

# Assistance for the Establishment of Waste Bank in the Luhur Lestari Women Farming Group (KWT) Baleendah District

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**Abstract**—Waste management pattern in RT 01 RW 02 Baleendah Village, Bandung Regency is only done by collecting and disposing of it. This problem has encouraged the “Luhur Lestari” Women Farmers Group (KWT) to reduce the waste problem as well as make it a business field to seek funds for its members because waste has both a negative and a positive impact. Handling waste and increasing its added value will be easier if the waste has been separated. However, in this location, the household waste is still mixed at the moment. This community service program (PKM) aims to increase the participation of residents in waste management as well as to increase the added value of the waste. The programs involve waste management training for the residents, the establishment of a waste bank, and maggot cultivation. The PKM programs show that the training increases residents’ participation to sort out organic and non-organic waste, and the waste bank named KWT Luhur Lestari Waste Bank is established to handle the non-organic waste. Meanwhile, organic waste is used for maggot cultivation. The maggots are fed to the local livestock such as catfish, chickens, ducks, etc. However, farmers who cultivate are still limited in number and operate on a small scale, so the use of organic waste must be increased.

**Keywords**—waste bank, maggot cultivation

## I. INTRODUCTION

Waste must be properly managed to avoid environmental pollution and to improve an area's cleanliness and comfort. To regulate the management of waste generated by a region, a waste management system is required. The waste problem in Neighborhood 01 (RT 01) Hamlet 02 (RW 02) Baleendah Village, Baleendah District, Bandung Regency is that waste has not been properly managed due to the collect-transport-dispose waste pattern. The Baitul A'mal boarding school students take household waste from each house and collect it in temporary waste disposal. The garbage men of the sanitary agency are then pick up the collected garbage only twice a month and frequently arrive later than scheduled. This waste management method causes the temporary waste disposal to be filthy, stinks, and attracts a swarm of flies.

The poor state of waste management in RT 01 motivates the Luhur Lestari Women Farmers Group (KWT) management to address the issue while also creating a business opportunity to fund KWT activities through the establishment of a waste bank. To improve the welfare of its members, the KWT has carried out urban farming activities by utilizing home yards and conducting food processing for small and medium enterprises (SMEs). Due to the limited funds owned by KWTs, KWTs must seek alternative sources of funding to meet their own funding needs. The waste bank is one of the community-level strategies for implementing the 3Rs (reduce, reuse, and recycle) in waste management. In principle, the implementation of a waste bank is a form of social engineering to encourage people to sort waste.

A new approach to waste recycling known as "waste bank" has recently emerged in Southeast Asian countries. Typically, waste banks allow members to exchange recyclable materials for money saved, with varying returns based on the type and weight of the materials [1]. The findings revealed that the waste bank management model not only benefits the environment but also has an impact on the local economy by increasing the income of housewives in the waste bank's vicinity [2,3].

The Luhur Lestari KWT Waste Bank is a unit waste bank that is fostered by the main waste bank. In the unit waste bank, inorganic waste is collected from members and then sold to the main waste bank. Meanwhile, organic waste is used as feed for maggot cultivation. Maggot is an organism derived from the eggs of the Black Soldier Fly (BSF) and classified as a spoilage organism because it grows by consuming organic materials [4]. Maggots BSF can be used as a foundation for urban insects recycling organic waste technology [5-8].

Maggots can be used to feed fish and poultry. Maggots have the potential to be used as catfish feed due to their high protein content of 30-40% [9]. The benefits of using maggots as a fish feed substitute include their ease of cultivation in both small and large quantities, high nutrient content, antimicrobial

and antifungal properties, lack of disease transmission, and lack of human competition [7].

Waste management must not only solve environmental problems but also add economic value [10]. A waste management system using appropriate technology is expected to drive the local economy and community empowerment that has a positive impact on the relevant areas. Integrated community-based waste management involves both external and internal parties and provides benefits such as cleanliness and environmental sustainability, improved local community welfare, and social interactions that promote local learning [11].

Maggot cultivation requires organic waste as a growing medium. Organic waste can be obtained from household waste. Housewives play an important role in the generation of household waste. Waste separation into organic and non-organic waste at the source by housewives is critical for waste management [12-14].

