

Success Level of Nile Nile Fish (*Oreochromis Niloticus*) Cultivation In Supporting Food Security In Sukaraya Village, Bekasi Regency

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Abstract.

*This study aims to analyze the success level of Nile tilapia (*Oreochromis niloticus*) farming in supporting food security in Sukaraya Village, Bekasi Regency, identify factors influencing farming success, and examine its contribution to community food security. A qualitative method with a case study approach was employed. Data were collected through observation, interviews, documentation, and questionnaires involving village officials, program facilitators, relevant institutions, and 15 beneficiary Nile tilapia farmers participating in the village food security program. The success level of farming was assessed based on the implementation of Good Fish Rearing Practices (CPIB), farming productivity, and actual production achievement compared to the established production targets. The contribution to food security was analyzed through the dimensions of food availability, accessibility, and utilization. The results indicate that CPIB principles were generally implemented well in terms of farming facility preparation, seed selection, feeding practices, fish health management, harvesting, and post-harvest handling. However, farming productivity was constrained by suboptimal feed management, unstable water quality, and relatively high fish mortality rates in several ponds. Based on the production evaluation of 15 farmers, 3 were categorized as successful, 5 as unsuccessful, and 7 as failed. These findings suggest that farming success remains varied and is strongly influenced by farmers' technical capacity to apply proper aquaculture practices. Nevertheless, Nile tilapia farming contributes to food security by increasing the availability of animal protein sources, improving access to nutritious food, and supporting household food consumption. Therefore, strengthening farmers' capacity, providing continuous technical assistance, and implementing intensive monitoring are necessary to enhance productivity and ensure the sustainability of the program.*

Keywords: Nile tilapia farming, Good Fish Rearing Practices (CPIB), productivity, farming success and food security.

I. INTRODUCTION

The United Nations (UN) has placed food security as one of the global development agendas through the Sustainable Development Goals (SDGs), specifically the second goal, Zero Hunger, which focuses on eliminating hunger, improving nutritional quality, achieving food security, and developing sustainable agriculture. Indonesia, as part of the global community, has a responsibility to ensure the availability of sufficient, safe, nutritious, and affordable food for all. These efforts need to be supported through the utilization of local resources, strengthening village institutions, and community participation in productive activities that can increase food availability (Rumawas et al., 2021). In line with Law Number 18 of 2012 concerning Food, food security is not only related to food availability, but also the community's ability to access and utilize food sustainably. Kaminski et al. (2024) showed that the development of small-scale aquaculture can increase the diversification of food consumption, access to animal protein, and household food security, especially in rural areas.

In an effort to support village food security, the government is directing the use of Village Funds for productive activities based on local potential. Through Regulation of the Minister of Villages, Development of Disadvantaged Regions, and Transmigration of the Republic of Indonesia Number 2 of 2024 concerning Operational Guidelines for the Focus of Village Fund Use in 2025, a minimum of 20% of Village Funds is allocated for food security programs that consider aspects of food availability, affordability, and utilization. This policy provides opportunities for villages to develop various productive activities according to regional characteristics, including the aquaculture sector. Sarjiyanto et al. (2024) explain that the use of Village Funds in productive sectors can increase community economic capacity if supported by adequate resource management and active community participation.

Based on the Food Security and Vulnerability Atlas (FSVA) of Bekasi Regency, Sukaraya Village is included in priority category 5 with a score of 4.8, indicating a somewhat food insecure condition. Meanwhile, the Bekasi Regency Food Security Index of 74.55 is in the moderately food secure category. However, the level of fish consumption in Bekasi Regency is still relatively low, at 21.67 kg/capita/year, far below the national average of 59 kg/capita/year (KKP, 2024). This condition indicates that the fulfillment of the community's animal protein needs is still limited, so efforts are needed to increase production and access to nutritious food sources.

Sukaraya Village has an area of 3.36 km² with a relatively high population compared to other villages in Karang Bahagia District. On the other hand, the development of industrial and residential areas has reduced productive agricultural land, necessitating alternative activities that can utilize land more efficiently. One effort undertaken by the village government is to develop tilapia (*Oreochromis niloticus*) cultivation using circular tarpaulin ponds at 15 cultivation locations. Nugrahaini et al. (2025) stated that the utilization of yard land through fishery cultivation activities can be an effective alternative in increasing household food availability while supporting community income.



