ECO-FRIENDLY PLATES: REDUCING SINGLE-USE PLASTICS IN THE FOOD SERVICE INDUSTRY

Christine Weveti*, Moses K. Njeru, Faith Kamene, Mary Githenduka, Kennedy Mwaniki
Department of Environmental Studies and Resources Development, P.O Box 109-60400, Chuka

ABSTRACT
Single-use plastic tableware is widely used in the food service industry due to its affordability and convenience. However, its non-biodegradable nature contributes significantly to greenhouse gas emissions, environmental pollution, clogged sewer systems, and public health risks. In response, this study developed a biodegradable, eco-friendly plate as a sustainable alternative to conventional plastic tableware. The plate was produced using dough formulations of red sorghum flour, wheat flour, and margarine in varying ratios across five samples (A–E): 2:2:1, 3:2:1, 2:3:1, 1:2:0.5, and 1:1:0, respectively. This variation aimed to evaluate the effect of ingredient proportions on plate performance and identify the optimal blend. Each sample was assessed for organoleptic properties (texture, colour, smell, taste, and overall acceptability), water absorption capacity, and biodegradability. Sample C (2:3:1) emerged as the most preferred in sensory evaluation, with 77% of panelists favouring its qualities. While Sample E, which lacked margarine, had the lowest water absorption (18.32%) and the longest structural integrity, Sample C had the highest water absorption (33.27%) yet maintained its form—attributed to its higher wheat flour content that enhanced binding. Notably, all plate variants biodegraded naturally within six days. The results indicate that Sample C offers the best balance of functionality, consumer acceptability, and environmental sustainability. Its edibility, biodegradability, and performance position it as a viable alternative to plastic tableware. Adopting such eco-friendly plates in food service settings can significantly reduce plastic waste and its associated environmental impacts.

Keywords: circular economy; edible tableware; eco-friendly packaging; environmental sustainability; single-use plastics

INTRODUCTION
Food service industry encompasses a wide range of establishments that prepare and serve meals to customers for either on-site or off-site consumption. The main categories within the industry include: full-service restaurants, which provide a complete dining experience with table service; fast-food outlets, known for their speed and convenience, offering counter or drive-through service; cafeterias, which emphasize efficiency through self-service counters and are commonly found in schools, hospitals, and factories; and catering services, which supply food for special events, either on-site or off-site, such as weddings, corporate functions, and parties. The food service industry is one of the largest and fastest-growing economic sectors globally. In 2022, its market size was valued at USD 2,395.03 billion and is projected to grow to USD 5,423.59 billion by 2030 (Fortune Business Insights, 2023). The industry plays a significant role in economic development by generating employment and contributing to national GDPs. For example, it accounted for 7.02% of Indonesia's GDP in 2020 (Srimulyani & Hermanto, 2022), employed over 4.1 million people in the U.S. in 2021 (US Bureau of Labor Statistics, 2023), and created over 7 million jobs in India the same year despite COVID-19 job losses (Keelery, 2023). In South Africa, the fast-food sector alone contributed 13% to the GDP in 2018 (Habanabakize, 2020).

Traditionally, food service establishments catered primarily to individuals away from home. However, growing demand for convenience has led to widespread adoption of food delivery services and increased preference for on-the-go meals. This shift is largely driven by growing urban populations which are expected to reach 70% of the global total by 2050 (United Nations, 2022). From a development standpoint, this projection is good since cities and metropolises are centres of business activity and economic growth. However, urban lifestyles favour quick, affordable, and hassle-free meal options, boosting demand for takeout and home-delivered food. As a result, urban expansion significantly contributes to the increase in plastic waste from food service sector (Phelan et al., 2021).

Plastic is commonly used in food packaging due to its durability, ease of processing, and chemical stability. Items such as plastic bags, straws, cutlery, and containers dominate the food service industry (Walker et al., 2021). Plastics in food service are single-use and often short-lived, contributing significantly to littering. Due to prevalent use of plastic food packaging, plastic pollution has turned out to be a global menace. A report by UNESCO showed that hotel industry is a major contributor to plastic pollution whereby it produces over 150 million tons of single-use plastic, annually (Ella, 2022). Despite the wide use of plastics, their use is associated with significant environmental pollution. This is what motivated a resolve by the United Nations Environmental Assembly in 2022 calling for development of stricter laws on use of plastics (UNEP, 2023a). This global concern calls on governments, the hospitality industry, and stakeholders to take immediate action. Some notable efforts by different governments in regard to this include countries like China, India and Ireland and countries in the Southern African Development Community (SADC) region which have developed policies on single-use plastic bags.

