

Challenges of Food Storage and Preservation in Restaurants in Katsina Metropolis, Katsina State, Nigeria

**Abdulkadir Bello¹, Nura Isyaku Bello², Kamaluddeen A. Baba¹
and Ahmad Said Abubakar⁴**

¹*Social Sciences Department, Geography Unit, Kano State Collage of Education and Preliminary Studies*

²*Geography Department, Kano State University of Science and Technology, Wudil*

³*General Studies Department, Nigerian Institute of Leather and Science Technology, Zaria*

⁴*Geography Departments, Aminu Kano College of Islamic and Legal Studies*

Corresponding author: asa99939@gmail.com

ORCID: 0000-0001-6332-465X

Abstract

Restaurants produce the greatest amount of food waste and loss in the food supply chains of most developing economies including Nigeria. Reducing all food losses will result in a more secure global food system and it is important for us to show how restaurants services can reduce food waste in their domain. Food waste is one of the major challenging issues facing most restaurants as well as food services operators as it post many negative economic and environmental health impacts. Thus this study examines challenges of food preservation in restaurants, providing data and insights with a case study on Katsina city. Primary and secondary sources of data were adopted as a method for the data collection. From the finding of the study, most restaurants in the study area conduct an inventory checks on a daily basis, to stock up on required materials and gather understanding on which items are being used. In addition, restaurants keep a regulated check to ensure minimum possible preparations on certain items need to be prepared in excess. It was also found that, fresh foods purchased have a reported 5.8-fold greater food waste compared to frozen food purchases in most restaurants in Katsina. Obtaining such data is a challenge future research into food waste and preservation will need to address so that it can be transferred to food product development operations for maximum impact. It concluded that Katsina restaurants do not recognize the need to have a scientific approach for the treatment of their surpluses and mitigation of the same. The true solution lies in creating heightened levels of awareness in the restaurant industry about correct waste management practices and stringent measures need to be taken to ensure that these are adequately followed.

Keywords: Food waste, Food preservation, Restaurants and Katsina Metropolis

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INTRODUCTION

Food plays a central role in our lives, not only providing fuel, nutrients and sustenance, nor merely being central to many of our social interactions, but also feeding into our sense of identity (White et al., 2009). However, across the world one-third of all the food produced is wasted which amounts to a staggering \$400 billion annually (Nixon, 2015). Food waste has attracted the attention of researchers, the media, politicians and others, largely because of its far-reaching effects on the economy and the environment (Buzby et al., 2014). Food wastage and food losses combined together constitute the issue at hand resulting in food shortage across the world besides other negative implications (Lipinski et al., 2013).

This issue is fast assuming grave dimensions in Katsina, Nigeria. Restaurants produce the greatest amount of food waste and loss in the food supply chains of most developing economies including Nigeria (Lipinski et al., 2013). Reducing all food losses will result in a more secure global food system and it is important for us to show how restaurants services can reduce food waste in their domain. Although the safety of foods served in restaurants in Nigeria has been an ongoing concern. At the same time, restaurants play an important socioeconomic role in meeting food and nutritional requirements of city consumers at affordable prices to the lower and middle income groups and are appreciated for their unique flavours and convenience (Buzby et al., 2014)).

In the last few decades, increased intra-urban mobility of Katsina dwellers due to urban expansion, coupled with the increased engagement of women in the wage labour market, have left most working class people in Katsina with less time to cook and eat meals at home. This resulted in changes in their eating patterns and habits, and in an increased demand for ready-to-eat food out of the house. Many people have thus taken the chance to start their catering business to meet such demand: brick-and-mortar sit-down restaurants (eg. luxury, mid-range, ethnic/foreign), traditional “*Bukas*” or “*Mama puts*” (street kiosks, small diners, and hole-in-the-wall restaurants), as well as modern American-style fast food outlets have mushroomed in most cities including Katsina.

