STUDY REPORT

Save the Children

NAIROBI CITY COUNTY

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UNIVERSITY OF HOHENHEIM

Willingness to Pay for Biodegradable Bags among Market Traders in Kibera Subcounty, Nairobi

June, 2024
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Acronyms

KNBS	Kenya National Bureau of Statistics
MPL	Multiple Price Lists
NEMA	National Environment Management Authority
SC	Save the Children
UN	United Nations
WTP	Willingness to Pay

Introduction

Today, more than half of the world population lives in urban areas, and by 2050, it is projected that two thirds of the world population will be living in cities (UN, 2014). Africa and Asia are expected to account for 90% of this growth, with ~40% and ~47% of their populations residing in urban areas (Potts, 2009).

Kenya is one of the most rapidly urbanizing countries in Africa and the world. Just in one decade, the share of its urban population increased from 22.4% in 2007 to 26.6% in 2017. In the last ten years, nearly 1.5 million people moved to Kenya's capital city, Nairobi. During the last population census of 2009, Nairobi city had 3,138,369 inhabitants (KNBS, 2009). Population projections of the UN Population Division assume an annual growth rate of about 4% in Kenya. It estimates Nairobi's 2019 population to be 4,556,381, with a population density of 4,850 residents per square kilometer. It is forecasted that the city will continue its upward trajectory, reaching 5 million in 2025 (UN, 2018). The reasons for this rapid growth are manifold, primarily the high birth rates and the promise of employment opportunities in the city.

Globally, the rapid growth of the cities and depletion of resources increase stressors for city dwellers. With urbanization, poverty, food insecurity and malnutrition are also moving to the cities. Malnutrition brings "a triple burden", which means coexistence of hunger, "hidden hunger" (Biesalski, 2016), and overweight and obesity. In Kenya, under-nutrition and over-nutrition can co-exist even in the same household. For the urban poor, the most easily available and affordable diets are often low in nutritional value and thus detrimental for health. These stressors particularly affect the low-income residents, thus widening of "food deserts" and existing inequalities in the city. However, urbanization also presents opportunities: it increases access to infrastructures, information, education and knowledge as well as to digital social networks, thus creating new avenues for sharing and growth.

In Kenya, the informal sector dominates in the sales of most fresh food while supermarkets and other formal stores supply more processed foods. An urban household survey in Kenya showed that while wealthy households might buy all types of foods from a supermarket, poor and middle-income households do not buy fresh fruits and vegetables from large formal supermarkets. Except for the households in the wealthiest quintile, almost 30 percent of Nairobi consumers spent most of their food expenditure in traditional 'dukas'. The second most important food retail outlet for Nairobi consumers was the open market, followed by the butchery and then the kiosks (Tschirley et al., 2004).

Food safety: The informality of the urban markets and the small scale of vendors present several challenges in the food markets. There is poor quality control and health hazards that affects the safety of the foods sold in these markets. There is poor disposal of the rotting produce that contaminates the fresh produce sold to the consumers. The market vendors are not properly trained on how to handle the produce and often sell expired goods. Food safety is a major concern in these urban markets where fruits and vegetables are particularly vulnerable to contamination and often the result of contamination from the wastewater that is used to irrigate the crops. Most food commodities are often contaminated due to poor storage, handling, display and waste disposal conditions. The lack of awareness and skills of the vendors and consumers, as well as failures of inspection and enforcement of public health regulations by the

Ministry of Health and the City Inspectorate Department, add to the increasing problem and threats to the food safety and human health.

Our recent market survey in Kibera showed that the largest category of produce brought to the market was fresh vegetables, accounting for 50% of the total. This indicates that a significant portion of the produce being sold in the market consists of freshly harvested vegetables that are in good condition. The next highest category was moderately ripe produce, representing 33% of the market offerings. This suggests that a considerable portion of the produce is at an intermediate stage of ripeness, neither completely unripe nor fully ripe. Ripe produce accounts for 25% of the market. This category likely includes fruits and vegetables that have reached their optimal level of ripeness and are ready to be consumed.

Food Packaging: The SC market study noted that 34% of the traders do not provide packaging materials for their customers, while the 66% do provide packaging materials. "Single use plastic bags" account for 13% of the packaging materials. While they are convenient for customers, they are generally considered detrimental to the environment due to their non-biodegradable nature. "Mesh bags" constituted up 21% of the packaging materials. Mesh bags are more environmentally friendly compared to single-use plastic bags as they are reusable and often made of breathable materials. In addition, "Uhuru bags" represented 39% of the packaging materials. Uhuru bags, typically made of fabric, are reusable and durable. They contribute to a sustainable environment by reducing waste and promoting responsible consumption. From a hygiene standpoint, uhuru bags can be washed and reused, minimizing the risk of contamination.

The use of biodegradable decomposable bags was negligible. Biodegradable bags are designed to break down naturally over time, reducing their impact `on the environment. These bags align with sustainable practices and can contribute to a cleaner ecosystem. From a hygiene perspective, the use of biodegradable bags ensures that packaging materials do not persist in the environment, reducing the risk of contamination. According to a 2022 report by MarketsAndMarkets Research, the global biodegradable plastics market size is projected to grow from $1.2 billion in 2022 to $2.3 billion by 2027, at a compound annual growth rate of 14.5% during the forecast period.

