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Enhancing the Economic Value of Waste with Maggot Utilization in Village-Owned Enterprises of Arthomoro Based on Circular Economy

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Abstrak

Kurangnya pengetahuan tentang pengelolaan sampah organik menjadi permasalahan utama di berbagai daerah termasuk di Pekon Panutan, Kecamatan Pagelaran. Sampah yang tidak terkelola dengan baik dapat memicu berbagai dampak negatif seperti pencemaran lingkungan dan masalah kesehatan. Salah satu solusi yang dapat diterapkan adalah memanfaatkannya menjadi produk yang bernilai ekonomis, yaitu dengan budidaya maggot. Maggot adalah larva lalat BSF (Black Soldier Fly) yang mampu menguraikan sampah organik menjadi kasgot yang dapat digunakan sebagai pakan ternak. BUMDes Arthomoro di Pekon Panutan memiliki potensi untuk meningkatkan nilai ekonomi sampah melalui pemanfaatan maggot, didukung oleh akses terhadap sampah organik yang melimpah, memiliki sumber daya manusia yang cukup serta potensi dukungan dari Masyarakat. Pengabdian Masyarakat ini bertujuan untuk meningkatkan kesadaran dan partisipasi masyarakat dalam pemanfaatan maggot. Hasil dari kegiatan ini menunjukkan adanya peningkatan pemahaman warga tentang pentingnya mengelola sampah organik dan partisipasi aktif dalam program budidaya maggot ini. Metode yang digunakan meliputi sosialisasi dan praktik budidaya maggot. Program ini mendapatkan sambutan dan apresiasi yang positif dari pihak warga desa serta berhasil meningkatkan pemahaman peserta mengenai budidaya maggot sebagai solusi pengelolaan limbah organik dan peluang peningkatan pendapatan ekonomi. Koordinasi awal yang baik, antusiasme peserta, serta dukungan dari Kepala Pekon dan pihak terkait menjadi faktor kunci keberhasilan ini.

Kata kunci*: Pengelolaan Limbah Organik, Budidaya Magot Lalat Black Soldier Fly (BSF), BUMDes, Ekonomi Sirkular, Sumber Pendapatan Alternatif, Pekon Panutan*

Abstract

The lack of knowledge regarding organic waste management poses a significant challenge in various regions, including Pekon Panutan and Pagelaran District. Improper waste management can lead to negative impacts such as environmental pollution and health issues. One viable solution is to utilize organic waste as a valuable product through maggot cultivation. Maggots are the larvae of the Black Soldier Fly (BSF), which can decompose organic waste into high-quality compost (kasgot) used as animal feed. BUMDes Arthomoro in Pekon Panutan has the potential to enhance the economic value of waste through maggot utilization, which is supported by abundant organic waste, sufficient human resources, and community support. This community service aims to raise awareness and encourage community participation in maggot utilization. The results indicate increased residents' understanding of the importance of managing organic waste and active participation in the maggot cultivation program. The methods used include socialization and practical maggot farming training. The program received positive feedback and appreciation from community members, successfully improving participants' understanding of maggot farming as a solution for organic waste management and an opportunity to enhance economic income. This success was vital to good initial coordination, participant enthusiasm, and support from the Pekon Head and relevant stakeholders.

Keywords*: Organic Waste Management, Black Soldier Fly (BSF) Cultivation, BUMDes, Circular Economy, Alternative Income Source, Panutan Village*

1. INTRODUCTION

Waste is the result of human activities that have various negative impacts. Therefore, excellent and sustainable waste management is crucial to preserve the environment and human health [1]. Law Number 18 of 2008 concerning waste management defines waste as the residue of daily human activities or natural processes in the form of solid or semi-solid. This waste can be in the form of organic or inorganic substances, whether biodegradable or not, and is considered no longer valid, so it is disposed of in the environment. More than just a definition, this statement contains significant meaning about how we view waste. Waste is not just a useless object but a residue of human activities and natural processes that has the potential to be reused. Organic waste, for example, can be processed into nutrient-rich compost to fertilize the soil. Inorganic waste, on the other hand, can be sorted and recycled into new products or even converted into alternative energy. Effective and efficient waste management is the key to harnessing its potential and minimizing its negative environmental impact [2].