Fig. 1. Map of Sukaraya Village



Fig. 2. Red Tilapia

Tilapia was chosen because it has relatively fast growth, a high level of adaptation to environmental changes, is easy to cultivate, and has a good protein content for community nutritional needs. The use of circular tarpaulin ponds is considered more efficient because it can support better water circulation and facilitate cultivation management (Mahargyo et al., 2025). In this activity, each pond has a diameter of 3 meters with a stocking capacity of 850–1,000 fry and a maintenance period of around 3–4 months until reaching consumption size. In addition, farmers also utilize alternative feeds such as azolla and cassava to reduce production costs. Tang et al. (2024) explained that the success of tilapia cultivation is influenced by the quality of the fry, feed management, and the ability of farmers to maintain the quality of the cultivation environment.

Despite its significant potential, pre-survey results indicate that some farmers are experiencing declining yields due to high fish mortality rates and suboptimal cultivation management. This situation indicates differences in success rates among farmers, which may be influenced by the implementation of Good Fish Breeding Practices (GFP), water quality management, feeding, and technical skills in carrying out cultivation activities. Ansyari et al. (2024) stated that the success of tilapia cultivation is greatly influenced by water quality management, stocking density, and the application of good cultivation principles to achieve optimal productivity.

Tilapia cultivation in Sukaraya Village is relatively new, so evaluation of its success rate is still limited. Therefore, this study was conducted to analyze the success rate of tilapia cultivation based on the application of Good Fish Farming Practices (GMP) principles and the productivity of cultivation, identify factors influencing production success, and assess the contribution of tilapia cultivation to community food security. The results are expected to provide evaluation material and recommendations for the village government, farmers, and other stakeholders in improving the success of cultivation and the sustainability of local potential-based food security programs in Sukaraya Village.

II. METHODS

This research uses a qualitative method with a case study approach to understand in-depth the implementation of tilapia cultivation activities in tarpaulin ponds as an effort to support food security in Sukaraya Village, Karang Bahagia District, Bekasi Regency. According to Sugiyono (2023), qualitative

research places the researcher as a key instrument, uses triangulation techniques in data collection, and emphasizes meaning over generalization. The case study strategy was used because the research focuses on one specific case, namely the implementation of tilapia cultivation activities that were only implemented at the end of 2024 as part of the village food security policy.

The research was conducted in Sukaraya Village from March to June 2026, covering the preparation, data collection, analysis, and report preparation stages. Informants were selected using purposive sampling and snowball sampling, taking into account their direct involvement, knowledge, and strategic role in the activities. The research informants consisted of nine tilapia fish farmers as beneficiaries, one activity assistant, one representative of the Sukaraya Village government, and one expert informant each from the Bekasi Regency Fisheries Service and the Bekasi Regency Food Security Service.

Data were collected through observation, semi-structured in-depth interviews, documentation, and supporting questionnaires. Observations were conducted to observe pond conditions, cultivation processes, and the activities of the farmer groups. In-depth interviews were used to explore the experiences, perceptions, and assessments of informants regarding the implementation of activities. Documentation included the collection of activity photos, official activity documents, and relevant policy archives. Questionnaires were used as supporting data to obtain a general overview of farmer perceptions regarding the implementation of activities, the level of cultivation success, and its contribution to food security. The questionnaire instrument was prepared based on the theoretical indicators of the Principles of Good Fish Cultivation Practices (CBIB) according to the Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia, and the concept of food security in Law Number 18 of 2012 concerning Food.

