

# The Role of Indonesian Muslim Millennials in Reducing Food Waste towards Sustainable Development Goals: Empirical Analysis PLS-SEM

**Muhammad Alfarizi\***

Department of Management, BINUS Online Learning, Bina Nusantara University, Indonesia.

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## ABSTRACT

Food waste is a critical concern under SDGs 12 due to its global welfare implications. Islam, with its substantial following worldwide, can play a role in addressing this issue, particularly through the involvement of Muslim millennials. This study aims to explore the impact of religiosity, product usage efficiency, and intention to reduce food waste, with da'wah, Instagram, and Muslim eating manners as mediators. Quantitative research was conducted through an online survey of Indonesian millennials using purposive sampling. The research model, consisting of five hypotheses, was analyzed using the PLS-SEM analysis method. Results indicate that individual religiosity significantly influences Instagram proselytizing and eating behavior among Muslim millennials. Instagram proselytizing strongly affects millennial Muslim consumer behavior, particularly in terms of food consumption efficiency. Additionally, Muslim millennials' eating etiquette impacts food consumption efficiency and environmental awareness. The efficiency of food consumption can shape millennials' intention to reduce food waste. Implications of this study include promoting millennial involvement in food waste reduction, sustainable agricultural practices, improving literacy on food consumption efficiency, incorporating food waste education in Islamic religious curricula, and fostering collaboration among Muslim millennial organizations in Indonesia's food waste reduction programs.

**Keywords:** *Da'wah instagram, food consumption efficiency, food waste, Muslim millennials, SDGs 12*

## Introduction

Sustainable Development Goals or SDGs is a topic often mentioned by the academic world recently. The goal initiated by the United Nations (UN) in 2015 consists of 17 values. One of these values, "Zero Hunger," is a topic that can be related to practical science related to food and public health. Increasing public awareness of this issue is reflected in the Sustainable Development Goals (SDGs) Agenda on halving global food waste per capita at retail and consumer levels by 2030 and reducing food loss along the production and supply chain for 2030 (Fassio and Tecco 2019).

Food loss and food waste (FLW) are two of the most challenging issues facing the world today. SDGs Zero Hunger targets them because of the severe impacts that affect the food security, environment, and economic sectors globally, regionally, and nationally. According to data

\* Corresponding author: [muhammad.alfarizi@binus.ac.id](mailto:muhammad.alfarizi@binus.ac.id).

obtained by the Food and Agriculture Organization of the United Nations (FAO) in 2011, one-third of the food (equivalent to 1.3 billion tons) produced in the world each year does not end up on our plates but is thrown into the trash (Skawińska and Zalewski 2022). The estimated losses caused by FLW globally reached USD 936 billion. This figure does not include the environmental and social waste costs the more comprehensive community bears.

The exact condition has also become a national issue in some Muslim-majority countries. The amount of food waste in these countries increases, especially during Ramadan. The United Arab Emirates generates 500 tons of food waste per day in Ramadan, a 2-fold increase compared to a typical day (Elimelech et al., 2023). In the UAE alone, annual food waste is worth 4 billion USD, equivalent to 53.2 trillion rupiahs. Meanwhile, according to the Solid Waste And Public Cleansing Corporation (SWCorp), in Malaysia, as many as 270,000 tons of food are wasted during Ramadan, or 9,000 tons every day ( Abiad and Meho 2018). From an Islamic perspective, there are various teachings that we can use as guidelines in dealing with this Food Waste issue. Islam teaches that food is one of the blessings of Allah Almighty.

وَكُلُوا وَاشْرَبُوا وَلَا تُسْرِفُوا إِنَّهُ لَا يُحِبُّ الْمُسْرِفِينَ

“... Eat and drink, and do not exaggerate. Surely God does not like extravagant people.”  
(QS. Al-A'raf (7): 31)

Rasulullah shallallahu 'alaihi wa sallam also forbids us to leave food, even though we are encouraged to lick our fingers after eating because we do not know where God's blessings lie in the food we eat.

