

# Increasing Food Security Through Waste Management in Pandemic Time

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## Article

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## Abstract

During the pandemic, people's activities were dominantly carried out at home, resulting in increased online shopping activities and their packaging causing accumulation of household waste. RW 05 area of Sukamenak Village, Margahayu District, Bandung has not had independent waste management yet, leading to the accumulation of household waste. Politeknik Negeri Bandung takes a role in helping to solve this problem by educating the residents to increase their knowledge in sorting household waste through the 3R program (Reuse, Reduce, Recycle), effective management of inorganic and organic waste, Budikdamber (Cultivating Fish in Buckets aimed at increasing family food security), and building a waste bank. The methods used are training, technical guidance, mentoring, and evaluation. The results of the activity show that inorganic waste management produces daily necessities and can be sold to increase income; organic waste is processed into liquid and solid fertilizer for yard greening; and catfish and kale from Budikdamber can increase family food security. The founding of the "Suka Berseri RW 05" waste bank can reduce the volume of waste and residents can withdraw their savings at any time. In addition, the results of the questionnaire show that people's awareness and knowledge on waste management increased significantly..

**Keywords:** Organic waste; Inorganic waste; Waste bank; Budikdamber.

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## Introduction

The volume of waste continues to increase along with the increase in population, changes in consumption patterns, and people's lifestyles which are unknowingly the cause of the increasing amount of landfills, and characteristics of waste (Widodo & et al, 2021). According to Permen PU number: 21/PRT/M/2006 concerning Garbage, healthy waste can be interpreted as a condition that can be achieved if waste can be managed properly so that it is clear from the residential environment as a place for humans to do activities (Ministerial Regulation on Garbage, 2006). Referring to the definition, waste

is the residue of human daily activities and/or natural processes in solid form (Republic of Indonesia Law No. 8 concerning Waste Management, 2008). Meanwhile, activities that are systematic, comprehensive, and continuous which consist of reducing and handling are referred to as waste management. Based on their physical and chemical characteristics, waste grouping consists of 1) organic (easily decomposed) waste, for example, leftovers, vegetables, fruits, fruit, leaves, meat scraps, and so on; 2) dry waste, for example, plastic, glass, paper, rubber, metal, leftover building materials, and so on; 3) waste in the form of dust/ash; and 4) Hazardous Fuels (B3), for example, industrial and hospital waste containing hazardous chemicals. The source of waste comes from housing, three-quarters of which consists of wet (organic) waste and the rest is dry (inorganic) waste (Republic of Indonesia Law No. 8 concerning Waste Management, 2008). The RW 05 area of Sukamenak village consists of seven RTs including areas with a high population density with a total of 1600 households. Based on information from RW officials, waste management in Sukamenak RW 05 village is not yet integrated, it is still managed individually and payments are made monthly depending on the volume of waste disposed of. Other information, the RW 05 area has never had socialization on waste management. Because of this, there are still people who throw garbage indiscriminately, in rivers, vacant land, under trees, and in large fields, and then burn it as shown in figure 1. Temporary Storage Sites (TPS) are temporary waste bins before being transported to the recycling site waste, processing, and/or integrated waste processing sites. The Final Processing Site (TPA) is the location for carrying out the process where waste is returned to the environmental media safely for humans and the environment (Regulation of the Minister of Home Affairs concerning Guidelines for Waste Management, 2010). The TPS in Sukamenak village RW 05 is in the form of a small open tank, unable to accommodate large volumes of waste.



*Figure 1. The TPS condition of RW 05 Sukamenak*

The volume of household waste increased during the pandemic, which was caused by restrictions. Most activities are carried out at home, and as a result, household waste accumulates. Not to mention, online shopping activities that leave packaging waste, further increase the volume of waste. Online sales activities increased sharply during the pandemic, resulting in an organic waste composition of 55% – 60%. On the other hand, some companies laid off their workers. This condition resulted in a reduction in some of the residents' income. Not a few of the residents experience difficulties in meeting their family's food needs.

