

FOOD QUALITY ASSESSMENT AND ITS ASSOCIATION WITH VEGETABLE PLATE WASTE IN THE FREE NUTRITIOUS MEAL PROGRAM AT SMP NEGERI 30 BATAM

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ABSTRACT

The Free Nutritious Meal Program (Program Makan Bergizi Gratis/MBG) is an initiative to provide meals for students in order to meet their nutritional needs in accordance with health standards and local dietary habits. One of the challenges in implementing this program is the high level of food waste. Food quality is one of the factors that may influence the amount of food waste generated. Preliminary findings showed that the highest percentage of food waste came from vegetable dishes, reaching 81.5%, which exceeded the recommended maximum limit (<20%). This study aimed to analyze the effect of food quality on vegetable dish food waste in the Free Nutritious Meal Program at SMPN 30 Batam. A cross-sectional study design was employed with a sample of 92 students selected through simple random sampling. Data were collected using a food quality assessment questionnaire and food waste measurements using the food weighing method. Data were analyzed using logistic regression. The results showed a significance value of 0.352 ($p>0.05$), indicating that there was no significant effect of food quality on vegetable dish food waste. The Odds Ratio (OR) value of 0.580 indicated a tendency for good food quality to reduce the likelihood of food waste; however, the association was not statistically significant. Food quality had no significant effect on vegetable dish food waste in the Free Nutritious Meal Program at SMPN 30 Batam. Nutrition education and evaluation of other factors potentially influencing food waste are recommended to improve students' vegetable consumption.

Keyword: Food Quality, Food Waste, Free Nutritional Meal Program

ABSTRAK

Program Makan Bergizi Gratis (MBG) merupakan upaya penyediaan makanan bagi siswa untuk memenuhi kebutuhan gizi sesuai standar kesehatan dan kebiasaan lokal. Salah satu tantangan dalam pelaksanaan program ini adalah tingginya sisa makanan. Kualitas makanan merupakan salah satu faktor yang dapat memengaruhi jumlah sisa makanan. Hasil studi pendahuluan menunjukkan bahwa persentase sisa makanan tertinggi berasal dari menu sayur sebesar 81,5%, melebihi batas maksimal yang dianjurkan (<20%). Penelitian ini bertujuan menganalisis pengaruh kualitas makanan terhadap sisa makanan menu sayur pada Program Makan Bergizi Gratis di SMPN 30 Batam. Penelitian menggunakan desain *cross-sectional* dengan sampel sebanyak 92 siswa yang dipilih melalui *simple random sampling*. Data dikumpulkan menggunakan kuesioner penilaian kualitas makanan dan pengukuran sisa makanan dengan metode *food weighing*. Analisis data dilakukan menggunakan uji regresi logistik. Hasil penelitian menunjukkan nilai signifikansi sebesar 0,352 ($p>0,05$), sehingga tidak terdapat pengaruh yang signifikan antara kualitas makanan dan sisa makanan menu sayur. Nilai *Odds Ratio* (OR) sebesar 0,580 menunjukkan kecenderungan bahwa kualitas makanan yang baik dapat menurunkan peluang terjadinya sisa makanan, namun hubungan tersebut tidak bermakna secara statistik. Kualitas makanan tidak berpengaruh signifikan terhadap sisa makanan menu sayur pada Program Makan Bergizi Gratis di SMPN 30 Batam. Disarankan pemberian edukasi gizi serta evaluasi faktor lain yang berpotensi mempengaruhi sisa makanan untuk meningkatkan konsumsi sayur pada siswa.

Kata kunci: Kualitas Makanan, Sisa Makanan, Program Makan Bergizi Gratis

INTRODUCTION

The Free Nutritious Meal Program (Program Makan Bergizi Gratis/MBG) is one of the Indonesian government's priority programs aimed at improving the nutritional status of students through the provision of balanced and nutritious meals in schools. This program is supported by the Presidential Regulation of the Republic of Indonesia Number 83 of 2024 concerning the National Nutrition Agency, which is responsible for implementing national nutrition services and fulfillment in a planned and systematic manner (Presidential Regulation, 2024). One of the schools that has implemented this program is SMP Negeri 30 Batam. However, its implementation still faces challenges, particularly the high level of food waste, especially from vegetable dishes.

