International Journal on Science and Technology (IJSAT)

E-ISSN: 2229-7677 ● Website: www.ijsat.org ● Email: editor@ijsat.org

# Enhancing Sustainability Efforts Through Biodegradable Alternatives to Plastic in The School Canteen

**Mekyla Avanceña[1], Nenochka Bianca Daño[2], Angel Faith Manto[3], Fatima Christianne Jayma Montero[4], Jelian Amber Noval[5], Keisha Mae Pigar[6], Trisha Colline Siboa[7], Rhadajemie Yase[8], Rachel Tapia[9]**

[1,2,3,4,5,6,7,8,9]IBED Department, Senior High School of Sto. Tomas College-Danao Inc., Danao City, Cebu, Philippines

[1]mekyla.avancena@stcd.education, [2]nenochka.bianca.dano@stcd.education, [3]angel.faith.manto@stcd.education, [4]fatima.christianne.jayma.montero@stcd.education, [5]jelian.amber.noval@stcd.education, [6] keisha.mae.pigar@stcd.eduaction, [7]trisha.colline.siboa@stcd.education, [8]rhadjemie.yase@stcd.education, [9]rachel.tapia@stcd.education

**Abstract**

Plastic pollution is a major environmental issue, particularly in school settings where single-use plastics are commonly utilized. This study is to raise central knowledge and awareness in reducing the environmental impact and promote sustainability practices among students that also examines the potential of biodegradable alternatives for plastics at the school canteen of Sto. Tomas College Danao City Inc. Using qualitative research methods such as survey questionnaires and semi-structured interviews, the study examines the Grade 11 STEM and ABM students' viewpoints, willingness to adopt eco-friendly practices, and challenges associated with switching to biodegradable alternatives. Their responses show a comprehensive and replicable collection of data that analyzes their strong expression to each of the following questions provided to them. The results show that students strongly favor biodegradable alternatives such as paper bags and plant-based packaging, citing benefits including less plastic waste, enhanced environmental sustainability, and that the alternation of biodegradable products is beneficial when it is packed in a standard and sustainable packaging regarded quality. However, cost and adaptability constraints still remain to be major barriers. The results highlight the challenges of transitioning to alternatives and how important it is to develop environmentally conscious behavior in students while managing financial restrictions that also affects both the students and the school canteen to ensure successful implementation when accommodating for a change. This research offers practical advice to reduce plastic waste in school canteens and promote responsible environmental behavior among dedicated students in educational institutions.

**Keywords**: Biodegradable Alternatives, Bioplastics, Climate Change, Community Health, Eco-Friendly Packaging, Ecological Balance, Ecological deterioration, Ecosystem, Environmental Benefits, Environmental Challenges, Environmental Degradation, Environmental Hazards, Environmental Responsibility, Food Packaging, Government Policies, Greenhouse Gas Emissions, Plastic Pollution, Regulations, School Canteens, Single-Use Plastics, Sustainability, Sustainable Practices, Waste Accumulation, Waste Management, Waste Segregation.

## 1. Introduction

According to the Australian Bureau of Statistics, Australia generated over 76 million tonnes of waste in 2019, highlighting the urgent need for waste reduction strategies. Similarly, in school canteens, plastic waste remains a persistent issue due to the reliance on disposable packaging. The overuse of plastics leads to severe pollution, which necessitates immediate action. Encouraging both students and staff to use biodegradable alternatives can significantly mitigate plastic waste and promote environmental sustainability.

Plastic pollution is a major contributor to waste accumulation and ecological degradation globally. School canteens, in particular, generate substantial amounts of single-use plastic waste (Manukyan, 2024). International initiatives have highlighted the potential of biodegradable alternatives, such as bioplastics made from food waste, in addressing this crisis. Research by Filiciotto and Rothenberg (2020) emphasizes the environmental benefits of bioplastics, including reduced microplastic pollution and lower greenhouse gas emissions. However, high production costs and low consumer adoption remain significant barriers to widespread implementation. Additionally, Scarpi et al. (2021) found that consumers often prioritize product attributes other than sustainability, necessitating targeted interventions to promote behavioral change.