Bandung State Polytechnic (Polban) as one of the higher vocational institutions plays a role in finding solutions to the waste problems in RW 05 Sukamenak village. Through community service programs (PkM) as one of the Tri Dharma of Higher Education. The main problem is the lack of public awareness and knowledge about waste and the community has never received socialization on waste management and utilization. Based on the results of the questionnaire, the identification of problems, the characteristics of the community, and the potential that exists in the RW 05 area of Sukamenak village, the Polban has provided an alternative solution that is considered the most appropriate through an education and outreach program. Education and socialization on a wider scale

must go hand in hand in order to obtain more optimal results (Sandika, Ekayana, & Suryana, 2018). Law number 18 of 2008 states that the most accurate and real way of managing waste is the 3R method which stands for Reduce, Reuse, and Recycle. Reduce means to reduce, Reuse means to reuse, and Recycle means to reuse or recycle. 3R waste management can indirectly foster a caring character for the environment (Arisona, 2018). The results of the utilization of organic waste into liquid and solid fertilizers are used for yard plant media. Utilization of used bottles, used cooking oil plastic, used soap, etc can be used in limited yards. Generally, the plant used is kale which is relatively easy to maintain so as to create the cultivation of nutrient-rich vegetable crops to meet the needs for vegetable food (Nurdeni & et al, 2021). Management of inorganic waste (dry waste) requires a supply of waste segregation as a raw material. The results of inorganic waste crafts are still local, requiring socialization and training to increase the number of craftsmen and the absorption capacity of waste by craftsmen (Fatoni & et al, 2017).

The goal of PkM Polban is to increase the food security of the RW 05 community through community empowerment in managing waste during a pandemic. To build waste independence in an integrated manner, a waste bank was formed. The waste bank is a social activity through waste sorting. Storing waste in a trash bank, then it can be exchanged for money. Waste management through waste banks is a way for the community to participate, support regulations, and show public understanding of waste banks (Sri Suryani, 2014). It is expected that the waste bank activity can educate residents to respect waste so that people get used to sorting waste. The factors supporting the implementation of waste bank activities are the village government and community awareness. Whereas, the obstacles include the low value of waste to be sold to collectors and competition between stalls (Bachtiar, Hanafi, & Rozikin, 2015).

The results of this research can provide input to partners, in this case, the village of Sukamenak RW 05, so that they can overcome waste problems in their area, through the efforts mentioned above through education and socialization programs. The programs start with waste sorting with the 3R concept, waste management organic and inorganic, forming a waste bank to build self-reliance for the RW community, and utilizing limited land with the Budikdamber concept which indirectly can meet the community's food needs, especially fish and vegetable food during a pandemic. These efforts will not run smoothly without the support of village officials; the village head to the grassroots.

## Research Method

Based on the situation analysis, problems, capabilities, and resources, as well as expected outputs, the solution provided is a training/education program. Other methods are technical guidance, mentoring, and evaluation. The educational program begins with socialization about waste, its benefits, and dangers, sorting waste with the 3R program starting from the smallest group, the household. Inorganic waste management training was aimed at the types of waste that were most common in the RW 05 area during the pandemic. Organic waste management training was aimed at household waste (wet waste) which has increased since the pandemic. Processing household waste into compost can provide economic opportunities for residents if managed with the right composter technology and it can be carried out at the community level within the RT and RW scope (Achiraeniwati, 2016). Establishing a waste bank in RW 05 is an absolute must. According to statistical data, on average, each person disposes of approximately 2 kg of waste per day. So, if the number of RW 05 households reaches 1,600, you can imagine that the volume of waste that will go to landfill will be bigger. It means that the concept of establishing a waste bank in RW 05 in Sukamenak village can reduce the volume of landfill waste. Another training, the Budikdamber activity seeks two developments simultaneously, namely catfish and kangkong plants that grow together. The process is simple and the cultivation time is short, making Budikdamber widely adopted by many people. Budikdamber is an activity of cultivating fish and vegetables in one container commonly known as the aquaponic system (Nasrudin & Nurhidayah, 2021).

