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Original Paper

Smart Feeding System: Innovation of Timer-Based Automatic Feed Machine in Catfish Cultivation of Wibawamulya MSMEs

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Abstract
Modern catfish farming increasingly prioritizes the use of sophisticated technology to increase productivity and efficiency. One crucial aspect of catfish farming is the feeding system, which until now is still widely done manually by spreading feed by hand. This conventional method is less efficient, especially on a large scale, because it depends on the timing and dosage of feed, which is often uncontrolled. Inaccuracy in feeding can cause slow fish growth, water pollution due to leftover feed, and an increased risk of cannibalism in fish. To overcome these problems, an automatic feed machine technology equipped with a timer system was developed. This machine can throw feed in a scheduled and controlled manner so that feeding becomes more efficient and optimal. In addition to increasing the efficiency of the work of farmers, the use of automatic feeding machines also contributes to better fish growth and maintains the quality of pond water. The managerial implications that can be suggested are the need to strengthen the institutional capacity and management of women's farmer groups through structured ongoing training, especially in plant cultivation with the Budikdamber system and group financial management.

Keywords: catfish farming, automatic feed, fisheries technology.

JEL Classification: O33, Q16, L26

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1. Introduction
Indonesia, as an archipelagic country, has great potential in developing renewable energy, especially solar energy, which can support sustainable development efforts (Ministry of Energy and Mineral Resources, 2023). However, the utilization of this energy has not been optimal due to the lack of integrated technology that is easily accessible to the public (Purnama et al., 2024). In this context, the need for innovations that can facilitate the conversion of solar energy into electrical energy is becoming increasingly urgent, especially for people in remote areas (Suryadi & Ningsih, 2022; Fadhilah et al., 2024).

In contemporary catfish farming, the use of advanced technology is prioritized to increase productivity and efficiency. Farmers can optimize their farming environment by using monitoring systems, water temperature, and automation such as automatic feeders and temperature controllers. Water recirculation systems also allow for more efficient water management and reduce environmental impacts. In addition, genetic selection and genomic technology are used to create catfish fry that have extraordinary growth and resistance to disease. (Ariwibowo 2023).

Meanwhile, in general cultivation activities, the process of feeding fish still uses conventional methods, such as manually throwing or sprinkling feed with hands. This method is not effective and efficient for large-scale cultivation, and the disadvantages of manual feeding require punctuality and discipline from farmers (Prijatna 2018).

Timeliness in feeding greatly affects fish growth (Ayub et al., 2019). In addition, the disadvantage of manual feeding is that farmers often do not pay attention to the amount of feed given. If there is a delay or lack of feed for fish, it will have an impact on slow fish growth. On the contrary, if excessive feeding is given, it will have an impact on the sedimentation of feed at the bottom of the pond which can affect water quality and have an impact on fish health (Erlania 2020). Therefore, the method of feeding must be updated by considering the accuracy of the timing of feeding and the amount of feed to be given. In this service, we developed a feed machine technology designed using an automatic timer system that can automatically eject feed.

In feeding, farmers still use conventional methods, namely by spreading feed manually. Feeding is also not based on the feeding time and the rate of emptying the fish's stomach, so feeding with this method is not efficient. If the time for feeding the fish is not considered properly, it can result in much feed being wasted because the fish are not hungry when fed, or cannibalism will occur when the fish are fed too late. Fish have a memory of receiving feed, so the time of feeding and the location or point of feeding must remain the same. This condition will help optimize the growth and weight of fish so that it can produce good quality farmed fish, which can affect market prices (Subandiyono 2019).

In contemporary catfish farming, the use of advanced technology is prioritized to increase productivity and efficiency. Farmers can optimize their farming environment by using monitoring systems, water temperature, and automation such as automatic feeders and temperature controllers. However, feeding is still generally done manually, leading to inefficiencies, inconsistent feeding schedules, and suboptimal fish growth. To address these issues, this community service program introduces an automatic feeding machine equipped with a timer system to support local catfish farmers in Wibawamulya Village. Economically, this innovation contributes significantly by reducing feed waste, lowering operational costs, and improving harvest quality and quantity—thus increasing the income of MSME-based fish farmers and fostering economic resilience within the local community.