Despite advancements in sustainable materials, limited research exists on effectively integrating biodegradable alternatives into school canteen operations. Case studies from Europe and Asia showcase successful eco-friendly canteen solutions, such as plant-based meals, composting systems, and reusable utensils (1)(2). However, these approaches often overlook the economic constraints faced by schools in different communities. Moreover, previous strategies have underestimated the role of curriculum collaboration and student participation in fostering long-term behavioral changes. This study aims to bridge these gaps by exploring school-specific methods for implementing biodegradable alternatives in canteens. By analyzing international case studies and identifying barriers such as cost, consumer behavior, and institutional readiness, this research seeks to provide actionable insights that not only reduce plastic waste but also cultivate eco-conscious habits among students—future leaders in global sustainability efforts.

The excessive use of plastics in school canteens has contributed to significant environmental problems, including pollution, waste management issues, and climate change. According to Brownie et al. (2023), school food systems are among the largest sources of municipal solid waste in high-income nations. Consequently, institutions are actively seeking solutions to reduce environmental damage. While biodegradable plastics present a promising alternative, they also pose challenges, such as microplastic pollution and the need for specific conditions to break down. Additionally, highly processed, plastic-packaged foods are commonly sold in schools due to their convenience and popularity among students. Brownie et al. (2023) suggest that public health nutrition programs face challenges in promoting healthy, sustainable food choices in school environments dominated by energy-dense, low-nutrient snacks. Addressing these issues requires raising awareness of plastic pollution's consequences and fostering informed decision-making regarding consumption habits. Research on healthy eating and sustainable food choices can support the transmission of meaningful information, encourage behavioral changes, and enhance engagement among younger generations.

Plastic pollution is a significant environmental concern in the Philippines, where school canteens contribute substantially to the problem. Many people prefer single-use plastics—such as disposable utensils, plastic-wrapped snacks, and straws—due to their convenience. However, plastic waste presents serious environmental hazards. According to Julia C. Crowley in The Journal of Solid Waste Technology

and Management (2024), plastic pollution in the Philippines has become a severe issue due to inadequate recycling and disposal methods. Many plastics end up in landfills or pollute natural ecosystems, threatening biodiversity and public health. Efforts by community and school organizations to mitigate plastic pollution through alternative packaging solutions and eco-friendly initiatives often go unrecognized due to a lack of public awareness. Addressing plastic pollution in Philippine school canteens requires a combination of strict regulations, improved waste management systems, and comprehensive educational campaigns to promote sustainable practices.

Schools in the Philippines face significant waste management challenges. According to Parocha et al. (2015), waste generated in schools includes not only plastic but also paper, boxes, and other materials, many of which are discarded inefficiently. Without designated disposal areas, schools struggle to manage waste effectively. Implementing school-based solid waste management (SWM) programs can instill proper waste segregation habits among students and create a balanced learning environment that fosters sustainable practices. According to Nabor & Dela-Cruz (2022), the variety of waste produced by students further complicates waste management, necessitating proper handling, storage, and disposal strategies.

The Philippine government has responded to the plastic pollution crisis through local ordinances. On June 1, 2023, the Danao City local government in Cebu reintroduced its plastic regulation policy to control plastic bag usage. Mayor Thomas “Mix” Durano emphasized that the initiative aims to reduce environmental hazards, such as clogged waterways and ecological imbalance. The ordinance promotes alternative packaging materials, including woven and cloth bags, while enforcing penalties for non-compliance. Cebu Technological University (CTU) Danao Campus has also implemented sustainability policies, such as waste segregation systems and composting pits, to promote responsible waste disposal (CTU, 2023). Encouraging students and staff to adopt reusable containers and utensils further supports the university’s goal of minimizing plastic pollution and serves as a model for other institutions.