Circular economy is an economic concept that is closely related to the concept of sustainable development. The main goal of the circular economy is to improve economic prosperity, followed by improved environmental quality and its impact on social justice and future generations supported by consumers' business and consumption patterns [3]. The circular economy also aims to generate economic growth by maintaining the value of products, materials, and resources in the economy for as long as possible, thus minimizing the social and environmental damage caused by the old linear economic approach. Circular economy activities are focused on the 5Rs: Reduce, Reuse, Recycle, Refurbish, and Renew [4].

Like many other regions in Indonesia, Pringsewu Regency faces a complex waste problem. According to data from the National Waste Management Information System (SIPSN) website, as much as 50% of the waste composition generated in 2023 will come from food waste. The increasing waste volume, inadequate waste management infrastructure, and low public awareness are the main factors exacerbating this situation.

Proper waste management and improvement of the community's welfare can be achieved by utilizing Maggot. Maggot is the larva of the BSF (Black et al.) fly, which is a potential organism utilized as a decomposer of organic waste commonly produced by households, such as food waste and other organic materials [2]. The ability of BSF flies to decompose organic matter is better than earthworms. Maggot has a high protein and fat content, a chewy texture, and the ability to secrete natural enzymes to be used as an alternative feed for livestock such as fish and poultry [5]. The nutritional content of BSF larvae varies depending on the life cycle phase and growth media, with the highest protein reaching 61.60% in the fly phase using chicken manure and tofu dregs (KA+AT) media [6].

Figure 1. Black soldier fly (BSF) maggot

Pringsewu is one of the districts with many sub-districts and villages, so efforts are needed to develop the economy and welfare of rural communities in Pringsewu Regency. One of the sub-districts and villages in Pringsewu Regency is Pagelaran Sub-district and Pekon Panutan Village. Administratively, the area of Pekon Panutan consists of 5 hamlets and 13 neighborhood

associations, and based on the typology of Pekon Panutan, it consists of rice fields, fields, plantations, fisheries, and small industries.

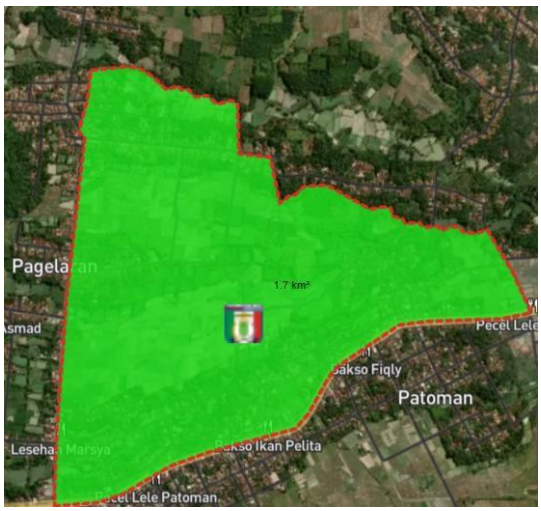

Figure 2: Map of Pagelaran Sub-district

In the Pagelaran sub-district, Pekon Panutan has a BUMDes called Arthomoro, located in Pekon Panutan. The BUMDes Arthomoro business only has a mineral water refill business. Based on the profiles of villages in the Buay Bahuga sub-district, of course, this is a challenge and a shared obligation to improve community welfare, as well as business differentiation so that in the Pagelaran Pekon Panutan sub-district, there is equitable development. One method to encourage development at the village level is to conduct training for the community on maggot cultivation.