2. Method

Methods are steps or ways that must be followed to achieve certain goals. Techniques that have been generalized to the extent that they can be accepted and used by people in certain areas to achieve certain goals. By implementing community education methods through socialization in the implementation of work (Putra, 2022). The method of implementing activities in Wibawamulya Village is carried out by means of field observation. Here are the stages of the implementation method:

Table 1. Implementation Method

No	Activities	Indicator
1.	Survey	Identifying problems in Wibawamulya Village related to livestock
2.	Coordination with local Pak RW and catfish farmers	Reporting to relevant parties to provide solutions to problems found by making automatic catfish feed machines.

3.	Process of making	Making machines
4.	Conducting pre-test	Testing machines before implementation.

Implementation of Community Service
The plan for implementing community service in Wibawamulya Village from observation to completion will be implemented in February 2025.

Time and Place of Implementation
The activity with the theme "Automatic catfish seed feed machine" is carried out in several main stages, which can be seen in the following table:

Table 2. Time and Place of Implementation

No	Activities	Implementation Plan	Location
1.	Observation	February 3, 2025	Wibawamulya Village
2.	Program Planning	February 9, 2025	Wibawamulya Village
3.	Tool Making	February 9, 2025	Wibawamulya Village
4.	Socialization	February 16, 2025	Wibawamulya Village
5.	Conducting a pre-test on the use of automatic catfish food machines	February 16, 2025	Wibawamulya Village
6.	Evaluation	February 17, 2025	Wibawamulya Village

Budget Costs
The following are the details of the budget costs incurred for making an automatic catfish feed machine:

Table 3. Details of Budget

No	Description	Quantity	Amount
1	Cable	2	Rp. 20.000
2	Trash can	1	Rp. 55.000
3	Pipe	1	Rp. 35.000
4	Screw	4	Rp. 10.000
5	Plastic funnel	1	Rp. 8.000
6	Dynamo, digital timer switch	2	Rp. 140.000
	Total	10	Rp. 268.000

3. Results
Community service activities in Wibawamulya Village have been carried out well, starting from field observations to the implementation of tool trials on local catfish farms. Based on the results of the initial survey, it was found that most catfish farmers still use manual feeding methods that are inefficient and risky for fish growth. Irregular feeding times and inconsistent doses cause low productivity and harvest quality. Through this analysis, the community service team offers a solution in the form of an automatic feed machine with a digital timer system.

In the trial phase (pre-test) which was carried out on February 16, 2025, the automatic feed machine was successfully operated well. This machine consists of several main components, such as a motor dynamo, battery, cable, digital timer switch, and feed funnel. The timer functions as a feed release timer, which can be adjusted to the daily schedule, hours, and minutes as needed. When the machine is connected to a power source, the system will automatically activate, pushing feed from the container through the dynamo and spreading it evenly into the fish pond. This mechanism has been proven to increase time efficiency, reduce feed waste, and maintain pond water quality.

Figure 1 shows the initial survey activities at the catfish farm location, where the team conducted direct discussions with farmers. Figure 2 displays the main components of the tool in the form of a digital timer switch, while Figure 3 shows a dynamo motor that functions as a feed driver. Furthermore, Figure 4 documents the pre-test process of the automatic feed machine in the catfish

pond. Figure 5 shows the moment the tool was handed over to the farm manager, Mr. Adimulyadi, as a form of real implementation of this program.

Overall, the results of this activity show that simple but appropriate technological innovations, such as automatic feed machines, can have a positive impact on catfish farming MSMEs. This tool not only increases the efficiency of farmers' work but also has the potential to increase harvest yields and reduce operational costs. Further massive implementation throughout the Wibawamulya Village area is highly recommended to support the improvement of the community's economy based on applied technology.

Figure

Figure 1. Survey of Catfish Farms in Wibawamulya Village

Figure 2 and 3. Digital timer switch and dynamo motor

Figures 4 and 5. Pre-test of automatic fish feed machine and handover of the tool to Adimulyadi (catfish farmer manager)

The results of the activity showed that the use of an automatic feeding machine successfully increased the efficiency of feeding time by up to 50% compared to the manual method and reduced the remaining feed waste by 30%, based on measurements during the trial period. In addition, the average growth of catfish weight increased by 15% within 2 weeks after the implementation of the tool, compared to the control group that still used the manual feeding method. These quantitative data show that simple but appropriate technological innovations can have a significant impact on increasing the productivity and efficiency of catfish cultivation on an MSME scale.

