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Grassroots Circular Economy: Community-Based Zero Waste Management in an Indonesian Traditional Market

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This research proposes an integrative zero-waste model for traditional markets by combining Community-Based Participatory Research (CBPR), circular economy principles, and Islamic environmental ethics. The research was conducted at Nirmala Market, Yogyakarta, Indonesia, involving 76 traders, market managers, and members of the surrounding community. A qualitative CBPR approach is used, with data collected through observation, surveys, focus group discussions, and documentation, and analyzed using thematic and descriptive statistical analysis. Initial assessments identified critical challenges in waste management, particularly low environmental literacy, with all participants unable to recognise key recyclable materials (e.g., HDPE and multilayer plastics), while plastics made up 68% of total waste. These findings point to structural, behavioral, and ethical gaps in existing waste practices. Interventions are carried out through participatory waste sorting training, institutional strengthening, and organic waste processing through maggot cultivation. The results showed an increase in waste literacy and observable behavioral changes among traders. In addition, maggot cultivation operationalizes circular economy principles by converting organic waste into economically valuable outputs, thereby linking environmental management with local income generation. The study further conceptualizes zero-waste practices within the framework of Islamic ethics, emphasizing management (*caliph*), responsibility (*amanah*), and avoidance of environmental degradation (*façade*), which increases community engagement and sustainability of interventions. The model also shows the potential for scalability, supported by an estimated 211 kg/day of organic waste generated by the surrounding community. The study contributes to the literature by advancing integrated socio-technical and ethical models for waste management in traditional markets, offering theoretical enrichment and practical implications for sustainable development in developing countries.

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Introduction

Traditional markets still have an important position in social life in society. Activities in traditional markets are not only about buying and selling, but as a social space to interact

with each other. Activities in traditional markets that still maintain closeness between sellers and buyers, show that the arena is still in demand by the community (Ikram & Nur, 2012; Ketjil et al., 2022; Pangiuk, 2019). Thus traditional markets not only have economic value, but also important social and cultural values in people's lives. (Astuti et al., 2019, Dima, 2023). The intensity of trading activities in traditional markets also produces serious problems, especially related to waste production. Buying and selling activities in traditional markets have great potential to produce waste (Rofifah & Tarlani, 2023). Trade activities in traditional markets leave the rest of goods that are considered useless so that they are thrown away and become waste. Waste is the residue of goods that have been used/consumed by the market (Sulistyo & Cahyono, 2010).

Waste management so far still tends to be carried out by transportation and final disposal, not by reducing waste at the source (Rauzi et al., 2021). This approach has limitations because it only moves waste from the market to the landfill without reducing the volume of waste production. This practice is widely found in many traditional markets which shows the weak system of waste sorting and management based on community participation (Nurbaya et al., 2026). The gap between the concept of waste management in traditional markets and real practices in the field. Many traditional market traders still think that waste has no benefit left, so they immediately throw it away without choosing and sorting it first. Good waste management is still a serious problem in traditional markets. Waste that is not managed properly can lead to environmental and health problems.

Waste must be managed properly, safely, and environmentally friendly. The waste management process consists of temporary storage, collection, transportation, processing, and final disposal (Oktapiana & Hermanto, 2022). Zero waste is one way to manage waste. Zero waste adheres to the principle of waste management which emphasizes the prevention of waste production (Handayana et al., 2019). Recycling, composting, reducing, and reusing used goods (reuse) is a concept of zero waste management (Wirasmita et al., 2020; Zitri, 2022). This concept makes the waste produced by the community processed into something useful so that it can realize a circular economy. A circular economy refers to all reduction, reuse, and recycling activities in production, circulation, and consumption. As an important link to achieve a resource-efficient and environmentally friendly society, the 'Circular Economy' is becoming increasingly important both strategically and economically (Khajuria et al., 2022; Zeng et al., 2022).