Figure 3. BUMDes Arthomoro Pekon Panutan

Based on Law No. 6 of 2014 concerning Villages, Village-Owned Enterprises (BUMDes) are businesses where the village owns all or most of the capital through direct participation derived from wealth. The BUMDes is a business entity in which the village owns all or most of the capital through direct participation derived from the separate assets of the village in order to manage assets, services, and other businesses for the welfare of the villagers. The ability of BUMDes in the village is controlled by the government's nawacita, which is the driving force of the village economy. Next, some critical cases were found regarding the development of BUMDes business units. The activity attempts to analyze the leading cases of BUMDes management. The capabilities and the cases experienced will be differently influenced by each village's capabilities [7].

The problem faced by the Pagelaran Pekon Panutan sub-district is the absence of business differentiation in the Pagelaran Pekon Panutan sub-district. Several factors are a problem so that the BUMDes of Pagelaran Pekon Panutan sub-district does not yet have a diverse business, including because:

a) Budget Funds are inseparable from the importance of funds in every activity or even the creation of a body or organization; if you look at the creation of BUMDes, the budget already exists, but it is not appropriate for implementation because many village priorities must be resolved first, be it regarding assistance or development. After all, this has been compiled together and agreed upon in its implementation, making it difficult to have a budget for building BUMDes.
b) There is no common understanding of BUMDes, which has yet to reach the community. This is preceded by the village officials, especially the village heads, who need to understand BUMDes better.
c) Many village officials do not fully understand the village's authority in accordance with the contents of Law no. 6/2014 on Villages. 6/2014 on Villages. An understanding of the principles of subsidiarity and recognition has not been fully utilized as a village strength in an effort to explore and utilize village potential.
d) Not Understanding the Concept: Physical development is inversely proportional to empowerment projects that are programs, and the results are not physically visible. In fact, human resource development is an important asset in maintaining village independence.
e) BUMDes does not attract the younger generation. The existence of BUMDes has not really been able to attract the younger generation as managers. It can be said that in many villages in Indonesia, BUMDes are not attractive for most young people to work for.

Another problem that arises in the community in Pekon Panutan, Pagelaran Subdistrict, Pringsewu Regency, as in other areas, is that they need to have adequate knowledge in overcoming household waste problems and utilizing organic waste that can increase economic value. The community does not know the use of Maggot as an alternative ingredient for animal feed and organic fertilizer. Several studies have shown that BSF maggot cultivation can reduce the volume of household organic waste and produce high-protein animal feed [8]. This is necessary to reduce feed production costs. The black soldier flies (Hermetia illucens), or BSF (Black et al.) is known as a decomposer of organic waste [9]. The cultivation of Black Soldier Fly (BSF) maggots has been implemented in various parts of Indonesia as a solution to organic waste management and an alternative source of animal feed.

A common method for introducing BSF maggot farming is through socialization and training in local communities. The results of BSF maggot cultivation can be live, dried, or pelleted larvae that can be used as alternative feed for fish and poultry [10]. In addition to environmental and feed benefits, BSF maggot cultivation also has the potential to provide economic value to the community through the sale of maggot products [11].

So, the purpose of mentoring and mentoring activities in this business is to differentiate the business by socializing maggot cultivation so that in Pagelaran Pekon Panutan Sub-district, it can be more creative in responding to economic challenges and can increase the income of the Pagelaran Pekon Panutan Sub-district community.

2. METHODS

Methods and Stages in Community Service Activities

In conducting this program, several methods and stages will be explained as shown below:

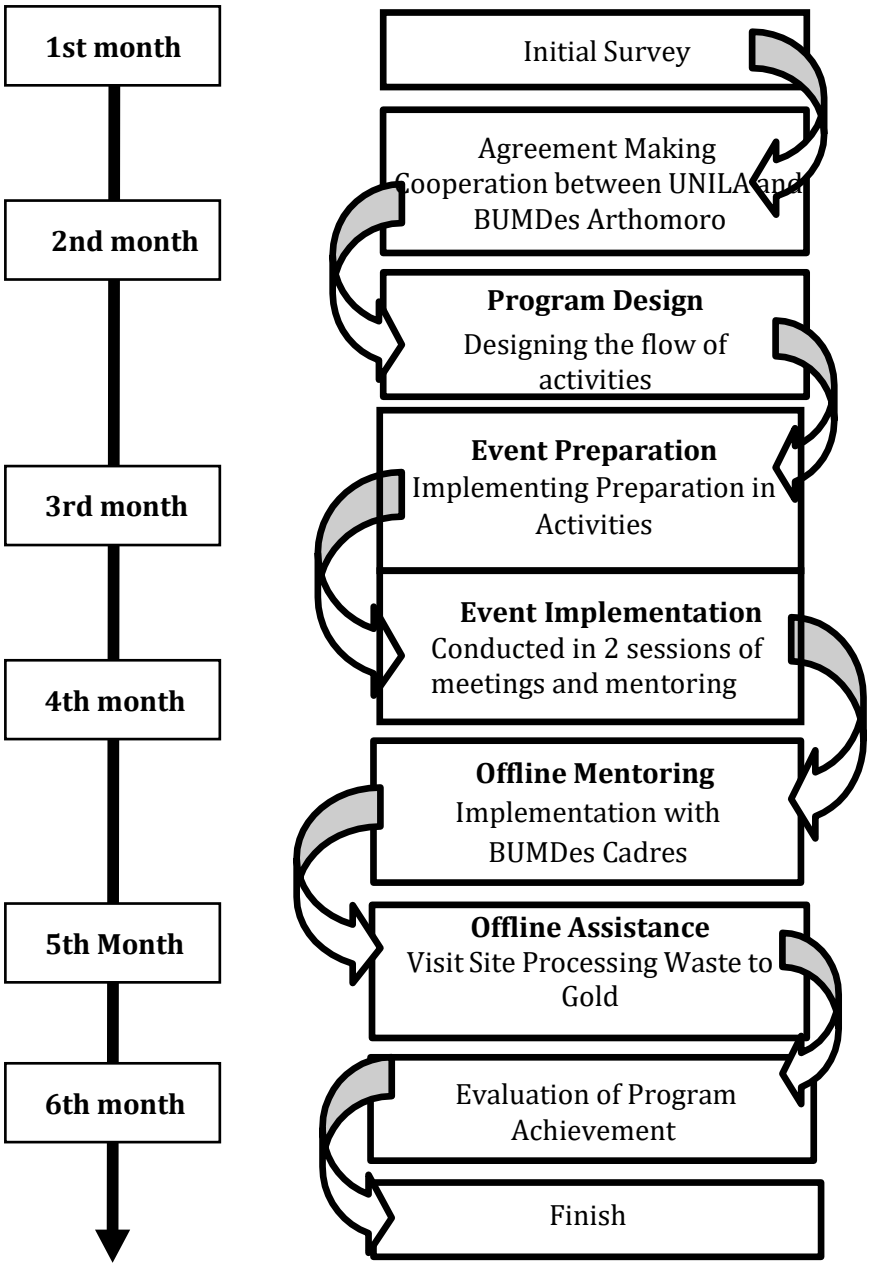

Figure 4: Stages of Activity Implementation

Description of Activities to be Disseminated to the Community

Activities that will be disseminated to the community include socialization, mentoring, and mentoring. The seminar material provided to the community is in the form of explanations related to how to care for maggots, processing organic waste that will be eaten by maggots, putting finished fertilizer into gunny sacks, some maggots that have started to grow into animal feed, and cultivating some maggots that have become BSF flies to return to laying eggs, management methods, and work methods.