The Stages of PKM activities are as follows: 1) The Preliminary Study. This study consists of the identification of conditions and socio-economic characteristics of partner village communities. It was conducted to obtain information regarding the selection of waste management training methods, adding information searching from the internet. Thus, you can choose which form of training is most appropriate and adapted to the socio-economic and demographic conditions of partner citizens, also adapted to the pandemic; 2) Develop a plan, and schedule for the implementation of activities, and the necessary supporting facilities. Confirmation of waste cadres, RT and RW officials, as well as village officials, needs to be carried out so that activities go according to plan and are attended by the community while still observing health protocols, but training materials are delivered. TPS locations and the most dominant types of waste were identified; 3) Identify TPS locations and the most dominant types of waste. A direct survey was carried out through interviews with the community at the TPS location, to find out the most dominant types of waste in the RW 05 area, and the conditions at the existing TPS locations; 4) Carry out Training. Some of the training carried out include socialization on waste sorting with 3R, training on the utilization of inorganic waste into recycled products with economic value, training on making liquid fertilizer and solid fertilizer from organic waste, training on Budikdamber activities, and socializing the waste bank. In addition, the PKM team also provided counseling related to health waste during a pandemic.

Bimtek and Assistance: 1) Program Monitoring and Evaluation. Record the difficulties that may occur at the location of the activity and try to help provide a solution for the solution. Some residents who have the talent and ability to make recycled products from inorganic waste are motivated to improve quality and innovation so that marketing efforts can be made and can be used as additional income; 2) Gradual and continuous evaluation. The evaluation was carried out using a questionnaire that was distributed to participants at the beginning of the activity and at the end of the activity so that the development process could be identified. The distribution of questionnaires was carried out at the beginning of the activity to find out the participants' initial abilities regarding knowledge about waste sorting, organic waste management, inorganic waste, Budikdamber, and waste banks; 3) Evaluation: how is the implementation of the training that has been carried out? To get the overall activity, to what extent the results of the training that has been carried out and its implementation for the community, an ongoing evaluation is carried out; 4) Thorough evaluation of the series of Polban PKM activities. This evaluation is the final step followed by the preparation of the final report. Identify things that are lacking during activities, so that they become notes for PKM improvements in the future. The overall evaluation is based on the results of a questionnaire filled out by 20 participants. The questionnaire contains statements and questions related to attitudes, knowledge, (20 pieces), and attitude statements (10 pieces) using a Likert scale. The data were analyzed using simple statistical analysis, a paired t-test (Arikunto, 2010). A Paired t- test is used as a comparative or difference test if the data scale of the two variables is quantitative (Interval or Ratio). This test is also known as the pairing T-test. This test compares whether there is a difference in the mean of the two paired groups. Paired (paired) because the data source comes from the same subject (Santoso, 2011).

## **Results & Discussion**

### **Preliminary Studies**

Preliminary study to partner locations and conducting interviews with RW 05 residents and RW, RT, and Sukamenak village officials, with the following interview results:

The utilization of waste has not been managed in an integrated manner. Garbage is collected at TPS, and after piling up it is burned. However, TPS is inadequate and the smoke from burning creates pollution. Public awareness and knowledge about waste are relatively minimal, residents have never been given training on integrated waste utilization. To facilitate coordination in the field, garbage cadres were formed in partner villages based on the number of RTs.



Implementation of Training Activities. The opening ceremony was carried out at the beginning of the activity, explaining the plans, objectives, implementation period, and outputs that must be achieved by PKM activities, as shown in Figure 2.



