



FACTORS INFLUENCING UTILISATION OF PLASTIC/NYLON MATERIALS CAUSING POLLUTION IN OYO STATE, NIGERIA

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Abstract

This study examined factors influencing the intensive use of plastic/nylon, which invariably leads to environmental pollution. The study was conducted in eleven (11) Local Government Areas (LGAs) of Oyo State, which was randomly selected out of the 33LGAs using structured questionnaire with fifty respondents randomly selected per LGA. A total of 454 questionnaires were valid for the research from 550 questionnaires collected. The analytical tools used were descriptive statistics (such as percentage, frequency counts and mean) and multinomial logit regression. Result showed that the average age of the respondents was 36.4years, about 81.1% of the respondents were married and 88.6% educated; attained primary, secondary or tertiary level. The average household size was 2 persons, while income was ₦32,000 per month. About 36.6% of the respondents used plastics and nylon as refuse bins, 22.5% used it for carrying material, 19.6% for storage, 11.9% for wrapping food and other items, and 9.5% as aesthetics. About 32% of the respondents affirmed that availability of plastic and nylon at their disposal influenced its utilization and many indicated using paper (38.5%) and leaves (35%) in place of plastic/nylon. Important (significant) factors influencing the use of plastic/nylon were age, occupation, income, household ownership, sources of plastic and price. It is therefore recommended that awareness on degradable, alternative materials should be encouraged because of the menace of disposal of the materials.

Keywords: Factors, Influencing, Plastic, Nylon, Utilisation

Introduction

Over 300 million metric tons of plastics are produced in the world annually and about 50% of this volume is for disposal applications; product that are discarded within few days to a year of their purchase. It is the boon and bane of our times (Sridhar and Hammed, 2016). The main cause for the increase in plastic production is the rising use of plastic packaging, which indirectly leads to environmental pollution. Most of these plastics are not biodegradable and easily discarded, which become major waste management challenges (Science for Environmental Policy, 2011). Every year, 8 million tons of plastic from all around the world flows into the ocean creating devastating effects to the health of the ocean and sea life. Plastic pollution was first found in the ocean in the 1970's; it is now becoming such a problem that it will outnumber fish by 2050 (Earth Day, 2018). In Nigeria, plastic products are used as household packaging materials; from plates, bowls, spoon, forks and bottles, to cell phone, credit cards, to industrial packaging in sachets, bags and beverage drinks to mention few. We have been so accustomed to plastic materials, as if one cannot do without using plastic in a day or come across plastics. Actually compared to other materials like metals and glass containers, it is found

cheaper, and the polythene material to manufacture is readily available. This is because plastics are produced from petrochemicals from fossil and gas (Jefferson *et al.*, 2009), which is Nigeria's main natural resources. Low income earners spend mostly on sachet water and nylons to pack food items and vegetables, while high income earners spend on hard, sophisticated plastics for decorations, toilet items, carriers, bottled drinks and as much as on dispenser bottles. It is abundantly found littering most areas of Oyo State, thus an aesthetic nuisance. It is found filling gutters, waterways and storm drains all over the city, especially the suburbs. Thus mixed plastic waste has become an environmental nuisance in Oyo State, Nigeria (Kadafa *et al.*, 2017). This study therefore examined diverse utilisation of plastic/nylon, and socioeconomic and other factors influencing the utilisation of plastic/nylon materials.

Methodology

Area of Study

A cross sectional study design was utilized to sample 362 residents from 5 urban areas in Ibadan, capital of Oyo State, Nigeria. Nigeria is located in West Africa with an estimated population size of 170,000,000 (2.04% of the world population) and a total of 774 Local

Government Areas (LGAs). Oyo State is in the Southwest geo-political zone of Nigeria and lies within longitude 3.933° East and latitude 7.85° North. It has a landmass of 28,246.264km² and a population of about 6,182,172 (Adebulu, 2014). There are 33 LGAs in the State. It is bordered in the north by Kwara, east by Osun and the south by Ogun States. In the west, it is bordered by Ogun State and the Republic of Benin. The state has an annual rainfall between 1000mm and 1400mm and has a vast area of fertile land that is suitable for the production of crops such as the vegetables, yam, cassava, cowpea, tomatoes, maize and perennial crops such as Sheanut, Cashew etc. Farming in the state is largely traditional and small scale relying on manual labour involving the use cutlasses and hoes (Ademola *et al.*, 2012).

