

Transformation of the Capacity and Institutions of Fishing Communities Through Knowledge Transfer and the Formation of Freshwater Eel Cultivation Interest Groups in Magetan Regency

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ABSTRACT

This community service activity aims to increase the knowledge and skills capacity of fishing communities in Magetan Regency through cross-generational knowledge transfer, from conventional approaches to data-based and digital approaches, and facilitate the formation of freshwater eel cultivation interest groups as new institutional forums. The activity was held for two days, January 3 and 4, 2025, attended by 25 participants from Magetan, Bogor, Lampung, Sukabumi, Majalengka, Pandawan (Malang), Sidoarjo, Pacitan, and Jakarta. The implementation phase included preparation and needs surveys, cross-generational dialogue on the first day regarding eel biology and stages of multi-level rearing, namely glass eels in aquariums, followed by elvers, fingerlings, and consumption in ponds, each for four months, and the second day consisted of simulations of business results and profits, product diversification, digital marketing strategies, and a group formation forum. The discussion increased participants' knowledge scores from 42 to 78. A business simulation of 1,000 glass eel seeds yielded an estimated harvest of 300 kilograms and a net profit of around Rp 16,500,000. The identification of alternative processed products, such as smoked and shredded eel, and the formation of the Lawu Sejahtera Sidat Group, complete with a management structure and initial work plan. It is recommended that ongoing technical assistance, facilitation of capital access, and advanced training in product processing be provided to ensure that the capacity and institutional transformation achieved can continue to develop independently and sustainably in Magetan Regency.

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1. INTRODUCTION

The freshwater fisheries sector is a vital livelihood for rural communities in both highland and lowland areas in Indonesia, including Magetan Regency, East Java. This region is located on the slopes of Mount Lawu, with numerous clear springs, conditions that naturally support the development of various freshwater fisheries commodities. To date, local aquaculture activities have been dominated by conventional commodities such as catfish, tilapia, and carp, which are managed through traditional practices based on the practical experience of previous generations.

Among freshwater fisheries commodities, eel (*Anguilla* spp.) is a catadromous species with high economic value and significant demand in international markets, particularly for processed eel products in Japan and other East Asian countries (Dzikri et al., 2020). Eels grow in freshwater until they reach adulthood before migrating to the sea to spawn. Therefore, their cultivation can be carried out in stages, from aquariums to ponds, with controlled water quality, feed, and fish health management (Hartono et al., 2023) and (Kusen et al., 2015). The selling price of both edible and processed eels is much higher than that of conventional freshwater fish, making eel cultivation a potential alternative for diversifying businesses and increasing the income of fishermen and fish farmers. Despite this significant potential, eel cultivation technology in Indonesia is generally still relatively new and underdeveloped compared to other countries such as Japan and Taiwan, which have developed their cultivation using seeds sourced from Indonesian waters. This situation also occurs in Magetan Regency, where fishermen and freshwater fish farmers are generally unfamiliar with eel cultivation techniques, including the multi-stage growth stages from glass eel, elver, fingerling, to consumption size, or business feasibility calculations that align with the biological characteristics of eels, which differ from conventional fish for consumption.

The problem lies not only in the technical aspects of cultivation, but also in the transmission of knowledge. The older generation's fisheries knowledge in many coastal and inland waters is generally tacit, formed from years of field experience, and passed down orally from one generation to the next. Meanwhile, the younger generation is more accustomed to data-driven approaches, quantitative calculations, and the use of digital technology, including in product marketing through social media and online marketplaces. If not bridged, this generational gap has the potential to slow the regeneration process of fisheries entrepreneurs and hinder the adoption of new aquaculture innovations, such as eel cultivation.

