JURNAL BINA PRAJA
Journal of Home Affairs Governance

ARTICLE

Enhancing Food Security Through Green Canteen Initiatives

A Case Study of the Role of Elementary Schools in Sustainable Nutrition Education

Istiqomah [1], **Laurensia Claudia Pratomo** [2], **Dian Isnawati** [3]

[1, 2, 3, 4]Jenderal Soedirman University, Purwokerto, Indonesia

laurensia.pratomo@unsoed.ac.id

Abstract: The problem of child nutrition in Southeast Asia, including Indonesia, remains a serious issue due to the triple burden of malnutrition. Although Indonesia has made progress in reducing malnutrition rates, challenges persist in addressing stunting, undernutrition, and childhood obesity. Socioeconomic factors and unhealthy dietary patterns further exacerbate these conditions. Sustainable nutrition education in schools, implemented through green canteen initiatives, serves as a strategy to introduce healthy eating habits from an early age. This initiative aligns with the Sustainable Development Goals (SDGs) and the national program Asta Cita, where sustainable nutrition education contributes to strengthening children's food security. This study aims to explore initiatives for implementing green canteens in primary schools as a means of providing healthy food and promoting sustainable nutrition education to enhance students' food security. A qualitative approach was employed with data obtained through interviews, observations, and documentation, and analyzed through reduction, display, and conclusion drawing. The results indicate that green canteens contribute to enhancing students' food security by fostering healthy eating habits and improving nutrition literacy. Furthermore, the success of the program depends greatly on the involvement of schools, teachers, students, and parents. These findings reinforce the strategic role of elementary schools as key agents in promoting food security and sustainable nutrition education at the local level.

Keywords: Green Canteen; Food Security; Sustainable Nutrition Education; Sustainable Development Goals; Asta Cita.

OPEN ACCESS

Citation: Istiqomah, Pratomo, L. C., & Isnawati, D. (2025). Enhancing Food Security Through Green Canteen Initiatives: A Case Study of the Role of Elementary Schools in Sustainable Nutrition Education. *Jurnal Bina Praja, 17*(2). https://doi.org/10.21787/jbp.17.2025-2576

Submitted: 23 May 2025

Accepted: 23 August 2025

Published: 30 August 2025

1. Introduction

Children's health and nutritional intake have increasingly become global issues of concern. Southeast Asian countries such as Thailand, Indonesia, Vietnam, and Cambodia are facing nutritional challenges, including undernutrition, micronutrient deficiencies, and a rising prevalence of obesity among children (Ernawati et al., 2021; Pongcharoen et al., 2024; Tan et al., 2024; Widyaningsih et al., 2022). This situation poses a significant public health challenge due to the emergence of the triple burden of malnutrition. It is closely linked to the diverse socioeconomic, cultural, and environmental conditions of each country. Moreover, nutritional problems are further exacerbated by the disparities between urban and rural populations.

Indonesia made progress in reducing child malnutrition rates in 2023; however, cases of malnutrition among children are still being reported (UNICEF, 2024b). There are three major trends of child malnutrition in Indonesia: stunting, undernutrition, and obesity. Among these, stunting remains the most critical issue that demands serious attention. Data from UNICEF Indonesia (2023) showed that in 2013, 37.2% of children in Indonesia were affected by stunting. Although the prevalence of stunting decreased to 21.5% in 2023, this figure remains considerably high compared to the rates of undernutrition (8.5%) and childhood obesity (4.2%) in Indonesia. An increasing number of children are experiencing obesity compared to previous years, primarily due to unhealthy eating patterns, such as the consumption of foods high in sugar and fat, combined with a lack of physical activity (UNICEF, 2024a). Findings from Banyumas Regency also indicate that primary school students in rural areas experience issues related to undernutrition, while those in urban areas face problems with obesity (Lalita et al., 2024). Other findings show that children from low-income households and rural areas are at a higher risk of experiencing stunting and micronutrient deficiencies due to limited access to nutrient-rich foods and healthcare services (Widyaningsih et al., 2022). Nevertheless, both urban and rural children are currently facing a similar challenge: the widespread availability of vendors selling unhealthy foods and beverages that are high in sugar, fat, and calories, which may negatively impact their nutritional intake.

In response to these issues, one of the efforts that can be undertaken to prevent malnutrition in children is through strengthening food security (Putra et al., 2023; Sanggelorang et al., 2024). Food security was originally used to describe a country's independence in terms of food and its ability to meet the energy needs of its population. However, over time, food security has also been understood as the availability of food and the ease of obtaining it (Cangussu Botelho et al., 2020). Food security can also be defined as the ease of access to nutritious food (Butcher et al., 2021; Holloway et al., 2023). When food security is unmet, it leads to food insecurity, where access to nutritious food is limited and uncertain (Butcher et al., 2021). If food insecurity occurs among children, it can result in a lack of food diversity and nutritional deficiencies, which pose a risk to children's growth and lead to stunting (Patriota et al., 2024). Low and insufficient food security can also impact students' motivation to learn and academic achievement (Gamba et al., 2021).

