in stabilizing feed prices, expanding market access, and providing capital, which can hinder program scalability and long-term sustainability.

Contributions: This study contributes to community empowerment literature by demonstrating how locally adapted aquaculture interventions enhance technical skills, economic independence, and social cohesion. The findings offer practical guidance for policymakers and local governments in designing sustainable fisheries-based empowerment programs.

Keywords: Empowerment, Fish Farming, Sustainability, Village Community Welfare

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1. Introduction

Community empowerment is the responsibility of academics, as part of educational institutions, that play a role in improving community welfare. This empowerment is a strategy for building communities by focusing on local problems and needs (Setiawan et al., 2021). Considering the current situation

of rural communities who are still living in poverty and economic backwardness, there is a need for empowerment programs that can improve the economic conditions of villages, so that communities become more prosperous and independent by utilizing the resources they have available ([Akhirudin & Purnomo, 2023](#); [Natonis, 2023](#)).

Aquaculture development is a community empowerment program that has the potential to develop rural community resources. According to data from the East Java Statistics Agency (BPS), aquaculture potential exceeds 1.2 million tons. Gresik Regency, including Gredek Village, is a major contributor to this sector. These data indicate that the fish farming sector has significant potential for further development in rural areas, including Gredek Village, which boasts natural resource potential and favorable market access. The legal foundation supporting this empowerment program is Law Number 6 of 2014 concerning Villages, which states that villages have the authority to manage their natural resources and village assets to improve community welfare. In addition, Government Regulation Number 60 of 2007 concerning the Conservation of Fish Resources emphasizes the importance of sustainable fisheries resource management, making fish farming development a strategic step in enhancing community prosperity and resilience ([Arief et al., 2023](#); [Sari et al., 2022](#)).

Fish farming serves as a primary source of income for many families and provides employment opportunities for individuals previously engaged in agriculture or other less productive sectors ([Kuswanti & Purnomo, 2023](#); [Njiru et al., 2019](#)). As this sector develops, the people of Gredek Village can improve their standard of living through stable and sustainable income generated from fish farming, directly contributing to their overall welfare. Beyond its economic and health benefits, the fisheries sector also generates a multiplier effect on the local economy ([Darwis et al., 2022](#); [Endah, 2020](#)). The success of fish farming stimulates the growth of various supporting businesses, such as fish feed supply, fish distribution and sales, and fish processing industries. Thus, fish farming creates an economic ecosystem involving multiple sectors, with its impact extending beyond fish farmers to other business actors engaged in the fisheries value chain ([Imtihan et al., 2023](#); [Purnamasari & Riyadi, 2023](#)).

The fisheries sector plays a vital role in stabilizing village economies. During times of economic uncertainty, fish farming has proven to be more resilient to economic fluctuations than other sectors ([Fianti, 2023](#); [Maheswara et al., 2023](#)). The relatively stable fish market and continuously increasing demand in local and regional markets have enabled this sector to sustain growth. This makes it a reliable economic buffer for Gredek Village, even during economic crises. As the fisheries sector, particularly fish farming, continues to develop, the overall welfare of the community improves. Higher income from fish farming provides better access to healthcare, education, and other basic necessities. Moreover, with a stable income, residents can invest in housing development, improve their quality of life, and contribute to the social and economic advancement of the Gredek Village. Therefore, the fisheries sector, especially through cage fish farming, serves as the backbone of the local economy and as a key element in promoting sustainable community welfare ([Erwantiningsih et al., 2022](#); [Fathmadi, 2021](#)).

Like many other rural areas, the community of Gredek Village faces various socioeconomic challenges that affect their quality of life. One of the major issues is poverty, which stems from limited access to economic opportunities ([Indriasih et al., 2022](#); [Khotijah, 2023](#)). Most residents depend on traditional agriculture, which often fails to generate adequate income because of factors such as unpredictable weather, fluctuating commodity prices, and limited productive land. Consequently, many families in Gredek Village live below the poverty line. Unemployment also poses a significant challenge in the Gredek Village. The lack of job opportunities outside the agricultural sector means that most of the working-age population does not have stable employment in the formal sector. Many are trapped in seasonal or informal work that does not provide sufficient income to meet their daily needs. The limited availability of alternative jobs has made it difficult for young people in the village to achieve economic

independence, often leading to migration to urban areas in search of employment, although this move does not always guarantee better economic conditions for them (Mendos et al., 2024; Wijayanto & Purnomo, 2023).