The main problem of recycling in the waste bank is that the housewives do not have waste separation behavior so that all the solid waste gets mixed [14]. Without adequate knowledge about the types of waste and the impact on how to dispose of waste, then housewives will unite all types of garbage and then just throw it into the trash can. On the other hand, if the mothers as household managers understand the importance of sorting out the types of waste, they will be very helpful in waste management.

The household waste should be separated into organic and non-organic waste, because waste processing becomes difficult and expensive without sorting, and there is a high risk of polluting the environment. Waste management knowledge is an important factor in household solid waste separation [14]. To persuade every family to sort waste and make it a habit, it is necessary to find a way to increase residents' knowledge through training. The training was primarily given to housewives due to the mother's role as a household manager. However, the training is designed to help society in managing household waste, particularly waste sorting.

According to the above description, we conduct Community Service Program (PKM) to increase society's, particularly the housewives, knowledge of the waste problem and its utilization by providing training. The training purposes are to change society's perception of the importance of the environment, to motivate residents to sort waste and to train them to use waste. The PKM program also aims to practice maggots cultivation to increase the added value of organic waste. Maggot cultivation can be used as an alternative poultry feed or fish feed, and the residual compost of maggot cultivation is very useful for KWT urban farming. Hence, feed costs for poultry or fish will be reduced and revenue will be earned as well.

As a result of this program, the community is expected to be more aware of the importance of sorting waste from their homes and managing waste on a regional scale. Community

participation will benefit the environment by reducing the amount of waste that must be handled by the government, reducing the risk of flooding caused by garbage dumped into rivers, reducing the incidence of diseases caused by garbage piles, and creating a clean, green, and shady environment.

## II. METHODOLOGY

The PKM program is implemented using the participatory approach method. In the participatory approach, rural people are given opportunities to be involved in the entire developmental process which will affect their lives [15,16]. The research objects are members of the KWT Luhur Lestari that are involved at all stages of the PKM program. Research materials and tools are training materials, a list of questions for pretest and posttest, materials and tools required for maggot cultivation and waste bank. Collecting data is conducted through observation, interviews, also conducting pretest and posttest. Meanwhile, data analysis was carried out by comparing the pretest and posttest results and then qualitatively analyzing the results of interviews and field observations. The steps of program implementation are as follows:

### A. Preliminary Study

At this stage, a preliminary study includes a direct survey of the field and conducting interviews with relevant parties. Interviews were conducted with the KWT management, the head of the RT, the head of the "Jasmine Lapas" waste bank as a pilot waste bank, and the management of the main waste bank (BSB). This direct survey aims to see the actual conditions and obtain more accurate information about the problems to be studied.

### B. Preparation of Training

Training preparation is done by preparing pretest, posttest, and training materials following the community service program's (PKM) objectives. Another preparation is to provide trash cans which will be distributed to training participants who are willing to sort the waste.

### C. Training

The training was conducted to improve participants' knowledge about waste and its utilization, waste bank, and maggot cultivation.

### D. Set Up a Waste Bank

The implementation of the waste bank is divided into the following stages:

- Purchasing tools required for the implementation of waste banks, such as scales, notebooks, waste bank nameplates, and so on.
- Discussing the technical management of the waste bank regarding the organizational structure, the working mechanism of the waste bank beginning with sorting,

depositing, weighing, recording, transporting, and sharing the waste bank management results.

- Waste bank implementation within the agreed time.

*E. Implementation of Maggot Cultivation*

The implementation of maggot cultivation is implemented by preparing tools and materials for maggot cultivation facilities. Based on discussions with BSB administrators, who have prior experience cultivating maggots, the first maggot cultivation will be done on a small scale and will be scaled up as needed.

*F. Assistance in Waste Bank Management*

Assistance is provided to discuss the obstacles that arise in the field regarding waste bank practices and organic waste utilization, as well as alternative solutions proposed.

*G. Evaluation*

The evaluation of waste management training is done by comparing pre-test and post-test results. Following the training, data on the waste bank's sustainability and the impact of waste sorting were collected through direct observation and interviews. It also evaluates the outcomes of maggot cultivation practices and fields obstacles.