Food waste is one of the major challenging issues facing most restaurants as well as food services operators as it post many negative economic and environmental health impacts. Economically, they represent a wasted investment that can reduce restaurant owners’ incomes and increase consumers’ expenses. Environmentally, food waste inflicts a host of impacts, including unnecessary greenhouse gas emissions and inefficiently used water and land. “Food waste” refers to the edible parts of plants and people do not ultimately consume animals that are prepared in city restaurants for human consumption but that. In particular, “food loss” refers to food that spills, spoils, incurs an abnormal reduction in quality before or after food being prepared in the restaurants, before it reaches the consumer. “Food waste” refers to food that is of good quality and fit for human consumption but that does not get consumed because it is discarded either before or after it spoils. Food waste is the result of negligence or a conscious decision to throw food away (Haq, 2016).

This study examines challenges of food preservation in restaurants, providing data and insights with a case study on Katsina city, to appraise the operational efficiency of the system and contributes to understanding of food waste dynamics. Through in-depth interviews of 63 restaurant owners/managers, the paper also explores the strategies adopted by restaurants in Katsina to reduce challenges in food preservation and recommends ways to reduce waste amounts.

Food Loss and Food Waste

According to the Food and Agriculture Organization (FAO, 2016), roughly one-third of the food produced in the world for human consumption every year, approximately 1.3 billion tons, gets lost or wasted. Food losses and waste amount to roughly US\$ 680 billion in industrialized countries and US\$ 310 billion in developing countries. Studies have pointed out repeatedly that the proportion of food wasted in India is almost one-third the amount of its annual production. Around 67 million tons of food is wasted in India every year, which has a value of more than more than US\$14 billion (Haq, 2016).

Statistics provided by the United Nations Development Program states that India wastes 40 percent of the food it produces. The causes of food losses and waste in low-income countries are mainly connected to financial, managerial and technical limitations in harvesting techniques, storage and cooling facilities in difficult climatic conditions, infrastructure, packaging and marketing systems (Food and Agriculture Organization, 2011).

Food Preservation

Food preservation involves the action taken to maintain foods with the desired properties or nature for as long as possible. The process is now moving from an art to highly interdisciplinary sciences that need to be known to restaurants operators. In most countries, innovation, sustainability, and safety have become the main foci of modern industry and economy. The United Nations World Commission on Environment and Development defined sustainable development as “meeting the needs of the present generation without compromising the ability of future generations to meet their own needs.” A sustainable way of designing and developing food products stands to appeal to consumers, and provides a point of differentiation from competitors in an urban setting and a perfect platform for a range of positive public relations activities (Biswa et al., 2010).

Previous food waste reduction initiatives have typically focussed outside of this restaurants service arena and they have focussed on manufacturing and retail food losses. They have been successful at designing out food waste using the right-weighting of food products (portion control) and light-weighting of packaging (material resource efficiency). Their success has been made possible through cooperative actions across the food industries that have developed joint responsibility for food waste. It is essential that these initiatives now act to reduce the food that consumers purchase but do not eat (Mena et al., 2011).

Food Handling in Restaurant

Food handling is indeed a crucial (but not the sole) factor that can pose serious challenge in food preservation as it can cause food contamination. Several authors found that only a small percentage of food handlers in restaurants and or vendors in major cities in Nigeria including Katsina attended training workshops on food hygiene and safety before engaging into the food business. This gap, though, does not seem to prevent most of the handlers/vendors to show a good knowledge of safe food handling practices (e.g. hand washing). However, such knowledge does not always translate into good practices: for instance, while almost all food handlers are found to wash their hands with soap and water after going to the toilet, only a few wash their hands after touching dirty materials and body parts (Smith et al., 2010).

Food Storage in Restaurants

Food storage practices are another crucial issue. About one third of the street food vendors in Katsina usually sell leftovers, that is, food prepared and cooked more than 24 hours before selling. Given that storage facilities in many low-class households (e.g. fridge) are missing or become almost useless due to the frequent power outages plaguing Katsina, leftovers could serve as a breeding ground for microorganisms that could lead to food poisoning. It is important to note that even when food handlers have knowledge about safe food storage, handling, and preparation practices, they do not necessarily know the factors and mechanisms that cause food contamination, nor the effects of such contamination. For instance, more than one third of street food vendors in cities like Kano, Lagos and alike are not aware that food contaminated by pathogenic germs can cause serious damage to health.