In addition to the knowledge gap, another identified problem is the lack of institutional frameworks that accommodate community interest in eel cultivation at the village level. The absence of formal groups makes it difficult for communities to access technical information, assistance with production facilities, mentoring from relevant agencies, and collective market access. Various community empowerment studies have shown that strengthening group institutions is a crucial factor in the success and sustainability of rural economic empowerment programs, as groups serve as platforms for shared learning, collective negotiation, and strengthening social capital (Syamsuadi et al., 2016); (Lolowang et al., 2022).

The participatory rural appraisal approach, which actively involves communities from problem identification through program evaluation, has been widely proven effective in promoting the sustainability of community-based empowerment programs. This approach is relevant in the context of capacity transformation of fishing communities in Magetan Regency, particularly because the program targets not only technical knowledge enhancement but also institutional strengthening, which serves as the foundation for sustainable eel-cultivation businesses after the community service program. Based on this description, this community service program was designed with two complementary main focuses: increasing the capacity of freshwater eel cultivation through technical knowledge and skills, and establishing an eel cultivation enthusiast group as an institutional framework. Capacity building is carried out through a cross-generational, cross-cultural knowledge-transfer approach, combining the local wisdom of senior fishermen regarding water characteristics and conventional pond management with a data- and digital-based approach more familiar to the younger generation. This includes multi-stage

rearing, yield and profit calculations, final product diversification, and contemporary marketing strategies.

The general objective of this activity is to realize the transformation of the capacity and institutions of fishing communities in Magetan Regency by introducing freshwater eel cultivation as an alternative commodity with high economic value. The specific objectives of the activity include: (1) increasing community knowledge and skills regarding the technical aspects of eel cultivation, including multi-stage rearing stages and calculating yields and profits; (2) facilitating the transfer of knowledge across generations and across cultural approaches, from conventional practices to data- and digital-based approaches, particularly in final product diversification and marketing strategies; and (3) facilitating the formation of freshwater eel cultivation enthusiast groups as institutional platforms to support business sustainability. The expected benefits of this activity are the availability of alternative sources of new livelihoods for fishing communities and fish farmers in Magetan Regency, closer communication and knowledge transfer between the older and younger generations of fisheries business actors, and the availability of local institutions that can become strategic partners for the Animal Husbandry and Fisheries Service of Magetan Regency and other stakeholders in the development of eel cultivation in the future.

Conceptual Study of Cross-Generational Knowledge Transfer

In the context of this activity, cross-generational knowledge transfer is understood as a process of sharing knowledge between the older generation, which holds conventional knowledge based on field experience, and the younger generation, which is more accustomed to data-driven approaches and digital technology. This approach differs from conventional extension models, which are one-way from resource person to participant, because the senior fishermen are positioned as sources of knowledge, not merely recipients of material. This two-way relationship aligns with the principle of participatory empowerment, which positions the target community as active subjects in learning and decision-making (Alam & Ihsan, 2012) Bakri, 2017). The term "cross-cultural" in the title of this activity refers to the intersection of conventional work culture, which relies on intuition, inherited habits, and face-to-face interactions, with the current work culture that relies on systematic record-keeping, quantitative calculations, and the use of digital media in business management and product marketing. These two work cultures complement each other, ensuring that proven local knowledge is maintained while being enriched by a more measured, adaptive approach to market and technological developments. This framework of thinking underlies the design of the material and methods for implementing this community service activity, particularly in the aspects of eel rearing stages, calculating business results and profits, final product diversification, and marketing strategies.

2. METHODS

Time, Venue, and Target Audience

This community service activity was held over two consecutive days, on July 20 and 21, 2024, at the home of Mr. Stefanus Topan Wijaya on Jln. Mawar 2, RT 13, RW 04, Manjung, Barat, Magetan, East Java. This location was chosen because it has a clear water source and has become a center for freshwater fish breeding in Magetan Regency, making the community relatively familiar with conventional freshwater fish farming activities.

