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The Implementation of Automation of Processed Fisheries Supports Food Security in Berahan Kulon Village, Demak Regency

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Abstract. Universitas Maritim AMNI carried out community service activities at Berahan Village to support Demak Regency program. It is not only students/cadets and lecturers who carry out community service activities but also the surrounding community. They are very enthusiastic in participating in implementing various program activities carried out at Berahan Village. The method of implementing this activity uses a direct socialization and training approach, observation, interviews and literature studies. Socialization Automation of Fishery Processing Supports Food Security in Berahan Village. The observation was held in Berahan Village. The data collection was carried out through interview methods and as a reference for implementing community service activities was using the literature study method. The success of these program was indicated by increase the income of the Berahan Community.

1. BACKGROUND

Coastal and fisheries-based communities play a strategic role in supporting regional food security in Indonesia, particularly through the availability of animal protein sources derived from marine and inland fisheries. One of the coastal villages with significant fisheries potential is Berahan Kulon Village, located in Wedung District, Demak Regency, Central Java. This village is situated along the northern coast of Java Island and is supported by estuarine waters and brackish ponds that are suitable for capture fisheries and aquaculture activities. The main fisheries commodities in this area include marine fish, milkfish, catfish, and shrimp, which serve as primary sources of income for the local community as well as contributors to local food availability.

Despite the abundance of fisheries resources, the economic benefits gained by fishermen and small-scale fish processors in Berahan Kulon Village remain relatively low. Most fisheries products are marketed in raw form with minimal post-harvest handling, resulting in limited added value and low competitiveness. Traditional fish processing practices such as manual scaling, cleaning, and cutting are still widely used and require

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considerable time and labor. Previous studies indicate that manual processing methods reduce productivity, increase post-harvest losses, and limit product quality consistency, which in turn affects market acceptance (Nashikul, 2020; Sujatmiko et al., 2023). These conditions highlight the need for technological intervention to improve efficiency and product quality at the community level.

In addition to technical constraints, limited managerial capacity and inadequate understanding of business development and marketing strategies further hinder the sustainability of fisheries-based micro-enterprises. Fish processing activities in coastal villages are often conducted at the household scale without proper planning, cost efficiency analysis, or market-oriented strategies. Studies on community empowerment programs have emphasized that productivity improvement must be accompanied by capacity building in entrepreneurship and marketing to generate sustainable economic impacts (Rahmasari, 2023; Jaziri et al., 2025). Without such integration, technological interventions alone may fail to deliver long-term benefits.

The application of appropriate technology in fisheries processing has been widely recognized as an effective approach to enhance productivity, hygiene, and value addition. Automation-based processing tools, such as automatic fish scaling and cutting machines, are capable of reducing processing time, minimizing physical workload, and improving product uniformity. Several community service programs in Indonesia have reported positive outcomes from the adoption of automated or semi-automated fisheries processing technologies, including increased production capacity, improved product quality, and higher income levels among beneficiaries (Sandi, 2021; Matini, 2022; Ziliwu et al., 2025). These findings indicate that technology-based interventions are particularly relevant for coastal communities facing labor and efficiency constraints.

Furthermore, technological innovation in fisheries processing is closely linked to broader development goals, including food security and rural economic empowerment. Improved post-harvest handling and processing efficiency can reduce food losses, stabilize supply, and enhance income resilience among small-scale fisheries actors. The Food and Agriculture Organization has emphasized that post-harvest technology plays a crucial role in strengthening food systems and supporting sustainable livelihoods in fisheries-dependent communities (FAO, 2022). In the Indonesian context, community-based technology adoption aligns with national priorities on village development and

empowerment, as well as the Sustainable Development Goals, particularly SDG 2 (Zero Hunger) and SDG 8 (Decent Work and Economic Growth).

Figure 1 . Fishermen's activities in Berahan Kulon Village, Wedung District, Demak Regency

Based on these considerations, the Community Service Program entitled "Automation of Processed Fisheries Supports Food Security in Berahan Kulon Village, Demak Regency" was designed to address priority problems related to processing inefficiency, limited value addition, and weak business capacity among local fisheries actors. This program integrates the implementation of an Automatic Fish Processing Machine with participatory training, mentoring, and business assistance activities. Through this integrated approach, the program aims to enhance fisheries processing productivity, strengthen community capacity, and contribute to sustainable food security at the village level. The outcomes of this program are expected to serve as a practical model for similar coastal communities facing comparable challenges in fisheries-based economic development.

2. METHODS

This community service program employed a participatory and technology-based empowerment approach aimed at improving the productivity and income of fisheries communities in Berahan Kulon Village, Wedung District, Demak Regency. The program was implemented through several systematic stages, including problem identification, technology design and implementation, capacity building, and evaluation. The initial stage involved field observations and in-depth interviews with fishermen and fish processors to identify priority problems related to post-harvest handling, processing inefficiency, and

limited business development capacity. Based on the findings, an Automatic Fish Processing Machine was designed and introduced as an appropriate technology to support efficient fish scaling, cleaning, and cutting processes. The implementation stage included direct socialization, hands-on training, and demonstrations to ensure that community members were actively involved and able to operate the technology independently. This participatory approach is essential in community service activities to enhance technology adoption and ensure program sustainability (Matini, 2022; Dewa, 2025).