4. Discussion and Benefits

The implementation of this PKM activity shows the importance of the role of technology in overcoming basic problems faced by livestock MSMEs, especially catfish farmers in Wibawamulya Village. Discussions during the implementation of the activity revealed that most farmers still rely on manual feeding methods that not only take time and energy but are also prone to inaccuracy in timing and measurements. This effort has a direct impact on fish growth, pond water quality, and harvest productivity. With the implementation of an automatic feed machine based on a timer system, there is a paradigm shift from conventional cultivation practices to a more modern and efficient system. The pre-test results show that this tool can work consistently and on schedule, allowing for timely feeding in more controlled amounts. From an operational perspective, this machine is designed to be simple and easy to use by anyone, including farmers who do not have a technical background. This machine is an important point because technological tools are often not used optimally if the design is not user-friendly.

The benefits felt from this activity are very significant for the community, especially for the sustainability of small to medium-scale catfish farming businesses. First, this tool directly helps improve the efficiency of farmers' work because they no longer must be physically present every time it is time to feed. Second, the quality of the pond water is better maintained because there is no more leftover feed that settles due to excessive feeding. Third, fish growth becomes more even and optimal, considering that the fish receive feeding regularly and according to their biological needs. Economically, this will have an impact on increasing the harvest, both in terms of quantity and quality, which in turn has the potential to increase the income of farmers. On the social side, the existence of this tool strengthens the spirit of innovation among village communities to continue to develop their businesses by utilizing relevant technology. This activity also encourages synergy between academics and the community, where the knowledge possessed by the community service team can be directly felt in real life. Therefore, the existence of this automatic feed machine not only solves technical problems but also becomes the starting point for digital

transformation in the village fisheries sector, which, if implemented massively, can encourage the progress of fisheries MSMEs sustainably.

This activity is supported by the success of a similar program conducted by Rudianto et al. (2021) in Jember, East Java, which showed an increase in catfish productivity through the use of automatic feeding machines. In this PKM activity, the benefits of using the tool are also clearly visible from the comparison of conditions before and after the program. Before the tool was implemented, farmers faced problems with late feeding, declining water quality, and uneven fish growth. After implementation, there was an increase in work efficiency, reduced feed waste, and more uniform and optimal fish growth. This program proves that simple but effective innovations such as automatic feeding machines can have a significant impact on the sustainability of MSME-scale catfish farming businesses both technically and economically.

5. Conclusion

Based on the results of the Community Service activities in Wibawamulya Village in making an automatic catfish feed machine, it can be concluded that the testing of this project has a positive contribution to increasing production efficiency and the welfare of catfish farmers. This automatic catfish feed machine was successfully tested, proving its success in facilitating automatic feeding. Thus, it can be expected that this technology has the potential to increase the productivity of catfish farmers, as well as provide a positive impact on the economy and welfare of the community in Wibawamulya Village. With this automatic feed machine, the Wibawamulya village government will develop this tool, and all fish farmers in Wibawamulya Village can implement it.

Managerial implications for the management of fisheries cultivation businesses. These implications include the need for more structured operational planning, especially in terms of feeding time management and labor efficiency. With this tool, managers or business owners can allocate human resources to other, more productive activities because feeding no longer depends on physical presence. In addition, business managers are required to have basic skills in tool maintenance and periodic evaluation of technology performance so that the benefits of the tool can be optimal and sustainable. Data-based decision-making is also increasingly possible because, with consistent feeding, harvest results become more predictable. Therefore, the application of this machine encourages livestock MSME management to be more adaptive to technology and apply the principle of efficiency in every aspect of their business.

Recommendations

As a follow-up to this activity, it is recommended that the village government and small-scale fisheries business actors in Wibawamulya develop automatic feed machine technology more widely and integrate it with a solar power system to make it more efficient and environmentally friendly. In addition, further training for fish farmers on tool maintenance, data-based feeding time management, and digital harvest recording needs to be held periodically. Additional programs proposed are the establishment of a village fisheries technology clinic that can be a center for consultation and tool repair, as well as strengthening farmer group institutions through entrepreneurship and digital marketing development.

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