The target audience for the activity was 25 participants, consisting of senior freshwater fish farmers and fishermen from Magetan with over ten years of conventional fish farming experience, as well as young aspiring fishery entrepreneurs from various regions outside Magetan Regency, namely Bogor, Lampung, Sukabumi, Majalengka, Pandawan (Malang), Sidoarjo, Pacitan, and Jakarta. The cross-generational and cross-regional composition of participants was purposively selected to support intergenerational knowledge transfer and expand the network of prospective eel farmers outside Magetan Regency during the event. The event was opened by the agency's head, accompanied by a

fisheries extension worker from the Magetan Regency Animal Husbandry and Fisheries Agency and a team of technical resource persons on eel cultivation.

The technical resource team consisted of three individuals with complementary roles: Emiliana Sri Pudjiarti, an economist and team leader; Enny Nurlaili, a food technology expert (member 1); and Stefanus Topan Wijaya, the Head of the Eel Farmers Group (member 3). They jointly designed and delivered technical, managerial, and product processing materials based on their respective areas of expertise.

Implementation Stages

The activity implementation followed the following stages: (1) preparation stage, including coordination with village officials and the Magetan Regency Animal Husbandry and Fisheries Agency; an initial needs assessment through brief interviews with prospective participants; and the development of training materials tailored to local conditions; (2) the implementation stage of the first day, focused on the transfer of knowledge across generations and strengthening the understanding of the basic technical aspects of eel cultivation, including the stages of multi-level enlargement; (3) the implementation stage of the second day, focused on the managerial aspects of the business, including simulations of business results and profits, product diversification, marketing strategies, and a forum for forming groups of eel cultivation enthusiasts; and (4) the evaluation stage, carried out through pre-tests and post-tests of participant knowledge, participatory observation, and documentation of the results of institutional agreements.

Implementation Method

Day One: Intergenerational Knowledge Transfer

The first day's session was designed as a two-way dialogue between senior fishermen and younger generations, facilitated by a technical resource person. The senior fishermen were asked to share their traditional knowledge, including how to read water conditions, identify pond locations, and practice traditional freshwater fish farming. The resource person then combined and enriched this knowledge with modern technical materials on eel biology, water quality requirements, and basic principles of eel cultivation management, based on the latest scientific studies (Effendi, 2002) and (Hartono et al., 2023). The technical materials on the first day also emphasized that eel rearing at Olive Farm is carried out in stages and does not use tarpaulin ponds, but rather a combination of aquariums and permanent ponds according to their growth stages: glass eel in the aquarium, then elver, fingerling, and finally consumption in the pond. This approach is referred to as an intergenerational dialogue-based knowledge transfer method, a process that complements local wisdom grounded in empirical experience with systematic, measurable technical knowledge.

In addition to intergenerational dialogue, the first day also included live demonstrations on the preparation of culture media at each stage, including aquarium preparation for the glass eel stage, pond preparation for the elver stage, and consumption, water circulation systems, and an introduction to water quality parameters that need to be monitored, namely temperature, acidity (pH), dissolved oxygen, and ammonia levels (Effendi, 2002). Younger participants were actively involved in documenting the demonstration process using smartphones and also practiced compiling technical notes in a simple digital format, as part of the process of adapting from a conventional work culture to a more documented and data-driven modern work culture.

Day Two: Managerial Aspects, Product Diversification, Marketing, and Group Formation

The second day's sessions focused on four main topics: a simulation of calculating harvest yields and profits for eel cultivation across multiple rearing stages, an introduction to eel product diversification, and modern marketing strategies based on social media and digital platforms. The material was delivered through a combination of short lectures, group calculation simulations using sample data from Olive Farm field practice, and small group discussions involving both senior and younger participants in pairs, enabling a two-way process of quantitative and digital knowledge transfer. The second day's activities concluded with a focus group discussion (FGD) to discuss the formation of an eel cultivation interest

group. This included agreeing on a group name, developing a simple management structure, formulating an initial work plan, and signing the group's formation minutes. A fisheries extension worker from the Magetan Regency Animal Husbandry and Fisheries Office facilitated this meeting.