Clayton et al. (2020) note that single-use plastic regulations are more active in developing countries than in industrialised countries. Furthermore, Africa leads in implementation of plastic bags policies (Nwafor & Walker, 2020). The Kenyan government, through the National Environmental Authority (NEMA) has continued to put significant efforts in containing plastic pollution. For example, a ban on the manufacture and use of single-use plastics has been in effect since 2017 (Andae, 2023).

According to Djekic *et al*. (2024), management of various types of food packaging is becoming an increasingly significant environmental issue. Moreover, continued use of plastics is associated not only with environmental pollution but also health problems. Therefore, production and use of eco-friendly food packaging could have a profound impact on the environmental, societal, and economic concerns which are engrained in the Sustainable Development Goals (SDGs). Substituting single-use plastics with alternatives such as paper and compostable materials could reduce plastic pollution by up to 17% (UNEP, 2023b). With growing environmental awareness, many food service establishments are exploring alternatives. The transition to substitutes that are biodegradable, mitigate health risks and reduce environmental pollution is highly desirable. This project aims to address the pressing issue of single-use plastic plates by introducing a sustainable solution in the form of eco-friendly plates. It proposes a prototype of an eco-friendly, biodegradable plate made from red sorghum and wheat flours, offering a sustainable alternative to the widespread use of plastics in the food service industry.

MATERIALS AND METHOD

Raw Materials

The raw materials used in producing the eco-friendly plate were sourced locally to support the economic sustainability of communities in Tharaka Nithi County. Wheat flour, margarine, salt, and sugar were purchased from a local supermarket, while red sorghum was obtained from a local market and then milled. Red sorghum was selected as a primary ingredient due to its drought resistance and widespread cultivation in Tharaka Nithi and neighbouring counties. Additionally, sorghum remains underutilized in food production despite its appealing colour and superior nutritional value compared to rice and maize. According to Ratnavathi et al. (2016), sorghum is a rich source of proteins, minerals, vitamins, and phenolic compounds, which contribute to its anti -cancer properties and make it beneficial for human health. Red sorghum flour also exhibits excellent water absorption capacity, enabling it to effectively absorb and retain moisture, an advantageous property for eco-friendly plates, particularly when serving moist foods (Taylor & Duodu, 2018). Additionally, its fat absorption capability contributes to extended shelf life and imparts a soft, tender texture to baked products like eco-friendly plates (Taylor & Duodu, 2018). Wheat flour was incorporated due to its high gluten protein content, which offers natural binding properties that sorghum flour lacks. Gluten protein enhances the dough's strength and elasticity (Ye et al., 2023), making it easier to spread the dough thin without tearing. Margarine was added to enhance flavour, soften the dough for easier spreading without tearing, and give a pleasant crunch and crumble to the texture of the final product. Shortening agents such as butter and margarine work by interfering with the development of gluten protein strands in the dough, which helps create a softer, flakier, and more crumbly texture in baked goods.

Preparation of Eco-friendly Plate

Five distinct samples were prepared using different proportions of red sorghum flour, wheat flour, and margarine. To ensure precise proportions, the flours and the margarine were weighed using a digital kitchen weighing scale. The ratios for samples A, B, C, D and E are shown on Table 1. It was crucial to use varying ratios of ingredients to help in assessing how each ingredient influenced the overall characteristics and performance of the final product, ultimately enabling the identification of the most effective formulation for a sustainable tableware alternative.

Table 1: Formulation details of the samples

Ingredients	Sample A	Sample B	Sample C	Sample D	Sample E
Red sorghum flour	500 g	750 g	500 g	500 g	250 g
Wheat flour	500 g	500 g	750 g	250 g	250 g
Margarine	250 g	250 g	250 g	125 g	0 g
Salt	To taste	To taste	To taste	To taste	To taste
Sugar	To taste	To taste	To taste	To taste	To taste

For each sample, the flours and the margarine were thoroughly mixed with adjusted equal amounts of salt and sugar to enhance a savoury flavour. To start with, water equivalent to 60% of the flours' weight was gradually added to the mixture. The mixture was further mixed and then kneaded to make dough. Depending on the flour ratios, more water was added to make a smooth and soft dough that was easy to roll out without sticking. The dough was then left to rest for 30 minutes, allowing the starch to absorb moisture fully. The dough was place on a flat kitchen counter top and rolled out with a rolling pin into 2mm thick sheets large enough to fit the similar-sized non-stick plate moulds. These sheets were carefully placed over the plate moulds (Figure 1), covered with parchment paper, and the paper was filled with uncooked dried beans to weigh the dough down and prevent it from puffing up during baking. The dough was baked without direct heating in a preheated oven at 170°C for 30 minutes. After this initial baking, the beans and parchment paper were removed, and the cooked plates were baked for an additional 5 to 10 minutes until crispy. **The plates were then allowed to cool** before quality and functionality tests were carried out (Figure 1).