Restricted access to business capital is also a socioeconomic problem faced by the people of Gredek Village. Many residents aspire to start or expand their cage fish farming operations but lack sufficient access to financing and capital support. This situation is worsened by the scarcity of credit programs that are accessible and favorable to small-scale farmers and fishermen. Consequently, their potential to increase their income through fish farming or other business ventures is hindered, further perpetuating the cycle of poverty within the village (Nasir, 2021; Sinta & Purnomo, 2023).

Community empowerment through fish farming using the cage system is an effective solution for addressing socio-economic challenges in Gredek Village. The cage system allows the community to optimize the use of local water resources to produce fishery products with high economic value. Through this program, residents are not only taught technical skills in fish farming but are also encouraged to become more economically independent by sustainably managing fishery enterprises (Hadinata et al., 2023).

One positive impact of the cage fish farming program is the increase in community income. By farming fish more efficiently, residents can increase production and sell it in local and regional markets (Sugiri, 2019; Sumarsono et al., 2024). The rising demand for fish allows farmers in Gredek Village to earn a stable income while creating new job opportunities in cage preparation, fish maintenance, and harvest distribution. This program is often accompanied by training and technical assistance, enabling community members to learn about fishery business management, financial management, and more efficient and environmentally friendly fish-farming techniques (Fathmadi, 2021). The development of these skills is crucial as it provides opportunities for the community to continue growing and innovating. In addition, cage farming activities are typically conducted in groups, which helps strengthen social cohesion and solidarity among residents.

Based on the explanation above, the author intends to conduct a study entitled “The Role of Cage System Fish Farming on the Empowerment and Economic Strengthening of the Community of Gredek Village, Gresik Regency.” This research aims to analyze the effectiveness of community empowerment programs through cage system fish farming, evaluate their socio-economic impacts, and identify the challenges faced in implementing the program.

2. Literature Review

2.1 *Cage System Fish Farming and Community Empowerment*

Cage system fish farming has become an increasingly popular method for rural economic development, particularly in coastal communities with abundant water resources. This aquaculture technique allows communities to utilize rivers, lakes, or coastal areas efficiently, creating sustainable income opportunities and employment for local residents (Araujo et al., 2022; Chu et al., 2020). Cage aquaculture not only provides a source of protein but also serves as a mechanism for skill development, fostering self-reliance and community engagement. The empowerment aspect of cage fish farming extends beyond technical training. According to Njiru et al. (2019), participatory approaches involving cooperative planning, training sessions, and mentoring programs significantly improve farmers’ knowledge, confidence, and ability to independently manage aquaculture operations. Participation in decision-making processes strengthens social capital and builds leadership capabilities within local communities, enhancing their capacity to implement sustainable practice (Nyakeya et al., 2022; Shamsuddin et al., 2022).

Moreover, cooperative institutions such as Pokdakan (Kelompok Pembudidaya Ikan) provide organi-

zational structures that facilitate collaboration, information sharing, and collective problem-solving (Arief et al., 2023). These networks improve access to critical resources, including feed, fingerlings, and marketing channels, which are essential for scaling fish farming operations. By integrating technical, organizational, and social empowerment, cage system programs help build resilient communities capable of adapting to environmental and market changes (da Silva Cacho et al., 2020).

2.2 Economic Strengthening Through Fish Farming

Fish farming in cages significantly contributes to local economic strengthening by providing direct income generation and increasing household financial security. According to Fianti (2023), stable production systems and growing demand for freshwater and brackishwater fish allow households to secure additional revenue streams, reducing dependence on traditional agriculture or wage labor. Research shows that combining aquaculture with business skills, such as financial management and marketing, amplifies the economic benefits (Erwantiningsih et al., 2022). Communities that adopt value-added practices, such as producing processed fish products, can increase profitability while diversifying income sources. These strategies not only improve household welfare but also enhance local market development and encourage entrepreneurship.