Given the pervasive nature of plastic pollution along with uncertain and complex policy solutions (Brodhagen et al., 2017), innovative approaches and new technologies for controlling pollution are being considered. Shopping bags produced from biodegradable polymers (such as starch or cellulose), have been proposed as a sustainable and environmentally friendly alternative to conventional plastics.

Study Objectives

The main objectives of study were:

(i) Analyze the traders' awareness and willingness to pay the biodegradable bags;

(ii) Analyze the demographic factors (age, gender, level of education) that influence the willingness to pay for the biodegradable bags;

iii) Document the traders' preferences with regard to the biodegradable bags.

The study findings address gaps in terms of the willingness to pay for the biodegradable bags among traders to inform policy debate in the uptake and use of the biodegradable bags in the country. In 2017, the Government of Kenya in a Gazette Notice numbers 2333 and 2356 banned the manufacture, importation and use of plastic carrier bags and flat bags for commercial and household packaging. In a notice dated April 8, 2024, National Environment Management Authority (NEMA) announced a ban on the use of plastic bags to collect and dispose of garbage. From the foregoing therefore, the manufacture and use of biodegradable bags by market traders and households is timely and important. The findings of this study will be disseminated through workshops and meetings with policy makers, partners and the Nairobi County.

Previous Studies / Literature Review

Measuring willingness to pay for goods and services is an important part of many research studies. Multiple price lists (MPL) are a convenient tool to elicit willingness to pay (WTP) in surveys and experiments. Researchers have used it to elicit willingness to pay (WTP) for a diverse set of goods and services, from timed rewards to cookstoves. Willingness to pay (WTP) here refers to the subject's (relative) preferences between two options expressed in a common unit, such as money. In an MPL, preferences may be elicited by asking repeated questions that allow the subject to "buy" or "sell" indivisible goods at various prices, or to choose between divisible goods at different quantities, thus establishing the subject's (relative) valuation of these goods.

The use of MPL in WTP elicitation is not new; for example, Kahneman et al. (1990) employ it in their seminal laboratory study on the endowment effect, involving subjects who buy and sell everyday items such as pens or mugs. Since then, the literature has grown to include both methodological studies (e.g. Andersen et al., 2007) and applied measurement (e.g. Bursztyn et al. 2018).

MPL are also commonly used for the elicitation of other preference parameters, such as time preferences and risk aversion (e.g. Andersen et al. 2008), and much of the methodological research on MPL has been done in that literature. A key difference is that risk aversion and time preference elicitation are primarily used to establish ordinal preferences (through the parameters in a utility function), whereas in WTP elicitation, the cardinal valuation is often a key research interest.

This study contributes to the methodological literature on WTP elicitation in field applications (e.g., Berry et al. 2020; Burchardi et al. 2021)). We focus on multiple price lists for the biodegradable bags, an increasingly common elicitation approach in development economics. MPL are popular because they hold the promise of both straightforward implementation for researchers and ease of comprehension for subjects.

Methodology

The study was conducted in selected formal and informal markets in Kibera Subcounty in Nairobi County. Data was collected from 7 markets within Kibera subcounty as presented in the table below. The formal markets have physical market structures and cess collected from traders while in informal markets, traders

mainly sell in the open with semi-permanent market structures. The target group included traders selling food commodities in the markets. Data on social demographic characteristics of the traders, food commodities traded, and willingness to pay for the biodegradable bags was collected.

Table 1: Food Markets in Kibera Subcounty

Formal Markets		**Informal markets**	
1	Kenyatta formal market	1	Matumbo lane market
2	Makina Hawkers market	2	Kenyatta informal market
3	Makina Stalls	3	Toi Market
		4	Othaya Market

Study Design

A representative sample of traders was randomly sampled from each market based on commodities traded and gender of the participants. About 30 traders were randomly sampled from each market based on different commodities they were selling. A total of 210 traders were therefore sampled and this sample size generated ensured that all the markets (formal and informal) were adequately covered.

Experimental Design

In this study, we employed the Multiple Price Lists (MPL) design for the willingness to pay elicitation. There are several MPL designs but for this study MPL elicit the subject's relative preference for an option A at increasing prices. In this case we have option A as the biodegradable bag where the subject makes repeated choices as the monetary value is varied systematically. Similar approach was use by Burchardi et al. (2021), about purchasing a voucher directly redeemable for money at increasing prices. The prices were ranging from 0 to 35 Kenya shillings per bag.

Data Analysis

The statistical software SPSS was employed to analyse the quantitative data and the data was uploaded from ODK/KOBO. Consistency checks during data collection were checked and the results (descriptive statistics) of the analysis were given in terms of totals, averages, ranges, frequencies, per centages, and any other forms found necessary. Graphics were done using Microsoft excel. In addition, tests of significance (T-test) was done in STATA to check if the difference in selected indicators was statistically significant.

Ethics & Accountability

To ensure ethical collection of data, study participants were explained about the study through the informed consent and voluntarily agreed to be interviewed. In addition, the study went through an ERC

approval process from Maseno University Scientific and Ethic Review Committee. The approval number is MUSERC /01219/23 dated 5th April 2025.