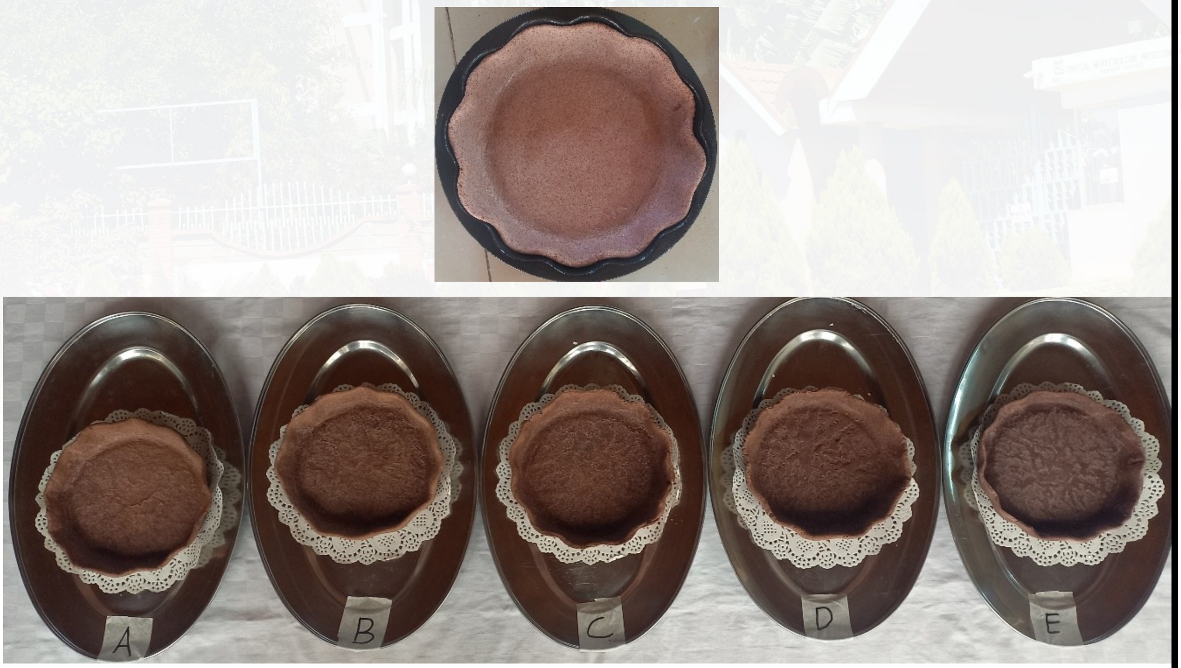

Figure 1: Samples of Eco-friendly plates. A raw sample in a non-stick mould (top), with five finished samples containing different ingredient proportions (bottom)

RESULTS AND DISCUSSIONS

Three tests, namely organoleptic, water absorption capacity, and biodegradability tests were performed on the eco-friendly plate samples.

Organoleptic Evaluation

The organoleptic characteristics of the eco-friendly plate samples were appraised based on texture, colour, aroma, taste, and overall acceptability, in line with the method by Sood and Deepshika (2018). Sensory appeal was a key consideration in developing eco-plates, as it may encourage the safe and voluntary consumption, thereby contributing to waste reduction and minimizing environmental pollution. In contrast to disposable plastic plates that contribute to landfills accumulation, eco-plates with high sensory ratings support a more sustainable disposal approach that helps reduce solid waste. A sensory panel comprising 30 randomly selected judges participated in the evaluation. Prior to testing, the panellists received instructions on the key attributes to note. Each judge was assigned an individual testing booth and provided with coded plate samples measuring about one square inch. Evaluation was conducted using a structured questionnaire incorporating a nine-point hedonic scale, where 1 indicated "dislike extremely," 9 indicated "like extremely," and 5 represented a neutral response of "neither like nor dislike."

The ratings for each organoleptic parameter were recorded, and the average scores for each were calculated (Figure 2). In terms of texture, Sample E received the lowest average score (4.92), compared to Samples A (6.92), B (5.71), C (6.71), and D (5.50). This lower score was primarily attributed to the absence of a margarine in its dough formulation, which resulted in a product that was less flaky and more difficult to chew. Margarine inhibits the formation of extensive gluten networks and reduces dough elasticity, resulting in a more tender structure that is easier to chew.

Margarine inhibits the formation of extensive gluten networks and reduces dough elasticity, resulting in a more tender structure that is easier to chew. Additionally, as margarine melts during baking, it creates air pockets that contribute to a more aerated and porous final product (Goh et al., 2019). The presence of margarine in the other samples likely accounts for their slightly higher texture likability scores. Furthermore, Samples B and D showed exhibited low texture acceptability, attributed to dryness linked to increased water absorption capacity resulting from higher red sorghum flour content (Taylor & Duodu, 2018).