This study aims to develop comprehensive guidelines for reducing plastic waste in school canteens by implementing biodegradable alternatives. Specifically, it seeks to (1)Assess the feasibility of replacing plastic materials with biodegradable alternatives in food packaging. (2) Identify challenges schools may encounter when transitioning to biodegradable packaging and propose possible solutions. (3) Examine the role of students and staff in implementing sustainable practices in school canteens. (4)Analyze students’ and staff’s perceptions of biodegradable alternatives and their impact on environmental responsibility.

Plastic pollution continues to threaten both ecosystems and human health, as hazardous chemicals in plastics can contaminate food and water supplies (Hazardous Chemicals in Recycled and Reusable Plastic Food Packaging, n.d.). Addressing this global issue requires innovative solutions, such as adopting biodegradable alternatives in school canteens. Research indicates that bioplastics made from food waste can serve as sustainable substitutes for conventional plastics, reducing microplastic pollution and climate impact (Filiciotto & Rothenberg, 2020). According to Moshood et al. (2022), bioplastics offer a viable alternative to petrochemical plastics, with the potential to drive sustainable growth in the plastics sector.

Thushari et al. (2020) emphasize the detrimental effects of plastic pollution on marine and terrestrial ecosystems, highlighting its economic and ecological consequences. They advocate for pragmatic solutions, including plastic reduction, recycling, and policy interventions. Similarly, Espiritu (2022) underscores the importance of holistic waste management strategies in educational institutions, arguing that schools should serve as models for sustainable practices. Implementing biodegradable alternatives in school canteens represents a critical step in reducing plastic waste and promoting environmental stewardship.

## 2. Methodology

### Research Design

This study employs qualitative research using thematic analysis to explore the perceptions, experiences, and insights of students concerning biodegradable alternatives to plastics. Data were collected through surveys and semi-structured interviews to gather insights from students.

### Environment

The research took place at Sto. Tomas College, Danao City, a private Catholic institution that desires to strengthen its waste management system.

### Participants

The study involved two groups of participants. The first group contains the Grade 11 STEM students of Sto. Tomas College, Danao City, Inc.. The second group consists of 10 Grade 11 ABM students of Sto. Tomas College,Danao City Inc..

### Instruments

The researcher's primary instrument for data collection in this study is a semi-structured interview, which will serve as a flexible and in-depth means to gather and explore diverse responses, allowing for a richer understanding of the research phenomenon. These questions are designed to get the perspectives and opinions of the students at Sto. Tomas College Danao City regarding the environmental impacts of plastic use and the potential benefits of implementing alternative solutions.

### Researcher - Made Questions

Researchers provided questions that specifically allowed the participants to respond in detail to information that supports the gathering of the data that is needed. The questions were created to get a comprehensive response on the use of alternative plastics in school canteens from students.

### Ethical Considerations

This research strictly followed ethical principles in order to ensure the well-being and rights of participants. Participants were fully informed about the purpose and procedures of the research; they also provided their consent. Confidentiality was observed by anonymizing personal data. Necessary precautions were made to reduce risks while maximizing the research benefits, and participants were treated fairly and respectfully. Consistent with these ethical considerations, the study promoted transparency and honesty by allowing the participants to voice their concerns and provide comments on the process.

## 3. Data Analysis

Thematic Analysis was employed to examine students' perspectives on implementing biodegradable alternatives in school canteens. The identified themes and corresponding codes are presented in the table below.