In line with the SDGs and supporting the national Asta Cita program, schools can introduce food security as a strategy for improving student nutrition education. Nutrition education in schools plays a crucial role in promoting healthy eating behaviors and preventing childhood obesity (Onur et al., 2021). Schools can address food insecurity by implementing programs and policies that promote nutrition, education, and the involvement of various stakeholders in supporting food security among students (Njura et al., 2020). Additionally, nutrition education provided by teachers can have

a positive impact on students' eating habits and nutritional knowledge (Cotton et al., 2020). Several studies highlight the importance of proper nutrition intake to achieve food security through educational activities conducted by schools. These activities may include the implementation of programs that promote nutritious eating (Amorim et al., 2020), school gardening activities combined with agricultural education and life skills (Kasumba, 2022), and integrating nutrition education into lessons or curricula (Dacunha et al., 2022). While sustainable nutrition education can be conducted in various ways, effective teaching strategies are necessary for nutrition education in schools, especially in primary schools (Cotton et al., 2020; Follong et al., 2022).

One tangible form of this strategy is the implementation of a green canteen, which serves as a model of sustainable nutrition education and provides a healthy eating environment (Onur et al., 2021), locally sourced, sustainable, and environmentally friendly food (Putri et al., 2024) thereby strengthening children's food security. A green canteen, or eco canteen, is an effort to create a school canteen that provides health. This green canteen is an extension of the healthy canteen concept. In addition to meeting the needs of students and school members, a green canteen also pays attention to the nutritional content of healthy food. The green canteen also contributes to instilling a love for the environment in primary school students, including reducing plastic waste in daily life.

From a health perspective, the presence of a green canteen in schools is ideal for implementing nutritional health strategies, as the frequency of student visits and the canteen's reach within the school environment are both very high (Delaney et al., 2023). A green canteen, or healthy canteen, is closely related to important health aspects such as nutritional content, food safety, and the development of healthy eating habits among school-aged children (Dahmani et al., 2024; Devine et al., 2023). Therefore, the green canteen focuses on providing healthier and nutritionally balanced meals that offer direct benefits to students' overall health (Kadaryati et al., 2024). In this context, healthy food refers to items classified as green, which contain lower levels of saturated fat, sugar, and sodium (Delaney et al., 2023) while also promoting the availability of fruits and vegetables on the menu (Kadaryati et al., 2024). The initiative to implement green canteens is also based on research findings that show many school canteens still provide unhealthy snacks. The food offered in these canteens contains harmful additives (Handayani et al., 2023) and is high in sugar, salt, and fat (Matondang & Yuliaty, 2024). Such foods clearly do not meet students' nutritional needs and pose health risks, such as obesity, diabetes, and hypertension in children, thus increasing food insecurity. To avoid these risks, green canteens can collaborate with local households or communities near the school to provide food that is prepared with greater attention to the nutritional value for students' health.

When linked to environmental issues, the green canteen contributes to reducing food waste generated from both food production processes and consumer leftovers (Lorenz-Walther & Langen, 2020). This effort can be realized through the implementation of green canteen practices that involve consumers in purchasing procedures designed to achieve zero plate waste, thereby minimizing waste processing activities that affect the sanitation and cleanliness of the canteen (Thongplew et al., 2021). Furthermore, schools can pay more attention to product packaging that may increase the risk of students consuming microplastics, while ensuring that the food consumed by students maintains its nutritional quality. Foods that are typically packaged in plastic and wax paper can be replaced with banana leaves, and instead of using a stapler, food skewers made from coconut leaf spines or bamboo skewers can be used for sealing. The canteen can also provide reusable eating utensils, such as those made from stainless steel or ceramic.

However, several studies have indicated that the implementation of green canteens is often ineffective and difficult to apply in Indonesia. It was found that 84% of school canteens in Indonesia do not meet hygiene and sanitation standards (Hadi et al., 2022). Many school canteens lack adequate infrastructure, such as proper handwashing facilities, and are generally poorly maintained (Rahmiwati et al., 2025). In addition, canteen management is often handled informally, with limited regulation, monitoring, and supervision from schools (Rachmadewi et al., 2021). From the perspective of school food vendors, many express concern that their products will not sell because healthy foods are often less appealing to students' taste preferences (Kadaryati et al., 2024). Furthermore, sales from healthy food are perceived as less profitable (Coady et al., 2025) since foods with lower nutritional quality are generally cheaper than healthier options (Haynes et al., 2021). Vendors also face challenges due to limited access to tools or packaging materials that meet food safety regulations, making it difficult to comply with proper food handling procedures (Ramos & Despojo, 2025). Another challenge comes from student behavior, which can hinder the success of green canteen programs. For instance, when schools implement programs that require students to bring their own meals, students are less likely to purchase food from the canteen, making the green canteen program irrelevant on those days (Lorenz-Walther & Langen, 2020). Changing students' attitudes and behaviors toward healthy food purchases and food waste reduction requires more time and a systematic approach (Evenhuis et al., 2020). Kadaryati et al. (2024) also found that students are often reluctant to adopt zero-waste practices in the canteen, as they prefer using disposable plastic cups that are convenient to carry without needing to return them. The implementation of green canteen practices is further constrained by poor environmental management, as no monitoring systems are in place to record food waste generated during the production and consumption process (Sousa et al., 2025).