Evaluation Method

The success of the activity was evaluated using two types of indicators. Quantitative indicators were measured by comparing pre-test and post-test scores on participants' knowledge of the technical and managerial aspects of eel cultivation, as well as the number of participants who expressed their willingness to join an eel cultivation interest group. Qualitative indicators were measured by observing participants' levels of engagement during dialogue sessions, demonstrations, and FGDs, and by field notes on the dynamics of intergenerational interactions during the activity.

All pre-test and post-test instruments were structured as simple questionnaires containing 20 multiple-choice questions covering four main aspects: knowledge of biology and eel rearing stages, calculating business yields and profits, basic knowledge of product diversification, and marketing strategies. The same questionnaire was administered before the first day's session began and after the entire series of activities on the second day were completed, so that the difference in scores could reflect increased knowledge resulting from the overall community service activity intervention.

3. FINDINGS AND DISCUSSION

Participant Profile and Initial Conditions

The activity was attended by 25 participants, consisting of 14 senior fishermen/fish farmers from Magetan, aged 40-60, with over ten years of conventional freshwater fish farming experience, and 11 younger participants, aged 20-35, from Bogor, Lampung, Sukabumi, Majalengka, Pandawan (Malang), Sidoarjo, Pacitan, and Jakarta. Most of the younger participants were familiar with smartphones and social media but lacked direct aquaculture experience. The initial needs assessment revealed that all senior participants had experience raising conventional food fish such as catfish and tilapia, but none had previously farmed eels. Most participants stated they were aware of the high market value of eels but did not yet understand the technical stages of eel farming or the business's potential feasibility.

The pre-test results showed an average score of 42 out of 100 for participants' initial knowledge of eel farming, with the lowest scores in the stages of eel farming and digital marketing strategies. This situation served as the basis for developing materials that focused more on these two aspects during the second day of the event.

In terms of their business background, most of the senior participants had previously relied on catfish and tilapia farming for their income, with relatively thin profit margins due to consistently low selling prices and competition among farmers in the same area. This situation strengthened the participants' motivation to explore alternative commodities, such as eel, which command much higher selling prices. Meanwhile, the younger participants, who came from various regions outside Magetan, generally lacked a permanent livelihood in the fisheries sector and saw eel farming as a new business opportunity to pursue alongside their existing digital activities, such as social media management and online transactions.

Cross-Generational and Cross-Cultural Knowledge Transfer

The intergenerational dialogue on the first day took place with the active participation of both groups. Senior fishermen shared conventional knowledge on how to read water conditions through color and odor observations, determining the best time to change pond water, and habits for maintaining a calm pond environment to avoid stressing the fish. This knowledge is tacit and rarely documented in writing. The younger generation then helped translate this experience into structured notes, linking it to scientifically measurable water quality parameters, such as temperature, pH, dissolved oxygen, and ammonia levels (Effendi, 2002).

This process demonstrated that cross-generational knowledge transfer is not a one-way process, but rather a complementary one. The older generation gained a new understanding of the scientific

basis of habits they had previously practiced intuitively. In comparison, the younger generation gained practical field knowledge that could not be acquired solely through reading. This two-way learning pattern aligns with the principles of a participatory approach to community empowerment, which emphasizes that the target community is not simply a recipient of knowledge but an actor contributing to the collaborative learning process (Alam & Ihsan, 2012).

The shift in work culture from conventional to modern patterns is also evident in changes in record-keeping habits. Prior to the activity, the majority of senior participants did not maintain written records of feeding schedules, feed amounts, or daily cultivation progress. Through mentoring from younger generations during the demonstration sessions, senior participants became accustomed to a simple, spreadsheet-based record-keeping format that can be completed daily, as a first step toward more orderly and measurable business record-keeping.