From Hadist Muslim, Rasulullah shallallahu 'alaihi wa sallam say,

*Indeed, the Prophet (peace and blessings of Allaah be upon him) commanded him to lick his fingers and plates. Then he said, “Surely you do not know where the blessings of the food are.”*

The rise of food waste in Indonesia is an urgency for change (Suhartini et al. 2022). Maximum effort is needed in dealing with the problem of food waste. Muslim millennials are one crucial factor in fixing this problem. Because young people certainly have a significant influence on change. With the skills to use social media, be responsive in doing something, and have the courage to express opinions, Muslim Millennials can easily influence their surroundings. The Millennial generation will continue this nation in 20-30 years. The easiest way is to create content on social media to reach the wider community, especially the younger generation. The millennial generation, which we usually call Gen Y or Gen Z, dominates the use of social media in Indonesia, with an age range of 25 - 34 years (Nugraha, Parhan, and Aghnia 2020; Dahlan 2020).

There are many types of delivery of Food Waste educational information, especially among Muslims, one of which is Instagram da'wah media as a form of da'wah or dissemination of Islamic messages carried out through the Instagram social media platform (Nurrahmi and Farabuana 2020; Dervish 2020; Zahra, Sarbini, and Shodiqin 2016). Instagram da'wah can be essential in educating and inspiring Muslims to overcome Food Waste. Instagram da'wah can help Muslims become more aware, responsible, and concerned about food wastage by spreading information, Islamic values, and practical solutions and inviting concrete actions.

In the context of various food waste research show that the main focus has been given to environmental and economic approaches, while religious approaches have been sidelined (Kumari, Bharti, and Rahaman 2022; Makov et al. 2020; Filimonau et al. 2022; Dudziak, Stoma, and Derkacz 2022; Waluyo and Kharisma 2023). However, recently there has been a study of the religiosity of examining the purchasing behavior of food products (Usman, Chairy, and Projo 2022); it is just that it does not enter the context of Food Waste in more detail and the contribution of Muslims there. Various studies of world Muslim consumer behavior, both in the context of halal products and banking service products, show religious and religious interests in driving

psychological behavior of product purchase desires (Yuliani and Khuwarazmi 2022; Dzulfikar, Santosa, and Gunanto 2022; Mohd Thas Thaker et al. 2020; Arifin, Raharja, and Nugroho 2022). In addition, no studies have assessed the influence of religiosity in digital civilization and da'wah to encourage the intention to reduce millennial food waste. So this study aims to explore the role of religiosity, efficiency of product use, and intention to reduce food waste with mediators, da'wah, Instagram, and Muslim eating manners. This study significantly bridges the gap between food waste research and religious approaches. By exploring the role of religiosity, digital proselytizing, and Muslim eating manners, the study can provide new insights into the factors that can drive the intentions of individuals, particularly millennials, in reducing food waste. The results of this study can be used as a basis for developing more effective strategies and interventions in reducing food waste, taking into account religious and ethical values in the process.

## Methods

The method used in this study uses a descriptive method of causality with a quantitative approach. In the quantitative approach, quantitative methods are a process that allows someone to build hypotheses and empirically test the hypotheses that have been built (Becker et al., 2023). The research design used in this study is descriptive design and causality. Descriptive research describes and interprets specific details of an object or phenomenon according to what happens (Bairagi and Munot, 2019). It can also be explained that a quantitative approach uses data analysis in the form of numbers to develop systematic models and theories or hypotheses related to the phenomena investigated by researchers (Khan et al. 2019). Then, in this study, a survey method was used, which is a study conducted by taking samples from the population and using questionnaires as a data collection tool. Through this descriptive analysis, the description of the variables used in the study can be known. This study has five variables with details of builder indicators as the basis for making research questionnaires in Table 1 below.

**Table 1.**

Variable Indicator

Variables	Indicators	References
Religiosity	Belief in the Rukum of Faith Belief in the Pillars of Islam Frequency of attendance at the mosque Understanding of Islamic law Obedience to Islamic teachings and laws The spiritual importance of Islam in everyday life Religious Social Support in Carrying out Muslim Ethics Involvement in social charity The Role of Religion in decision making	(Ahmed et al. 2017; Avifah 2017; Nurrahmi and Farabuana 2020; Purnama 2020; Ridwan and Nurdin 2019)
Da'wah Instagram	Interaction with Da'wah Content Da'wah Content Satisfaction Positive Behavior Change Understanding Da'wah Material Relevance of Da'wah Materials with Consumption Behavior The Effect of Da'wah Content on Perspective Belief in Da'wah Accounts Social Impact of Da'wah Content Motivation for Sharing Da'wah Content	(Muharam, Sumijaty, and Fatoni 2020; Trans and Kamil 2022)