Sustainability of income is influenced by the efficiency of production processes, proper feed management, and environmental stewardship. Fianti (2023) highlight that successful cage system farmers employ adaptive strategies to mitigate risks, including fluctuating feed prices and environmental challenges. These approaches ensure that aquaculture remains a viable source of economic empowerment for long-term community development.

2.3 Social Cohesion and Skill Development

Cage system programs also contribute to community cohesion by fostering collaboration among fish farmers. Collective action through Pokdakan facilitates mutual assistance in problem-solving, technology adoption, and resource sharing (Arief et al., 2023). Social cohesion enhances trust and communication within the community, which is crucial for maintaining consistent production standards and cooperative marketing efforts. Skill development is a core outcome of empowerment initiatives. According to Fathmadi (2021), technical training in water quality monitoring, feed management, and fish health management equips farmers with the knowledge needed for sustainable production. Simultaneously, workshops on cooperative governance, record-keeping, and marketing improve managerial capabilities, enabling participants to make informed business decisions.

Furthermore, social networks created through cooperative groups increase resilience during environmental or economic shocks. Communities that collaborate effectively are better positioned to access loans, negotiate fair prices, and respond to market changes. These outcomes reinforce the dual impact of cage aquaculture on economic growth and social capital, making it a holistic tool for rural empowerment.

2.4 Challenges and Supporting Factors

Despite its benefits, cage system aquaculture faces multiple challenges. Limited capital, variable feed prices, and fluctuating market demand can constrain growth and limit the sustainability of community empowerment programs (Oon et al., 2023; Proctor et al., 2020). Technical challenges, such as maintaining water quality and preventing disease outbreaks, also require ongoing training and monitoring. Supportive factors include government assistance, access to infrastructure, and institutional frameworks that promote knowledge sharing. Programs that integrate participatory planning, consistent field mentoring, and access to cooperative networks demonstrate higher success rates in improving both income and social empowerment (Perkins & Zimmerman, 1995). Environmental considerations, including proper site selection and sustainable feed use, are essential to avoid overexploitation of natural resources (Izah & Ogwu, 2025).

Overall, the literature highlights that the combination of technical skills, economic strategies, and social cohesion is critical for the long-term success of cage system fish farming. Empowerment interventions that address these interrelated factors effectively can produce significant gains in income, social capital, and community resilience, providing a model for sustainable rural development ([Bohara et al., 2024](#); [Kulwant & Yadav, 2024](#)).

3. Methodology

3.1 Type of Research

In this study, a qualitative method was chosen to analyze community empowerment through the cage fish farming system in Gredek Village, Gresik, Indonesia. The selection of this method aligns with the research focus on exploring an in-depth understanding of how the empowerment program operates and its impact on improving community welfare. This approach also identifies the supporting and inhibiting factors that influence the program's success. The research results are expected to provide recommendations for developing more effective empowerment programs ([Suyatna et al., 2024](#)).

3.2 Research Focus

This study focuses on community empowerment through the cage fish farming system in Gredek Village, Gresik. The goal is to understand the extent to which the cage system can improve community welfare by optimizing local resources for fish farming. The study also identifies the supporting and inhibiting factors in implementation and examines its impact on economic independence and the management of the village's natural resources. The analysis employs Jim Ife's Community Empowerment Theory Ife 1997, which includes four key aspects: resources, opportunities, knowledge, and skills. These aspects form an analytical framework for understanding how local fishery potential can be utilized to promote sustainable community empowerment ([Andari et al., 2023](#)).

3.3 Research Location

The research location is the site where the researcher observes, explores, and collects data. This study was conducted in Gredek Village, Panggangsampeyan Subdistrict, Gresik Regency, East Java. This village was chosen because it has great potential in aquaculture, particularly in cage fish farming, and is a key contributor to fishery production in Gresik Regency. Additionally, the location provides good access to natural resources and local markets, which are essential factors for this study.