According to research conducted by (Syukriya & Safitri, 2021), the concept of zero waste is in line with Islamic values. The Islamic worldview considers this zero-waste practice to be an implementation of the values contained in the Qur'an (Al-A'raf: 56; Al Maidah: 32; Al Baqarah: 205; Al Isra: 70; Al Shad: 27-28; Ar Rum: 41, Al A'raf: 58). Therefore, when this zero-waste habit is applied, it means applying several verses of the Qur'an to preserve the environment. The Prophet once said in the hadith of Hasan, "Take care of the earth, for it is indeed your mother" (Narrated by Abu Daud and Ahmad from Abu Sa'id and Khudri). Nirmala Market is one of the traditional markets located in the

Tirtonirmolo Bantul Temple. Nirmala Market was established in 2020. The total number of traders in the Nirmala market is 76 which is divided into three groups, namely market stalls, morning stalls, and night stalls. The average waste generated by the Nirmala market per day is 176kg. Like other traditional markets, trading activities in the Nirmala market also cause waste problems. Based on this, we conducted a research entitled Zero Waste Traditional Market Development for the Realization of a Circular Economy.

Literature Review

A traditional market is an economic institution where buyers and sellers meet in person to carry out trading traditions. Sellers and buyers who carry out existing economic transactions have recognized the exchange in meeting daily needs (Purwanto). Buying and selling transactions in traditional markets is one way that can improve the community's economy (Dima, 2023). The existence of traditional markets has a strategic role for the community, especially for people in suburban areas. Pricing in traditional markets can be done by bargaining so that prices can be cheaper and affordable for the community. Meanwhile, according to Wicaksono in Angkasawati, traditional markets are a meeting place for sellers and buyers which is characterized by a direct bargaining process. Market traders do not directly determine the exact price of the goods being traded. The price is determined by the bargaining process between the seller and the buyer (Ikram & Nur 2012). This is in line with the Islamic principle of freedom to conduct transactions based on mutual consent and prohibits coercion. In the research of Angkasawati and Milasari (2021), traditional markets are markets that open in the morning, at cheaper prices because many commodity goods are directly from the manufacturers. In addition, the characteristic of the traditional market is the direct bargaining process. So that sellers and buyers have an emotional bond with each other.

The people's economy can grow with the existence of traditional markets. In traditional markets, the interests of the small to upper middle classes are accommodated. Money circulates faster and more widely in traditional markets, money circulates in many hands, directed and stored in many pockets. The circulation chain is longer, so long circulation multiples have an impact on economic movements (Pangiuk, 2019).

Zero waste is part of Islamic teachings that aims to protect the environment and prevent environmental degradation. The concept of zero waste involves waste management which begins with waste disposal, recycling, reduction, and reuse of used goods (Alvi, 2021; Gone 2023; Atiyeh, 2024). Zero waste is based on five principles known as the 5R's. First, *Refusal* means refusing to use something unnecessary or undesirable. Second, *Reducing* means reducing or avoiding excess. By avoiding excess waste, the amount of waste that needs to be managed is also reduced. Third, *Reuse* means reusing items that can still be used. Fourth, *recycling* means processing waste into useful new goods or products. Fifth, *Rot* (compost/decomposed) means processing organic waste into compost.

Zero waste promotes material reuse, product redesign, and distribution changes to prevent waste from being generated in the first place (Mansour, 2024; Vinod, 2025).

The main goal of zero waste is to replace new raw materials with recycled and reused materials.

The linear economy model has three pillars: products are made, used, and then disposed of after use (Amardas, 2024). This poses several problems, including overexploitation of natural resources and waste management issues. A new concept has emerged to replace the linear economy: the circular economy. The circular economy model has been introduced to the community as a solution for waste management and environmental protection (Iffatun, 2024). In a circular economy, a product can be reused, thereby extending its life (Bappenas, 2021). The UN Environment Assembly defines a circular economy as an economic model in which all products and materials are reused, remanufactured, recycled, or restored, and stored in economic circulation for as long as possible (Almas, 2015; Benedetta, 2025; Amardas, 2024). The main goal of the circular economy is to create a positive impact on the economy, the environment, and society as a step towards sustainable development. Circular economy practices focus on reducing waste and pollution, keeping products and materials in use, and regenerating natural systems (Khushbu, 2024).