<b>Variables</b>	<b>Indicators</b>	<b>References</b>
Millennial's Muslim Eating Manners	Understanding of Halal and Haram Food Choose Halal Food Maintain Cleanliness while Eating Say Bismillah before eating. Using the Right Hand while Eating Eat with Appropriate Portions Sharing Food with Others Respect and Love Animals Avoid Haram and Doubtful Foods Maintaining Ethics when Eating in Public Places	(Abdul Latif and Aziz 2018; Constable 2013)
Food Consumption Efficiency	Food Selection Based on Nutrition Selection of Food that Becomes the Lifestyle of Rasulullah SAW Optimum Utilization of Food Materials Reduction of Food Waste Minimizing the Use of Plastic and Single Use Packaging Sustainable Food Selection Consumption of Plant Foods Local Food Selection Food Choices Based on Environmental Sustainability Awareness of Portion Control	(Yang, Chen, and Chen 2022; Duro et al. 2020; Sun et al. 2010)
Reducing Food Waste Millennial Intention	Awareness of the Impact of Food Waste Knowledge of Food Waste Reduction Strategies Commitment to Reduce Food Waste Meal Planning Proper Use of Food Before Expiry Date Appropriate Portion Arrangements Reusing Food Leftovers for other things Selection of Food Based on the Amount Required Food Sharing with Others	(Chun T'ing et al. 2021; Russell et al. 2017; Lin and Guan 2021)

Data collection in this study was carried out using the survey method by filling out questionnaires delivered directly to research respondents. The respondent population in this study is Indonesian Millennials (age range 18-39 years) with a Purposive Sampling technique. The criteria for respondents must have a history of following Da'wah accounts on Instagram.

The data obtained were analyzed statistically using the Structural Equation Modeling (SEM) method. In contrast, the tool for processing data used Partial Least Square (PLS) 3.3. SEM is a statistical technique that can directly analyze the pattern of relationships between latent constructs and indicators, latent constructs with one another, and measurement errors. SEM is a statistical family of multivariate dependent. SEM allows analysis among several dependent and independent variables directly (Hair Jr. et al. 2017). First, SEM can estimate relationships between variables that are multiple relationships. This relationship is formed in a structural model (the relationship between dependent and independent constructs). Second, it can describe the pattern of relationships between latent constructs (Unobserved) and manifest variables (manifest variables or indicator variables) (Rigdon, Sarstedt, and Ringle 2017).

### Characteristic of Respondent

The two-month data collection process (May-June 2023) resulted in 204 respondents. However, after a screening process to eliminate incomplete data or did not meet the respondent criteria, 189 respondents were determined to be ready for analysis. The majority of respondents in this study were women. On the age side, most respondents are still aged 18-30 years. Furthermore, for marital status, the majority are still single. Finally, for the Education side, the majority have Bachelors and High School diplomas. Table 2 presents the results of tabulated data in more detail.

**Table 2.**

Characteristic of Respondent

	Total	Percentage
<b>Gender</b>		
Man	57	30%
Woman	132	70%
<b>Respondents Age</b>		
18-25 Years Old	56	29%
26-30 Years Old	60	32%
31-35 Years Old	41	22%
36-39 Years Old	32	17%
<b>Marital Status</b>		
Single	121	64%
Married	63	33%
Widowed/Divorced	5	3%
<b>Level of Education</b>		
Has a High School Certificate	68	36%
Has a University Certificate	74	39%
Has a Post-Graduate Certificate	47	25%

### Measurement Outer Model

The analysis model used to analyze the proposed model uses variance-based SEM-PLS model analysis is carried out to assess the outer model or model measurement that relates manifest variables with latent variables; assessing the inner model, latent variables are related to each other based on the path diagram model (Hair et al. 2018).