Data analysis used the Miles, Huberman, and Saldana model, which includes data reduction, data presentation, conclusion drawing, and verification. To answer the first problem formulation, data were analyzed using technical cultivation standards based on the CBIB guidelines issued by the Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia, including preparation of cultivation facilities, seed use, feed management, pest and disease control, and harvesting and post-harvest. In addition to analyzing the suitability of cultivation practices with CBIB standards, this study also examined the success rate of tilapia cultivation production by comparing the actual harvest yield of each pond to the production target of 112 kg per pond per cycle according to the productivity standards for tilapia cultivation in tarpaulin ponds set by the Ministry of Maritime Affairs and Fisheries of the Republic of Indonesia (2024). The production achievement level was calculated based on the percentage comparison between the actual harvest yield and the production target, then classified into three categories: successful (>100%), unsuccessful (60–100%), and failed (<60%) referring to the Central Statistics Agency (BPS) production achievement measurement approach. This classification was used to describe the success rate of tilapia cultivation carried out by beneficiaries in Sukaraya Village. The second research problem is analyzed using the concept of food security based on Law Number 18 of 2012, which encompasses aspects of food availability, affordability, and utilization. This research is limited to an analysis of tilapia fish farming activities in Sukaraya Village, focusing on policy implementation, cultivation standards, and its contribution to community food security, without discussing detailed quantitative financial or production analysis.

III. RESULT AND DISCUSSION

Village Fund Allocation for Tilapia Cultivation

The tarpaulin pond tilapia cultivation activity in Sukaraya Village is carried out as part of the village food security policy through the utilization of Village Funds. This activity aligns with the Ministry of Villages' policy that encourages the use of Village Funds for community empowerment and strengthening food security based on local potential. In the 2024 Fiscal Year, the Sukaraya Village Government allocated Rp139,500,000 in Village Funds for the Development of Biofloc Tilapia Ponds/Cages. Fishery cultivation activities at the village level have the potential to increase local food availability by increasing the supply of animal protein, increasing fish consumption, and strengthening household food security based on local resources (Kaminski et al., 2024).

Tilapia Fish Cultivation Production Results

Tilapia cultivation production results were analyzed based on the harvest achieved in each pond. According to Table 1, the average harvest per pond reached 90.75 kg, or 85.12% of the target production of 112 kg per pond per cycle. This achievement indicates that tilapia cultivation has yielded quite good results, although the average production target has not been fully achieved.

Table 1. Tilapia Cultivation Production Results Per Pond (Average)

No	Cultivation Name	Community Group	Fish Seed Stocking Density*/pond	Mortality (%)	Harvest Time*	Harvest Size*/kg	Harvest Yield*/kg	Level %
1.	Yaman	Group 3	600	10	4 months	5	108.00	96.43
2.	Asep	Group 4	500	30	5 months	5	70.00	62.50
3.	Tahir	Group 9	500	10	4 months	5	90.00	80.36
4.	Mahendra	Group 10	500	10	4 months	5	90.00	80.36
5.	Yaman	Group 11	700	10	4 months	4	157.50	140.63
6.	Sulaeman	Group 12	500	10	5 months	5	90.00	80.36
7.	Edi	Group 13	1000	10	5 months	4	225.00	200.89
8.	Edi	Group 15	650	10	4 months	5	117.00	104.46
9.	Alex	Group 6	500	35	4 months	5	65.00	58.04
10.	Hendrik	Group 1	500	35	6 months	6	54.17	48.36
11.	Gatot	Group 2	500	40	4 months	7	42.86	38.27
12.	Fahrul	Group 5	500	40	5 months	7	42.86	38.27
13.	Nadi	Group 7	500	45	5 months	7	39.29	35.08
14.	Pedru	Group 8	500	45	6 months	7	39.29	35.08
15.	Yeyen	Group 14	500	45	4 months	7	39.29	35.08
Average						5.27	90.75	85.12

Source: Processed Primary Data , 2026.

Variations in production yields among farmers are influenced by fish mortality rates, the number of seeds released, the size of the harvest, and skills in feed management and pond maintenance. Nevertheless, tilapia cultivation has contributed to increasing the availability of fish for consumption in Sukaraya Village. A significant portion of the harvest is marketed to the local community, increasing access to a relatively affordable source of animal protein. Furthermore, post-harvest innovations in the form of marinated tilapia products provide added value and expand marketing opportunities for the cultivated products.

Success Rate of Tilapia Cultivation

The success rate of cultivation was analyzed by comparing the actual harvest yield with the target production of 112 kg per pond per cycle. Based on Table 2, the success rate of cultivation varied among cultivators.