The evaluation stage focused on assessing the effectiveness of the program in improving productivity and supporting food security at the village level. Data were collected using observation sheets, semi-structured interviews, and documentation, both before and after the implementation of the technology and business assistance activities. Key indicators evaluated included processing time efficiency, perceived ease of use of the technology, and changes in production capacity and income levels of participants. In addition to technological intervention, business assistance and marketing strategy training were provided through focus group discussions (FGDs) to strengthen participants' managerial and entrepreneurial skills. The collected data were analyzed descriptively to identify changes resulting from the program implementation and to capture community responses to the introduced technology. This evaluation method aligns with previous studies emphasizing the importance of combining appropriate technology with capacity building to achieve sustainable economic empowerment and food security in fisheries-based communities (Nashikul, 2020; Sandi, 2021).

3. RESULTS AND DISCUSSION

3.1 Results

The implementation of the Community Service Program in Berahan Kulon Village was centered on the application of an Automatic Fish Processing Machine integrated with capacity-building activities for fishermen and small-scale fish processors. The results indicate that the introduced technology, combined with training and mentoring, produced measurable improvements in processing efficiency, productivity, and community participation. Prior to the program, fish processing activities were carried out manually, resulting in relatively long processing times, inconsistent product quality, and limited daily processing capacity. These conditions constrained the ability of community members to increase production volume and improve income levels.

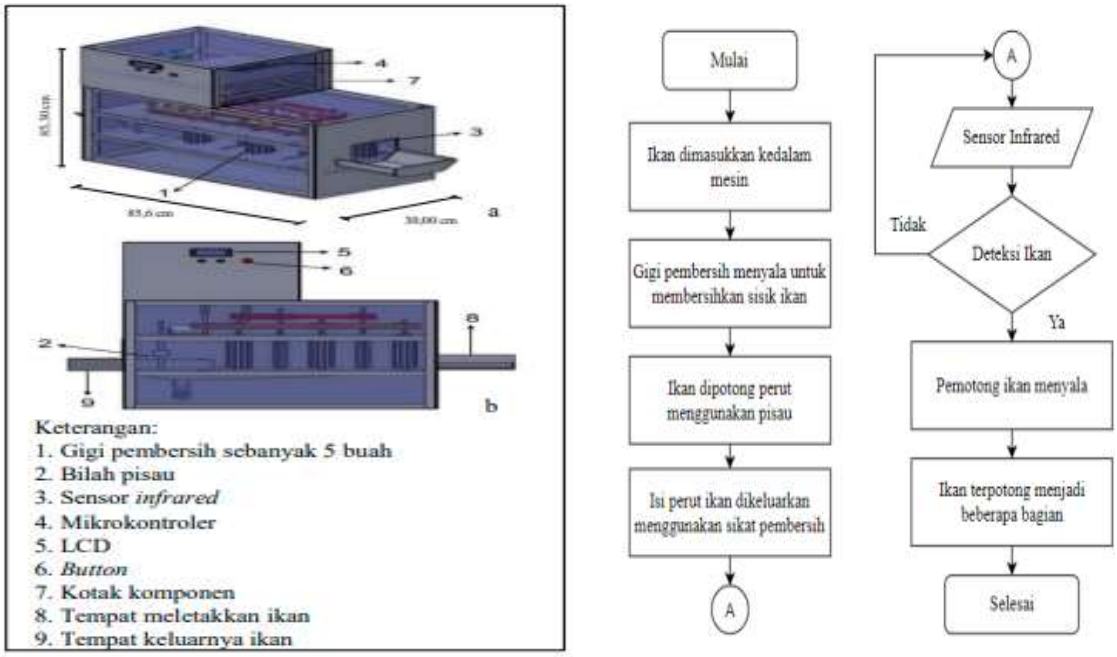

Figure 2. Automatic Fish Processing Machine Design

Field observations during trainin g and mentoring sessions showed that the automatic fish processing machine was capable of processing fish at an average speed of up to 30 fish per minute, depending on fish size and type. This performance significantly exceeded manual processing capacity, which averaged only 8–10 fish per minute. The reduction in processing time allowed participants to handle larger quantities of fish within the same working hours. In addition, the automated process produced more uniform cuts and cleaner fish surfaces, which improved hygiene standards and increased acceptance of processed products in the local market. Similar improvements in efficiency and hygiene have been reported in other community service programs implementing fisheries processing technology (Jaziri et al., 2025; Musarofah et al., 2025).

The comparative performance of fish processing activities before and after the program implementation is presented in Table 1. The table illustrates clear differences in processing speed, time efficiency, cleanliness, and community engagement, demonstrating the practical benefits of automation-based intervention at the community level.