**Table 1.**

| Themes | Code |
|---|---|
| Willingness to Adopt Change | Gradual adaptation to new practices |
| Environmental Impact | Reduction of plastic wasteand pollution |
| Biodegradable Alternatives | Preference for paper bags |
| Pollution Reduction | Broader community impact |
| Cost- Related Concerns | Environmental sustainability benefits<br>Financial constraints and supply limitations |
| Challenges in Student Adaptation | Budgetary concerns and student cooperation |

## RESULTS AND DISCUSSION

All 50 respondents indicated awareness of biodegradable alternatives, such as plant-based containers and utensils. This suggests that students are well informed about the existence of eco-friendly alternatives for plastic. In terms of willingness, 36 (72%) of students expressed strong willingness to use biodegradable alternatives, while 14 (28%) were somewhat willing. None of the respondents were unwilling to make the switch, which means they are in favor of switching toward environmentally friendly initiatives.

Of the strong majority, 33 out of 50, there were those who were very concerned about the ecological cost of plastic waste, while the remaining 10 respondents were somewhat concerned. Out of the suggested biodegradable alternatives, paper bags were the most frequently mentioned option, followed by wooden utensils, plant-based packaging, and fabric bags. Other students also came up with bioplastic packaging and compostable plates as viable options.

The primary benefits identified by students mentioned are the reduction of plastic waste, less pollution, and improved sustainability. The majority of the students also believed that using biodegradable materials can lead to a cleaner and healthier environment. Despite their strong support for biodegradable materials, there were various challenges that students mentioned, mainly cost, availability, and student transition. Most respondents stated that the biodegradable alternatives tend to be more expensive compared to plastic, making the adaptation difficult. Others also pointed out that students would need time to adjust to these alternatives

Willingness to adopt change

> It can help in making the canteen cleaner because biodegradable alternatives are a lot easier to dispose of than plastic ones… Through adopting eco-friendly materials, we can lessen plastic waste, and a cleaner environment.

This study discovered that students are more favorable to the shift towards biodegradable alternatives. Out of 50 participants, 72% showed strong willingness and 28% were somewhat willing to adopt eco-friendly materials. Importantly, no one rejected the concept, which means that students are willing to accept eco-friendly solutions.

However, students emphasized that their willingness depends on availability and convenience. One of the respondents said, "Letting students get used to it could also minimize their options on what to sell in the canteen, as most products have plastic packaging." This indicates that although students are willing to change, their day-to-day purchasing decisions are influenced by what is available to them.

These findings align with Zahari et al. (2020), who found that while students support sustainability, their buying decisions tend to be influenced by external factors such as availability and habit. Their study emphasized that promoting eco-friendly habits requires accessibility and steady change strategies to make sustainable choices become easier for students

Environmental impact

> It can reduce plastic waste and promote eco-friendly practices and enhance environmental awareness… It helps the environment clean as it reduces plastic waste, it also encourages students to be more eco-friendly and it makes the school be more sustainable… The need to teach students and staff how to use and dispose of them properly

Students generally recognized the environmental advantages of utilizing biodegradable materials. Many benefits cited were minimizing plastic waste, reducing pollution, and enhancing sustainability. Some of the respondents also had concern regarding the long-term effects of plastic utilization. One respondent mentioned, "Switching biodegradable material can reduce plastic waste and pollution. It also supports sustainable agriculture."

Though the students understand the necessity of environmental preservation, they lack an understanding of biodegradable materials. Most of the answers show the understanding of the difference between biodegradable and compostable materials as bad, which indicates better waste management learning.

This is in line with Ahmed and Paramasivam (2024), who found that students are aware of the harmful effects of plastic but do not have in-depth knowledge about how biodegradable products work. Their study emphasized the importance of formal environmental education to ensure that students not only support sustainability but also practice it effectively.

Biodegradable Alternatives

> It can help in making the canteen cleaner because biodegradable alternatives are a lot easier to dispose of than plastic ones… It makes the school clean and less plastic and it is easy to use biodegradable materials.. Biodegradable materials break down eventually and reduce pollution.

Respondents emphasized various biodegradable alternatives such as plant-based containers, cornstarch utensils, and paper straws as replacements for plastic. They believed that these materials break down quickly and have a lower environmental impact meaning they cause less harm to the environment.