Table 2. Success Rate of Tilapia Cultivation

No	Name of Cultivator	Community Group	Harvest Yield*/kg	Level %	Success Category
1	Yaman	Group 15	225.00	200.89	Successful
2	Asep	Group 11	157.50	140.63	Successful
3	Tahir	Group 15	144,00	128,57	Successful
4	Mahendra	Group 3	108,00	96,43	Unsuccessful
5	Yaman	Group 9	90,00	80,36	Unsuccessful
6	Sulaeman	Group 10	90,00	80,36	Unsuccessful
7	Edi	Group 12	90,00	80,36	Unsuccessful
8	Edi	Group 4	70,00	62,50	Unsuccessful
9	Alex	Group 6	65,00	58,04	Failed
10	Hendrik	Group 1	54,17	48,36	Failed
11	Gatot	Group 2	42,86	38,27	Failed
12	Fahrul	Group 5	42,86	38,27	Failed
13	Nadi	Group 7	39.29	35.08	Failed
14	Pedru	Group 8	39.29	35.08	Failed
15	Yeyen	Group 14	39.29	35.08	Failed

Source: Processed Primary Data, 2026.

Three farmers were categorized as successful, exceeding their production targets (>100%). The highest yield was achieved by farmers from Pokdakan 15, with a harvest of 225 kg, or 200.89% of the target. This success was supported by sound cultivation management, low mortality rates, and optimal maintenance. Five farmers were categorized as unsuccessful, with production reaching between 60 and 100% of the target. This group was still able to produce a reasonable amount of fish for consumption, but did not achieve the activity target. The other seven farmers were categorized as failed, with production reaching below 60% of the target. Low production results were generally caused by high fish mortality rates, suboptimal water quality, weather changes, and limited farmer management skills.

, although the level of production success is still varied, tilapia cultivation activities continue to contribute to increasing the production of fish for consumption and have the potential to continue to be developed as an effort to support food security in Sukaraya Village.

The Role of Village Funds in Supporting the Success of Tilapia Cultivation and Food Security in Sukaraya Village

The tarpaulin pond tilapia cultivation activity in Sukaraya Village is one of the food security activities funded by the Village Fund for the 2024 Fiscal Year. Sukaraya Village received Village Funds amounting to Rp2,094,309,000, with a minimum allocation of 20% to support food security programs in accordance with government regulations. Of this allocation, Rp139,500,000 was used to procure tilapia cultivation facilities at 15 cultivation locations. The utilization of these Village Funds is a crucial factor in supporting the availability of production facilities, increasing community capacity, and developing food sources based on local potential.

Based on research results, Village Funds play a role in providing tarpaulin ponds, fish seeds, initial feed, and basic operational needs that enable communities to carry out tilapia cultivation activities. This support provides access for communities to develop cultivation businesses without requiring large initial capital. Sarjiyanto et al. (2024) explain that utilizing Village Funds in the productive sector can increase community economic capacity if supported by adequate resource management and active community participation.

, the research results indicate that the available budget allocation does not fully meet the ideal cultivation needs. Based on operational requirements calculations, the ideal cost for 15 cultivation ponds is estimated at IDR 195,840,000, while the realized budget is only IDR 139,500,000. There is a budget difference of IDR 56,340,000 which impacts the limited fulfillment of feed and fish maintenance needs until harvest time. This condition indicates that adequate funding is one of the factors influencing the success of cultivation. Dompseh et al. (2024) stated that limited financial resources can affect the quality of fish maintenance, feed use, and achievement of production targets.

Overall, the Village Fund has provided significant support for the implementation of tilapia cultivation as a food security program based on local potential. However, increasing the effectiveness of these activities requires more thorough budget planning, strengthening the technical capacity of farmers, ongoing mentoring, and more intensive monitoring to ensure sustainable growth in cultivation productivity and its contribution to community food security.