Due to the various challenges faced in implementing green canteens in Indonesia, it is essential to conduct a deeper investigation into how schools can optimize their role in promoting green canteens not only as providers of healthy food but also as platforms for sustainable nutrition education among elementary school students. Therefore, this study aims to fill this gap by identifying the efforts made to implement green canteens in providing healthy meals and sustainable nutrition education in elementary schools. In addition, the study seeks to explore students' and teachers' perceptions of green canteens and examine the school's role in supporting sustainable nutrition education.

2. Methods

This study employed a qualitative case study focusing on the implementation of the green canteen at SDN Kedondong, Banyumas Regency, conducted over a three-month period (January–March 2024). Data were obtained from three key respondents—the school principal, the teacher who initiated sustainable nutrition education, and the canteen manager—through interviews, observations, and documentation of school activities. Each interview lasted about 45–60 minutes and was conducted on-site. Data validity was ensured through triangulation across methods, sources, and researchers, followed by cross-checking of transcripts and observation notes to maintain consistency and minimize bias.

This study used purposive sampling, which involves selecting subjects based on specific considerations and objectives. The research subjects who meet these criteria are: (1) the school principal, (2) the teacher who initiated the green canteen, and (3) the teacher managing the canteen. These three subjects were chosen based on their involvement and roles in supporting and monitoring the implementation of the

green canteen initiative at SDN Kedondong over several periods. Table 1 presents the respondent data from SDN Kedondong for this study.

Table 1. Respondent Data

Respondent Name	Description
UP	A 58-year-old male, the school principal, with a bachelor's degree as the highest level of education.
EAW	A 41-year-old female, a teacher and initiator of sustainable nutrition education, with a bachelor's degree as the highest level of education.
RBH	A 52-year-old female, a teacher and manager of the green canteen, with a bachelor's degree as the highest level of education.

The data collection techniques used in this study include interviews, observations, and documentation. The researcher asked the respondents to provide information about the green canteen initiative at the primary school as part of implementing student food security and the ongoing sustainable nutrition education processes at the school. The observations conducted by the researcher used a non-participant observation technique, as the researcher was an independent observer and not involved in the topic being studied. The observations in this research included recording interview results, followed by the analysis of the information to conclude the implementation of the green canteen in primary schools. Each preparation, process, and implementation of the green canteen, which the primary school had archived, was then documented by the researcher in the form of recordings and photographs. The collected data was then analyzed through three stages: data collection, data reduction, verification and conclusion drawing.

Interviews, observations, and documentation also serve as one of the techniques for measuring data validity used in this study, specifically the triangulation method approach. In addition to method triangulation, data validity in this study was also measured using data triangulation and researcher triangulation. Data triangulation in this research was carried out by comparing information obtained from different research subjects: the school principal, the teacher who initiated the green canteen, and the teacher managing the canteen. This study also employed researcher triangulation, where two researchers were involved in the data collection, analysis, and interpretation process, with the goal of reducing subjectivity and enhancing the validity of the research results. All collected data were subsequently analyzed collectively by presenting the data from each researcher's perspective. The analysis results were then discussed to ensure that the conclusions drawn were not based solely on one researcher's viewpoint but represented the validation of various perspectives within the research team.

Data analysis in this study involved the stages of reduction, data display, verification and conclusion drawing. The data reduction process enabled categorizing information from each respondent related to the school's role in implementing the green canteen, policies regarding the green canteen, its implementation, and its impact on food security and student nutrition education. If any information was found to be irrelevant to the study, it was eliminated. The categorized data were presented in a structured display, including flow diagrams, to illustrate and analyze the implementation of the green canteen and its impact on food security and nutrition education at the school. The final stage involved verification and drawing conclusions from the analyzed data, which had undergone the triangulation process to ensure data validity. The conclusions of this study aim to clarify the impact of the school's role in sustainable nutrition education and explain the relationship between the green canteen and food security. Data verification in this study was conducted by comparing data from various

sources, such as the statements of the school principal, teachers, and the researcher's observation results, to ensure data consistency.

3. Results and Discussion

This research was conducted at SDN Kedondong, Sokaraja District, Banyumas Regency, Central Java. The subjects of this study were the principal of SD Negeri Kedondong, the coordinator of the healthy canteen program, and the canteen staff. The number of data sources in this study was based on the consideration that qualitative research prioritizes the quality of information rather than the number of informants.

The results of interviews with several informants indicated that the green canteen at SDN Kedondong plays an important role in sustainable nutrition, and in the long term, there is a connection between the green canteen and food security. All parties involved accepted the green canteen program positively. A fundamental point of concern was the role of the school in sustainable nutrition education, which includes the types of food provided in the school canteen, the sources of food used, the initiatives taken by the school regarding sustainable nutrition education, and the involvement of students and parents in the green canteen and food security.