However, some students raised concerns about the product's durability and effectiveness. One respondent states, "The most viable alternatives for school canteens is paperbag because they are biodegradable or any renewable sources." This suggests that while students see the benefits, they also value product functionality when making purchasing decisions.

Pollution Reduction

> Less pollution to not only the school but the community… The benefits of using biodegradable alternatives to plastic in the canteen to help our environment avoid the pollution and lessen the risk of trash… The challenges the school might face in implementing these alternatives is that the other trash didn't throw properly following simple instructions such as throwing the garbage properly… The lack behaviour of student if they are willing to cooperate

Majority of the students agreed that switching to biodegradable alternatives would help in reducing pollution. One student said, " if we replaced plastics with biodegradable packaging, waste will break down faster, and we will see less garbage buildup."

However, improper waste disposal remains a challenge as some students dispose their biodegradable materials in regular trash bins rather than its designated compost bins. This means that reducing waste is not just about the materials used but also about disposing them properly.

A research conducted by Grasso (2024), states that the improper disposal of biodegradable materials wont help lessen the pollution regardless if it is Biodegradable or not. Biodegradable materials may not decompose as intended without proper waste segregation and composting. So, to maximize their effectiveness in waste management, efforts are needed across policy makers, businesses, consumers, and most especially waste management authorities.

Cost Related Concerns

> Their budget might increase due to the high price of paper cups… Biodegradable products can be more expensive… Biodegradable materials can be more expensive than those plastics we are using because of their limited availability. Biodegradable materials may not be widely available or easily accessible… The school might face several challenges, such as the struggle because of higher prices of biodegradable stuff

Adapting biodegradable alternatives has many challenges including the cost that may be consumed in these practices. Most of the students' concerns are biodegradable products being more prohibitive than plastic materials that makes them less attainable. One of the respondents stated that "Higher costs and limited supply of biodegradable products are major obstacles to making the switch."

Cost concerns are a major barrier in sustainable transitions, as budget limitations affect both students and school canteens. Without financial incentives, many students and vendors may prefer plastic for economic reasons.

Cultural resistance to change and adapt to these new practices is also a barrier but mostly, budget limitations emphasize the relevance of being part of these challenges. As stated by Editor (2024) discovered that, in facing through this challenges, schools may counteract expenses through partnerships with local businesses that support the act of switching to the practices of biodegradable alternatives. Adapting to new practices may involve complexities, but with resistance and dedication with the right resources, and incorporated knowledge, every school can be a catalyst for change.

Student Adaptation Challenges

> The challenges the school might face in implementing these alternatives are the ignorance of the students for not applying the rules into themselves. Even if they are already aware of the purpose of using biodegradable materials, they will still think that it is more convenient to use plastics especially for a liquid meal… The hardship of students might face in adapting to these new alternatives of plastic and some students can probably struggle to maintain being eco friendly

Even though biodegradable materials are available, some students still have a hard time adjusting to new waste disposal methods. A significant issue mentioned by respondents was improper waste segregation, as many still dispose of biodegradable packaging in general waste bins instead of compost bins. One student stated, "The challenges that schools might face in implementing these alternatives are the budget and the students who are not willing to cooperate."

This issue emphasizes the importance of getting used to new habits and learning about it. Without effective waste management, biodegradable alternatives won't be as useful because people won't follow proper waste disposal which prevents them from achieving the full potential of reducing waste.