The concept of the circular economy is in line with the concept of zero waste, emphasizing the importance of recycling and reusing products to minimize waste. The basic principles of zero waste and the circular economy are centered on waste management models that eliminate waste, maximize resource efficiency, and create sustainable products and processes. This model not only addresses environmental issues but also offers economic benefits and contributes to sustainable development (Khushbu, 2024).

The Government of Indonesia is focusing on the implementation of the circular economy concept in five priority sectors: food and beverages, textiles, construction, wholesale and retail trade, and electronic equipment. Traditional markets fall under the category of wholesale and retail trade. Therefore, traditional markets are a priority sector for the implementation of the circular economy concept in Indonesia. The linear economy model has three pillars: products are made, used, and then disposed of after use (Amardas, 2024). This poses several problems, including overexploitation of natural resources and waste management issues. A new concept has emerged to replace the linear economy: the circular economy.

Methods

This study adopts a single-case study design, focusing on the Swadaya Pribumi. This research is a qualitative study with a Community Based Participatory Research (CBPR) approach. Community Based Participatory Research (CBPR) is a partnership between academics and the community who collaboratively conduct research with the aim of providing solutions to urgent problems faced by society so that they can lead to social change (Christopher et al., 2020; Wallerstein et al., 2011). The community is no longer used as an object of research, but also as a subject or research partner (Horowitz et al.,

2009). This research is considered impactful (Ochocka & Janzen (2014) so that the community or partners will benefit from the process carried out in this study. The stages carried out in this study are diagnosis, action planning, taking action, evaluating and learning. An overview of these stages is presented in Figure 1 under Davison (2004):

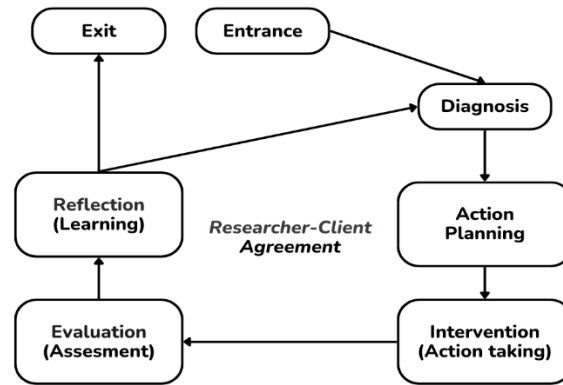


Figure 1. Community-Based Research Scheme, *source* (Davison, 2004)

Mendiagnosis

Diagnostic analysis focuses on finding the root cause of a problem, aiming to determine the reason behind an event. This approach is aimed at identifying and understanding the causes behind an event or behavior (Riahi & Riahi, 2018).

Action Planning

Researchers and participants jointly understand the main problems and then proceed to develop the right action plan to solve the existing problems. By paying attention to the needs and strengths of each stakeholder, researchers and participants began to create an action plan.

Action Taking

Researchers and participants jointly implement an action plan in the hope of solving a problem.

Evaluate

After the implementation period (action taking take) is considered sufficient, researchers and participants evaluate the results of the implementation, at this stage it can be seen how the user accepts the activities that have been carried out.

Learning

This stage is the final part of the cycle that has been passed by reviewing the stages that have ended, so this research can end. All criteria in the learning principle must be studied,

changes in the organizational situation are evaluated by the researcher and communicated to the client, the researcher and the client reflects on the results of the project.

Results

This research has produced a transformative impact on the habits of market traders in terms of market waste management. In addition, it also has an economic impact on the income of the people around the Nirmala market.