Figure 2. The opening of Polban PKM in RW 05 Sukamenak Village

The introduction of waste knowledge and its benefits as well as waste segregation through the 3R program (Reduce, Recycle, Reuse) was carried out starting from the smallest group, namely, the household Bimtek and education on the use of inorganic waste are aimed at the dominant types of waste in the RW 05 area, namely plastic bags, and plastic. Recycled products were focused on making bags, wallets, and flower ornaments. Approximately 6 piles of crackle and plastic were then covered with cloth and oil paper is put on top of them, then they were ironed with optimal heat level so that a new material was obtained which was thicker and could be formed into bags, wallets, and flower ornaments. The tools needed were colorful plastic bags, ordinary needles, mattress needles, ordinary thread, mattress thread, and embroidery floss, pen heels, oil paper, bedding, scissors, a glue gun, and other decorations.



Figure 3. Inorganic Waste Training Activities in RW 05

Tools and materials were facilitated during field practice (Bimtek). The PKM team divided the participants into several groups to facilitate coordination. As an evaluation, participants were required to make products or training results according to their innovation and creativity, then their products were evaluated.

The training on the utilization of organic waste was focused on the manufacture of solid fertilizers and liquid fertilizers used for garden plants. Communities with limited land can use used large drink bottles, used cooking oil plastic, or used soap as pots. Inorganic waste training activities are shown in Figure 3 along with the products they produced. Organic waste training (wet waste) was carried out using simple tools and materials. The process began with collecting wet waste (food scraps, vegetable scraps, used rice, etc.). After being sliced (to make it easy to decompose), they were put in a closed container (used bucket or used gallon) then EM4 media and other media were put. The steps for making fertilizer are shown in Figure 4. Then, it was left for two weeks, and the fertilizer

obtained was used for planting media for garden plants. When produced on a larger scale, solid fertilizer and liquid fertilizer are then attractively packaged and sold to increase income.



*Figure 4. Organic Waste Training Activities in RW 05*

Budikdamber training was conducted using simple tools and materials. The tools and materials needed include catfish, a large bucket, a plastic cup, plant seeds, rice husk charcoal, cocopeat, pellets (catfish food), a filter, a scoop to collect fish, and a plastic hose. Containers for the growth of catfish and kale plants can be in the form of buckets or paint containers or other used containers. Catfish were fed with pellets 3 times a day: morning, afternoon, and evening. The water in the containers in which the spinach was replaced with fresh and clean water once a week in order for the catfish can grow and develop with clean water. Before the containers were refilled with fresh and clean water, they were cleaned and dried under the sunlight. Kale is harvested after growing approximately 35 days after planting and it was harvested in the morning. Whereas catfish can be harvested when they are 2 months old

Dissemination of health waste, for example, used masks, used gloves, used sanitizer bottles, and others was held so that the disposal was carried out in the right place and separated from other waste and was kept in closed place. So the things causing the risk of infection are avoided.



*Figure 5. Budikdamber RW 05 Training Activities*

The establishment of the “Suka Berseri RW 05” waste bank was held on September 10 2021 and received a good reception from the community because it was very supported by village officials. Whereas, all of the needs of the waste bank, like brochures, savings books, ledgers for customers and register books, digital scales, and large sacks of rice for sorting bins are temporarily facilitated by the PkM team and also the formation of the composition of the waste bank management. The waste bank administrators work with the nearest existing waste bank or the closest collectors to sell their segregated waste. Providing the tools and materials, appointing the manager, and supervising the ongoing activities of the waste bank were facilitated.



Figure 6. Establishment of the "Suka Berseri RW 05" Garbage Bank

### Guidance and Assistance

Bimtek and assistance in the management of inorganic waste. Some inorganic waste was not saved in the waste bank but it was made into recycled products or household items that could be used alone or sold. Residents who have an interest and skills in inorganic waste recycling products were motivated to improve the quality of their products to make them more attractive and innovative so that they have high selling power, then the PkM team helps market them. Bimtek and organic waste management assistance are carried out continuously. The community focused more on the use of solid and liquid fertilizers produced from wet waste for their own yard plants. However, it is possible for the residents to make fertilizer in large quantities, with good quality and technology, and attractively packaged so that it can be sold to their neighborhood.