Sampling Procedure

Multistage random sampling technique was employed in the study with the aid of structured questionnaire. Eleven (11) LGAs were randomly selected from the 33 LGAs in Oyo State. Fifty respondents were randomly selected from each LGA. But four hundred and fifty four (454) were eventually used in the study analysis instead of five hundred and fifty (550) respondents. The LGA used were Oluyole, Ibadan Southwest, Ido, Lagelu, Atiba, Owode, Ibadan North, Ibadan Northeast, Ogbomosho North, Ogbomoso south and Orire. Descriptive tools such as percentage, frequency and mean were used in the analysis with Multinomial logit regression.

Multinomial Logit

Whenever there is a dependent variable that has more than two alternatives from which decision maker has to choose, the requisite econometric model would be either Multinomial Logit or Ordered Probit Regression Model. It estimates the effect of predictor variables on dependent variable involving multiple choices with unordered response categories (Greene, 2000). Therefore, since the response variable for this study has more than two categories, Multinomial Logistic Regression Model was considered appropriate. It is a simple extension of the binary choice model and is the most frequently used model for nominal outcomes that are often used when a dependent variable has more than two choices. Therefore, for this study, five mutually exclusive utilisation types were identified. These are for; refuse bin, storage, carrying of materials, wrapping and aesthetics. Based on literature, Multinomial Logit Model is a widely used technique in applications that analyze 'polytomous' response categories in different areas of economic and social studies. Therefore, following Greene (2003), suppose for the ith respondent faced with j choices, the utility choice j can be specified as:

$$U_{ij} = Z_{ij} \beta + \epsilon_{ij} \dots\dots\dots (1)$$

If the respondent makes choice j in particular, then U_{ij} is the maximum among the j utilities. So the statistical model is derived by the probability that choice j is made,

which is:

$$\text{Prob}(U_{ij} > U_{ik}) \text{ for all others } K \neq \dots\dots\dots (2)$$

Where; U_{ij} is the utility to the i_{th} respondent from utilisation strategy j; and U_{ik} is the utility to the i_{th} respondent from utilisation strategy k. Thus, the ith household's decision can be modeled as maximizing the expected utility by choosing the jth utilisation strategy among J discrete utilisation strategies, that is:

$$\text{Max}_j = E(U_{ij}) = f_j(x_i) + \epsilon_{ij}, \quad j=0 \dots J \dots\dots\dots (3)$$

In general, for an outcome variable with J categories let the j_{th} utilisation strategy be that the i_{th} household chooses to maximize its utility take the value 1 if the i_{th} household chooses j_{th} utilisation strategy and 0 if otherwise. The probability that a household with characteristics x chooses utilisation strategy j, P_{ij} is modeled as:

$$P_{ij} = \frac{\exp(\alpha_i \beta_j)}{\sum_{i=0}^j \exp(\alpha_i \beta_j)} \quad j=0 \dots\dots\dots (4)$$

With the requirement that $\sum_{i=0}^j P_{ij} = 1$ for any i

Where; P_{ij} = probability representing the i_{th} respondent's chance of falling into category j; X_i = predictors of response probabilities; and β_j = covariate effects specific to j_{th} response category with the first category as the reference. A convenient normalization that removes indeterminacy in the model is to assume that β₁ = 0 (Greene, 2000).