Based on a preliminary study conducted among 30 students of SMP Negeri 30 Batam using the Food Comstock method, the highest percentage of food waste was found in vegetable dishes (81.5%), followed by plant-based side dishes (26.5%), rice (18.1%), animal-based side dishes (10.8%), and fruit (1.6%). The percentage of vegetable waste greatly exceeded the recommended maximum food waste threshold of less than 20% (Daumi, 2026). This high level of food waste not only indicates low acceptance of the meals provided but also has the potential to increase food service costs, contribute to food waste, and reduce students' nutrient intake. Consequently, such conditions may hinder the achievement of the objectives of the Free Nutritious Meal Program in improving students' nutritional status if factors affecting food acceptance are not adequately evaluated.

Food waste in school meal programs is influenced by various factors, one of which is food quality. According to Rahmawati (2018), food quality encompasses taste, aroma, texture or consistency, freshness, appearance, degree of doneness, and food variety. Good food quality can enhance students' acceptance of and satisfaction with the meals served. Conversely, poor food quality may lead to incomplete consumption of meals, thereby increasing the amount of food waste.

Several studies have demonstrated an association between food quality and food waste. Keller et al. (2020) reported that students tend to enjoy and consume foods that they perceive as having good quality. Furthermore, Kurniawati et al. (2016) found that high levels of food waste among school students were predominantly associated with vegetable dishes that were less preferred. These findings suggest that food quality is an important factor to consider in efforts to reduce food waste in school meal programs.

Based on this background, food quality is presumed to be one of the factors influencing vegetable dish waste in the Free Nutritious Meal Program. Therefore, this study aims to analyze the effect of perceived food quality on vegetable dish waste among students of SMP Negeri 30 Batam. The study hypothesizes that there is a significant effect of food quality on vegetable dish waste.

RESEARCH METHODS

This study employed a quantitative observational approach with a cross-sectional design, in which the independent and dependent variables were measured simultaneously without any intervention being administered to the participants. The study was conducted at SMP Negeri 30 Batam, Batam City, Riau Islands Province, Indonesia, in April 2026.

The study population consisted of all students enrolled at SMP Negeri 30 Batam, totaling 1,207 students. The sample size was determined using the Slovin formula with a 10% margin of error, resulting in a sample of 92 students. A simple random sampling technique was applied, ensuring that each student had an equal opportunity to be selected as a respondent. The inclusion criteria were students who participated in the Free Nutritious Meal Program (MBG) and were willing to participate in the study. The exclusion criterion was students who were absent during data collection.

The independent variable in this study was food quality, while the dependent variable was vegetable dish plate waste. Food quality was assessed using a questionnaire consisting of 12 items covering seven indicators: taste, aroma, texture/consistency, freshness, appearance, degree of doneness, and food variety. Responses were measured using a four-point Likert scale: very

dissatisfied, dissatisfied, satisfied, and very satisfied. The total score obtained by each respondent was subsequently categorized as satisfied or dissatisfied based on a cut-off value determined by the mean or median, according to the results of the normality test.

Vegetable dish plate waste was measured using the food weighing method by weighing the vegetable portion before and after consumption. The percentage of plate waste was calculated using the plate waste percentage formula and categorized as low plate waste ($\leq 20\%$) and high plate waste ($> 20\%$).

Data collection was conducted through the administration of the food quality questionnaire and the measurement of plate waste using the food weighing method. The collected data underwent editing, coding, data entry, cleaning, and tabulation before being analyzed using the Statistical Package for the Social Sciences (SPSS). Univariate analysis was performed to describe food quality and vegetable dish plate waste. Data normality was assessed using the Kolmogorov–Smirnov test. Furthermore, bivariate analysis was conducted using simple logistic regression to determine the effect of food quality on vegetable dish plate waste in the Free Nutritious Meal Program. Statistical significance was set at $p < 0.05$ with a 95% confidence interval (CI).