Measurement outer model is the first stage to measure the validity and reliability of research. The validity measurement is seen from each indicator's loadings factor value, which must reach a minimum of 0.7. In addition, validity support is seen from the minimum average variant extracted value of 0.5 (Memon et al. 2021). Furthermore, reliability with Cronbach's Alpha value for the minimum value is 0.7. The value of composite reliability is interpreted the same as Cronbach's Alpha. Composite reliability measures the actual value of the reliability of a construct. A latent variable of at least 50% must describe the indicator variance. The absolute correlation between latent variables and indicators is more significant than 0.7 (Sarstedt et al. 2020).

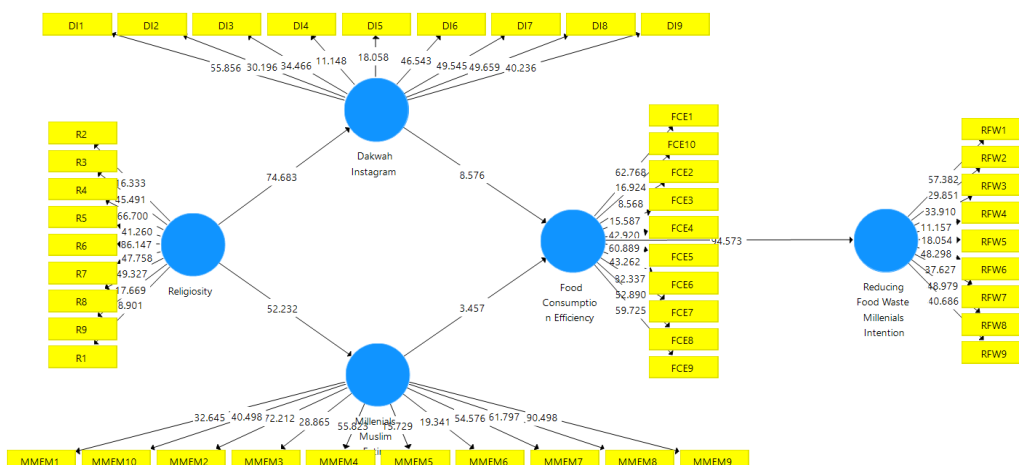
In Table 3, it can be found that the loadings factor indicator result scale has exceeded the minimum number of 0.7. In addition, the average value of the extracted variant of each variable is above 0.5, so the study's validity has been met. Furthermore, the reliability value of this research variable, both composite reliability and Cronbach alpha, is above 0.7 so that the reliability of the study is met.

**Table 3.**  
Measurement Outer Model Result

Variable	Indicator Code	Loadings Factor Scale	Average Variant Extracted	Composite Reliability	Cronbach Alpha
Religiosity	R1-R9	0.701-0.871	0.567	0.919	0.897
Dakwah Instagram	DI1-DI9	0.775-0.903	0.556	0.917	0.897
Millennial’s Muslim Eating Manners	MMEM1-MMEM10	0.724-0.867	0.624	0.942	0.931
Food Consumption Efficiency	FCE1-FCE10	0.700-0.866	0.581	0.930	0.913
Reducing Food Waste Millenials Intention	RFW1-RFW9	0.757-0.826	0.554	0.916	0.897

**Inner Model Structural**

An assessment of the inner model is an assessment of the relationship between each latent variable. The inner model assessment process is done through the SmartPLS Version 3 Application Bootstrapping procedure. Figure 2 is the model output from the following research data analysis.



**Figure 2.**  
Output Inner Model Structural

The Inner Model structure has two primary outputs: R-Square and Path Coefficient Test. The R-Square value is used to clarify how strongly independent data can interpret dependent data. Sarstedt et al (2022) stated that the R-Square value is categorized as vital if it is more than 0.67, moderate if it is more than 0.33 but lower than 0.67, and weak if it is more than 0.19 but lower than 0.33 (Sarstedt et al. 2022). Table 4 shows that the R-Square value of the dependent variable is in a strong category, which means that the dependent variable has succeeded in clarifying very dominantly.

Furthermore, hypothesis testing is carried out by looking at the path coefficient to determine the magnitude of influence between latent variables. The hypothesis is accepted if the Path Coefficient value is positively charged, T-Test >1.96, or P-Value <0.5 (Kock 2018). Table 4 shows that the whole hypothesis has the value of the Path provision is positively charged. The T-Value and P-Value values meet the standard. So it can be concluded that this study accepts the entire hypothesis proposed. The fifth hypothesis is the hypothesis that has the most decisive influence, namely the T-Test value of 94.573. Interpretation of the results of hypothesis testing is further presented in the next section.