The next discussion focuses on the perceptions of students and teachers regarding the green canteen, which includes their views on the quality and variety of the food, their perceptions of the canteen's impact on health and eating habits, and their views on the educational program about healthy food. The final discussion addresses the connection between the green canteen and food security.

3.1. The Role of Schools in Sustainable Nutrition Education

Schools play a strategic role in shaping healthy eating patterns in children from an early age. Sustainable nutrition education in schools focuses not only on providing nutritious food but also on building awareness and promoting better food consumption habits. In this context, implementing a green canteen becomes a key strategy for enhancing student food security by providing healthy, high-quality food and promoting sustainable nutrition education. The introduction of green canteens in elementary schools has shown a positive impact in forming healthier food consumption habits among students. Schools act as facilitators in creating an environment that supports healthy eating patterns by providing nutritious food, educating students on the importance of healthy food choices, and involving various stakeholders, including teachers, students, and parents, in the management of school canteens. Through this approach, nutrition education becomes an integrated part of students' daily lives, helping to establish better and more sustainable food consumption habits.

One important aspect of the successful implementation of a green canteen is the type of food provided in the school canteen. The food served must meet balanced nutrition standards and minimize the use of harmful food additives. In this study, it was found that the green canteen at SDN Kedondong offers a variety of healthy foods, including complex carbohydrate sources such as tubers, high-quality protein from fish, tofu, and tempeh, as well as fresh vegetables and fruits, in the students' daily menus. Furthermore, the school also reduces the use of sugary or caffeinated beverages, replacing them with plain water and fruit juices without added sugar. This food provision aims not only to improve the nutritional quality of students but also to reduce the consumption of processed foods high in sugar, salt, and saturated fats.

In addition to considering the types of food provided, the sources of food used in the green canteen also play a key role in supporting the sustainability of the program.

In this study, SDN Kedondong tends to use locally sourced ingredients from nearby plantations, ensuring the availability of fresh and healthy food while contributing to the economic sustainability of the local community. Furthermore, the school reduces its reliance on processed products by using more natural and fresh ingredients in food preparation. This approach aligns with food safety principles, as the school also provides training for canteen staff in hygiene and food safety practices.

Sustainable nutrition education in schools does not only rely on providing healthy food in the canteen but also requires various initiatives to increase students' understanding and awareness of healthy eating patterns. Based on the findings of this study, schools that implement green canteens generally offer various nutrition education programs, including workshops and seminars on healthy eating, cooking demonstrations with nutritious ingredients, and healthy eating campaigns that involve both students and teachers. Additionally, schools integrate nutrition education into the curriculum through science subjects (IPA). Another effort involves monitoring students' food consumption, where the school actively observes students' eating habits in the canteen and conducts surveys regarding healthy food preferences offered. In some cases, schools also collaborate with health institutions and academics to provide counseling and guidance on implementing effective green canteen policies.

The success of implementing green canteens in supporting sustainable nutritional education is also highly influenced by the active involvement of students and parents. Student participation in various green canteen programs is not limited to consuming healthy food but also include canteen management and peer education activities on healthy eating. Some schools involve students in selecting healthy menus and cooking practices in the canteen as part of efforts to raise awareness about the importance of good nutrition intake. Additionally, some schools develop school gardens as an additional food source for the canteen, where students participate in planting and harvesting vegetables that are then used as food ingredients in the canteen. Besides student involvement, the role of parents is also crucial in supporting the sustainability of the green canteen program. Schools actively involve parents through various educational programs aimed at aligning healthy eating patterns at school with those practiced at home. In some cases, parents form communities that help provide healthy food ingredients for the school canteen or partners in nutrition education for students. This collaborative approach demonstrates that enhancing student food security is not only the responsibility of the school but also requires full support from families and the surrounding community.

3.2. Students' and Teachers' Perceptions of the Green Canteen

The implementation of green canteens in elementary schools focuses not only on providing healthy food but also on fostering students' and educators' awareness of the importance of a nutritious and sustainable diet. Students' and teachers' perceptions are crucial in evaluating the effectiveness of this program, particularly regarding food quality, its impact on health and eating habits, and the effectiveness of the nutrition education program. The quality and variety of food provided in the school canteen are primary factors in the success of implementing a green canteen. Based on the research findings, both students and teachers had varied views on this aspect. The majority of students appreciated the availability of a more diverse healthy menu compared to conventional canteens, particularly with the inclusion of local food options such as fresh vegetables, plant-based proteins, and beverages without added sugar. However, some students also expressed that the limited availability of certain food options posed a challenge, particularly for those who were accustomed to consuming processed

foods or more convenient snacks. As a result, some students resorted to purchasing food outside the school, even from distant locations.