The colour scores across all samples displayed minimal variation, a consistency likely due to the natural pigmentation of red sorghum flour, which strongly influenced the final appearance of the products. As noted by Clydesdale (1984), colour is one of the most prominent cues that shape expectations sensory attributes of food. Consequently, the panellists perceived little difference in colour among the samples, which may have limited its influence on the relative acceptability of one sample over another.

All organoleptic parameter scores for Samples A and C exceeded 6.0, indicating higher acceptability compared to the other samples evaluated. Both samples contained equal proportions of red sorghum flour and margarine in their dough formulations. However, Sample C included a greater quantity of wheat flour, which contributed to its higher ratings for aroma and taste relative to Sample A. Notably, over 77% of the panellists ranked Sample C as the most preferred, awarding it an overall acceptability score of 6.97. In this study, a score of 6.0 or above on the 9-point hedonic scale was considered the threshold for acceptability, indicating that the sample was at least slightly liked by the panellists. These findings are consistent with previous studies on edible cutlery products developed by Thagunna et al. (2023) and Iqbal et al. (2022). These findings underscore the critical role of sensory acceptability in advancing the adoption of edible tableware as a sustainable alternative within the food service industry. The integration of sensory quality in developing eco-friendly tableware strengthens its potential to replace conventional plastic products and contribute meaningfully to waste reduction and environmental sustainability efforts.

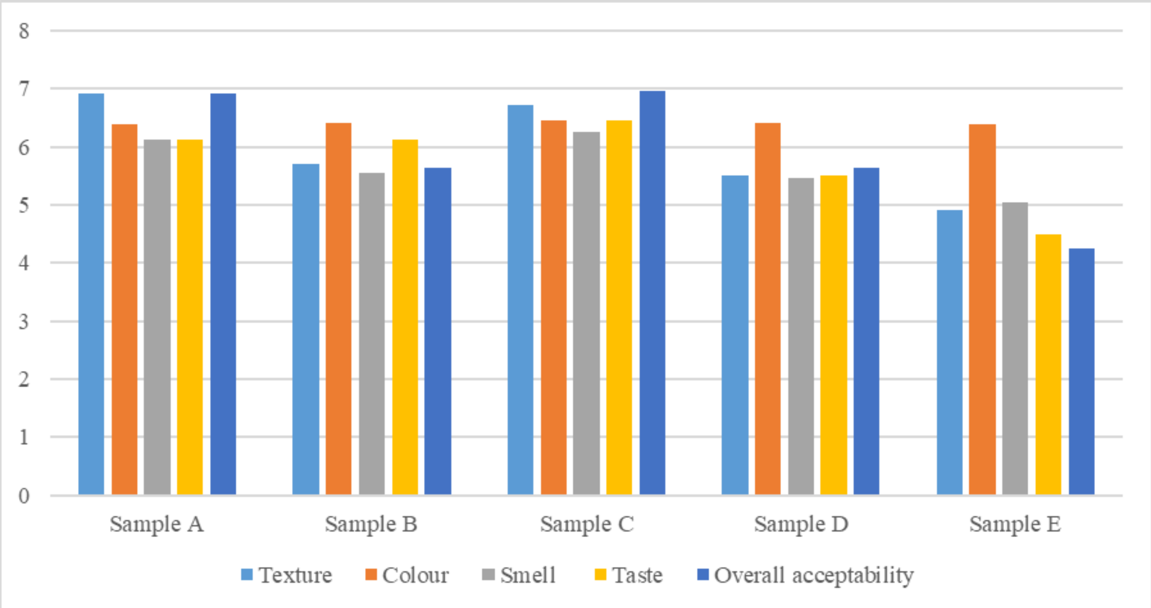

Figure 2: Organoleptic assessment of eco-friendly plate samples

Water Absorption Capacity

Water Absorption Capacity (WAC) was determined using a modified version of the method described by Shrestha and Srivastava (2017). Given that the density of water is 1g/ml, four replicate pieces of each sample were weighed and immersed in cold water. At five-minute intervals, the samples were removed, gently blotted to remove surface moisture, reweighed and the corresponding values recorded. This process was repeated until the samples reached saturation and became visibly soggy. The WAC for each sample was calculated as the mean value obtained from the four replicates. Using four replicates and calculating average weight was essential to enhance reliability and accuracy of the measurements for each sample. To simulate the behaviour of the samples in both cold and hot liquid foods, the same procedure was repeated using hot water. The WAC was determined using the following formula:

$$WAC(\%) = \frac{Weight\ of\ water\ absorbed\ (g)}{Weight\ of\ the\ sample\ (g)} x100$$