Work Procedures to Support the Realization of the Offered Method

In order to support the realization of the proposed method, the steps of the working procedure were taken:

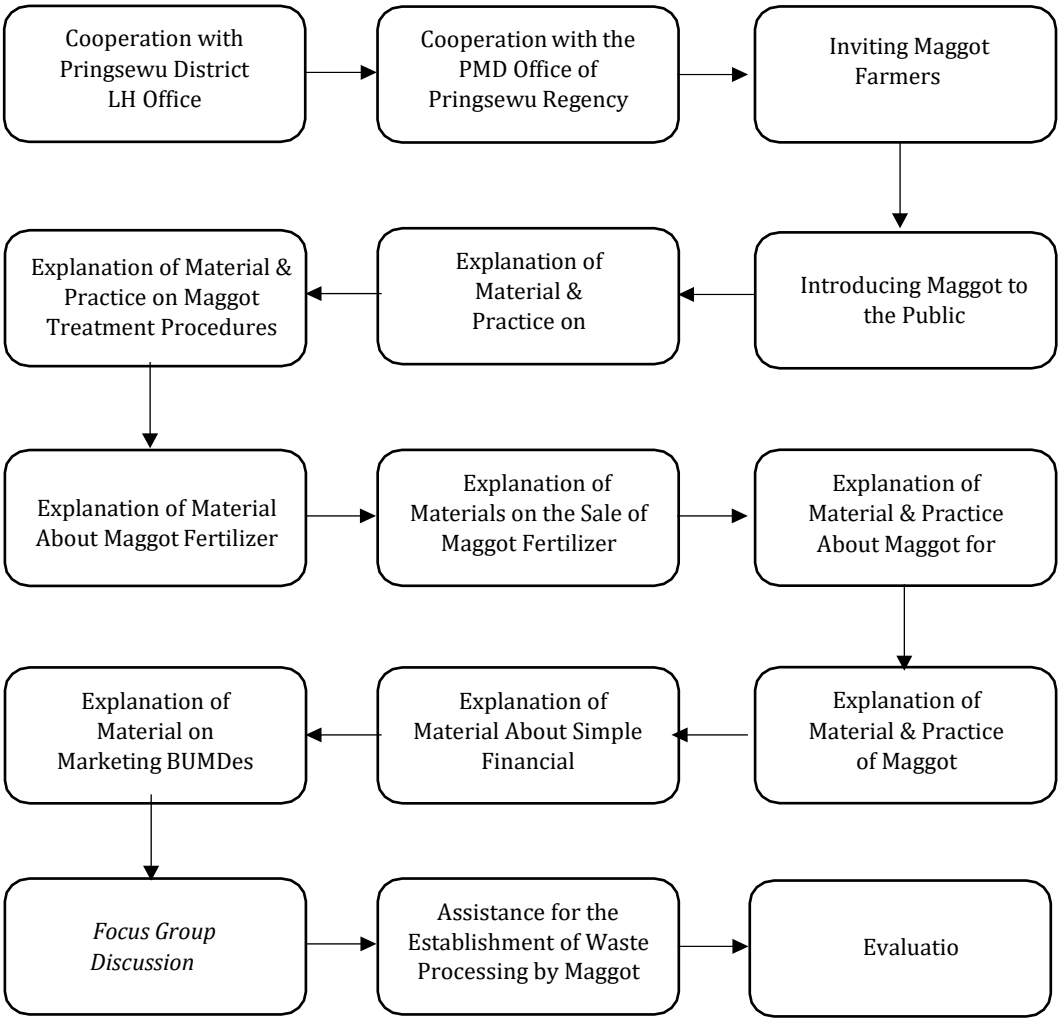

Figure 5: Stages of Work Procedure

Parties Involved in Service Activities

The parties that will be involved in the establishment of this BUMDes are Lecturers of Lampung University, Students of Lampung University, Pekon Panutan Stakeholders, the Pekon Panutan Community, Maggot Farmers, and Households in Pekon Panutan. The development of maggot-based organic waste processing in BUMDes Arthomoro is, of course, very much determined by the participation of stakeholders and the communities involved; if the participation of stakeholders and the community is good, of course, it will further streamline the development of maggot-based organic waste processing in BUMDes Arthomoro so that optimal and good organic waste processing can be created. The participation of stakeholders and the community will continue to be assisted in facilitating the establishment of maggot-based organic waste processing in BUMDes Arthomoro.