RESULTS AND DISCUSSION

Tabel 1. Distribusi Frekuensi Kualitas Makanan

Kualitas Makanan	n	%
Puas	50	54.3
Tidak Puas	42	45.7
Total	92	100

Based on Table 1, the majority of respondents rated the quality of the vegetable dishes provided through the Free Nutritious Meal Program as satisfactory, with 50 students (54.3%) reporting satisfaction, while 42 students (45.7%) reported dissatisfaction. These findings indicate that, overall, the quality of the vegetable dishes served at SMP Negeri 30 Batam was reasonably well accepted by the students. Food quality in this study was assessed based on several aspects, including taste, aroma, texture or consistency, freshness, appearance, degree of doneness, and menu variety. The results showed that texture/consistency had the highest percentage score (68.48%), whereas taste had the lowest percentage score (59.65%). This finding suggests that the texture of the vegetable dishes generally met students' preferences; however, the taste of the vegetables still requires improvement to enhance students' acceptance of the meals provided.

The findings are consistent with those reported by Keller et al. (2020), who stated that students tend to enjoy and consume foods that they perceive as having good quality. Furthermore, Adams et al. (2022) highlighted that sensory characteristics of food, particularly taste, play an important role in influencing food acceptance in school meal programs. Therefore, improving the quality of vegetable dishes, especially their taste, should be a priority in the implementation of the Free Nutritious Meal Program to enhance students' food acceptance and help reduce plate waste.

Tabel 2. Distribusi Frekuensi Sisa Makanan

Sisa Makanan	n	%
Rendah	14	15.2
Tinggi	78	84.8
Total	92	100

Based on Table 2, the majority of respondents were categorized as having high plate waste (>20%), accounting for 78 students (84.8%), while only 14 students (15.2%) were categorized as having low plate waste ($\leq 20\%$). These findings indicate that most students still left a considerable amount of the vegetable dishes provided through the Free Nutritious Meal Program.

The high level of plate waste observed in this study suggests that students' acceptance of vegetable dishes has not been optimal. This finding is consistent with the study by Marques et al. (2022), which reported that vegetables were the most frequently discarded food items among students in school settings. Similarly, Adjapong et al. (2024) found that vegetable dishes exhibited higher levels of plate waste than other meal components in school feeding programs.

The high level of plate waste may be influenced by several factors, including students' preferences toward vegetables, their habitual vegetable consumption, portion sizes, and the condition of the food when served. According to Andriani and Nurwulan (2021), excessively large portion sizes can contribute to increased food waste among school students. In addition, the relatively low preference for vegetables among adolescents may lead to greater amounts of food being left uneaten. These findings highlight the need for strategies to improve students' acceptance of vegetables, such as enhancing menu quality, adjusting portion sizes, and increasing nutrition education related to vegetable consumption.

Tabel 3. Analisis Regresi Logistik Pengaruh Kualitas Makanan Terhadap Sisa Makanan

Variabel	OR	95% CI	Sig.(p)
Kualitas makanan - Sisa Makanan	0,580	0,184 – 1,829	0,352

Based on the logistic regression analysis, a significance value of 0.352 ($p > 0.05$) was obtained, indicating that food quality had no significant effect on vegetable dish plate waste among students at SMP Negeri 30 Batam. Therefore, the null hypothesis (H_0) was accepted and the alternative hypothesis (H_a) was rejected. The Odds Ratio (OR) of 0.580 suggests that students who perceived the food quality as good were

0.580 times as likely to generate plate waste compared with students who perceived the food quality as poor. This finding indicates a tendency for better food quality to reduce the likelihood of plate waste by approximately 42%. However, because the p-value exceeded 0.05 and the 95% confidence interval (0.184–1.829) included the value of 1, this tendency was not statistically significant.

Theoretically, food quality is one of the factors that can influence food acceptance and the amount of plate waste generated. According to Rahmawati (2018), food quality encompasses several aspects, including taste, aroma, texture or consistency, freshness, appearance, degree of doneness, and food variety, all of which may affect students' satisfaction and acceptance of the meals served. The better the food quality perceived by students, the more likely they are to consume the food completely, resulting in lower plate waste.