MATERIAL and METHOD

Data collection and analysis

A qualitative inquiry has been used for this study. Primary and secondary sources of data were adopted as a method for the data collection. Primary data was collected using interview method and questionnaire survey; whereas the secondary data involves use of already publish papers, journals and article as well as other internet sources on food preservation and related areas.

The restaurant selection was undertaken with care. The research population for this study consisted of 63 restaurant owners/managers of “A” grade and “B” grade “C” evenly distributed across Katsina city whose establishments had been at least three years in the business with a minimum of five (5) employees each. The restaurants selected include all income range options ranging from higher end fine dining, fast food joints, cafes, mid-range restaurants, street food vendors, etc. Initially 78 restaurants had been shortlisted of which 15 did not wish to participate in the survey citing various constraints. Both closed- and open-ended questions were employed. In-depth face-to-face discussions held with these restaurant owners/managers in various matters of interest to this study. A research protocol was prepared to combine a systematic data collection from the 63 restaurants, which helped to address the research questions, guide the interviews and provide the structure.

In order to ensure accurate information collection, only restaurant managers, in case the owners were not available, who had complete information pertaining to operations, kitchen guidelines, rules and regulations and waste audit procedures have been interviewed for this research project. Also formal and informal discussions were held with a few employees subject to the opportunity and availability.

RESULTS and DISCUSSION

Food Surplus materials in Restaurants

Although the different restaurants used for the purpose of this study adopt different practices about food waste and surplus food management, some common threads have been observed (Figure 1).

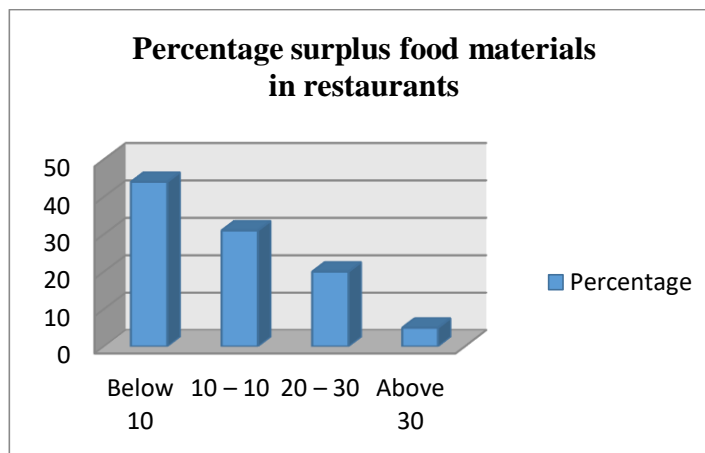


Figure 1. Percentages of surplus food materials in restaurant

The results show that 75 percent of the restaurants have 10-20 percent extra preparation that they claim is a safety margin, to enable them to cater to additional crowds. In total, 5 percent keep a margin of above 30 percent. It found that the high-end fine-dining restaurants make additional preparations as compared to the other types of restaurants. In-depth interviews with restaurant owners and managers reveal that after years of being in the restaurant business, several of them can estimate the requirements on specific days of the week and they only make what is required for the day, so generally food was not cooked greatly in excess.

Food Wasted in Restaurants

Although most restaurants keep a regulated check to ensure minimum possible preparations, certain items need to be prepared in excess. Also, several of the restaurants managers claimed not to re-use food and claim they are able forecast the footfall with a fair degree of accuracy. Some managers affirmed that they would rather declare a “sold out” than have to discard unsold stock at the end of the day (Figure 2).

Table 1. Food wasted in Restaurants in Katsina

Percentage food wasted in Restaurants	Standard restaurants	Street vendors	Fast food restaurant
Fresh food wasted	9.3	10	5
Frozen food wasted	2	8	7
Cooked food wasted	11	15	4

Source: Field work, 2019

Inventory check in Restaurants

Most restaurants conduct inventory checks on a daily basis, to stock up on required materials and gather understanding on which items are being used. Others conduct daily inventory only for perishables like dairy products, poultry items, etc., and weekly inventory checks for other materials like grains, sauces, etc. (Figure 2).