All samples were immersed in water for an equal duration of time. Among them, Sample E exhibited the lowest water absorption, recording only 18.32% at the end of the 20-minute experiment (see Figure 3). This reduced absorption was attributed to the absence of margarine in the formulation. Margarine is known to creates air sacs in the dough during baking, increasing the volume of the final product (Goh et al., 2019). In the absence of margarine, fewer air pockets were formed, resulting in a denser structure that likely reduced the permeability of the sample and inhibited rapid water penetration. Furthermore, Sample E did not become soggy as quickly as the other samples. This characteristic was also associated with the absence of margarine, which typically contributes to breaking down gluten protein strands in wheat flour, thereby promoting a more crumbly texture. Such a texture has more air spaces, which facilitate water absorption and drainage.

Although Sample C contained some margarine and lacked the compact structure observed in Sample E, it still exhibited a notably high water absorption capacity. Similar to Sample E, Sample C maintained its structural stability for a longer period and recorded the highest water absorption (33.27%) among all the samples. This observation could be explained by the increased amount of wheat flour in the sample mixture which improved its ingredients adhesiveness thereby maintaining the structure of the product even when it continued to absorb water. According to Iqbal et al. (2022) heat flour is capable of forming gluten networks and building starch-water bonds that retain moisture well. This finding is particularly relevant to the functionality of eco-plates, where structural resilience is essential when they are used to serve liquid foods, as it reduces the likelihood of the plates becoming soggy or deforming. The WAC percentages were closely related to the ones shown on Figure 3, when the test was repeated using hot water. The similarity in absorption capacity may be attributed to reduced strength of gluten formation in the dough when exposed to heat (Mann et al., 2014). It was essential to perform this test to evaluate the functional properties of the eco-friendly plate, especially in practical scenarios where it would be used in serving hot foods.

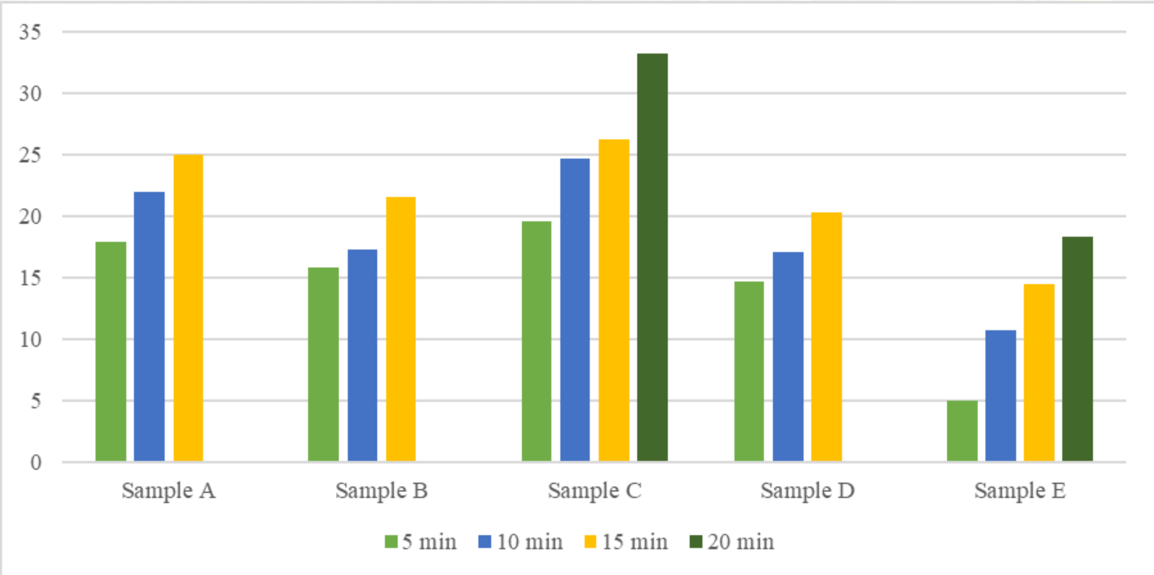

Figure 3: Temporal analysis of water absorption capacity in various eco-friendly plate samples

Biodegradability Test

During the first two days, the samples retained their original shape and colour, with no noticeable physical changes. By day 3, softening of the material became evident, accompanied by darkening in colour and initial fungal growth, particularly along the edges where small fragments began to detach. On day 4, fungal growth had extensively covered the surfaces, and the structural integrity of the samples further deteriorated, leading to partial disintegration. By day 5, the plates had largely crumbled into small, irregular pieces. Complete disintegration occurred was noted from day 6, where the samples were reduced to fine particles mixed into the surrounding soil, leaving no visible traces. These observations confirm a high rate of biodegradability for all plate samples under natural soil conditions, supporting their potential as more sustainable alternatives to single-use plastic tableware.