Limitations

The study was only limited to selected markets in one Subcounty in Nairobi County and therefore interpretation of the results may be limited in scope.

Findings

Demographic Data & Respondent Characteristics

A total of 214 traders were interviewed across Seven markets in Kibera subcounty, Nairobi County. This included 4 informal and 3 formal markets. The interviews targeted traders dealing with different foodstuffs and intended to find out the packaging used by the traders and how much they are willing to pay for the biodegradable bags.

Toi market had the highest response rate, with 73 respondents participating in the survey. Conversely, Kenyatta formal market, Makina Hawkers market, and Makina Stalls had the lowest number of respondents. The female respondents were majority from all the markets. Kenyatta market and Makina stalls had no response from the males.

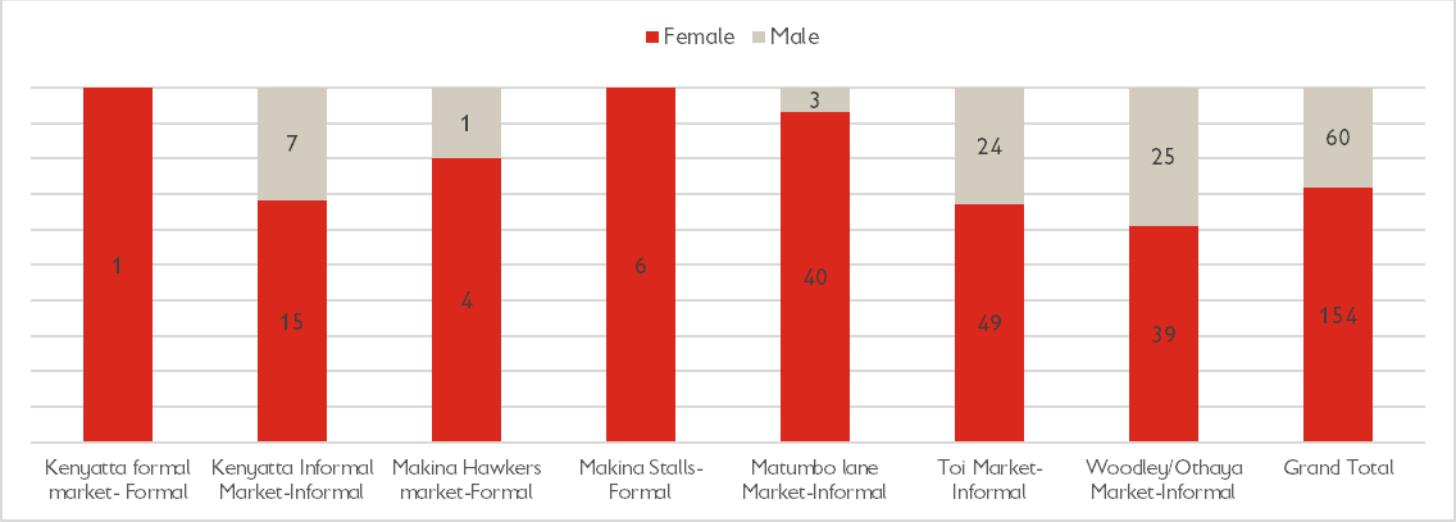

Figure 1: Summary of Market traders

The female market traders were 4 years younger than the male traders with a mean age of 38 years for the female and 42 for the male traders. The maximum age was 73 years and 72 years for the female and male traders respectively.