4. Results and Discussion

4.1 Results

The results of the study show that the role of fish farming in the cage system in empowering and strengthening the economy of the people of Gredek Village, Gresik Regency, has a significant influence on increasing the skills, income, and economic independence of the community members. This empowerment program is carried out through a participatory approach between the village government, the Fisheries Service, and fish farming groups (Pokdakan), who jointly design, implement, and evaluate activities to achieve the goal of improving the welfare of the village community. Gredek Village has considerable water resources and favorable environmental conditions for fish farming. Most of the population makes a living in the agriculture and fisheries sectors; therefore, cage system fish farming activities are one of the economic alternatives that are relevant to local potential. Support for village infrastructure, such as US Irrigation canals, stable water sources, and adequate road access, also supports the success of this program. The village government uses the potential of these resources to develop sustainable community economic activities through a cage fish cultivation system in village waters ([Palsa & Yustiati, 2023](#)).

The implementation of community empowerment programs through fish farming in cage systems is conducted in stages. The first stage is planning and socialization, which is carried out openly and participatively to ensure that the program is in accordance with the community's needs. Furthermore, technical training was conducted, where the community gained knowledge about making cages, feed management, fish disease control, and good harvesting techniques (Santi et al., 2019; Soeprapto & Ariadi, 2022). After that, the community received field assistance from Fisheries Service officers to ensure that the application of cultivation techniques was according to standards and to help overcome technical obstacles in the field. The last stage is institutional evaluation and strengthening, which is carried out through the establishment of a fish farming group (Pokdakan) as a forum for collaboration, discussion, and program sustainability (Basir et al., 2022).



Figure 1. Implementation Activities of Empowerment

Based on the results of interviews with the community and related officials in Figure 1, most of the respondents stated that this program was effective in improving the community's technical capabilities and productivity. Approximately 85% of the participants were able to manage fish farming activities independently after participating in training and mentoring. Some participants have even developed new businesses based on fish product processing, such as making smoked fish and processed fish feed independently, which has also increased the economic value at the household level.

From an economic perspective, the implementation of the cage system fish farming program has a real impact on increasing community income. On average, people experienced an increase in income of 25-30% compared to before participating in the program. The increase occurred because the community was able to increase production and save operational costs through the innovation of locally sourced alternative feed. From a social perspective, fish farming activities also strengthen solidarity and the spirit of mutual cooperation among residents. Fish farming groups are forums for sharing experiences, exchanging knowledge, and helping each other overcome business obstacles. This shows that the program not only improves the community's economy but also strengthens social cohesion at the village level.

The results of the study also show that the success of this empowerment program cannot be separated from several supporting factors, including the potential of abundant natural resources, support from the village government and the Fisheries Service, as well as the enthusiasm and spirit of community cooperation. However, several obstacles remain, such as fluctuations in feed prices that affect production costs, limited capital for small communities, and limited market access. Nevertheless, the community has demonstrated adaptive ability through alternative feed innovation and self-marketing strategies,

illustrating their increasing capacity and independence in the face of economic challenges.

Overall, the results of this study illustrate that the cage system fish farming program in Gredek Village has succeeded in empowering the community and strengthening the local economy by increasing skills, knowledge, and social solidarity. This program is a concrete example of the application of the concept of community empowerment based on local potential that can provide a sustainable socioeconomic impact for villagers.

4.2 Discussion

Community empowerment through cage system fish farming in Gredek Village represents an effective local potential-based economic development strategy to improve community welfare. Prior to program implementation, the community faced several obstacles, including limited access to resources, lack of technical knowledge, and insufficient managerial capacity. Through the empowerment program facilitated by the village government and the Fisheries Office, the community received comprehensive support in the form of training, provision of facilities, and institutional strengthening of local fishery enterprises. Based on the results, community empowerment in Gredek Village is reflected through four main aspects, as outlined by Ife 1997 : the provision of resources, the creation of opportunities, the enhancement of knowledge, and the development of skills.

First, the provision of resources is implemented through the distribution of fish cages, seeds, and financial assistance from the local government to the farmers. This support has helped the community improve productivity and efficiency in aquaculture. Nevertheless, challenges remain, particularly fluctuations in feed prices and limited access to financing, which constrain business expansion in the industry. These findings align with the mandate of Law Number 6 of 2014 on Villages and Government Regulation Number 27 of 2021 concerning the Implementation of the Marine and Fisheries Sector, both of which emphasize sustainable utilization of local resources.