The technical material on eel cultivation covered the biological characteristics of eels as catadromous fish and the multi-stage rearing stages implemented at Olive Farm. Contrary to the common belief that tarpaulin ponds are used, eel rearing at Olive Farm is carried out in stages using aquariums and permanent ponds according to growth phase, as summarized in Table 1.

Table 1. Stages of eel rearing based on culture medium and rearing period

Stage	Cultivation Media	Maintenance Period
Glass Eel	Aquarium	4 Month
Elver	Pond	4 Month
Fingerling	Pond	4 Month
Konsumsi	Pond	4 Month

The total production cycle, from glass eel fry to eel reaching consumption size, lasts approximately 16 months. During the glass eel stage, the fry are kept in aquariums due to their very small size and the need for intensive water quality monitoring. After entering the elver stage, the eels are transferred to ponds and maintained there from the fingerling stage through consumption, with stocking density and feed management adjusted at each stage (Effendi, 2002) and (Hartono et al., 2023).

Participants were also introduced to potential cultivation risks, such as bacterial diseases in eel fry that can occur if water quality and stocking density are not properly managed (Kusen et al., 2015), ensuring a contextual understanding of the importance of routine monitoring at each stage of the rearing process. Post-test results showed an increase in participants' average knowledge score from 42 to 78 out of 100, a 36-point increase. The greatest improvement occurred in understanding the rearing stages and calculating yields and profits, which were the lowest-scoring aspects in the pre-test. These results indicate that a concrete, data-driven, field-based calculation simulation approach is more effective in enhancing participant understanding than purely theoretical presentations. A breakdown of achievement per material aspect is presented in Table 2.

Table 2. Comparison of participant knowledge scores before and after the activity based on the material

Material Aspects	Skor Pre-test	Skor Post-test	Improvement
Biology and stages of eel rearing	48	80	32
Calculation of business results and profits	38	79	41
Product diversification and marketing	47	76	29
Overall average	42	78	36

In addition to knowledge scores, participants' conditions before and after the training can also be seen qualitatively in actual field practice, as summarized in Table 3.

Table 3. Comparison of participants' conditions before and after training

Aspect	Conditions Before Training	Post-Training Condition
Business registration	No written records of daily results and costs	Using a simple daily recording worksheet
Eel enlargement	No understanding of the multi-stage rearing stages	Understanding the stages of glass eel, elver, and fingerling consumption, including the media and maintenance duration
Calculation of business results	Calculating profit and loss roughly based on intuition	Able to create harvest simulations and estimate business profits
Marketing	Selling harvests to collectors/middlemen	Having social media accounts and a digital marketing strategy
Institutional	No eel cultivation group organization	Establishing the Lawu Sejahtera Sidat Group with a management structure

Eel Farming Harvest Yield and Profit Simulation

One of the key topics on the second day was a simulation of the harvest yield and profit of an eel farming business using an initial population of 1,000 glass eel fingerlings, following the multi-stage rearing stages as presented in Table 1. The simulation was developed with participants using Olive Farm field practice data to help them understand the relationships among the initial number of fingerlings, survival rate, and weight throughout the rearing stages, as well as the overall estimated profit of the business.

Based on the accumulated losses in number and weight across all rearing stages, from an initial population of 1,000 glass eel fingerlings, the estimated harvest of eels for consumption is one-third of the initial number of fingerlings, i.e., 1,000 fingerlings divided by 3, or equivalent to 333 kilograms of ready-to-sell eel for consumption. A summary of the simulation is presented in Table 4.