Discussion

Diagnosing Outcomes

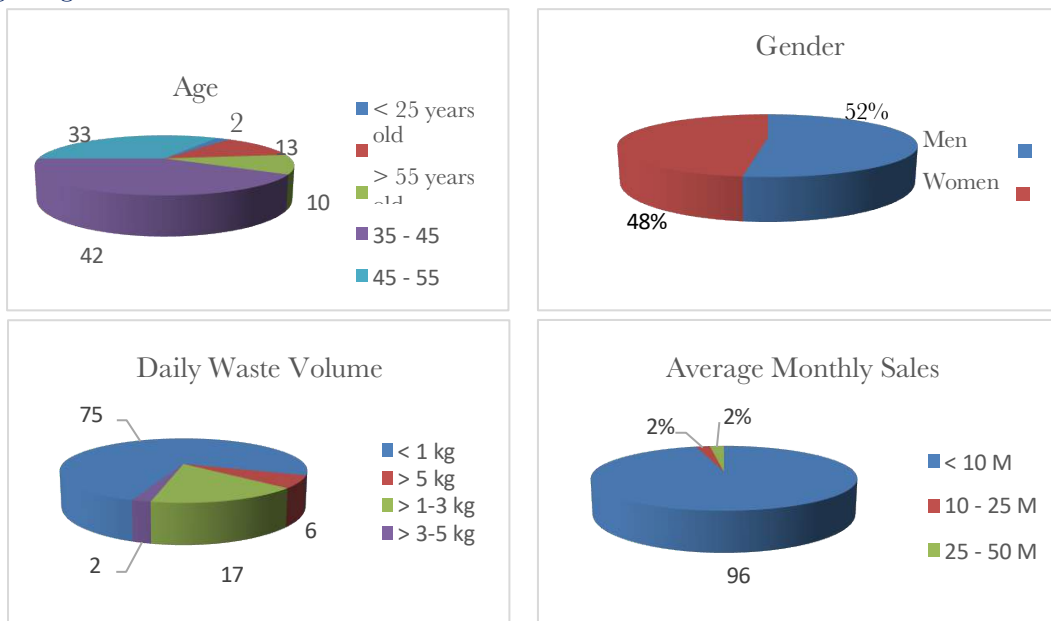


Figure 2. Overview of Participants

To obtain comprehensive information regarding the situation and conditions of Nirmala Market regarding waste management, two observations were made: a survey of traders' understanding of waste and observations of waste management infrastructure at Nirmala Market. Figure 2 shows the characteristics of the participants in terms of age, gender, volume of waste generated and average monthly turnover. The majority of respondents were in the age range of 35-45 years with a percentage of 42%. Participants with an age range above 55 years amounted to 13% while 33% of participants were in the age range of 45-55 years. 10% of participants were aged 25-35 and only 2% were under 25 years old. Based on gender, participants were divided into 52% males and 48% females.