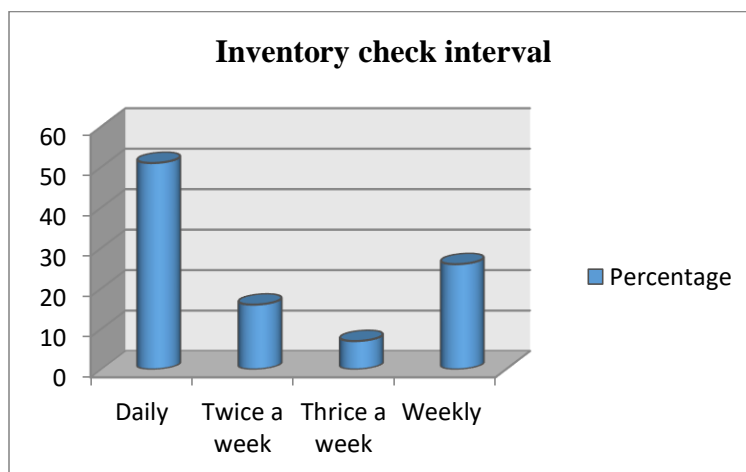


Figure 2. Inventory check interval among Restaurants managers

Preparatory leftover in restaurants

In Figure 3, high percentage (43 percent) of the participating restaurants immediately refrigerates these. In certain cases, if food chicken, fish or vegetables are in excess in the early stages of cooking, these are refrigerated and are reused. The treatment varies depending upon the item as well. Vegetables rot faster and are disposed of whereas meat can be refrigerated. However, 18 percent of the restaurants surveyed claimed to have a complete dispose of policy whereby everything prepared in the kitchen that has not been used till the end of the business day must go into garbage disposal. With the new laws in place the waste has to be segregated. However, all restaurant managers complain that though they have the waste divided as wet and dry, these procedures are not pursued at further stages so it is of no use to take all the trouble.

In all, 30 percent of the restaurants re-use these preparatory leftovers in some way. Three of the restaurants attached to five star hotels have made their own arrangements for waste handling (Figure 3).

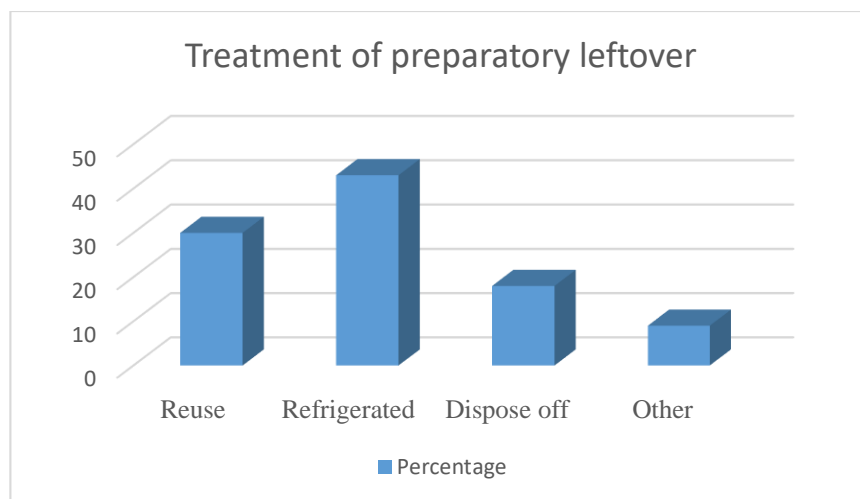


Figure 3. Treatment of preparatory leftover among restaurants in Katsina

Out of the 63 restaurants surveyed, only 2 had a tie-up with a food bank to donate the leftovers. Some of the luxury restaurants have a have tie-ups with NGOs to distribute the leftovers while some prefer not to do so due to bad experiences in the past. Some of the restaurants spoke highly of distributing the surplus the less privilege people living in a close settle zones.

Storage Temperature in Restaurants

Few restaurant surveyed has invested in a “public fridge” which has been mounted a few feet away from the restaurant, but majority used own fridge mounted in their restaurants. Destitute can pick up the surplus food from this fridge. One restaurant owner narrated that in the previous year a very complicated matter came up as the donee claimed that they felt sick after consuming the food, demanding massive compensation (Figure 5).