**Table 4.**

Path Coefficient Hypothesis Result

Hypothesis	Path Coefficient	T-Test	P-Value	Decision	R-Square
H1: Religiosity → Dakwah Instagram	0.915	74,683	0.000	Accepted	0.837
H2: Religiosity → Millenials Muslim Eating Manners	0.887	52,232	0.000	Accepted	0.787
H3: Dakwah Instagram → Food Consumption Efficiency	0.650	8,576	0.000	Accepted	0.845
H4: Millenials Muslim Eating Manners → Food Consumption Efficiency	0.280	3,457	0.001	Accepted	
H5: Food Consumption Efficiency → Reducing Food Waste Millenials Intention	0.914	94,573	0.000	Accepted	0.835

## Discussion

Religiosity affects Millennial Instagram da'wah, meaning individuals' religiosity level will affect or moderate the impact of da'wah carried out through the Instagram platform. Instagram is a popular platform among millennials, with a broad reach and the potential to reach a large audience. Millennial followers with high levels of religiosity may tend to respond and accept religious proselytizing more positively. They may be more open to da'wah messages and more likely to interact, disseminate, or store da'wah content, including food waste in Islam. As a Muslim Millennial generation with high religiosity, they may tend to produce and disseminate more religiously strong da'wah content through their Instagram accounts related to the importance of eating adab, the content of halal food products, and redundant food laws. Even if they do not spread, at least maintain their reputation as devout Muslims and their knowledge of more profound religious teachings by following Instagram, da'wah, and not doing things contrary to religion blatantly through Instagram social media. This condition also shows love for Islam by encouraging the sharing of Food Waste knowledge from an Islamic perspective.

Furthermore, this study reinforces the assumption of the second hypothesis that suggests individuals' religiosity level will influence or moderate the behavior and eating habits carried out by Muslim millennials. The religion of Islam has clear rules and guidelines related to eating habits. Individuals with high levels of religiosity tend to study and practice these rules diligently. They see eating as part of worship and want to follow religious teachings closely. A high religiosity often means a strong adherence and devotion to religion. Religious Muslim millennials may feel a responsibility to keep eating as a form of reverence and obedience to Allah. They see eating as an opportunity to worship and gain merit. Individuals with high levels of religiosity may have a stronger tendency to follow the rules of Islam. These include washing hands before eating, using the right hand to eat, saying prayers before and after eating, maintaining cleanliness, and avoiding forbidden foods (haram). High levels of religiosity can also affect an individual's awareness of halal food. Religious Muslim millennials may be more careful in choosing halal foods and avoid foods doubtful of halal (mashbooh). Religious Muslim millennials are also more aware of the need to eat in moderation and avoid wasting food, given the importance of qana'ah (being content with enough) in Islamic teachings.

The results of the Path Coefficient analysis in Table 2 found that millennials' da'wah through Instagram influences food consumption efficiency. This acceptance is interpreted as a strong impact of Instagram in influencing the behavior and preferences of Indonesian millennial Muslim consumers. Dakwah carried out through Instagram, can provide information and education to users about the importance of eating food efficiently. Da'wah content focusing on Islamic

values or specific social goods can inspire users to think more consciously about consuming food. Instagram proselytizing can also promote and encourage users to choose foods that come from sustainable sources. This could involve disseminating information about organic farming practices, encouraging the selection of plant-based foods, or educating about the environmental impact of the food industry. Instagram is a platform that allows users to share experiences, tips, and tricks related to various things, including food consumption. Through Instagram da'wah, millennials can share information on reducing food waste, using food efficiently, or processing healthy and nutritious food.

Furthermore, this study accepts the fourth hypothesis that Muslim millennials' eating behavior or eating ethics influences food consumption efficiency. Indonesian Muslim millennials are increasingly aware of specific rules and practices related to food in Islam. Muslim eating etiquette that involves avoiding food wastage can increase the efficiency of food consumption. By minimizing waste, Muslim millennials can reduce the amount of food wasted and use food more wisely. Muslim eating etiquette also teaches respect for nature and the environment. This can increase Muslim millennials' awareness of the environmental impact of food consumption. They can focus more on sustainable agricultural practices, resource selection, and reduced food waste. Muslim millennials can be crucial in sharing Muslim dietary values with the broader community. By sharing knowledge and educating them about ethical eating practices, they can inspire others to improve the efficiency of food consumption.