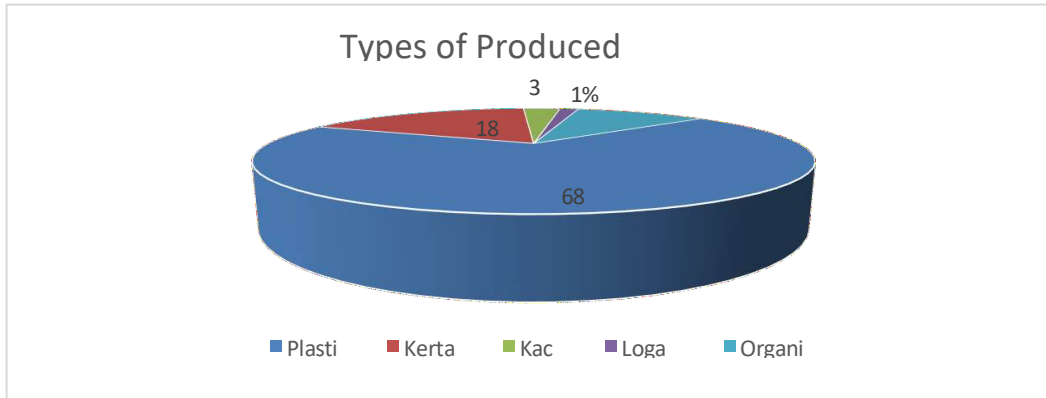


Figure 3 Types of Market Waste Generated

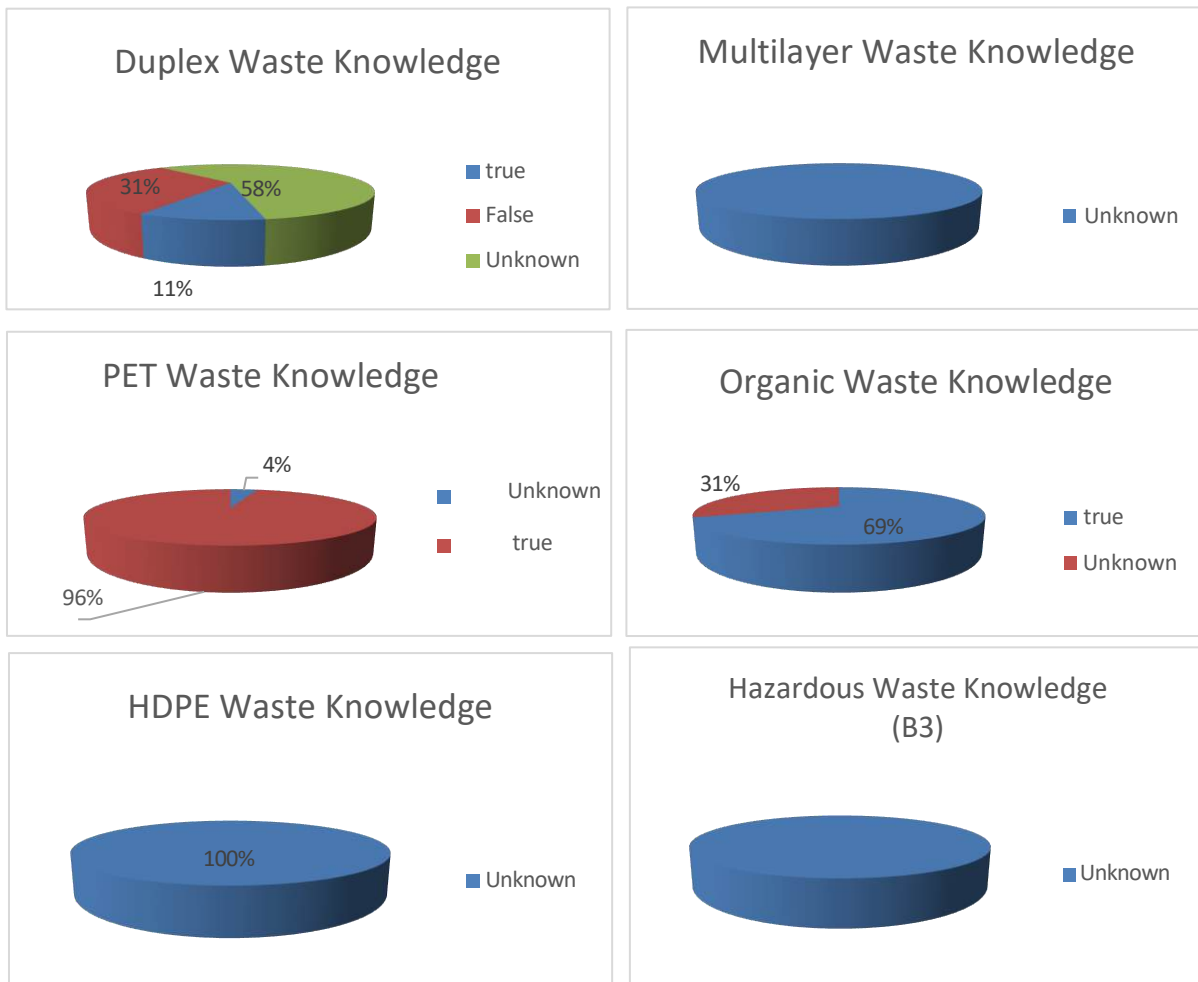


Figure 4 Market Traders' Knowledge Levels of Waste Types

Observations of the characteristics of waste volume and average turnover show that the daily volume of waste varies greatly. However, most traders, 75%, produce less than 1 kg of waste per day while 17% of traders produce 1-3 kg of waste per day. 6% of

traders produce more than 5 kg of waste, and 2% of traders produce 3-5 kg of waste. Figure 3 shows the type of waste produced in the Nirmala market. 68% is plastic waste. In addition to plastic, 18% of the waste generated is paper. Meanwhile, organic waste is in the form of food waste and natural materials by 10%.