Table 1. Comparison of Fish Processing Performance Before and After Program Implementation

Indicator	Before PKM (Manual Processing)	After PKM (Automatic Machine)
Average processing speed	8–10 fish/minute	Up to 30 fish/minute
Processing time per batch (50 fish)	±60 minutes	±20 minutes
Level of product cleanliness	Inconsistent	Consistent and hygienic
Daily processing capacity	Limited	Increased by ±20–30%
Community participation	Passive	Active and participatory

Beyond technological outcomes, the program also contributed to increased community awareness of business development and marketing strategies. Through focus group discussions and mentoring activities, participants gained a better understanding of value-added processing, cost efficiency, and basic marketing practices. Post-program interviews indicated that participants perceived an improvement in income potential due to higher production volumes and better product quality. These findings reinforce the notion that technological intervention accompanied by business assistance can effectively strengthen fisheries-based livelihoods in coastal communities (Darmadi et al., 2024; Ziliwu et al., 2025).

3.2 Discussion

The findings of this community service program confirm that the application of automation technology in fish processing can substantially enhance productivity and operational efficiency at the small-scale fisheries level. The significant reduction in processing time and increase in processing capacity observed in Berahan Kulon Village align with previous studies demonstrating the effectiveness of automated fish cleaning and cutting technologies in improving labor efficiency and product hygiene (Sujatmiko et al., 2023; Jaziri et al., 2025). Automation reduces reliance on manual labor, minimizes physical fatigue, and ensures more consistent product quality, which are critical factors for sustainable fisheries processing.

Compared to earlier PKM initiatives that relied on semi-manual or low-technology tools, the fully automated system introduced in this program offered more pronounced benefits. Matini’s earlier findings on semi-manual fish fillet tools showed productivity gains; however, those gains remained limited due to continued dependence on manual operations. In contrast, the automated system implemented in Berahan Kulon Village

enabled higher throughput and reduced physical workload, making it more suitable for long-term adoption by community members. Similar patterns have been observed in other technology-based PKM programs, such as automated fish feeding systems and smart aquaculture technologies, which significantly improved efficiency and output quality (Pengembangan teknologi mesin pakan ikan otomatis, 2021; Chaidir et al., 2025; Abubakar, 2024).

The integration of technology with capacity-building activities represents another key strength of this program. Business assistance and marketing strategy training complemented the technological intervention by enhancing participants' managerial and entrepreneurial skills. This integrative approach is consistent with Rahmasari's argument that productivity improvements must be accompanied by strengthened business capacity to generate sustainable economic outcomes. Comparable results have been reported in PKM programs focusing on value-added processing and waste utilization, which demonstrated increased income and stronger economic resilience when technology adoption was paired with community empowerment (Darmadi et al., 2024; Musarofah et al., 2025).

From a broader development perspective, the outcomes of this program also support the role of appropriate technology in enhancing local food security. Improved processing efficiency contributes to reduced post-harvest losses, increased availability of processed fish products, and more stable food supply at the village level. Similar conclusions have been drawn in studies emphasizing technology-based fisheries processing as a strategy to improve food quality, safety, and availability (Sujatmiko et al., 2023; Ziliwu et al., 2025). Furthermore, the success of automation-based interventions in fisheries and aquaculture sectors, as demonstrated by Fasya et al. (2025), indicates that technological innovation can serve as a catalyst for broader rural economic development.

Overall, the results and discussion highlight that the effectiveness of this community service program lies in its integrative approach, combining automation technology, participatory engagement, and business capacity strengthening. This approach not only addresses technical inefficiencies in fisheries processing but also empowers the community to manage, adapt, and sustain the introduced technology. Therefore, this program can be considered a replicable model for other coastal and fisheries-based communities seeking to improve productivity, income, and food security through technology-driven community empowerment.

4. CONCLUSION

The community service program on the implementation of an Automatic Fish Processing Machine in Berahan Kulon Village, Demak Regency, has been successfully carried out and demonstrated positive outcomes in addressing priority problems faced by local fisheries communities. The introduction of appropriate automation technology has proven effective in improving the efficiency of fish processing activities, particularly in scaling, cleaning, and cutting processes, which were previously conducted manually and required significant time and labor. The technology enabled a substantial increase in processing speed and production capacity, thereby enhancing overall productivity and operational efficiency at the community level.

In addition to technological improvements, the program also contributed to strengthening the capacity of fishermen and small-scale fish processors through training, mentoring, and business assistance activities. Community participation throughout the implementation stages increased awareness of value-added processing, product quality, and basic marketing strategies. As a result, participants experienced improved readiness to manage fisheries-based enterprises more professionally and sustainably. The combination of technological intervention and capacity building played a crucial role in supporting income enhancement and reducing dependency on traditional, less efficient processing practices.

Overall, this community service program demonstrates that an integrated approach combining automation technology, participatory engagement, and business development support can effectively empower coastal communities and contribute to local food security. The outcomes indicate that such an approach is not only applicable to Berahan Kulon Village but also has strong potential to be replicated in other coastal and fisheries-based communities facing similar challenges. Sustainable continuation of this program is expected to further strengthen community resilience, improve economic welfare, and support village-based development through innovation in fisheries processing.

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