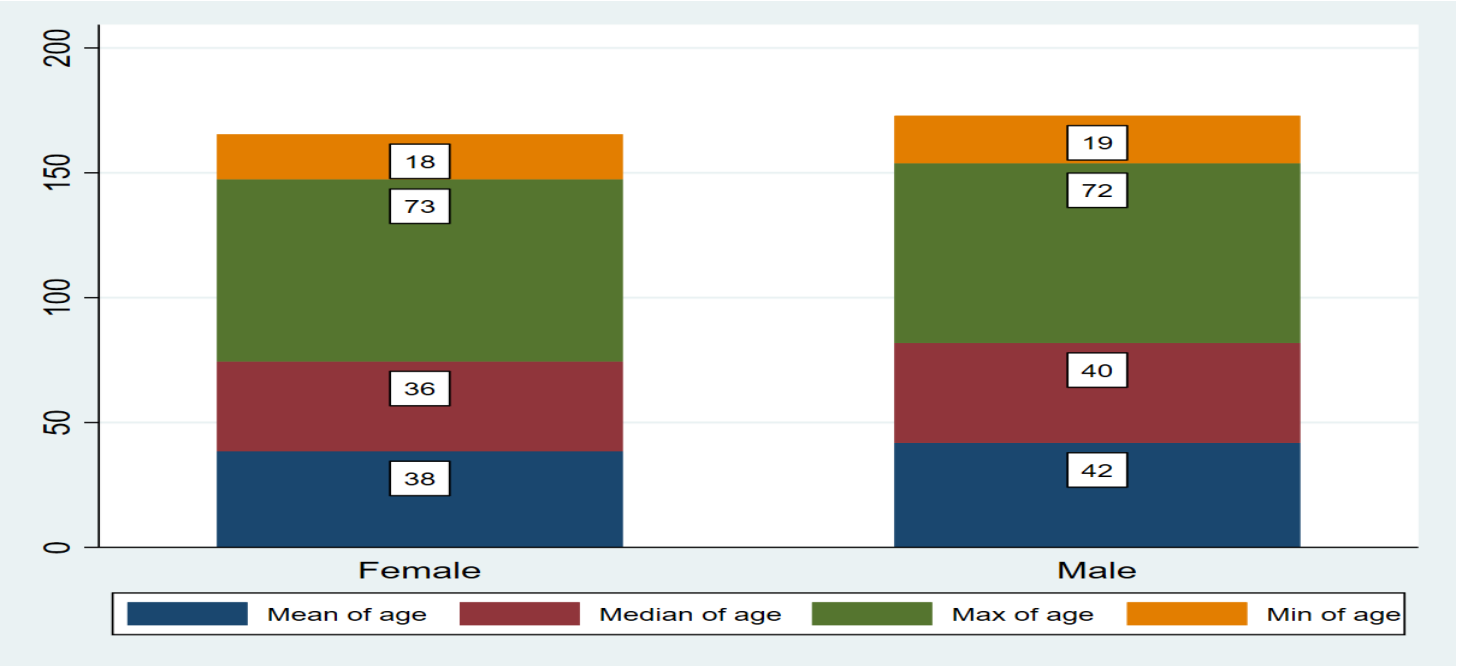

Figure 2: Age of market traders

More than three quarters of the female traders across all the markets were categorized as retailers (77 percent), while 63 percent of the males were both retailers and wholesalers. Overall, 65 percent of the traders interviewed were retailers.

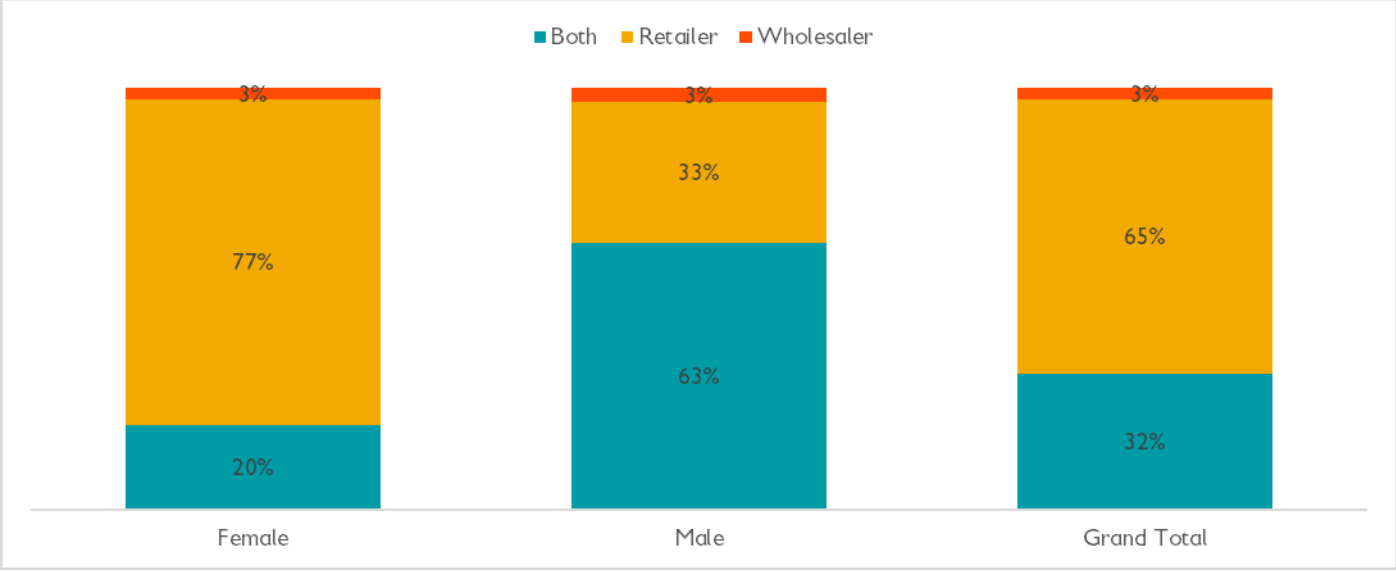

Figure 3: Types of traders

Types of foods sold

The market traders offered a variety of foods for sale to customers. The most commonly available food items were vegetables and leaves, accounting for 38.5 percent. Following closely behind were fruits, comprising 21.5 percent.

Table 2: Types of food commodities

Foods	Frequency	% of cases
Grains	45	11.39
Roots and tubers	53	13.42
Pulses	60	15.19
Vegetable and leaves	152	38.48
Fruits	85	21.52
Total	395	100

Number of customers served

The analysis revealed that the male traders were serving more customers on average with a mean of 31 customers and the females serving 24 customers. The maximum customers served per day was 200 for gender.