Second, opportunities are realized through the active involvement of community members in technical training and decision-making processes. This inclusivity fosters a sense of ownership and collective responsibility within the program itself. However, limited market access and unstable fish prices continue to hinder the economic growth. This initiative aligns with Law Number 25 of 2009 on Public Services and Ministerial Regulation Number 41 of 2014 on the Empowerment of Marine and Fisheries Communities, emphasizing public participation in development processes.

Third, knowledge improvement is achieved through continuous training and mentoring activities designed to strengthen technical expertise in fish farming, water quality management and fish health maintenance. These efforts have proven effective in enhancing community understanding of Good Fish Farming Practices (CBIB), as specified in Ministerial Regulation Number 49 of 2011, leading to more sustainable and environmentally friendly aquaculture practices.

Fourth, skill development focuses on both technical and managerial aspects, including cage maintenance, financial recording, and production management. This increased skill capacity has made the community more professional and self-reliant in managing fish-farming businesses. Such initiatives are consistent with Law Number 20 of 2003 on the National Education System, which highlights the importance of nonformal education in building community capacity.

Beyond these four main aspects, the study also identified several supporting and inhibiting factors affecting program implementation. The supporting factors include the availability of adequate natural resources, strong support from the local government, and high community cooperation through joint business groups (Pokdakan). However, the inhibiting factors consist of feed price fluctuations, limited access to capital, narrow market reach, and suboptimal infrastructure facilities.

Overall, the empowerment program through cage system fish farming in Gredek Village has positively impacted the community's technical skills, knowledge, and income levels. The program has successfully developed the community's social and economic capacities, although further strengthening is still needed in terms of market access and financial support to ensure sustainability. These findings reinforce the theory of community empowerment, which emphasizes that the success of community-based development depends on active community participation and sufficient structural support. Therefore, empowerment through fish farming in the cage system not only increases income but also strengthens social independence and economic resilience in rural communities.

5. Conclusions

Community empowerment through fish farming using the keramba (floating net cage) system in Gredek Village reflects Jim Ife's theory, which emphasizes four key aspects: resources, opportunities, knowledge, and skills. In this study, these aspects are interconnected in enabling the community to develop independent and sustainable fish-farming practices using the keramba system. The provision of resources such as cages, fish seeds, feed, and financial support, enhancement of knowledge through training, creation of opportunities through technical training, mentoring, market access, and participation in fishery business management, as well as the development of technical, managerial, and marketing skills, have become key steps in ensuring the success of this empowerment program, which ultimately aims to improve community welfare. The provision of these resources has enabled the people of Gredek Village to increase the productivity of their fish farming activities, although further evaluation is still needed to address constraints such as limited access to financing and fluctuations in feed prices. The opportunities created through the program have encouraged active community participation, improved aquaculture skills, optimized production outcomes, and contributed to higher income and welfare despite challenges in market access. Furthermore, the improvement of community knowledge through training on cage management, feed application, water quality control, fish health management, and environmental sustainability has strengthened the community's confidence and independence in managing fish farming activities. At the same time, skill development has enhanced the community's ability to manage businesses, reduce financial risks, and take advantage of broader market opportunities, thereby supporting sustainable empowerment. Overall, this study demonstrates that community empowerment through fish cage farming in Gredek Village, Gresik Regency, has positively contributed to improving community welfare in line with Jim Ife's empowerment theory and Law No. 6 of 2014 on Villages, although challenges such as fluctuating feed prices, limited access to financing, and distribution constraints continue to hinder program optimization. Therefore, continuous evaluation and program development remain essential to ensure more comprehensive implementation and greater long-term impacts on the welfare of the Gredek Village community.

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Author Contributions

MBG contributed to conceptualization, methodology, and writing of the original draft; SK was responsible for data collection, formal analysis, and supervision; KD handled literature review, validation, and project administration; ZF provided expert consultation, data interpretation, and review of technical aspects; and

RTP contributed to final manuscript review, critical editing, and approval of the version to be published.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this study. This research was conducted independently, and no financial or personal relationships influenced the results or interpretation of the findings.

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