When the process of eco-plate decomposition is compared to that of chemically modified biodegradable polymers, the process is easy since the product is made from natural ingredients. Leja and Lewandowicz (2010) noted that natural breakdown of chemically modified biodegradable polymer is a laborious procedure.

When the process of eco-plate decomposition is compared to that of chemically modified biodegradable polymers, the process is faster. This is because eco-friendly plates were made from natural ingredients decompose more easily due to their simpler molecular structure and lack of synthetic additives. Natural materials such as wheat flour and sorghum flour are biodegradable and readily broken down by microorganisms under typical composting conditions.

Conclusions

The escalating global plastic pollution crisis necessitates the development and adoption of sustainable alternatives. The eco-friendly plate introduced in this study presents a practical and effective substitute for conventional single-use plastic plates widely used in the food service industry. This eco-plate offers a sustainable solution by being fully biodegradable, decomposing naturally within six days as demonstrated by biodegradability tests. Unlike plastic, which takes many years to decompose, the eco-plate enriches the soil without releasing harmful residues, thereby functioning as a regenerative rather than a polluting end-of-life product. Moreover, the eco-plate is edible and nutritionally beneficial, primarily due to the inclusion of sorghum, which is rich in proteins, minerals, vitamins, and phenolic compounds. The plate is formulated without the use of synthetic chemicals or preservatives, ensuring its safety for human consumption. Its favourable taste and texture make it suitable for post-use consumption, thereby offering an innovative approach to minimizing both food and packaging waste. Although its edibility was not assessed in animals, the use of natural, food-grade ingredients such as red sorghum and wheat flour implies minimal ecological risk in the event of unintentional ingestion by wildlife or domesticated animals.

The plate's composition from locally sourced, natural ingredients also enhances its economic feasibility for both small and large scale production. Its manufacturing process requires substantially less energy and results in lower carbon emissions compared to that of conventional plastic alternatives. While the current prototype demonstrates significant potential, further efforts are needed to scale production, optimize manufacturing and enhance market awareness. Beyond its practical utility, the eco-friendly plate exemplifies environmentally responsible innovation and could serve as a catalyst for future research in edible and compostable packaging technologies. Its adoption aligns with circular economy principles and supports broader sustainability goals, including those outlined in the United Nations Sustainable Development Goals (SDGs).

REFERENCES

Andae, G. (2023). The Return of Single-Use Plastics Six Years after Ban. *Nation Media Group.* https://nation.africa/kenya/health/the-return-of-single-use-plastics-six-years-after-ban-4258862

AOAC (2005). *Official Methods of Analysis*. Association of Official Analytical Chemists. Washington D. C., USA.

Bezerra, J. C., Walker, T. R., Clayton, C. A., & Adam, I. (2021). Single-use plastic bag policies in the Southern African development community. *Environmental Challenges*, 100029. https://doi.org/10.1016/j.envc.2021.100029

Clayton, C. A., Walker, T. R., Bezerra, J. C., & Adam, I. (2020). Policy responses to reduce single-use plastic marine pollution in the Caribbean. *Marine Pollution Bulletin*, *162*, 111833. https://doi.org/10.1016/j.marpolbul.2020.111833

Clydesdale, F. M. (1984). The influence of colour on sensory perception and food choices. In: Walford J, editor. *Developments in food colours 2.* London, UK: Elsevier Applied Science; 1984. p. 75–112.

Djekic, I., Petrovic, T., Smigic, N., Udovicki, B., & Tomic, N. (2024). Confronting Various Quality Perspectives of Paper Straws—Case Study with Generation Z. *Applied Sciences, 14*(23), 11189. https://doi.org/10.3390/app142311189

Dordevic, D., Necasova, L., Antonic, B., Jancikova, S. & Tremlová, B. (2021). Plastic cutlery alternative: Case study with biodegradable spoons. *Foods,* 10(7), 1612. https://doi.org/10.3390/foods10071612

Ella, S. (2022, June 24). Finding a solution to plastic pollution. *Mantis collection.* https://www.mantiscollection.com/finding-a-solution-to-plastic-pollution/

Fortune Business Insights (June, 2023). *Food Service Market Size, Share & COVID-19 Impact Analysis, By Type (Full Service Restaurants*, Quick Service Restaurants, Institutes, and Others), and Regional Forecast, 2023-2030. https://www.fortunebusinessinsights.com/food-service-market-106277