Meanwhile, teachers generally had a more positive perception of the quality of food provided in the green canteen. They assessed that the nutritional standards applied in the food offerings helped improve students' nutritional intake, particularly by reducing the consumption of foods high in sugar and saturated fats. However, some teachers also mentioned the need to increase menu variety to prevent students from becoming bored, as well as the importance of innovating food presentation to make it more appealing to children. Perceptions of the impact of the green canteen on students' health and eating habits showed varied results. Most students recognized that the food provided in the canteen was healthier than the snacks they bought from outside the school. Some even began to adopt better eating habits, such as increasing their consumption of fruits and vegetables and reducing their intake of processed foods. However, challenges remained in changing the preferences of some students who tend to favor fast food.

From the perspective of educators, the green canteen policy was viewed as having a positive impact on raising students' awareness of nutrition. The teachers involved in this study expressed that the presence of the green canteen encouraged students to become more mindful of their food choices. Some teachers also noted a change in students' behavior regarding the selection of healthier foods, although obstacles remained, such as the habit of students bringing snacks from outside the school. In addition to the food provided, the effectiveness of the green canteen also heavily depends on the educational programs implemented at the school. According to the study findings, most students believed that the nutritional education provided at school had given them new insights into the importance of a nutritious diet. Programs such as healthy cooking demonstrations, education on the nutritional content of food, and healthy eating campaigns were considered quite effective in raising awareness. However, some students suggested that more interactive and hands-on educational methods could further enhance their understanding.

Meanwhile, teachers generally held positive views about the nutrition education programs implemented at school. They considered the integration of healthy food topics into the school curriculum a good step toward fostering healthy eating habits from an early age. However, some teachers emphasized the need to improve educators' capacity to deliver nutrition content in a way that is more engaging and practical for students. Overall, students' and teachers' perceptions of the green canteen indicate that the program has a positive impact on students' eating habits and nutrition awareness. Although challenges remain in terms of food variety, student preferences, and the effectiveness of nutrition education, the implementation of the green canteen is still viewed as a strategic step in enhancing food security and improving students' health in elementary schools. Therefore, further innovation is needed in providing more diverse menus, adopting more interactive educational strategies, and enhancing the role of teachers in supporting the sustainability of this program.

3.3. The Relationship Between the Green Canteen and Food Security

The concept of the green canteen is closely linked to efforts aimed at improving food security among elementary school students. The green canteen not only provides healthy food but also serves as an educational tool in fostering students' awareness of the importance of a nutritious and sustainable diet. Food security encompasses aspects such as the availability, accessibility, and sustainable utilization of nutritious food. In this context, the green canteen becomes a mechanism to ensure that students

have access to healthy food while also gaining an understanding of the importance of maintaining a healthy diet in the long term. By offering food based on fresh and nutritious local ingredients, the green canteen helps enhance students' access to healthy food. Additionally, regulations regarding the selection of nutritionally balanced food help reduce the consumption of processed foods that are high in sugar, salt, and saturated fats. Thus, the green canteen not only plays a role in improving the quality of students' food intake but also in promoting healthier eating habits as part of efforts to maintain food security for the younger generation.

The presence of the green canteen at SDN Kedondong has had a positive impact on increasing students' knowledge about healthy food. Through various educational programs accompanying the implementation of the green canteen, students gain a better understanding of the importance of choosing food with balanced nutritional content. These educational programs are typically conducted through socialization, nutrition workshops, and the incorporation of healthy food topics into the curriculum. Based on the research findings, students who are accustomed to the green canteen have shown an increased awareness of the nutritional content of food and its impact on health. They are more aware of the difference between healthy and unhealthy foods and are better able to make better choices in their daily consumption. With improved nutritional literacy, it is hoped that healthy eating patterns can be consistently applied both at school and at home, thereby contributing to better long-term food security.

In addition to improving knowledge, the green canteen also contributes to changing students' eating habits towards healthier choices. Students who have access to nutritious food within the school environment tend to adopt better eating habits compared to those who rely on unhealthy snacks. Findings from this study indicate that the green canteen encourages students to consume more fruits and vegetables, reduce the intake of fast food, and limit their consumption of sugar and processed foods. While dietary changes do not occur instantly, consistent implementation of the green canteen, supported by effective educational programs, can help students build healthier food consumption habits. In the long run, these changes not only impact individual health but also contribute to creating a generation that is more aware of the importance of food security. Overall, the relationship between the green canteen and food security is reflected in students' access to healthy food, improved nutritional literacy, and better eating habits. With an increasing number of schools adopting the green canteen concept, it is expected that food security among school-aged children will continue to improve, thus supporting the achievement of sustainable development goals in the health and education sectors.