**III. RESULTS AND DISCUSSION**

After implementing the PKM program the results are as follows:

*A. Preliminary Survey*

The waste management pattern in RT 01 RW 02 is collect-transport-dispose. Household waste collected at the residents' homes is still a mix of organic and inorganic 130-00-0520107-7waste. The Baitul A'mal boarding school students transport the collected household waste and then dispose of it in temporary waste disposal. The garbage men of the sanitary agency transport the collected garbage at the temporary waste disposal by truck two times a month. Every month, 10 m<sup>3</sup> of waste is generated. For this reason, each household is required to pay a waste fee of IDR 20,000,- per month. Programs to improve waste management will be carried out by establishing a waste bank to increase the value of selling inorganic waste. Meanwhile, organic waste is being used as a source of nutrition for maggot cultivation.

*B. Waste Management Training*

The waste management training was conducted in RT 01's multipurpose building. Residents of RT 01 and representatives from other regions were invited to participate in the training.

The training begins with a pretest to determine the initial knowledge of each participant before attending the training. The training was attended by 56 people. The training materials consist of 5 materials. The first material explains the verses in the Qur'an that discuss the environment, namely: Surah An

Nahl 10-11, Surah Al Hud 61, Surah Ar-Rum: 41, Surah Al-Qasas: 77, Surah Al Zalzalah: 7, Surah Al-Anbiya: 107, Surah Al-A'raf: 5. This material is intended to motivate Muslims, that protecting the environment is a good deed. Furthermore, the resource person explained the condition of the Citarum River which was polluted by garbage, and the environment in Baleendah which was frequently flooded, and also explained the current waste management pattern.

The second material is about knowledge of 3R-based waste management (Reduce, Reuse, Recycle) to reduce waste from the source as well as ways to process organic waste. The third material describes the waste bank, its technical implementation, and its benefits. The fourth material explains how to make local micro-organisms (MOL) that use organic waste as the basic ingredient. MOL has the potential to accelerate the conversion of organic waste into compost. The last material covered the role of the main waste bank, BSB, and maggot cultivation.

Following the material session, there were question and answer sessions. Participants will be able to ask questions during this session. The trainees are then asked questions to make the training more interactive and to test the participants' knowledge. Tools for the waste bank's operational needs, as well as tools for the practice of processing organic waste (tools and materials for maggot cultivation and for making MOL), were provided during the training activities. Figure 1 depicts the provision of goods for the waste bank.



Fig. 1. The provision of goods for the waste bank.

A wastebasket was provided at the event to encourage participants to sort their trash. Participants who are willing to sort the waste are given the basket for free. Figure 2 shows the participants' with their wastebasket.



Fig. 2. Trainees and their wastebasket.

### C. Practice Maggot Cultivation

One package of fly cages and other equipment for maggot cultivation that was given at the training event has been used to cultivate maggots in RT01, although on a small scale. The cultivated maggots have been used as catfish feed in the homes of several residents. Some maggots are re-bred using the same cycle. Maggot residue, which is the remainder of organic waste and maggot manure, is used to fertilize the KWT members' urban farming.

### D. Evaluation

The first evaluation is a comparison of the results of the pretest and post-test. This will be used to assess the success of the transfer of waste management knowledge. The second evaluation involves collecting data and observing participants whether they sort the waste or not. The third evaluation is to observe the implementation of the waste bank and the challenges faced. The fourth evaluation is to observe the cultivation of maggot and its field constraints. Another aspect to consider is the impact of the training on the environment. The results of the analysis are as follows:

1) *Analysis of waste management training:* The success of knowledge transfer is measured by comparing the pretest and post-test results. According to the data, the average correct answer before the pretest was 39%, and the average correct answer after the pretest was 87%. It means that the correct answers are increased by 48 % which demonstrates that participants' knowledge of waste management has grown.