Despite this theoretical expectation, the present study found no significant association between food quality and vegetable dish plate waste. Descriptive analysis showed that most respondents rated food quality as satisfactory (54.3%). However, at the same time, the majority of respondents were categorized as having high plate waste (84.8%). These findings indicate that although the overall quality of the food was perceived positively, vegetable dishes were still frequently left uneaten. This suggests that factors other than food quality may play a more dominant role in influencing students' decisions to consume or leave vegetable dishes.

One possible explanation is the role of taste. Among all food quality indicators, taste received the lowest percentage score (59.65%), whereas texture or consistency received the highest score

(68.48%), followed by degree of doneness and menu variety (67.94%), freshness (67.39%), appearance (64.31%), and aroma (62.50%). These findings suggest that although overall food quality was categorized as satisfactory, taste remained the least favorably rated aspect.

According to Rahmawati (2018), taste is one of the most important components of food quality and plays a major role in determining food acceptance. Foods with flavors that match consumers' preferences are more likely to be accepted and consumed completely, whereas foods perceived as less palatable tend to generate greater plate waste. In the present study, the relatively low rating of taste may have contributed to the high level of vegetable plate waste observed. In other words, students may have considered the texture, freshness, degree of doneness, and appearance of the food acceptable while still leaving vegetables uneaten because their taste did not fully align with students' preferences. This interpretation is supported by Afiatna et al. (2023), who reported that vegetable dishes with less preferred flavors tended to produce higher levels of plate waste. Similarly, Hasanah and Fauziah (2024) found that food taste significantly influenced the amount of plate waste left by consumers, making it an important determinant of plate waste levels.

These findings suggest that measuring food quality as a single overall construct may obscure variations across its individual components. Although most students categorized food quality as satisfactory, weaknesses in a key attribute such as taste may still influence students' decisions to consume or leave food. This may partially explain why overall food quality did not show a statistically significant effect on plate waste in this study.

In addition to taste, the high level of vegetable plate waste may also be influenced by factors beyond food quality. Adjapong et al. (2024) reported that vegetable dishes consistently generated higher levels of plate waste than other meal components in school feeding programs. This finding suggests that low acceptance of vegetables is not necessarily attributable to food quality alone but may also reflect individual preferences and pre-existing vegetable consumption habits.

The findings of this study are not entirely consistent with the theory proposed by Rahmawati (2018), which states that food quality can influence plate waste. However, this discrepancy may be explained by the characteristics of the study data, as most respondents provided relatively homogeneous assessments and tended to rate food quality as satisfactory. Furthermore, the lower rating of taste compared with other food quality indicators suggests that not all dimensions of food quality were equally well accepted by students. Therefore, although food quality was generally perceived as good, suboptimal taste and students' low preference for vegetables may have contributed to the persistently high level of plate waste and the lack of a statistically significant relationship between food quality and vegetable dish plate waste.

In conclusion, the results indicate that food quality did not have a significant effect on vegetable dish plate waste in the Free Nutritious Meal Program at SMP Negeri 30 Batam. Although there was a tendency for better food quality to reduce the likelihood of plate waste, other factors, such as students' preferences for vegetables, habitual vegetable consumption, and relatively low ratings of taste, appear to play a more substantial role in determining the amount of plate waste generated.

CONCLUSION

The findings of this study showed that the majority of students rated the quality of the vegetable dishes provided through the Free Nutritious Meal Program at SMP Negeri 30 Batam as satisfactory (54.3%). However, most students were also categorized as having high levels of vegetable plate waste (84.8%). Logistic regression analysis indicated that food quality did not have a statistically significant effect on vegetable plate waste. Nevertheless, there was a tendency for better food quality to reduce the likelihood of plate waste, although this association was not statistically significant.

These findings suggest that the high level of vegetable plate waste may not be explained solely by food quality but may also be influenced by other factors, such as students' preferences

for vegetables, habitual vegetable consumption, portion size, and the condition of the food when served. Therefore, efforts to improve students' acceptance of vegetable dishes should focus on enhancing the taste of vegetable-based meals and strengthening nutrition education programs that promote vegetable consumption within the Free Nutritious Meal Program.

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