Table 2. Showing cold storage temperature for food in restaurants

Cold storage temperature food in restaurants	Percentage
Below 36°F (2.222°C)	64
36 - 45°F (2.22°C – 7.222°C)	30
Above 45°F (7.222°C)	6

Source: Field work, 2019

Fresh/Frozen Food Wasted in Restaurants

Table 4, shows fresh foods purchased have a reported 5.8-fold greater food waste compared to frozen food purchases in most restaurants in Katsina. Obtaining such data is a challenge future research into food waste and preservation will need to address so that it can be transferred to food product development operations for maximum impact. The findings of this study correlated with Austrian research as, reported that the fresh food thrown away per household per person for 288 samples was 37.48 kg each year while the frozen food thrown away per household per person was 6.46 kg and per year. The nutritional losses associated with food waste despite employing preservation methods have yet to be fully characterised but they are an important component of food waste projections (Halloran et al., 2014).

Table 3. Showing fresh/frozen food purchase wasted

Percentage of fresh food purchase wasted		Percentage of frozen food purchase wasted	
Fruits	9.8	Fruits	2.5
Vegetables	6.7	Vegetables	3.4
Potatoes	3.9	Potatoes	1.0
Bread	5.5	Spinach	0.5
Pasta	1.9	Pasta	0.4
Meat	2.8	Meat	1.6
Fish	0.6	Fish	0.7
Snacks	5.8	Snacks	3.7

Source: Field work, 2019

Mitigation of Food Waste Among Restaurants

A good proportion of consumers in Katsina especially males have a tendency to fill their plates at buffets and cannot finish most of the food. A mid-range restaurant exhibited a sign put up at two strategic places at the buffet table “You are welcome to come back as many times as you want.” In total, 74 percent of the restaurants use 32 cm plates while the remaining use 27 cm plates. Larger plates might contribute to people serving and consuming more food due to visual illusions that lead to biased perceptions of how much food is served or consumed (Van Ittersum and Wansink, 2012).

Several of the managers complained the customers send food back as it has gone cold, in keeping with the Nigerian mentality that food must be served piping hot. Fine-dining restaurants are the ones more receptive to participating and also sensitive toward importance of waste management. Three of the fine-dining restaurants take efforts to ensure that the kitchen staffs chops vegetables correctly, does not over trim meat or add excessive ingredients thereby mitigating food waste.. Though preventing use of material-intensive equipment is a good idea, for instance pasta makers used by most restaurants have higher wastage of the pasta materials while there are other alternatives, perhaps due to the cost and effort involved this alternative did not find many takers among the restaurant owners and managers.

Table 4. Showing mitigation of food waste among restaurants

Mitigation of waste	Percentage
Redesigning menu	31
Portion related guidance	8
Waste Audit team	5
Single dinner option	13
Use of material intensive equipments	11
Reusing leftover	32

Source: Field work, 2019

DISCUSSIONS and IMPLICATIONS

The causes of food waste in restaurants are numerous and diverse. Food losses and waste are currently at the heart of academic debates, civil society initiatives and political agendas (Falasconi et al., 2015). A number of strategic challenges arise from the observations and inferences outlined in the previous section. Waste management and effective waste disposal practices are measures that have become essential for restaurants not only to reduce wastage of resources but also to ensure an economic business. Restaurants need to have complete information of various methods for effective disposal of surplus food and recycling options and in particular about the processes. Restaurants need to adopt strategies to translate the vision of zero food loss and wastage of food into concrete action.

As per this study, the hospitality sector is not keen on government interference to reduce avoidable the challenges of food preservation and would rather solve the issue at their level and through their associations. There is opposition to taxes on avoidable food waste. The larger establishments are frustrated by the subjective evaluations adopted by food administration inspectors and resent the fact they have to frequently bribe these inspectors. Experienced staff needs to be assigned the job of checking orders from distributors so that no substandard quality inputs enter the chain in the first place. Buffet restaurants could learn from the mid-sized restaurant in our sample and put up signage that it is socially acceptable for guests to help themselves several times. This might help to reduce the amount left over (Wansink, 2006).