Goh, K. M., Wong, Y. H., Abas, F., Lai, O. M., Cheong, L. Z., Wang, Y., & Tan, C. P. (2019). Effects of shortening and baking temperature on quality, MCPD ester and glycidyl ester content of conventional baked cake. *Lwt,* 116, 108553. https://doi.org/10.1016/j.lwt.2019.108553

Habanabakize, T. (2020). Assessing the Impact of Interest Rate, Catering, and Fast-Food Income on Employment in the Social Services Industry. *International Journal of Economics and Finance Studie*s, *12(2),* 534-550. https://doi.10.34109/ijefs.202012218

Iqbal, B., Raza, R., Khan, N., & Siddiqui, K. A. (2022). Bio-friendly edible cutlery-an effective alternative to plastic disposable cutlery. *Journal of Research (Science)*, *33*(1), 30-36.

Keelery, S. (2023, June 09). Employment in the food services industry in India 2013-2025. *Statista*. https://www.statista.com/statistics/676497/employyes-in-the-restaurant-industry-india/#statisticContainer

Leja, K., & Lewandowicz, G. (2010). Polymer biodegradation and biodegradable polymers-a review. *Polish Journal of Environmental Studies*, *19*(2).

Mann, J., Schiedt, B., Baumann, A., Conde-Petit, B., & Vilgis, T. A. (2014). Effect of heat treatment on wheat dough rheology and wheat protein solubility. *Food Science and Technology International*, *20*(5), 341-351. doi:10.1177/1082013213488381

Nwafor, N., & Walker, T. R. (2020). Plastic Bags Prohibition Bill: A developing story of crass legalism aiming to reduce plastic marine pollution in Nigeria. *Marine Policy*, *120*, 104160. https://doi.org/10.1016/j.marpol.2020.104160

Phelan, A., Meissner, K., Humphrey, J., & Ross, H. (2021). Plastic pollution and packaging: Corporate commitments and actions from the food and beverage sector, *Journal* of *Cleaner Production, 331*, 129827 https://doi.org/10.1016/j.jclepro.2021.129827.

Ratnavathi, C. V., Patil, J. V., & Chavan, U. D. (2016). *Sorghum biochemistry: an industrial perspective*. Academic Press

Sood, S., & Deepshika, M. (2018). Development and quality evaluation of edible plate. *ARC Journal of Nutrition and Growth,* 4(2), 1-4. http://dx.doi.org/10.20431/2455-2550.04020012

Srimulyani, V.A., & Hermanto, Y.B. (2022). Impact of Entrepreneurial Self-Efficacy and Entrepreneurial Motivation on Micro and Small Business Success for Food and Beverage Sector in East Java, Indonesia. *Economies*, 10(1), 10. https://doi.org/10.3390/economies10010010

Taylor, J., & Duodu, K. G. (2018). *Sorghum and millets: chemistry, technology, and nutritional attributes* (2^{nd} ed). Elsevier.

Thagunna, B., Shrestha, G., Karki, R., Baral, K., & Kaur, J. (2023). Development and Quality Evaluation of Biodegradable Edible Cutlery: A Replacement for a Conventional One. *Asian Journal of Pharmaceutical and Clinical Research 16(2), 49-52*

United Nations Environment Programme. (2023b). *Turning off the Tap: How the world can end plastic pollution and create a circular economy. Topic Sheet: Materials and Products Substitutions.* Nairobi. https://wedocs.unep.org/bitstream/handle/20.500.11822/42236/materials_substitution_sheet.pdf?sequence=3&isAllowed=y

United Nations Environment Programme. (May, 2023a). *Chemicals in plastics: a technical report.* Geneva. https://www.unep.org/resources/report/chemicals-plastics-technical-report

United Nations. (2022). *The Sustainable Development Goals Report 2022.* https://unstats.un.org/sdgs/report/2022/The-Sustainable-Development-Goals-Report-2022.pdf

US Bureau of Labor Statistics (2023). *Occupational Outlook Handbook: Food and Beverage Serving and Related Workers.* Washington DC. https://www.bls.gov/ooh/food-preparation-and-serving/food-and-beverage-serving-and-related-workers.htm#tab-1

Walker, T. R., McGuinty, E., Charlebois, S.et al. Single-use plastic packaging in the Canadian food industry: consumer behaviour and perceptions. *Humanit Soc Sci Commun 8,* 80 (2021). https://doi.org/10.1057/s41599-021-00747-4

Ye, L., Zheng, W., Li, X., Han, W., Shen, J., Lin, Q., ... & Zeng, X. A. (2023). The role of gluten in food products and dietary restriction: exploring the potential for restoring immune tolerance. *Foods, 12*(22), 4179. https://doi.org/10.3390/foods12224179