Tilapia Fish Cultivation Production Results

Based on the research results in Table 1, the average production of tilapia fish farming in Sukaraya Village reached 90.75 kg per pond or 85.12% of the production target of 112 kg per pond per cycle. This achievement indicates that the productivity of tilapia fish farming in Sukaraya Village is quite good, although on average it has not reached the set production target. These results indicate that tilapia fish farming is capable of producing fish for consumption in significant quantities, but still requires improvements in the implementation of cultivation practices to increase productivity in the next cycle. Variations in production achievements between farmers are not only influenced by technical factors of cultivation, but also by the support of available activity resources. The results of the study indicate that the ideal cost requirements for tilapia fish farming in 15 ponds are estimated to reach IDR 195,840,000, while the budget allocated through the Village Fund is only IDR 139,500,000. The budget difference of IDR 56,340,000 causes several operational needs, especially feed and fish maintenance until harvest, to not be optimally met. This situation impacts farmers with limited financial capacity to cover the costs themselves, resulting in suboptimal feeding frequency, feed quality, and pond maintenance. Consequently, fish growth and survival rates in some ponds have declined, resulting in low production yields.

The results in Table 2 show that the success rate of cultivation in Sukaraya Village varies among farmers and can be categorized as successful, unsuccessful, and failed. Production targets were also not fully met in various community-scale tilapia cultivation activities. Mappa and Sodiq (2025) reported that production variations among farmers were generally caused by differences in technical skills, seed quality, and water quality management during the cultivation period. In addition to budgetary factors, the study results showed that the selection of a Person in Charge (PIC) for the activity, who was not from an agency or the aquaculture sector, also influenced the implementation of the activity. Limited technical competence in the cultivation aspect resulted in the process of mentoring, problem identification, and providing technical solutions to farmers not running optimally. Several obstacles such as water quality management, stocking density regulation, feed management, and fish disease management could not always be addressed quickly and appropriately. This condition has the potential to increase fish mortality rates and reduce cultivation productivity, especially for farmers with limited cultivation experience.

Successful group consisted of three farmers who were able to achieve production above the activity target with an average harvest of 175.50 kg per pond or 156.70% of the production target. This achievement shows that tilapia cultivation has the potential to produce high production if supported by good pond management, low mortality rates, and the application of appropriate cultivation techniques. The success of this group indicates that the production target set in the activity can be achieved or even exceeded if the technical factors of cultivation are managed optimally. The success of this group supports the findings of Tang et al. (2024) that farmers who implement proper feed management and routinely monitor water quality tend to have higher productivity than other farmers.

Meanwhile, the unsuccessful group consisted of five farmers with an average harvest of 91.60 kg per pond, or 81.00% of the production target. Although not reaching the target, this group was still able to produce a sufficient amount of fish for consumption and contribute to the community's food supply. The failed group consisted of seven farmers with an average harvest of 46.11 kg per pond, or 41.17% of the production target.

These varying success rates demonstrate that tilapia cultivation productivity is influenced not only by the availability of facilities and assistance, but also by the technical skills and commitment of farmers to sustainably implementing cultivation practices. Although success rates are not uniform, all farmer groups continue to produce edible fish for household use and for marketing to the surrounding community. Thus,

tilapia cultivation continues to contribute to increasing fish production in Sukaraya Village and demonstrates potential for further development to support community food security.

These findings align with various studies on tilapia cultivation, which show that cultivation productivity is significantly influenced by seed quality, feed management, water quality management, and the farmer's ability to implement good cultivation techniques. Therefore, increasing the capacity of farmers through training, technical assistance, and regular monitoring is necessary to increase the success rate of cultivation and reduce production gaps between farmers in the next cultivation cycle. The results of this study align with Tang et al. (2024) who explained that the success of tilapia cultivation is influenced by the farmer's ability to implement cultivation techniques, feed management, and maintain the quality of the cultivation environment. Continuous technical guidance and training are important factors in increasing farmer productivity and income.