**References**

1. Admin. (2025, January 29). How to create an Eco-Friendly School Canteen - WinsSolutions. Winssolutions. https://www.winssolutions.org/how-to-create-an-eco-friendly-school-canteen/
2. Browne, S., Mullen, A., Mulholland, B., Lo, C., & Ruttledge, A. (2023). Nutrition quality and food and packaging waste associated with the school food system: A pilot, citizen science study in an Irish secondary school. Journal of Human Nutrition and Dietetics, 36(6), 2310–2322. https://doi.org/10.1111/jhn.13220
3. Business - Science and Environment | Philstar.com. (n.d.). Philstar.com. https://www.philstar.com/business/science-and-environment
4. Crowley, J. C. (2024). Knowledge, Attitudes, and Practices of Single-Use Plastics among university students in Ilocos Norte, Philippines. The Journal of Solid Waste Technology and Management, 50(5), 806–821. https://doi.org/10.5276/jswtm/iswmaw/504/2024.806
5. Danao breaks ground on Waste-to-energy plant. (2023, July 17). SunStar Publishing Inc. https://www.sunstar.com.ph/cebu/local-news/danao-breaks-ground-on-waste-to-energy-plant
6. Grasso, R. (n.d.). Biodegradable materials: The key to reducing landfill waste. www.alliedacademies.org. https://doi.org/10.35841/aaewmr-7.1.184
7. Kunesch, N., & Morimoto, R. (2019). The "Wickedness" of Trashing the Plastics Age: Limitations of Government Policy in the Case of the Philippines. In SOAS Department of Economics, SOAS Department of Economics Working Paper Series (No. 231). SOAS University of London. http://www.soas.ac.uk/economics/research/workingpapers/
8. Loophole in Cebu City law allows plastic to thrive. (2023, August 5). SunStar Publishing Inc. https://www.sunstar.com.ph/cebu/local-news/loophole-in-cebu-city-law-allows-plastic-to-thrive
9. Mugge, R., & Schoormans, J. P. (2012). Product design and apparent usability. The influence of novelty in product appearance. Applied Ergonomics, 43(6), 1081–1088. https://doi.org/10.1016/j.apergo.2012.03.009
10. Parocha, M. A., Esguerra, E., Jr, & Hular, C. G. (2015). Solid Waste Management Program: the

grade school experience. https://ejournals.ph/article.php?id=10671&fbclid=IwZXh0bgNhZW0CMTEAAR1OsmOwIQTRpOfNDLAsu65UxAokEPzMfVZrj7V-rIaIBJhzL8MZdRRYRYE_aem_kGXsh4IZ6LI3qQXfNgtL0Q

11. POLLUTION AND WASTE MANAGEMENT AND RECYCLING PROGRAM. (n.d.). Cebu Technological University Danao Campus. https://www.ctu.edu.ph/danao/sustainability/programs-and-initiatives/pollution-and-waste-mngt-and-recycling/
12. Projectmanager, B. (2024, October 10). Transforming Schools into Plastic-Free Environments - Interreg Baltic Sea Region. Interreg Baltic Sea Region. https://interreg-baltic.eu/project-posts/baltiplast/transforming-schools-into-plastic-free-environments/
13. Sustainable Dining: The Future of School Cafeterias. (2024, September 25). Sumkoka. https://www.sumkoka.com/sustainable-dining-the-future-of-school-cafeterias.html
14. Taylo, A. S., & Taylo, A. S. (2024, July 11). The future of Eco-Friendly packaging in the Philippines - BillionBricks | Net-Zero Homes. BillionBricks | Net-Zero Homes -. https://billionbricks.org/blog/future-eco-friendly-packaging-philippines/
15. View of “Exploring university students” awareness, Attitudes, and Behaviors towards Plastic-Free and Eco-Friendly Packaging. (n.d.).https://healthinformaticsjournal.com/index.php/IJMI/article/view/858/810?fbclid=IwZXh0bgNhZW0CMTEAAR3ZZ-SicMqczcDZ9IJ0PnO5mzZ36l_ffSwO9Cupjj3_G6bvNyCc9PyIHBc_aem_LQPjI-niN7nCNZsEjULAcg
16. Zahari, A. R. (2020). University students’ reactions to ecologically responsible packaging. the European Proceedings of Social & Behavioural Sciences, 331–340. https://doi.org/10.15405/epsbs.2020.12.05.35