Evaluation of Program Implementation and Sustainability

In conducting the evaluation, the team will contact stakeholders and the Pagelaran Pekon Panutan sub-district community to monitor how far the maggot-based organic waste processing development process at BUMDes Arthomoro has progressed. The team will also directly visit the

BUMDes Arthomoro organic waste processing site to see firsthand and continue providing input and assistance to stakeholders and the Pagelaran Pekon Panutan sub-district community. For the program's sustainability, it is hoped that the BUMDes Arthomoro organic waste processing that has been created can continue to run and develop. Besides that, the BUMDes Arthmoro organic waste processing will be used as one of the BUMDes routinely visited when conducting community service programs with students, lecturers, and experts.

3. RESULTS AND DISCUSSION

The observation stage is the most crucial part of implementing this service program; we conducted observations in the field as the first step. As seen in Figure 6, we started our visit to coordinate with the management of BUMDes Arthomoro in Pagelaran Pekon Panutan District. During this meeting, we identified the problems in Pekon Panutan, especially in BUMDes Arthomoro. The results of this discussion led us to an agreement to continue discussions with the Head of Pekon Panutan and other stakeholders regarding the plan for this service activity.

(a) (b)

Figure 6: Initial Coordination with Pagelaran Sub-district Pekon Panutan (a) at BUMDes Arthomoro (b)

Next, we revisited Pekon Panutan at the Office of the Head of Pekon Panutan, Pagelaran District, Pringsewu Regency. The head of Panutan Pekon, BUMDES Advisor, BUMDES chairman, UNILA lecturers, and fellow students attended this initial discussion.

Figure 7. Discussion and Cooperation Agreement Making

Figure 7 depicts us explaining the purpose and intent of the activities to be carried out, as well as discussing the existing problems in the environment and the desires of the BUMDES. It was revealed that BUMDes Arthomor has few business units and needs to add another business branch. In addition, Panutan villagers have organic waste that Panutan villagers underutilize. It is necessary to process organic waste, which has more benefits.

At this meeting, we presented maggot cultivation as an alternative solution to organic waste management, utilizing the decomposition of food scraps by maggots. We explained that maggot cultivation can not only help solve waste problems but can also be a stimulus in mobilizing the community economy on a small scale.

Based on the discussion, it was revealed that Pekon Panutan had tried maggot cultivation before. However, they experienced various obstacles, such as a lack of proper understanding of maggot management, difficulties in purchasing maggot seeds, and challenges in maintaining consistency among the village youth involved. The organic waste decomposer "maggot" was once utilized, but the villagers lacked understanding of the storage process, resulting in the Maggot dying and causing a very foul smell and trauma in the community.

Nonetheless, the BUMDES responded well to the discussion, facilitating the discussion process. The Pekon Head showed strong interest and eagerness to start the socialization of maggot cultivation. We also agreed on several important things related to the implementation of this activity, including the determination of the schedule, target community groups, and the implementation location. This agreement became the foundation for the next steps in this series of community service activities.

The process evaluation was conducted during the socialization and training activities, focusing mainly on the participants' activeness and participation. The aspects assessed included the participants' seriousness in paying attention to the material presented, their level of involvement in the discussion, and their willingness to ask questions or provide responses.

Figure 8. Socialization and Counseling on Maggot Cultivation

On the day of the socialization, several Panutan villagers, including youth and men, attended the event. Participants listened carefully to the speaker's presentation and demonstration during the event. They tended to prefer explanations that were closer to them because they could see the demonstrations clearly. During the activity, participants showed a very positive and enthusiastic response. Sosialisasi dan Penyuluhan Budidaya Maggot

Figure 9. Practice and Interactive Session with Participants

We explained maggot cultivation in detail, which caught their attention. They were very interested in the potential of maggot farming as a solution to organic waste management and a new source of income. We also discussed that maggot farming provides economic benefits and helps address the waste problem around them. Participants understood that maggots could improve feed nutrition, accelerate livestock growth, reduce feed costs, and serve as organic fertilizer- all of which can be achieved without the need for large tracts of land.Kegiatan menjadi lebih interaktif.