In addition to diagnosing the demographics of the participants, a diagnosis of participants' knowledge about the types of waste was also carried out. Figure 4 shows the percentage of participants' knowledge of the types of duplex, PET, multilayer, HDPE, organic and hazardous waste. From the diagnosis of the participants' knowledge levels, it shows that 100% of the participants do not know about the types of multilayer waste, HDPE and B3. For PET waste, 96% of participants answered that they did not know. For duplex waste, 58% of participants did not know, 31% answered incorrectly and 11% answered correctly. Meanwhile, the type of organic waste is the most widely understood waste by the participants. This is shown by the percentage of respondents who answered correctly, which is 69%.

Activities	Purpose	OUTCOMES (ACTIVITY SIZE/ACHIEVEMENT)
Waste Sorting Training	To improve environmental literacy for traders and market managers	Participants understand the waste problem and how to sort it.
<i>Focus Group Discussion</i> Budidaya Magot	To get support from traders, managers and residents around the market regarding the management of magot for organic waste handling.	Participants understood the problem of organic waste in the Nirmala Village Market and its surroundings. So it is necessary to carry out waste management based on magot cultivation.
Magot Cultivation Management Training	To solve problems related to the ability to execute Management of Magot Cultivation by Prospective Magot Cultivation Manager	Participants can understand and carry out management related to magot cultivation in accordance with magot management procedures.
Procurement of Supporting Infrastructure	Have the infrastructure to carry out operational activities in the framework of the Zero waste Traditional Market.	The market has the necessary infrastructure to realize a traditional market of Zero waste with economic impact.

Table 1. Action Plan

Action Planning

Based on the data obtained at the diagnosis stage, several facts were obtained, namely:

The level of knowledge of market traders about waste sorting is still very low.

The market does not yet have a comprehensive and integrated waste management program.

There are no supporting facilities and infrastructure for waste management.

From these facts, the action plan to achieve a zero waste market is carried out through the education and mentoring programs described in table 1.

Action Taking

Waste Sorting Training



Figure 5 Training and Implementation of Waste Sorting

Waste sorting training is an action taken to increase the understanding of traders and the community around the Nirmala market about waste. This step is taken so that waste is organized from the source, so that it is easier to manage. Waste sorting is carried out for inorganic waste. This waste is then deposited to the vendor. Figure 5 shows the documentation of segregated waste sorting and waste deposit training.

Focus Group Discussions

After the traders practiced waste sorting activities, a focused group discussion was held to handle the organic waste produced. Based on data from the diagnosis stage, the volume of organic waste reaches 10% of the total waste produced. The FGD was attended by the head of the Nirmala market, the head of Padokan Kidul hamlet, the head of RT 4, RT 2, RT 8 Padokan Kidul and their community representatives, as well as the research team. In the FGD, several things were agreed, namely:

Organic waste will be managed into magot cultivation.

Team composition

Budget for infrastructure procurement

Scheduling of the Maggot Management Team Maggot Cultivation Training

Maggot are Black Soldier Fly (BSF) larvae with a high protein content that is good for poultry or fish feed (Hidayah et al., 2020; Triani et al., 2023). When viewed from the aspect of muamalah fiqh, buying and selling maggots or feed for maggots in the form of food and livestock waste is allowed. This is because it fulfills the pillars of buying and selling which include 'aqidain, ma'qud alaih and shigat (Juniar & Nuzula, 2022). Therefore, the economic results obtained are halal income so that it can improve the economy of residents (Rodli & Hanim, 2021).