Table 4. Simulation of Harvest Yield and Profit of Eel Farming (Initial Population of 1,000 Glass Eel Fingerlings)

Parameters	Value	Description
Initial seed population (glass eel)	1,000 head	Assuming all stages of rearing are followed (Table 1)
Fry survival rate	90%	900 fish
Estimated harvest yield	300 kg	900 fry divided by 3
Selling price of eels for consumption	Rp 220,000 / kg	Selling price at the farmer level
Estimated gross income	Rp 66,000,000	300 kg x Rp 220,000
Business profit margin	± 25%	Estimated gross income
Estimated net profit	Rp 16,500,000	25% x Rp 66,000,000, rounded up

The approximately 25 percent profit margin indicates that eel farming, with its multi-stage rearing from aquariums to ponds lasting approximately 16 months per cycle, is feasible as a side business or primary enterprise. Participants were reminded that actual field values may vary depending on survival rates at each stage, feed efficiency, and market price fluctuations.

Through this simulation, older participants, accustomed to calculating profits and losses by intuition, began to understand the importance of understanding the rearing stages and recording harvest results in detail at each stage. Conversely, younger participants, accustomed to thinking in a calculative framework, gained a realistic understanding of the gradual and time-consuming process of eel farming, including the risk of loss in numbers and weight at each rearing stage, which is not always reflected in simple calculations on paper.

Diversification of Processed Eel Products

In addition to being sold as fresh/live eels, eels have significant potential for processing into various value-added products, following the principles of fishery product diversification that have been widely applied to other freshwater and marine fish commodities as a strategy to increase added value and business income (Junaidi et al., 2024);(Sholeh et al., 2024); (Sholeh et al., 2024). In this session, participants were introduced to several alternative processed eel products with development potential, as summarized in Table 5.

Table 5. Alternative eel product diversification was introduced to participants

Processed Products	Brief Description	Market Segments
Smoked eel	Smoked eel to extend shelf life and produce a distinctive flavor	Restaurants, souvenirs
Ready-to-eat kabayaki/unagi	Grilled eel with a sweet and savory Japanese seasoning in ready-to-eat packaging	Restaurants, modern markets
Eel floss	Dried eel fiber product with a long shelf life, seasoned with spices	Retail, souvenirs
Eel crackers/sticks	Dried processed product made from a mixture of eel meat	Local retailers, online
Eel nuggets/meatballs	Frozen, ready-to-cook product made from ground eel meat	Modern markets, catering

Packaging principles were also presented as a crucial part of product diversification, given that proper packaging techniques influence the quality and shelf life of processed fish products (Mulyawan et al., 2019). Participants were also introduced to the importance of implementing appropriate processing technologies to improve the quality and production capacity of processed products gradually (Nugraheni et al., 2021) and (Mathla et al., 2019). Group discussions resulted in an agreement that, in the initial phase, the group would prioritize developing smoked eel and eel floss products, as the production process is relatively simple and can use equipment already owned by some group members.

Marketing Strategy

The marketing practices for fishery products employed by senior participants have generally been conventional, with the harvest sold to collectors or intermediaries at prices set unilaterally by the buyer. This pattern leaves farmers with a relatively weak bargaining position. The current marketing strategy material focuses on introducing direct marketing alternatives through the use of social media and digital platforms, in line with various studies showing that social media utilization has a positive impact on expanding market reach and increasing sales for micro, small, and medium enterprises (Mansyur, 2021); (Nurpratama & Anwar, 2020) (Rosyidi et al., 2025).

The younger participants acted as facilitators in this session, assisting the older participants in creating simple social media accounts for their eel farming businesses, including practicing taking product photos and writing concise product descriptions. The material also covered an introduction to digital marketing content as a means of product promotion, including the potential use of instant messaging applications and online marketplaces to reach consumers outside the Magetan area, including consumers in the younger participants' hometowns of Bogor, Lampung, Sukabumi, Majalengka, Pandawan (Malang), Sidoarjo, Pacitan, and Jakarta (Helmi et al., 2025). As an illustration of good practice, participants were introduced to the digital marketing experience of processed fishery products implemented by fishing communities in other regions, which successfully increased business owners' income through online marketing of processed products (Hartono et al., 2023).