The activity became more interactive when participants asked about technical aspects, such as managing maggots, capital and profit calculations, and marketing strategies. However, some participants still needed more courage to ask questions directly after the presentation. Hence, during the event's closing, they met the presenters to ask about the technical matters that had been presented. The high interest of the participants in digging for more information showed that this activity succeeded in attracting attention and providing new insights that were useful for them.

Figure 10. Delivery of Product Samples from Maggot Cultivation Results

At the end of the event, the person's head responded favorably to encourage the participants to apply the techniques that had been taught. He offered "help" to Panutan villagers who wanted to apply the techniques competently and diligently. The full support of the Pekon Head further strengthened the plan to involve BUMDes Arthomoro in developing maggot cultivation. This is expected to provide dual benefits: as an organic waste management solution and an effort to create sustainable economic opportunities for the village community.

A final evaluation was conducted after the activity by visiting participants to assess the outcomes and impact of the training. We found that participants showed greater interest in the simulations and hands-on examples provided. The activity included simulated maggot cultivation practices guided by lecturers and students from Lampung University and materials on empowerment and entrepreneurial motivation by lecturers from Saburai University. This approach proved effective in attracting participants' attention and improving their understanding.

During the Q&A session, some participants still needed clarification about what they wanted to ask. To improve the effectiveness of the Q&A session, it was suggested that participants be allowed to see live demonstrations and get up close to the examples provided. This approach is expected to help participants better understand and apply the material presented. The final evaluation showed increased participants' understanding of the benefits and potential of maggots. They began to realize that Maggot could be used as a solution to manage organic waste and as an opportunity to increase household economic income in Pekon Panutan.

Based on the evaluation description above, it can be concluded that the participants already have basic knowledge of organic waste treatment. However, they have yet to find the proper techniques and ways of processing, so the process is often hampered. With the implementation of this activity, their understanding of maggot utilization as a solution to organic waste management and increasing economic income has increased. They are now better prepared to implement maggot cultivation techniques as an alternative business that is beneficial for increasing the selling value of their livestock and agricultural products.

4. CONCLUSION

Based on the dedication activity of Increasing the Economic Value of Waste Through the Utilization of Maggot in BUMDes Arthomoro Based on Circular Economy in Pekon Panutan, Pagelaran District, Pesawaran Regency, it can be concluded that the activity received good

response and appreciation from the villagers. This activity successfully increased participants' understanding of maggot cultivation as a solution to organic waste management and an opportunity to increase economic income. Good initial coordination, the enthusiasm of the participants, and support from the Pekon Head and related parties were critical factors in this success. In addition, the approach involving practical simulations and direct material delivery by lecturers and students proved effective in improving participants' understanding. Hands-on demonstrations provide a more real-world experience and make it easier for participants to understand concepts. The success of this activity can be seen from the activeness of the participants in the activities carried out, namely by following enthusiastically, and several questions were submitted to the presenters.

However, the main obstacle faced is limited participation, especially in remote areas, which hinders the overall scope and effectiveness of the activity. Based on the evaluation of the service activities carried out, namely to overcome the constraints of limited participation and ensure the success of future activities, it is recommended that this activity be continued with a strategy that is more focused on increasing the reach of information. Information distribution should be expanded to reach remote areas so that more participants can be involved. The capacity-building of participants through advanced training and adequate technical and financial support is also crucial. Periodic evaluations and the development of business models that comply with circular economy principles can help identify and address existing problems and increase the activities' overall impact. Strengthening the synergy between BUMDes, village government, and educational institutions will also expand the impact and effectiveness of the program.

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