The study also ultimately accepted a fifth hypothesis that means the efficiency of food consumption can influence millennials' intentions to reduce food wastage. By understanding the efficiency of food consumption, millennials can become more aware of the magnitude of the problem of food wastage and its negative impacts. This can motivate them to have a stronger intention in reducing food wastage. The efficiency of food consumption can affect millennial consumption behavior, including purchasing decisions, food storage arrangements, and food consumption patterns. More efficient behavior can help reduce food waste and encourage their intention to reduce food waste. The social environment can influence millennials' intention to reduce food wastage. Suppose there is support and positive influence from family, peers, or religious communities in the community in food consumption efficiency practices. In that case, this can strengthen their intention to reduce food waste.

## Conclusion

The study concluded that individual religiosity significantly influences millennials' Instagram proselytizing and millennials' Muslim behavior and eating habits. In the context of Instagram proselytizing, the study shows that the platform strongly influences millennial Muslim consumer behavior and preferences, especially regarding food consumption efficiency. The eating ethics of Muslim millennials also influence the efficiency of food consumption. Millennials who practice Muslim eating etiquette, such as avoiding food wastage, can improve the efficiency of food consumption and become more aware of the environmental impact of food consumption. The study also found that the efficiency of food consumption can influence millennials' intention to reduce food wastage. More efficient eating behaviors can help reduce food waste and encourage their intention to reduce food waste.

Several implications arise in this study, including the role of religious leaders and preachers in making the Instagram platform an effective tool to reach millennials with a high level of religiosity. Preachers can take advantage of Instagram's potential to spread religious messages, including about food practices, the content of halal food products, and food redundancy laws. In addition, da'wah content that focuses on food-related social and environmental issues can encourage millennials to think more consciously about their food consumption. Da'wah, through Instagram, is done creatively and innovatively. They can use images, short videos, gripping



narratives, and communication styles relevant to their generation to grab the interest and attention of other Instagram users. In addition, it is necessary to mobilize Muslim millennials to be actively involved in efforts to reduce food waste. They can be agents of change by being examples of reducing food waste in everyday life. They can also disseminate information and motivate others to adopt efficient behaviors in food consumption. By utilizing social media and sharing experiences, Muslim millennials can form movements or communities that care about food waste. To reduce food waste, it is essential to promote sustainable agricultural practices. Muslim millennials can support and encourage practices such as organic farming, sustainable use of resources, and reduction of food waste in the agricultural sector with the Millennial Green Business Scheme. They can learn and share information about these practices with the broader community through social media or community activities. To increase awareness and knowledge about the efficiency of food consumption in Indonesia, it is necessary to carry out literacy efforts targeting Muslim millennials. This can be done through educational programs and campaigns that provide information on the importance of reducing food wastage, choosing sustainable foods, and adopting efficient consumption behaviors. Education has a vital role in shaping the awareness and attitude of Muslim millennials toward food waste. In the Islamic religious education curriculum at the primary, secondary, and higher levels, it is essential to integrate material on SDGs (Sustainable Development Goals) and the phenomenon of food waste. This includes teaching Muslims ethical eating values, the importance of protecting the environment, and sustainable practices in food consumption. By including this topic in the curriculum, Muslim millennials will be given a more comprehensive understanding of the importance of reducing food waste. Finally, collaboration with organizations or movements focusing on food consumption efficiency and sustainability can have a more significant impact. Muslim millennials can get involved in activities organized by these organizations, such as outreach programs, campaigns, or social activities related to food waste reduction. Through this collaboration, they can support each other, share knowledge, and practice Muslim dietary ethical values in the context of reducing food waste.

This study needs to be continued with interdisciplinary research involving sociology, psychology, communication, and religious studies. An interdisciplinary approach can provide a more comprehensive understanding of the factors influencing Muslim millennials' food consumption behavior and how their influence can be maximized through social media platforms such as Instagram.

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