- Y = Refuse bin (Reference category)
- Y₂ = Storage
- Y₃ = Carrying materials
- Y₄ = Wrapping
- Y₅ = Aesthetics
- X₁ = Age (years)
- X₂ = Sex (dummy variable; 1= male, 0=female)
- X₃ = Marital status (dummy variable; 1= male, 0=female)
- X₄ = Occupation (dummy variable, 1=full time farming, 0=otherwise)
- X₅ = Educational level (years)
- X₆ = Household size (number of persons)
- X₇ = Income (N)
- X₈ = House ownership (dummy variable; 1=yes, 0=no)
- X₉ = Source of plastic to homes (dummy variable; 1=packaging, 0=otherwise)
- X₁₀ = Amount spent (N)
- X₁₁ = Alternative to Plastic/Nylon (dummy variable; 1=paper, 0=otherwise)
- X₁₂ = Price (N)

Results and Discussion

Socioeconomic Characteristics of the respondents

The result in Table (1) shows that majority (69.6%) of the respondents were females. This is because females are the ones who go to market; especially for food items and plastic /nylon, which are used mostly for packing or wrapping items. This could be because it is cheaper or

relatively available. Most (81.1%) of the respondents were married, 8.1% attained primary level of education, 42.1% secondary education, 46.5% tertiary education and only 15% did not have any form of formal education. With more education, they may be better informed on plastic/nylon utilisation and proper waste management practices. This is possible because as the level of education increases there is likely to be more

awareness and knowledge of the importance of plastic/nylon utilisation and disposal (Akerele *et al.*, 2015). Majority of the households (83.9%) had household range between 1 and 5 persons with a mean of 2 persons. This implied that utilisation of plastic/nylon is not restricted or dependent on small or large family size. The mean monthly income is ₦32,000, this made them to be able to afford plastic/nylon.

Table 1: Socio-Economic Characteristics of the Respondents

Variable	Frequency	Percentage	Mean
Age			36.4
16-30	140	30.6	
31-45	245	54.0	
46-60	62	13.7	
≥ 61	7	1.5	
Sex			
Male	138	30.4	
Female	316	69.6	
Marital Status			
Single	76	16.7	
Married	368	81.1	
Widow	7	1.5	
Separated	3	0.7	
Occupation			
Civil service	138	30.4	
Trading	214	47.1	
Artisan	77	17.0	
Farming	11	2.4	
Others	14	3.1	
Educational level			
Primary	37	8.1	
Secondary	191	42.1	
Tertiary	211	46.5	
No formal education	15	15.0	
Household size			1.59≈2
1-5	381	83.9	
6-10	62	13.7	
11-15	7	1.5	
16>	4	0.9	
Income ₦			1(₦32,000)
10,000-50,000	273	60.2	
51,000-100,000	115	25.3	
101,000-150,000	43	9.5	
151,000-200,000	12	2.6	
200,000>	24	2.4	
House ownership			
Yes	130	28.6	
No	324	71.4	

Source: Field Survey, 2020

Plastics and Nylon Utilisation

The results in Table 2 show the frequency distribution of Utilisation of plastics and nylon materials. Various uses of plastics/nylon were given by the respondents in the study area. About 37% of the respondents use plastics and nylon as refuse bin, 14% use it to store or preserve items, another 9.5% use it to wrap food and other items, 6% as aesthetics, very few (2%) to store water and keep clothing materials, while 29% had multiple purpose use of it; such as refuse bin, wrapping, store food, keep clothing, storage and aesthetics. This is in line with Association of African Entrepreneurs (2017) discovery

that nylon bags are essentially in great demand and has vast uses; can be sold to shopping malls, supermarkets, individuals, restaurants, public markets, water factories and waste management companies.

Sources of plastics and nylon int households: The study shows that plastic/nylon get into households in diverse ways but especially from packaging materials from items bought from shopping mall, foodstuff markets or other places (Table ii.) Majority (75%) of the respondents stated that they got plastics into their households through packaging materials, another 13%

of the respondents disclosed that plastics and nylon got into their households through purchase, 6% of the respondents maintained that plastics and nylon got into their households either through purchase, packaging or gift while 3.5% of the respondents obtained plastics and nylon through gift and the remaining 2% got plastics and nylon through souvenir. This is supported by Association of African Entrepreneurs (2017), who noted that plastic/ nylon enters the household through bottle and sachet water. Due to the inadequate supply of public drinking water, 8 in 10 households in the urban cities drink sachet water and plastic bottled water. More than 65% of individuals drink sachet water which has resulted to about 60 million used water sachet disposed daily across the country.