TRANSFORMING ETHNIC IDENTITY THROUGH STATE INTERVENTIONS: INTER-ETHNIC CONFLICT MANAGEMENT IN BUNGOMA COUNTY, KENYA

Mulati Job Chebai
Department Humanities and Social Sciences Chuka University
Corresponding Author Email: **jmulati@chuka.ac.ke**

ABSTRACT
Intra and inter-ethnic identities, built over time buttress ethnic conflicts globally. In Kenya, Bungoma in particular, the conflicts experienced in 1963, including unparalleled violence in 1992 were underpinned by socio-historical, cultural, ethnic and geographical identity factors. Specific objective of the study was to examine the statist inter-ethnic integration of ethnic identity issues in management of inter-ethnic conflicts in Bungoma County. The study was guided by a conceptual framework anchored on Galtung's Conflict Triangle and Lederach's Conflict Transformation theories. A descriptive research design was used, while the study was conducted in Bungoma County. Simple Radom and Purposive were applied to determine participants. A sample size of 394, derived from 26581 population using Yamane formula was used. Questionnaires, interviews, FGD and document analysis were instruments used. Data was quantitatively and qualitatively analyzed. The study findings which wobbled from inter-communal stereotyping to misunderstandings to lack of information and politics showed that, first, ethnic differences which emanated from varying inter-ethnic histories scored 50% responses, cultural differences 40% and varied geographical location 10% responses. Second, inter-communal social differences ranged from in-born hatred 17% responses, value differences 18%, cultural dissimilarity 17%, unfair distribution of education 17%, varying norms 17% and religious rivalry 14% responses. Finally, negative ethnicity response scores demonstrated that, except for inter-communal politics' driving negative ethnicity, underscored in politicians using ethnic differences for political expediency which scored 16% responses, the rest, inter-communal perceptions, ethnic majority-minority contests, ethnic fear of survival, inter-communal inequitable access to power, historical injustices and ethnic chauvinism scored 14% responses each in accounting for identity issues in influencing conflicts in Bungoma County. Statist interventions against inter -ethnic hatred over ethnic values, culture and religion are underpinned in 2010 constitution. However, in furtherance to curing inter-communal stereotypes, drives of negative ethnicity like politics and enhance understanding and tolerance, the study recommends translation of peacebuilding process in Bungoma into creative art and documentary. This will increase awareness and integration of identity issues in management of ethnic conflicts in Bungoma County.

Key words: Ethnic identity, Conflict transformation, State intervention, Peacebuilding, Bungoma, Kenya.

INTRODUCTION
Intra or inter-ethnic identity issues underpins ethnic conflicts globally. In Britain, religious identity defined Protestant-Catholic conflicts recorded as early as 1534. It was historical-religious identity factors which sharpened ethnic identity in Bosnia-Herzegovina, leading to the collapse of a nation, (Vesna, 1996). Canada has registered linguistic identity contests between the English-speaking and French-speaking Canadians. USA, is yet to overcome racial identity conflicts, (Sandra, 2003). Moreover, conflicts between Israel and Palestine has immense Islamic- Jewish religious cum cultural identity issues, (Yannis, 2018).

In Africa, ethnic identity contests underpinned Congo, Mozambique, Angola, Ethiopia including Uganda and Rwanda's conflict. Efforts to federate Eritrea to Ethiopia failed leading to the split of the Ethiopian nation and state (Ghebrehiwet, 2009). While Rwanda's, peace-building strategies sought to reconcile inter-ethnic identity issues between the Hutu and Tutsi by falling back to indigenous peace-building strategies *umuganda* (community work) and *girinka* (donating one cow to each needy family) as means of coexistence after 1994 genocide.

In Kenya, Bungoma in particular, the influence of statist transformation of inter-ethnic identity issues in management of inter-ethnic conflict has been ineffectively long. From independence in 1963, the conflicts acquired both national and violent inter-ethnic dimension in the region when KANU and KADU, the then two major political party contests situated communities' identity issues against each, (Kiliku, 1992, kiwumi Report of Judicial Commission, 1999). In 1992, instead of the newly introduced multiparty democracy breaking down volatile in inter-ethnic identity issues, the County lapsed into yet another unprecedented violence (Kiliku, 1992). This background contradicts the conventional approach which argues that statist inter-ethnic integration of inter-ethnic identity issues including politics or political leadership has a stake in inter-ethnic cohesion. It is from the foregoing that the study examined the statist transformation of inter-ethnic identity issues in the management of inter-ethnic conflicts in Bungoma County. Specific objective of study was to examine the statist inter-ethnic integration of ethnic identity issues in management of inter-ethnic conflicts in Bungoma County, while answering the question, what is the effect of statist inter-ethnic integration of inter-ethnic identity issues in management of inter-ethnic conflicts in Bungoma County.