4. Conclusion

The findings of this study indicate that the implementation of green canteens in elementary schools plays a crucial role in enhancing students' food security by providing healthy meals and fostering sustainable nutrition awareness. The green canteen serves as a learning setting that integrates environmental and health education into daily school practices. By prioritizing nutritious local ingredients and reducing the consumption of processed foods, this program has successfully encouraged healthier eating behaviors and improved students' nutrition literacy. This study also emphasizes that the success of green canteen initiatives depends on the active involvement of various stakeholders, especially teachers, students, and parents, as well as the presence of supportive school policies for sustainable canteen management. A new argument emerging from this research is that the green canteen serves not only as a medium for nutritional education but also as a strategic instrument for building a sustainable local food ecosystem within the school environment. However, this study

has several limitations. The research was conducted in only one school, and the qualitative approach used did not allow for quantitative measurement of students' nutritional outcomes. Future research is therefore recommended to expand the study area by including more schools and adopting a mixed-methods approach to provide a more comprehensive evaluation of the impact of green canteens on students' food security and health. In addition, future studies could explore how green canteen programs can be integrated into nutrition education curricula and sustainable school policy frameworks.

Acknowledgment

We would like to express our gratitude to Kendondong Elementary School, Banyumas Regency, Central Java Province, for their support and assistance during this research. All the data provided by the school enabled us to conduct a more in-depth analysis of the information we needed to support this study.

References

Amorim, A. L. B. de, Ribeiro Junior, J. R. S., & Bandoni, D. H. (2020). National School Feeding Program: Strategies to Overcome Food Insecurities During and After the COVID-19 Pandemic. *Revista de Administração Pública, 54*(4), 1134–1145. https://doi.org/10.1590/0034-761220200349x

Butcher, L. M., O'Sullivan, T. A., Ryan, M. M., Lo, J., Nyanjom, J., Wilkins, H. C., & Devine, A. (2021). To Dine In or Not to Dine In: A Comparison of Food Selection and Preparation Behaviours in Those With and Without Food Security. *Health Promotion Journal of Australia, 32*(S2), 267–282. https://doi.org/10.1002/hpja.427

Cangussu Botelho, F., França Junior, I., Dias da Silva Guerra, L., Ferrari Rodrigues, S., & Vicente Tonacio, L. (2020). Scientific Literature on Food and Nutrition Security in Primary Health Care: A Scoping Review. *Global Public Health, 15*(12), 1902–1916. https://doi.org/10.1080/17441692.2020.1783565

Coady, O. R., Styles, S. E., & Smith, C. (2025). Barriers and Enablers to Providing Healthy Food and Beverages in New Zealand Secondary School Canteens. *Health Promotion International, 40*(1). https://doi.org/10.1093/heapro/daaf011

Cotton, W., Dudley, D., Peralta, L., & Werkhoven, T. (2020). The Effect of Teacher-Delivered Nutrition Education Programs on Elementary-Aged Students: An Updated Systematic Review and Meta-Analysis. *Preventive Medicine Reports, 20*, 101178. https://doi.org/10.1016/j.pmedr.2020.101178

Dacunha, C., Ng, E., & Elton, S. (2022). The School Food Solution: Creating a Healthy School Food Environment With Canada's Food Guide. *Journal of Agriculture, Food Systems, and Community Development, 12*(1), 157–169. https://doi.org/10.5304/jafscd.2022.121.010

Dahmani, J., Teil, F., Pouyfaucon, M., Gaignaire, A., Nicklaus, S., & Marty, L. (2024). Effects of a Short Food Education Program Implemented at School Canteens on Children's Acceptance of Plant-Based Food: A Quasi-experimental Study. *Food Quality and Preference, 115*, 105104. https://doi.org/10.1016/j.foodqual.2024.105104

Delaney, T., Jackson, J., Lecathelinais, C., Yoong, S. L., Wolfenden, L., Sutherland, R., Webb, E., & Wyse, R. (2023). Exploratory Analysis of a Cluster Randomized Controlled Trial of a Multi-strategy Intervention Delivered via Online Canteens on Improving the Nutritional Quality of Primary School Students' Pre-ordered Foods & Drinks at Recess. *Appetite, 185*, 106528. https://doi.org/10.1016/j.appet.2023.106528

Devine, L. D., Gallagher, A. M., Briggs, S., & Hill, A. J. (2023). Factors That Influence Food Choices in Secondary School Canteens: A Qualitative Study of Pupil and Staff Perspectives. *Frontiers in Public Health, 11*. https://doi.org/10.3389/fpubh.2023.1227075

Ernawati, F., Syauqy, A., Arifin, A. Y., Soekatri, M. Y. E., & Sandjaja, S. (2021). Micronutrient Deficiencies and Stunting Were Associated with Socioeconomic Status in Indonesian Children Aged 6–59 Months. *Nutrients, 13*(6), 1802. https://doi.org/10.3390/nu13061802

Evenhuis, I. J., Jacobs, S. M., Vyth, E. L., Veldhuis, L., de Boer, M. R., Seidell, J. C., & Renders, C. M. (2020). The Effect of Supportive Implementation of Healthier Canteen Guidelines on Changes in Dutch School Canteens and Student Purchase Behaviour. *Nutrients, 12*(8), 2419. https://doi.org/10.3390/nu12082419