Restaurants should be encouraged to use 27 cm plates and this could be enforced through the associations to ensure uniformity. The average consumer consistently serves more onto relatively larger dinnerware than onto relatively smaller dinnerware (Wansink, 2006). This is thought to occur because of the Delboeuf illusion, which makes a meal appear smaller than it really is when more white space surrounds the food (Van Ittersum and Wansink, 2012).

This means that a large plate can make a meal look smaller and this causes guests to order meals they will never land up finishing. Thus using 27 cm plates would reduce the amount of food waste. Restaurants could be provided with some incentives like subsidies or lesser taxes for minimizing wastages. Seminars on food waste management can be conducted by food regulatory associations to create awareness amongst the kitchen staff.

At the time of primary data collection, negligence and indifference of restaurant staff in relation to waste and preservation was observed so they should be offered certain incentives to minimize the same. Taking a cue from the fine-dining restaurants in this study, the kitchen staff should be properly trained in chopping and trimming and made more conscious about the effects of food wastage. The staffs also needs more training in employing greater innovation of converting leftovers into dishes as two of the restaurants in the sample are doing. The menu could be rearranged to delete less popular items or the recipe could be readjusted. Proper systems to use perishables in a timely manner using the “first in, first out,” system would help prevent spoilage.

In the study by Falasconi et al., (2015), side dishes had the highest percentage of food waste so reducing the amount served of side dishes might be of help. From their experience, kitchens should learn to stagger meal preparation so dishes are ready at the same time and do not go cold before they are serve.

It would be immensely useful for these restaurants to allocate adequate resources toward formation of a Food Waste Audit and this should be made mandatory by law to reduce the challenges in food preservation. Prevention alone is not sufficient to achieve an optimal allocation of resources; it should be integrated with recovery mechanisms to intervene and adjust the additional failures of the catering system (Falasconi et al., 2015). This study recommends a three way strong digital communication between restaurants, NGOs/food banks and food regulatory governing bodies for quick transfer of information and leftovers. In addition, if the collection agencies undertake the responsibility of enforcing strict necessary quality checks on the donated food, the restaurants would be more receptive to the idea of donating it to the poor. More restaurants should tie up with reputed organizations. Currently, the checks conducted to determine whether restaurants are following the dictated waste management norms (preservation) are minimal. These should be conducted at intervals that are more regular and in a more comprehensive manner. In addition, integrity among the inspectors conducting checks on restaurants is vital. Waste management regulation in Katsina and Nigeria at large needs to be strengthened to include correct cold storage norms and recycling mandates. Both these are not given the importance they deserve in the Katsina as well as Nigerian food industry.

CONCLUSION

This paper has analyzed the challenges of food preservation in Katsina restaurants, attempted to assess the operational efficiency of the system and given recommendations to minimize challenges attached to food preservation. Katsina restaurants do not recognize the need to have a scientific approach for the treatment of their surpluses and mitigation of the same. The true solution lies in creating heightened levels of awareness in the restaurant industry about correct waste management practices and stringent measures need to be taken to ensure that these are adequately followed. Every restaurant needs to work harder to monitor and minimize food wastage, for the sake of the community and the bottom line, though some do have a good grip on it. Following the observation that there is a weak association between waste prevention attitudes and behaviours there could be enormous gains between pro-environmental behaviours and values. It is just a matter of finding the strategy that works for the restaurant. The restaurateurs affirm that the solution to Katsina's restaurant waste management lies in micro management (and a laudable initiative by one of the restaurants is the "public fridge") rather than large scale plans. While this may be true, there is also a need for the government to amend and strictly enforce the laws on the same. The Nigerian government including Katsina should also speed up research in nanotechnology to invent eco-friendly and healthy food preservation applications to preserve food for longer periods of time and to keep farm produce fresh. It is easy to argue that food loss when saved can feed the hungry Nigerians but food loss and waste reduction should then become a natural part of national and regional strategy for food security. It is important to consider that food loss, waste reduction is a mechanism to improve food security, poverty alleviation, economic development, environmental health, and interventions should focus on the largest possible gains.

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