2) *Waste bank analysis:* The waste bank's implementation started with the signing of a contract between the unit waste bank KWT Luhur Lestari and the main waste bank BSB. Following the signing of the contract, a bank account was established for the unit waste bank KWT Luhur Lestari. Inorganic waste may be sold by the unit waste bank KWT Luhur Lestari to the main waste bank BSB once a week. Before being sold to BSB, waste must be sorted after it has been collected from housewives. The waste is then picked up from the unit waste bank by the BSB officer. The implementation of the waste bank does not necessitate a large waste storage area, because it can be done in the mosque yard. The area will be cleaned up after the inorganic waste is picked up by the BSB.

According to the KWT's head, the people of RT 01 were aware of waste sorting after the establishment of a waste bank. Members are becoming more diligent about collecting and sorting waste. At the moment, 44 families have sorted their trash. It means that 54% of residents have participated in waste sorting and taking a part in the waste bank program. This may be due to the waste bank's management being honest, open, and transparent. Every waste sale to BSB is publicized on the residents of RT 01's social media.

The difficulties in sorting waste stem from the fact that not all residents participate in the training and that mothers are overburdened. As a result, the appeal from the heads of the RT and KWT must be carried out so that all residents can better manage their waste.

3) *Analysis of maggot cultivation:* Maggot cultivation has the advantage of reducing the volume of organic waste as well as air pollution caused by the smell of decaying organic waste. The main products of maggot cultivation are used to feed animals such as chickens, catfish, ducks, and so on. This will bring down the cost of animal feed.

Another advantage is that compost as the residual maggot cultivation can be used as a plant fertilizer for residents' urban farming. This also makes the environment becomes more beautiful because of the fertile plants.

Obstacles to maggot cultivation include cages that are not tightly closed, allowing maggots and BSF flies to be eaten by unwanted predators such as lizards, mice, and so on. As a result, it requires assistance to overcome these obstacles. If these challenges are not overcome, the farmers' motivation will drop significantly. Only two residents are currently cultivating maggots on a small scale. No housewives are interested in cultivating maggots because they are still afraid or disgusted with maggots. Therefore, the utilization of organic waste should be improved.

4) *Analysis of program sustainability:* The PKM program that has been implemented until now is still in effect. Based on field observations and interviews, maintaining a sustainable waste bank program requires the commitment of the waste bank management and members. This commitment can be sustained due to the sense of kinship, and the nature of cooperation that creates high social cohesion.

Social cohesion is the ability of a group to unite, formed by a sense of solidarity and the emergence of initiators who play a strong role in realizing common goals. The initiator, in this case, is the management of the waste bank, specifically the chairman, secretary, and treasurer. The management of the waste bank is always involved in waste sorting before the waste is picked up by the BSB officer.

The management's commitment and example are based not only on the desire to generate income through increased sales but also on the sincerity of doing good deeds and expecting a reward from Allah. This is frequently stated by the administrator every Friday during the "Jumat Shodaqoh Sampah (Jumshosa)" program, which is a regular activity to

give alms with garbage on Friday. This is expected to increase the motivation of residents who contribute to the waste bank's long-term viability.

#### IV. CONCLUSION AND SUGGESTION

##### A. Conclusion

Following the implementation of the PKM program, it is possible to conclude that training improves residents' knowledge and awareness of the importance of the environment. It also increases residents' participation in better waste management. The waste bank program has increased the added value of waste because inorganic waste is sold regularly and becomes residents' income. The percentage of residents who take part in the waste sorting program and the waste bank is 54%. To increase the residents' participation and program sustainability, the management must maintain the spirit and have an honest and transparent attitude.

Maggot cultivation will reduce the volume of organic waste as well as the cost of residents' livestock feed. However, the utilization of organic waste is still not optimal, because only two people cultivate maggots which operate on a small scale.

##### B. Suggestions

Because of the numerous benefits, maggot cultivation should be done on a larger and broader scale in the future. It must also develop a good harvesting schedule to ensure that ready-to-harvest maggots are available every day. It must also increase the added value of organic waste in ways that housewives find appealing, such as composting, and it must develop practical waste composting methods.

#### ACKNOWLEDGMENT

Thank you to LPPM who have supported and funded also the KWT Luhur Lestari who have worked well together and the Unisba Industrial Engineering department who has supported PKM activities.

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