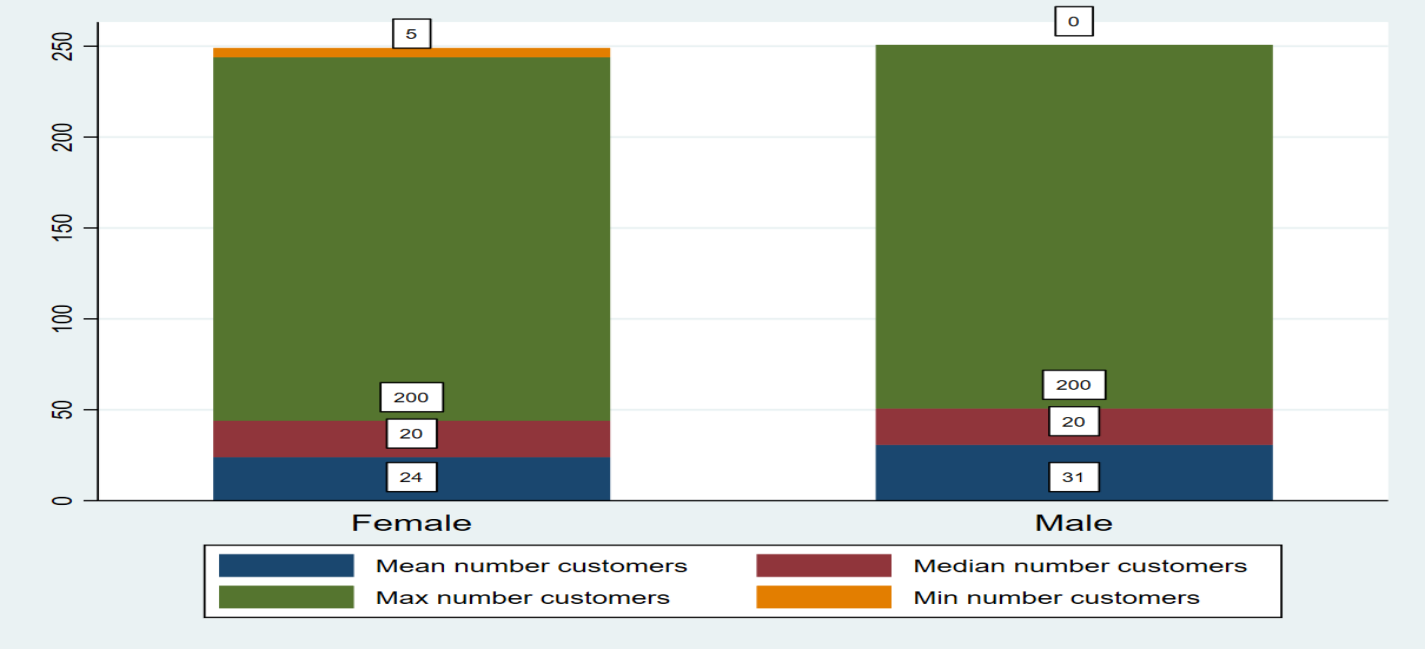

Figure 4: Number of customers served

Respondent involved in the daily operations of the business

Overall, 84 percent of the traders were the sole persons involved in the daily operations of the markets. Disaggregating by gender, 85 percent and 82 percent were female and male traders respectively were involved in daily business operations. This indicate that majority of the traders were involved in most decisions including the commodities traders, the source markets, prices offered, and the packaging materials used.

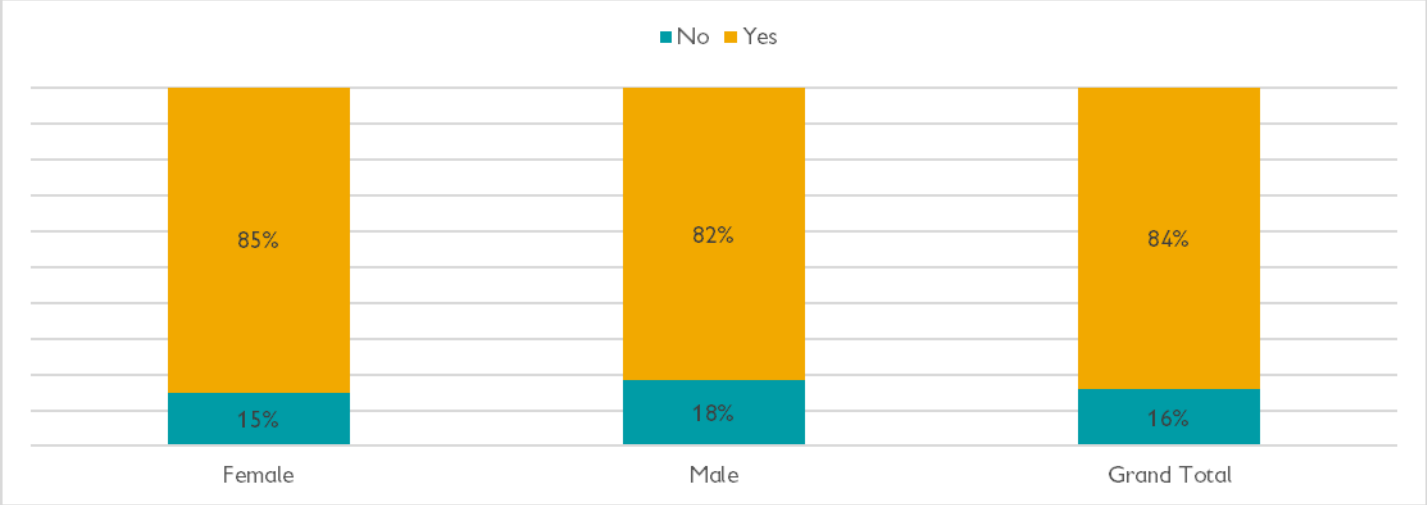

Figure 5: Involved in daily operations

Packaging/carrier bag material for the customers

Based on the analysis, it is evident that the provision of a packaging bag as an after-sale service is a common practice among market traders. Majority of female traders (84 percent) offer this service to their customers, while (62 percent) of the male traders providing packaging bags. Overall 78 percent of the traders provided packaging bags to customers.