Follong, B. M., Verdonschot, A., Prieto-Rodriguez, E., Miller, A., Collins, C. E., & Bucher, T. (2022). Nutrition Across the Curriculum: A Scoping Review Exploring the Integration of Nutrition Education Within Primary Schools. *Nutrition Research Reviews, 35*(2), 181–196. https://doi.org/10.1017/S0954422421000111

Gamba, R. J., Schmeltz, M. T., Ortiz, N., Engelman, A., Lam, J., Ampil, A., Pritchard, M. M., Santillan, J. K. A., Rivera, E. S., Wood, L. M., Ingram, D., Cheyne, K., & Taylor, S. (2021). 'Spending All This Time Stressing

and Worrying and Calculating': Marginal Food Security and Student Life at a Diverse Urban University. *Public Health Nutrition, 24*(10), 2788–2797. https://doi.org/10.1017/S1368980021001300

Hadi, H., Triastanti, R. K., Anggraeni, D., Nurwanti, E., Lewis, E. C., Colon-Ramos, U., Kang, Y., Yamaguchi, M., & Gittelsohn, J. (2022). The Role of the School Food Environment in Improving the Healthiness of School Canteens and Readiness to Reopen Post COVID-19 Pandemic: A Study Conducted in Indonesia. *Journal of Public Health Research, 11*(1). https://doi.org/10.4081/jphr.2021.2287

Handayani, P., Hanum, G. R., Supriyadi, S., Mahaputra, M. B., & Habib, A. K. (2023). Enhancing School Canteen Practices: A Catalyst for Healthier and Ethical Student Snacking. *Indonesian Journal of Cultural and Community Development, 14*(2). https://doi.org/10.21070/ijccd.v14i2.967

Haynes, A., Morley, B., Dixon, H., Scully, M., McAleese, A., Gascoyne, C., Busbridge, R., Cigognini, M., Regev, I., & Wakefield, M. (2021). Secondary School Canteens in Australia: Analysis of Canteen Menus From a Repeated Cross-Sectional National Survey. *Public Health Nutrition, 24*(4), 696–705. https://doi.org/10.1017/S1368980020003535

Holloway, T. P., Jayasinghe, S., Dalton, L., Kilpatrick, M. L., Hughes, R., Patterson, K. A. E., Soward, R., Burgess, K., Byrne, N. M., Hills, A. P., & Ahuja, K. D. K. (2023). Enhancing Food Literacy and Food Security through School Gardening in Rural and Regional Communities. *International Journal of Environmental Research and Public Health, 20*(18), 6794. https://doi.org/10.3390/ijerph20186794

Kadaryati, S., Prasetyaningrum, Y. I., Sukismanto, & Anggraeni, Y. S. (2024). Analysis of User Needs in Organizing a Healthy Canteen at School. *International Conference on Health Sciences, 11*(1), 143–150. https://doi.org/10.29238/ICHS.V11I1.2612

Kasumba, H. (2022). Assessing the Educational Role of School Gardens in Primary Schools in Chris Hani District, South Africa. *Ponte Journal, 78*(10). https://doi.org/10.21506/j.ponte.2022.10.4

Lalita, A. N., Khoiriani, I. N., Rahmah, H. A., Prasetyo, T. J., Sulistyaning, A. R., & Wicaksari, S. A. (2024). Perbedaan Jenis Transportasi ke Sekolah, Aktivitas Fisik dan Status Gizi pada Anak Sekolah Dasar di Perdesaan dan Perkotaan Kabupaten Banyumas. *Jurnal Gizi Dan Kuliner (Journal of Nutrition and Culinary), 4*(2), 43–52. https://doi.org/10.24114/jnc.v4i2.63143

Lorenz-Walther, B. A.-S., & Langen, N. (2020). Sustainable Changes in a Worksite Canteen: An Exploratory Study on the Acceptance of Guests. *Journal of Cleaner Production, 259*, 120737. https://doi.org/10.1016/j.jclepro.2020.120737

Matondang, R. J. A., & Yuliaty, M. (2024). Unhealthy Snacking Habits Are Prevalent Among Elementary School Students. *Business Economic, Communication, and Social Sciences Journal (BECOSS), 6*(1), 13–21. https://doi.org/10.21512/becossjournal.v6i1.10828

Njura, H. J., Kaberia, I. K., & Taaliu, S. T. (2020). Effect of Agricultural Teaching Approaches on Skills Development for Food Security: A Case of Secondary Schools in Embu County, Kenya. *The Journal of Agricultural Education and Extension, 26*(3), 239–252. https://doi.org/10.1080/1389224X.2019.1680401

Onur, O. O., Nomikos, G. N., Nomikos, N. N., Gerda, S. A., & Paleviciute, G. A. (2021). The Role of Nutrition Education in School-Age Children in the Prevention of Global Obesity Epidemic. *American Journal of Public Health Research, 9*(3), 114–119. https://doi.org/10.12691/ajphr-9-3-5