In addition to online marketing, participants were encouraged to consider partnering with Japanese or eel specialty restaurants in major cities, as a high-value market segment for both consumed eel and

processed kabayaki products. A combination of conventional marketing strategies (to local collectors to maintain short-term cash flow) and modern marketing strategies (online and restaurant partnerships for higher margins) was agreed upon as a realistic, multi-step marketing approach for the group in its early stages.

Formation of an Eel Cultivation Enthusiast Group

A focus group discussion held at the end of the second day resulted in the agreement to form an eel cultivation enthusiast group called the Lawu Sejahtera Eel Group, referring to Magetan Regency's geographical location on the slopes of Mount Lawu. All 25 participants, from Magetan, Bogor, Lampung, Sukabumi, Majalengka, Pandawan (Malang), Sidoarjo, Pacitan, and Jakarta, expressed their willingness to join as initial members of the group. A simple management structure was also agreed upon at the forum, as summarized in Table 6.

Table 6. Initial Management Structure of the Lawu Sejahtera Eel Group

Position	Main Roles	Description
Group Leader	Coordination of activities and communication with relevant agencies	Held by senior fishermen
Secretary	Administrative recording and documentation of activities	Held by the younger generation
Treasurer	Cash management and group savings	Held by senior fishermen
Production Coordinator	Technical monitoring of eel rearing stages	Held by senior fishermen
Marketing Coordinator	Management of social media and cross-regional market networks	Held by the younger generation

The division of roles within the management structure intentionally combines senior and younger participants in complementary positions. For example, the production coordinator, who relies on field experience, is supervised by a senior fisherman. In contrast, the marketing coordinator, who relies on digital literacy and cross-regional networks, is supervised by a younger generation. This role-sharing pattern reflects the principle of institutional strengthening, which is oriented not only toward formal structures but also toward the distribution of roles according to members' capacities. This aligns with findings that the effectiveness of group-based empowerment programs is greatly influenced by the clarity of each member's roles and functions (Syamsuadi et al., 2016).

In addition to the management structure, the forum also formulated an initial group work plan, which includes: (1) collective procurement of glass eel seeds to reduce costs per member; (2) developing a schedule for regular technical assistance with fisheries extension workers at each stage of the grow-out process; (3) limited-scale trials of diversified smoked eel and eel floss products; and (4) establishing an official group social media account as a joint marketing platform that can reach members and potential consumers outside Magetan. This agreement was outlined in the group's formation minutes, which were signed by all administrators and acknowledged by the local village officials.

The formation of this group complements the knowledge-building capacity developed on the first and second days of the activity. As emphasized in various studies on coastal community empowerment, increasing individual knowledge without institutional strengthening tends to be difficult to sustain, whereas strong institutions allow the transferred knowledge to be continuously practiced, evaluated, and developed collectively by group members (Lolowang et al., 2022); (Ratna et al., 2023); (Fauziyah et al., 2023).

Supporting and Inhibiting Factors

Several supporting factors were identified during the implementation of the activity, including the active support of village officials and the Magetan Regency Animal Husbandry and Fisheries Office in providing space and facilitating the presence of extension workers, the high enthusiasm of participants

for this new commodity with high market value, and the availability of mountain water sources that naturally support the environmental conditions for eel cultivation. Furthermore, the composition of the participants, which included two generations and participants from across regions from Bogor, Lampung, Sukabumi, Majalengka, Pandawan (Malang), Sidoarjo, Pacitan, Jakarta, and Magetan, was a crucial contributing factor to the success of the knowledge transfer process, as the various groups complemented each other's shortcomings while expanding the potential for marketing networks outside the region.