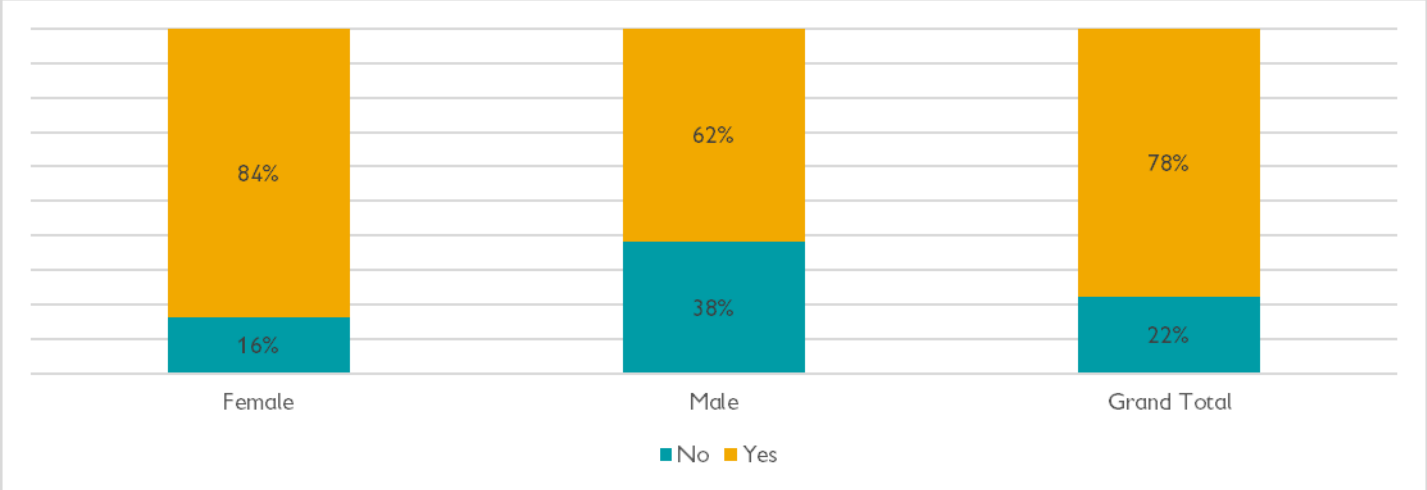

Figure 6: Providing packaging materials

In our follow-up to understand the types of bags offered to customers, we found that Uhuru/Woven bags were the most common, making up 41.2 percent of the packaging bags. Meshed bags were also common, though less so, while use of sisal bags was quite low, making up only 5.8 percent of the bags used. Notably, 7.7 percent of the traders used single use plastic bags despite the prevailing ban on the use of plastic bags.

Table 3: Type of packaging bag provided

Carrier bags provided	N	% of N
Single use plastic bags	29	7.71
Mesh bags	99	26.33
Khaki bags	23	6.12
Uhuru/Woven bags	157	41.76
Sisal bags	22	5.85
Nylon bag	45	11.97
Other specify	1	0.27

Aware of the non-plastic packaging policy

The analysis reveals a 100 percent level of awareness to the existing non-plastic packaging policy among market traders, both in formal and informal markets. The adherence levels were quite high at 93 percent in all the markets assessed. Comparison between the female and male traders was close with 92 percent and 95 percent of the female and males adhering to the policy respectively.