Patriota, É. S. O., Abrantes, L. C. S., Figueiredo, A. C. M. G., Pizato, N., Buccini, G., & Gonçalves, V. S. S. (2024). Association Between Household Food Insecurity and Stunting in Children Aged 0–59 Months: Systematic Review and Meta-Analysis of Cohort Studies. *Maternal & Child Nutrition, 20*(2). https://doi.org/10.1111/mcn.13609

Pongcharoen, T., Rojroongwasinkul, N., Tuntipopipat, S., Winichagoon, P., Vongvimetee, N., Phanyotha, T., Sukboon, P., Muangnoi, C., Praengam, K., & Khouw, I. (2024). South East Asian Nutrition Surveys II (SEANUTS II) Thailand: Triple Burden of Malnutrition Among Thai Children Aged 6 Months to 12 Years. *Public Health Nutrition, 27*(1), e152. https://doi.org/10.1017/S1368980024000053

Putra, D. P., Riantina, A., Nurindalia, B., Juniarti, Kirana, T. A., Mayang, D. I., Idris, H., Flora, R., Misnaniarti, & Hasyim, H. (2023). The Role of Food Security in the Incident of Stunting in Toddlers. *Community Medicine and Education Journal, 4*(3), 367–372. https://doi.org/10.37275/cmej.v4i3.405

Putri, T. N., Sujana, O. M., Hastika, N., Azizah, D. N., & Dewi, N. P. (2024). Pendampingan Pengembangan Eco-Canteen di SMAN 1 Padalarang Sebagai Strategi Menuju Sekolah Sehat dan Berkelanjutan. *Jurnal Pengabdian Tri Bhakti, 6*(2), 105–116. https://doi.org/10.70825/jptb.v6i2.2313

Rachmadewi, A., Soekarjo, D., Maehara, M., Alwi, B., Mulati, E., & Rah, J. H. (2021). School Canteens in Selected Areas in Indonesia: A Situation Analysis. *Food and Nutrition Bulletin, 42*(2), 225–246. https://doi.org/10.1177/03795721211008021

Rahmiwati, A., Febry, F., Etrawati, F., Sari, I. P., Yeni, Sabila, V. P., Prautami, E. S., & Maretalinia. (2025). Food Hygiene and Sanitation of the University Canteens in South Sumatra Province, Indonesia. *Kesmas: Jurnal Kesehatan Masyarakat Nasional, 20*(2). https://doi.org/10.7454/kesmas.v20i2.2221

Ramos, F. G. D., & Despojo, A. G. B. (2025). Food Safety Knowledge, Attitudes, and Practices of School Canteen Food Handlers in the District of Maria, Siquijor, Philippines. *Journal of Interdisciplinary Perspectives, 3*(3), 331–341. https://doi.org/10.69569/jip.2024.0586

Sanggelorang, Y., Sebayang, F. A. A., Malonda, N. S. H., & Rumayar, A. A. (2024). Insights Into Childhood Malnutrition: An Analysis on Food Vulnerability and Stunting Using 2021 Indonesian Nutritional Status Survey Data. *Media Gizi Indonesia, 19*(3), 282–290. https://doi.org/10.20473/mgi.v19i3.282-290

Sousa, J. M., Teixeira, A. C., & Liz Martins, M. (2025). Assessment of Food Sustainability in School Canteens: Menu Quality and Environmental Performance. *Sustainability, 17*(12), 5346. https://doi.org/10.3390/su17125346

Tan, P. Y., Som, S. V., Nguyen, S. D., Tran, D. T., Tran, N. T., Tran, V. K., Dye, L., Moore, J. B., Caton, S., Ensaff, H., Lin, X., Smith, G., Chan, P., & Gong, Y. Y. (2024). The Role of Complementary Feeding Practices in Addressing the Double Burden of Malnutrition among Children Aged 6–23 Months: Insight from the Vietnamese General Nutrition Survey 2020. *Nutrients, 16*(19), 3240. https://doi.org/10.3390/nu16193240

Thongplew, N., Duangput, N., & Khodkham, S. (2021). Addressing Plate Waste and Consumption Practice at University Canteens: Realizing Green University Through Citizen-Consumers. *International Journal of Sustainability in Higher Education, 22*(7), 1691–1706. https://doi.org/10.1108/IJSHE-02-2021-0056

UNICEF. (2024a). Analisis Lanskap Kelebihan Berat Badan dan Obesitas di Indonesia: Ringkasan Temuan Kunci. In *UNICEF*. UNICEF.

UNICEF. (2024b). Gambaran Singkat Anak-Anak di Indonesia: Kemajuan, Tantangan, dan Kesenjangan. In *UNICEF*. UNICEF.

UNICEF Indonesia. (2023). *Gizi: Mengatasi Tiga Beban Malnutrisi di Indonesia*. UNICEF Indonesia. https://www.unicef.org/indonesia/id/gizi

Widyaningsih, V., Mulyaningsih, T., Rahmawati, F. N., & Adhitya, D. (2022). Determinants of Socioeconomic and Rural–Urban Disparities in Stunting: Evidence From Indonesia. *Rural and Remote Health, 22*(1), 1–9. https://doi.org/10.22605/RRH7082