Figure 6 Cultivation of Magot

Procurement of Supporting Facilities and Infrastructure



Figure 7 Magot Cultivation Equipment

The training was attended by four representatives from Padokan Kidul hamlet. According to the Head of Padokan Kidul Hamlet, Mr. Wisnu, maggot cultivation activities are very interesting, because they have economic value, and are beneficial for the environment. It is hoped that this activity can be transmitted to each RT in Padokan Kidul. Maggot cultivation training is carried out with the aim that the market has human

resources who can manage maggot in the Nirmala market. In Figure 6, the participants looked enthusiastic listening to the explanation from the speaker.

Figure 7 shows the facilities and infrastructure needed for maggot cultivation. These facilities and infrastructure will be placed at the Nirmala market waste depot. The operation of the depot is carried out by the trainees who are selected as managers. The current absorption capacity of organic waste is 100kg.

Settlement	Total Population		Quantity	Waste (kg)
	L	P		
Kalipakis	645	645	1,290	161
Kersan	688	673	1,361	170
Jeblok	1,169	1,135	2,304	288
Plugran	971	972	1,943	243
Dongkelan Kauman	1,107	1,120	2,227	278
Padokan Lor	730	745	1,475	184
Jogonalan Lor	878	851	1,729	216
Padokan Kidul	686	674	1,360	170
Jogonalan Kidul	1,119	1,092	2,211	276
Gronjong	648	653	1,301	163
Mlisi	1,028	1,020	2,048	256
Concrete	493	506	999	125
Quantity	10,162	10,086	20,248	2,531
Breakdown				211

*Assuming each person produces 1/8 kg of organic waste per day

Table 2. Daily Organic Waste Estimation Data. *Source:* primary data, processed

Evaluate

After the traditional zero waste market program, several things were found that needed to be addressed, both related to management, work mechanisms, and strategies. From the management aspect, the capacity of the depot is still not optimal because there is still a lot of idle capacity. This is because the volume of organic waste produced on the market has not yet reached the optimal point. To meet the optimal target point, a projection of residents' waste around the Nirmala market consisting of 12 hamlets was carried out. The

data shows that the average resident around the Nirmala market produces 211 kg of organic waste per day, assuming each person produces 1/8 kg (1.25 ounce). Details of the projected organic waste generated are presented in Table 2.

Learning

As a lesson from the series of actions carried out to realize the traditional zero waste market, the stakeholders plan to expand the scope of activities to the surrounding community. A wider scope of activities allows for a more effective circular economy. For this reason, more massive socialization and education activities are needed.

Conclusion

This study shows that the development of traditional zero-waste markets through the Community-Based Participatory Research (CBPR) approach can effectively address environmental and socio-economic challenges. These findings reveal that low environmental literacy and the absence of a structured waste management system are the main obstacles in traditional markets. Through participatory interventions, such as waste sorting training, institutional strengthening, and maggot cultivation, the study demonstrated a measurable increase in waste awareness and behavioral change among traders, while generating economic value from organic waste.

Beyond its practical results, this research contributes theoretically by proposing an integrative model that combines community participation, circular economy practices, and Islamic environmental ethics. The incorporation of values such as management (*caliph*), responsibility (*amanah*), and avoidance of environmental degradation (*façade*) strengthens the sustainability of behavioral change by aligning environmental practices with local belief systems. This highlights the importance of embedding socio-cultural and ethical dimensions into sustainability frameworks, especially in community-based contexts.

From a policy perspective, the findings suggest that sustainable waste governance in traditional markets requires a shift from a top-down approach to a participatory and culturally embedded model. Local governments are encouraged to support circular economy initiatives through regulatory frameworks, infrastructure provision, and capacity-building programs, while leveraging local values to increase public engagement. The scalability potential identified further suggests that this model can be replicated in similar contexts to support broader sustainable development goals.

In conclusion, this research offers a measurable and context-sensitive pathway to transforming traditional markets into sustainable economic spaces, where environmental management, community empowerment, and ethical values are systematically integrated.

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Author's declaration

The authors made substantial contributions to the conception and design of the study. The authors took responsibility for data analysis, interpretation and discussion of results. The authors read and approved the final manuscript.

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Availability of data and materials

All data are available from the authors.

Competing interests

The authors declare no competing interest.

Additional information

No additional information related to this research.

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