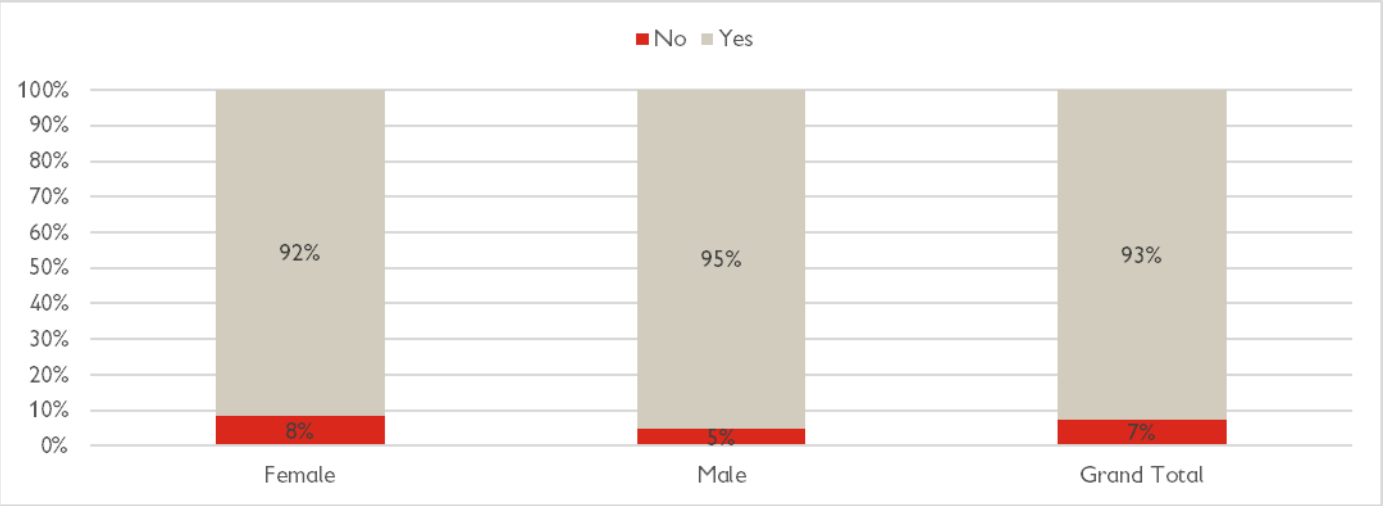

Figure 7: Adherence to the non-plastic policy

Summary statistics for income

Based on the conducted analysis, notable differences in income were observed based on gender of traders. The mean income earned per day for the female traders was KES 1502 and the males having a mean income of KES 1444. The maximum income earned pay was KES 14000. A two-sample t-test showed that the mean difference in daily income between male and female traders was not statistically significant (t=0.254).

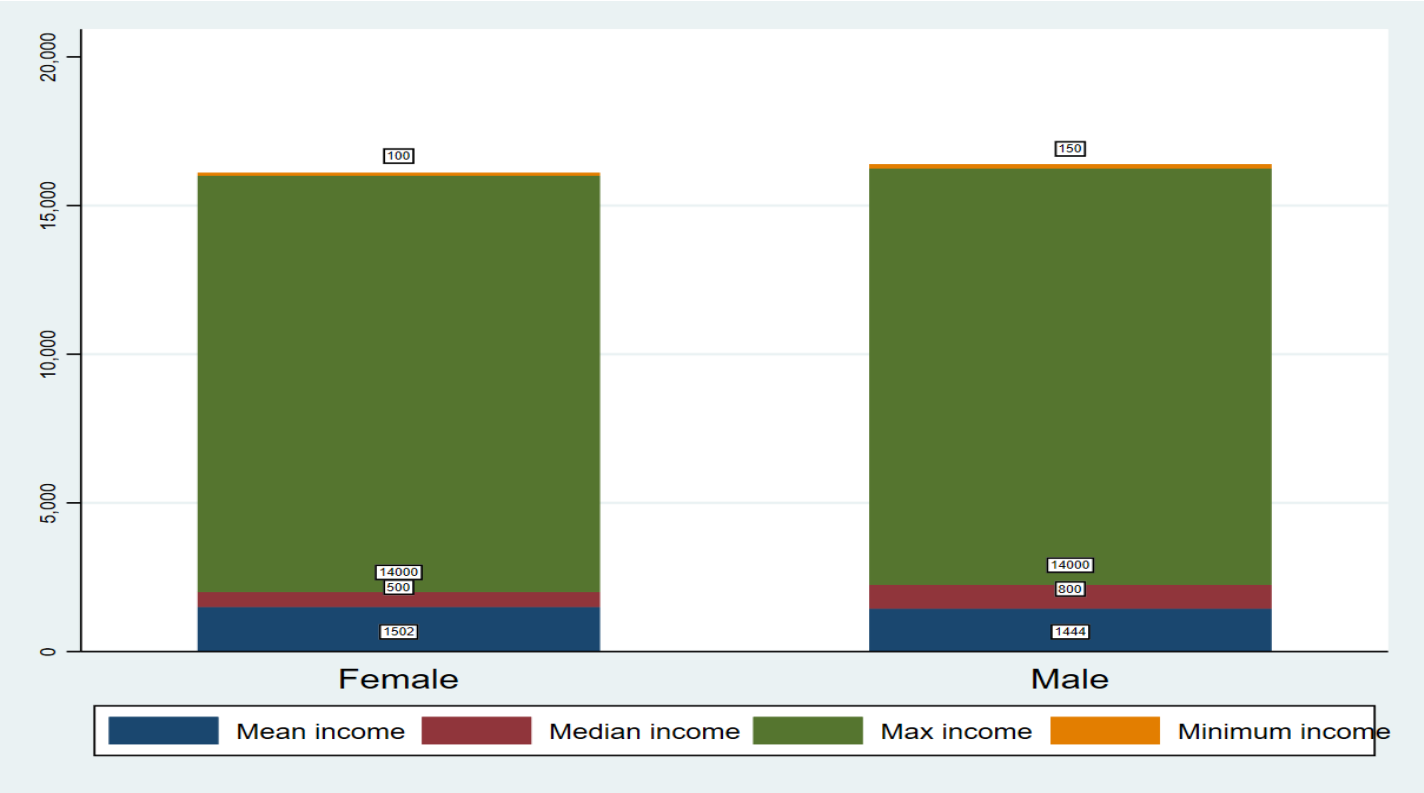

Figure 8: Average Daily income

Willingness to Pay for biodegradable bags

The analysis of the responses reported from the traders show that traders were willing to buy the bag at different prices. This showed a broad spectrum of preferences exists among respondents. The analysis shows that the price most preferred for one bag was 5 Kenyan shillings, with a large majority responding at 45.2 percent. On the contrary, only 0.23 percent of respondents showed minimal interest in bags priced at 30 shillings, which is the least favoured among traders.