The research also shows that fish mortality remains a major obstacle in aquaculture activities. High mortality in some ponds results in lower harvested fish numbers compared to the initial stocking numbers, impacting production. This condition indicates that water quality management, feeding, and disease control still need to be improved to optimize fish survival rates. Various studies have shown that water quality, stocking density, and feed management are the dominant factors influencing tilapia survival and growth. An imbalance in any of these factors can increase mortality and reduce aquaculture productivity (El-Sayed et al., 2024). Husain et al. (2023) explain that tilapia mortality in intensive aquaculture systems is generally related to fluctuations in water quality, disease attacks, and stocking densities that do not match pond capacity. Although production targets have not been met evenly, the harvest continues to benefit the people of Sukaraya Village. Much of the fish produced is used for consumption and marketed to the surrounding community, increasing the availability of animal protein sources locally. This demonstrates that tilapia cultivation not only generates production output but also contributes to a food supply based on local resources.

The findings of this study align with the principles of Good Fish Farming Practices (CBIB) according to the Ministry of Marine Affairs and Fisheries (2024), which emphasize the importance of seed management, feed, water quality, and fish health as determining factors for successful production. The better the implementation of these cultivation principles, the greater the opportunity for farmers to achieve optimal harvests. Mappa and Sodiq (2025) found that tilapia cultivation in tarpaulin ponds can produce high fish survival rates if supported by feed management, water quality management, and adequate technical assistance. Therefore, increasing the technical capacity of farmers, ongoing assistance, and providing production facilities are important factors for increasing tilapia cultivation productivity in Sukaraya Village in the future.

Based on the results of interviews, questionnaires, and analysis referring to Law Number 18 of 2012 concerning Food, tilapia cultivation in tarpaulin ponds in Sukaraya Village has been proven to contribute to food security by increasing the availability, accessibility, and utilization of food. In terms of availability, cultivation activities increase the supply of fish for consumption as a source of local animal protein with the highest average production in the successful group at 175.50 kg per pond, followed by the unsuccessful group at 89.10 kg and the failed group at 46.11 kg per pond. In terms of accessibility, the harvest is marketed around the village, making it easier for people to obtain fish at affordable prices while increasing the income of farmers and household purchasing power. Meanwhile, in terms of utilization, tilapia is not only consumed as a source of family nutrition but is also processed into value-added products such as marinated tilapia that support local economic development. However, the contribution of cultivation to food security is not optimal because there are still differences in success rates between farmers influenced by technical capabilities, water quality management, feed management, business capital, and maintenance discipline. Therefore, it is necessary to increase the capacity of cultivators, provide continuous technical assistance, and optimize cultivation management so that its benefits for food security and strengthening the economy of the Sukaraya Village community can continue to increase in a sustainable manner.

IV. CONCLUSION

Based on the research results, the success rate of tilapia (*Oreochromis niloticus*) cultivation implemented through the Sukaraya Village food security program shows that achievements still vary among farmers. Village Fund support has played a significant role in providing cultivation facilities, fish seeds, and initial operational needs so that the community can carry out cultivation activities as an effort to improve village food security. However, there are several obstacles in the activity planning stage, particularly related to budget allocations that have not fully met the operational needs of cultivation until harvest time. This budget limitation has an impact on the fulfillment of feed and fish maintenance needs that are not optimal. In addition, the appointment of a Person in Charge (PIC) of the activity who does not come from the agency or fisheries sector has resulted in technical assistance and cultivation supervision not being carried out optimally.

The results of the cultivation production showed an average harvest of 90.75 kg per pond or 85.12% of the production target of 112 kg per pond per cycle. Based on the evaluation of production achievements, there were 3 cultivators in the successful category, 5 cultivators in the unsuccessful category, and 7 cultivators in the failed category. The difference in success rates was influenced by the application of the principles of Good Fish Breeding Practices (CPIB), especially in the aspects of feed management, water quality management, fish mortality rates, and the technical capabilities of the cultivators in carrying out cultivation activities.

Tilapia cultivation has contributed to the food security of the Sukaraya Village community by increasing the availability of fish for consumption as a source of animal protein, facilitating community access to nutritious food, and utilizing the harvest for household consumption and family economic activities. However, this contribution is still not optimal because the level of production success is not evenly distributed across all cultivation locations. Therefore, more thorough budget planning, the involvement of competent fisheries assistants, increased technical capacity of farmers, and more intensive monitoring and mentoring are needed to sustainably increase cultivation productivity and its contribution to community food security.

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