Budikdamber technical guidance and assistance are carried out continuously because the development of catfish cultivation requires serious skills and attention. The aquaponics concept is starting to interest residents, apart from fulfilling family food security during this pandemic, especially the need for animal protein and vegetables.

Guidance and assistance for waste bank activities are carried out in several stages. First, the waste is weighed at the "Suka Berseri RW 05" Garbage Bank. Then, the waste group of each waste weighed is recorded. After that, the waste that is saved must be in a state of segregation based on the group before it is put into large sacks according to the type of waste. The last, it is sold to collectors. It ensures that waste bank activities continue and also provides opportunities for managers to receive waste bank management training.

### Monitoring and Evaluation

Monitoring is carried out periodically because the location of the partner village is quite far from Polban campus. So, monitoring and evaluation are conducted via gadgets, in-person visits, virtual, and recording.

The overall evaluation was conducted using a questionnaire carried out at the beginning and end of the activity to measure the changes in community knowledge. Respondents are participants and some members of the community. Suggestions and input from the community regarding PKM activities were recorded so that they become a reference for future PkM activities. The future PkM activities are expected to be better. The results of the questionnaire are processed with simple statistics, based on the Normality test using the Kolmogorov-Smirnov test. The following results are obtained:

Table 1  
Normality Test

Variable	Normality Test	
	Probability	Conclusion
Difference of Knowledge	0,200	Normal
Difference of Attitude	0,054	Normal

Based on table 1, it can be shown that the data on the difference (gain) of knowledge and attitudes has a probability value of 0.200 and 0.054 respectively which is greater than 0.05, meaning that the data is normally distributed so that the normality assumption is fulfilled. Next, a paired t-test was carried out, and one of the conditions for conducting a paired t-test is that the data is normally distributed.

**Table 2**  
**Paired t-test**

Variable	Paired t-test
Knowledge Posttest - Knowledge Pretest	0,702
Attitude Posttest - Attitude Pretest	0,090

Based on table 2, it can be shown that the probability value for each variable is 0.702 and 0.090, respectively, greater than 0.05. It can be concluded that the PkM activities for managing and utilizing waste provide increased knowledge and attitudes for the RW 05 community as the subject of this PkM activity. In other words, the Polban PkM activities had a positive impact on the participants in particular and in general for the RW 05 community in terms of knowledge and attitudes, and behavior in dealing with waste problems. Based on the experience of PkM activities in several previous places related to waste handling, what has become a finding for implementers is that the characteristics of each community are different in responding to PkM activities. Some people are enthusiastic and some are apathetic. The community mostly takes advantage of the results of the training, and they also develop. This will be a record for the implementing team for further activities. As a note, cooperation, cohesiveness, and common perceptions of the implementing team, officials, and the community should form unity in order to become a force to solve waste problems in their area.

## Conclusions

Based on the description of the activities above, it can be concluded that during the pandemic, people's activities were focused at home and online shopping activities increased, resulting in a sharp increase in household waste. Positive activities that can be carried out at home by utilizing accumulated household waste are by making solid and liquid fertilizers from kitchen waste for your own yard plants, and processing some inorganic waste into recycled products that have economic value. The latter activities you can increase your income, and save some of it in a garbage bank that can be withdrawn at any time to cover daily needs. Budikdamber cultivates fish and vegetables in one place using used goods in a simple and inexpensive way, the result is to meet the food needs of the family, especially the need for animal protein and vegetables. So during this pandemic, even though the activities are done at home, there are many positive things that can be done to reduce the increasing volume of waste. As a suggestion, it is expected that in the next PkM, the implementing team will first identify the potential that exists in partner locations in terms of waste management, if it already exists, then continue to develop an increase in the welfare of the partner community by utilizing dominant waste in partner locations so that the direction of goals and results is clear. To achieve the success of the program, it is essential to get support and cooperation from local government officials, central government, local government, universities, the Ministry of Environment, and the Ministry of Agriculture, as well as other institutions. Thus, waste problems can be handled in a comprehensive and integrated manner, involving technology, information systems, and high public awareness.

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