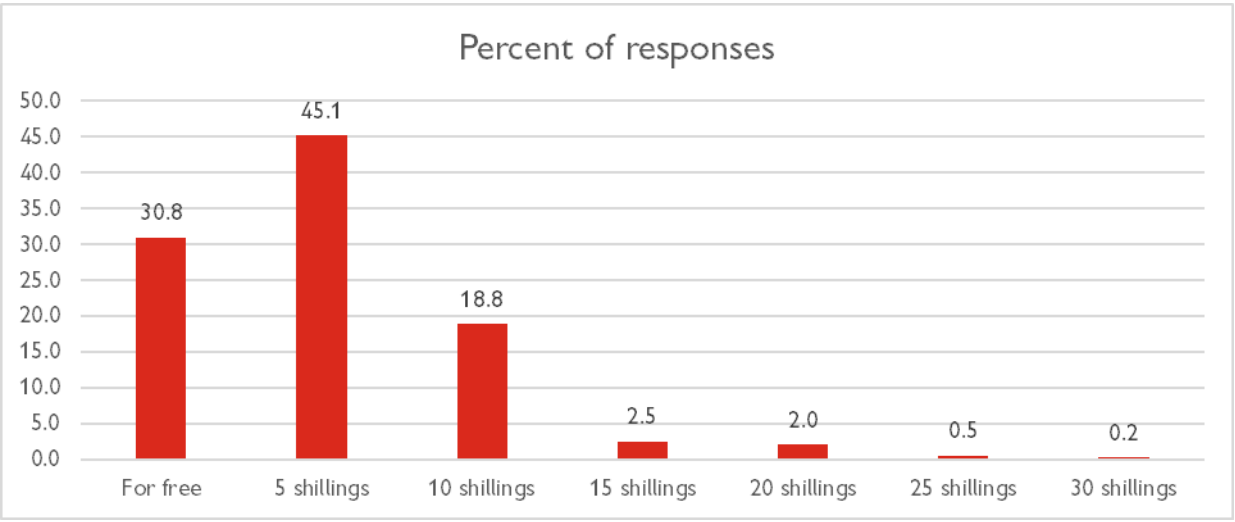

Figure 9: Willingness to pay

Preferred packaging size

The information from the market traders on the sizes of bags can easily be seen through the diverse choices among the people in that community. A majority, 48.7 percent of all respondents preferred bags of all sizes perhaps to cater to different customer needs. Notably, large bags were not popular— they represented only 9.7 percent of responses.

Table 4: Preferred sizes

Sizes	N	% of N
Small	68	22.67
Medium	57	19
Large	29	9.67
All sizes	146	48.67

Conclusions

The study explored the willingness to pay for biodegradable bags among market traders that were randomly sampled in selected food markets. These are compostable bags made of natural plant starch, can be used multiple times and are degradable within 90 days reducing the risk of environmental pollution. A representative sample of 214 traders trading in different food commodities from were interviewed from 7 different food markets in Kibera Subcounty, Nairobi.

In this study, we employed the Multiple Price Lists (MPL) design for the willingness to pay elicitation. There are several MPL designs but for this study MPL elicit the subject's relative preference for an option A at increasing prices. In this case we have option A as the biodegradable bag where the subject makes repeated choices as the monetary value is varied systematically. More than three quarters of the female traders across all the markets were categorized as retailers (77 percent) while 63 percent of the males were both retailers and wholesalers. The most commonly available food items were vegetables and leaves, accounting for 38.5 percent while fruits accounted for 21.5 percent. The analysis revealed that the male traders were serving more customers on average with a mean of 31 customers and the females serving 24 customers.

The provision of packaging bags was quite common in the market with 78 percent of the traders provided packaging bags to customers. The study found that Uhuru/woven bags were the most common, making up 41.2 percent of the packaging bags. while sisal bags were provided the least, making up only 5.8 percent. Notably, 12 percent of the traders used nylon bags despite the prevailing ban on the use of plastic bags. The awareness of the non-use of plastic bags was very high while 7percent of the traders did not adhere to this policy. On willingness to pay for the biodegradable bags, the analysis shows that the price most preferred for one bag was KES 5 shillings, with a large majority responding at 45.2 percent. On the contrary, only 0.23 percent of respondents showed minimal interest in bags priced at 30 shillings, which was the least favoured among traders. Regarding the size of the bag preferred, a majority, 48.7 percent of the traders' preferred bags of all sizes perhaps to cater to different customer needs.

Recommendations

Use of biodegradable bags is extremely significant and proves to be of great importance when it comes to reducing waste and helping the environment. With the increased use of these we can expect a greener and

a more sustainable future for our city. The study recommends that the biodegradable/decomposable bags should be made available to market traders in all sizes and at affordable prices.

The traders commended the use of the bags but recommended that the bags should be available in different sizes, transparent and made of a thicker material to carry heavier items.

Acknowledgements

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