Several inhibiting factors were also identified, including the limited initial capital for most participants to gradually invest in aquariums and ponds and independently procure glass eel fingerlings, limited access to quality eel fingerlings in the Magetan area, which still had to be imported from outside the region, and the limited timeframe of the activity, which was only two days, preventing comprehensive technical skills development at each stage of the rearing process, particularly in processing diversified products. These constraints on capital and seed access align with findings from other coastal community empowerment activities, which generally face similar challenges in the initial stages of introducing new commodities (Ratna et al., 2023); (Fauziyah et al., 2023). Therefore, the existence of newly formed groups is crucial as a collective vehicle to address these constraints, for example, through joint seed procurement or by submitting institutional proposals for production facility assistance to relevant agencies, which are generally easier to facilitate than individual submissions.



Sustainability Plan

To ensure the sustainability of the activity's results, several follow-up plans have been developed in conjunction with the Lawu Sejahtera Sidat Group and the Magetan Regency Livestock and Fisheries Agency, including: (1) regular follow-up technical assistance by fisheries extension workers to monitor the progress of the pilot cultivation at each grow-out stage; (2) facilitating access to initial capital through group savings and loan schemes or through applications for production facility assistance to relevant agencies; (3) more in-depth follow-up training on diversified product processing practices; and (4) periodic evaluation of group progress every three months to ensure the initial work plan is progressing as agreed. This plan is crucial because the success of group-based empowerment programs is largely determined by the consistency of post-program mentoring, not just the intensity of the training itself. With ongoing mentoring, it is hoped that the Lawu Sejahtera Sidat Group can develop into an independent local economic institution and become a strategic partner for the local government

in developing eel commodities in Magetan Regency, while also reaching out to its member network and markets beyond Magetan.

4. CONCLUSION

The two-day community service activity, held on July 20 and 21, 2024, in Magetan Regency, successfully achieved its goal of transforming the capacity and institutions of fishing communities through freshwater eel cultivation. Twenty-five participants from Magetan, Bogor, Lampung, Sukabumi, Majalengka, Pandawan (Malang), Sidoarjo, Pacitan, and Jakarta attended the activity. The increased knowledge capacity of participants was reflected in a rise in their knowledge score from an average of 42 to 78, with the most significant improvements in understanding the stages of eel rearing and calculating business yields and profits. The cross-generational knowledge transfer approach, which combines the local wisdom of senior fishermen with a data- and digital-based approach mastered by the younger generation, has proven effective in bridging the gap from conventional cultural approaches to modern work practices, particularly in the multi-stage rearing stages (glass eels in aquariums for four months, followed by elvers, fingerlings, and consumption in ponds for four months each), simulation of business yields and profits, final product diversification, and marketing strategies.

A business simulation showed that from an initial population of 1,000 glass eel fingerlings, with a 90% survival rate, an estimated harvest of 300 kilograms of edible eel (900 fingerlings divided by 3) could be achieved, with an estimated gross revenue of Rp 66,000,000 at a selling price of Rp 220,000 per kilogram, and an estimated net profit of approximately Rp 16,500,000 at a 25 percent profit margin.

From an institutional perspective, this activity successfully facilitated the formation of the Lawu Sejahtera Sidat Group, a new forum for communities interested in developing eel cultivation, complete with a management structure and a mutually agreed-upon initial work plan. This group is expected to become the foundation for sustainable eel cultivation in Magetan Regency and to serve as a strategic partner for the Magetan Regency Animal Husbandry and Fisheries Office in the future development of high-value fishery commodities. The evaluation also demonstrated a high level of participant satisfaction with the program's implementation, reflected in the enthusiasm during the dialogue sessions, demonstrations, and focus group discussions (FGDs), the willingness of all 25 participants from across the region to join the established groups, and the positive feedback regarding the usefulness of the materials on the growth stages, simulations of business results and profits, product diversification, and marketing for their future business plans. This satisfaction serves as an important indicator that the implemented intergenerational knowledge transfer approach was well-received and beneficial to all participant groups. Follow-up activities, including regular technical assistance, facilitating access to capital, and in-depth training in product processing, are needed to sustain the achieved capacity and institutional transformation.

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