Factors influencing use of plastics and nylon: About 32% of the respondents affirmed that availability of plastic and nylon at their disposal influence its utilization (Table 2), 20% noted that its light weight influence its utilization, 16% stated that it is flexible and thus makes it easier to use, while 12% affirmed that price and environmental awareness influence its utilization. This is corroborated by Olanrewaju and Oyeboade (2019), that plastics are durable, lightweight and inexpensive material, which moulds readily into a variety of products with wide range of applications. Also, some socio-economic factors such as age, household size, monthly income and educational level of the respondents (1.8%, 2.4%, 3.3% and 2.4%) respectively also influence its utilization and 4% noted

that combination of one or more factors could influence plastics and nylon utilization in the study area. This suggests that there are many factors that influence the use of plastics and nylon by the respondents.

Alternative materials for plastics and nylon: Many of the respondents used paper (38.5%) and leaves (35%) in place of plastics/nylon, 12% used ceramics, while, glass bottle were used by 11% of the respondents with very few (2.6%) who made use of other things available in their environment as against plastics/nylon. This clearly indicates that some respondents used other materials in place of plastics/nylon.

Threat that plastics and nylon waste pose to the environment: Plastics and nylon waste pose many threats to the environment. About 29.5% of the respondents stated that plastics/nylon waste disposal block water ways, another 22% opined that it litters the neighborhood, 20% indicated that waste forms heaps along major streets across the city, 10% that it causes water pollution, while 7% stated it poses threat on human health. It can be inferred that plastics and nylon waste pose many threats to the environment. This is reiterated by Zvanaka *et al.* (2020), that plastics/nylon is persistent pollutant and threat to the environment. By 2050, it is estimated that the cumulative amount of plastics ever produced will reach 34 billion tonnes, with 12 billion tonnes of plastic waste either in landfills or the environment as litter at current consumption levels (Geyer *et al.*, 2017)

Table 2: Plastic/Nylon Utilisation

Variable	Frequency	Percentage
Source of plastics and nylon		
Packaging	342	75.3
Gift	16	3.5
Souvenir	11	2.4
Purchase	58	12.8
Combination	27	5.9
Use of plastics and nylon		
Refuse bin	166	36.6
Carrying things	102	22.5
Storage	39	19.6
Wrapping items	54	11.9
Aesthetic	43	9.5
Materials used in place of plastic and nylon		
Leaf	159	34.9
Glass bottle	52	11.4
Ceramics	56	12.3
Paper	175	38.5
Others	12	2.6
Factors influencing plastic and nylon use		
Price	53	11.6
Light weight	92	20.2
Availability	145	31.9
Age	8	1.8
Income	15	3.3
Household size	11	2.4
Flexibility	74	16.3
Educational level	12	2.6
Environmental awareness	26	5.7
Combinations of any	18	3.9
Threat to the environment		
Blocking water ways	134	29.5
Air pollution	47	10.3
Heaps along the street	90	19.8
Health implication	32	7.0
Littering the neighborhood	101	22.2
Combination	45	9.9
Others	5	1.1

Source: Field Survey, 2020

Determinants of Plastic/Nylon Utilisation

Some socioeconomic factors were regressed against five dependent variables using Multinomial logit model. Age, occupation, income, household ownership, sources of plastic and price were factors found significant, influencing plastic/nylon utilisation in the study area (Table 3). Age was significant at 10% and the odds ratio of 1.042. This implies that increase in age of respondents by 1 year will lead to the probability of use of plastic/nylon for storage than for refuse bin by 1.042 units. The majority of respondents within the age group in this study are more liable to buy basic consumer goods related to health, food, clothing and household articles, following Schultz (2009). Age, location, occupation and amount charged for waste collection were determinant factors affecting waste collection services in Ibadan (Afon, 2007). Occupation influenced the utilisation of plastic/nylon as carrying material, rather than for refuse bin, and significant at 10% level with an odds ratio of 0.454. This results follows the findings of Lynn *et al.* (2017) that global plastic demand is mainly used for packaging and it is estimated that

about half of the global packaging, by end market, is used for packaging food. Income influenced the use of plastic/nylon for wrapping of food, and significant at 10% with an odd ratio of 0.526. This implies that the respondents use plastic/nylon for wrapping food items, than for refuse bin. This study is in contrast to Afon (2007) who stated that education, occupation and income influences the use of plastics/nylon for waste generation. Furthermore, household Ownership influenced the use of plastic/nylon utilisation for carrying and wrapping of food items at 5% significant level and have odd ratio of 1.876 and 3.137 respectively. This explains the fact that the being a house owner determines the plastic/nylon for being used for carrying and wrapping items than for refuse bin. The source of plastic/ nylon into homes is also very important and was significant 5% and 10% for storage and for carrying materials respectively. The odds ratio for storage (1.371) and for carrying material (2.657) were above one, implying that how plastic/nylon come into the house influence the use, but preferred being used for storage and wrapping than for refuse bin. Plastic/nylon

is generally cheap and given out cheaply as souvenir, at market and as packaging, so can afford to use at will. This is in consonant with Zvanaka *et al.* (2020), that plastics get into homes through medical, transportation, manufacturing, water, and sanitation and food packaging. Price is another factor that influenced the

utilisation of plastic/nylon for storage and the wrapping and significant at 1% level each. This means that price influenced being preferred to use as storage and carrying material than for refuse bin, in contrast with the findings of Resbung *et al.* (2020).

Table 3: Multinomial Logit estimates of Determinants of Utilisation of Plastic/Nylon materials

Variable	Storage (Y2)	Odds Ratio	Carrying materials (Y3)	Odds Ratio	Wrapping (Y4)	Odds Ratio	Aesthetics, (Y5)	Odds Ratio
Intercept	.395		.721		.485		.213	
X ₁ = Age	.096*	1.042	.485	1.093	.519	1.023	.221	1.039
X ₂ = Sex	.462	1.302	.877	1.904	.152	2.078	.389	.627
X ₃ = Marital status	.275	.566	.679	6.375	.640	1.482	.902	.910
X ₄ = Occupation	.951	1.012	.201	.470	.070*	.454	.185	1.405
X ₅ = Education	.974	.992	.659	.261	.512	1.306	.333	1.363
X ₆ = Household size	.555	1.198	.337	1.784	.229	1.611	.792	.871
X ₇ = Income	.498	.863	.740	.373	.060*	.526	.145	.614
X ₈ = House ownership	.333	1.514	.031**	1.876	.041**	3.137	.105	2.426
X ₉ = Source of plastic to homes	.041**	1.371	.075*	2.657	.103	1.429	.655	.862
X ₁₀ = Amount spent	.368	1.000	.496	1.001	.143	1.000	.346	1.000
X ₁₁ = Alternative to Plastic/Nylon	.326	1.130		1.456	.972	1.007	.563	.908
X ₁₂ = Price	.002***	.823	.274	.671	.013***	.787	.357	.929

Source: Field Survey, 2020; ***, **, * represents 1%, 5% and 10% level of significance respectively

Refuse bin = reference category

Conclusion

From the study, it was found that the factors influencing the utilisation of Plastic/Nylon utilization were; age, occupation, income, house ownership, source of plastics/nylon and price at varying levels of significance. Various uses of plastic/nylon were identified in the study from refuse bin, storage, wrapping, to aesthetics. It was found that most of the respondent use plastic/nylon because of the price, availability and flexibility. Also found that plastic/nylon gets to the households through packaging, gift, souvenir and purchases. It is therefore recommended because of the wide use of plastic/nylon and disposal problems, stakeholders should improvise for degradable and alternative materials such as leaves and papers to reduce the intensive use of the plastic/nylon. Also, need to prevent environmental pollution caused by plastic/nylon wastes, reuse and recycling are advocated.

References

- Adebulu T. (2014). The Nation Newspaper of June 5, 2014.
- Ademola, A.O., Oyesola, O.B. and Osewa, S.O. (2012). Assessment of shea butter processing among rural dwellers in Atisbo local Government area of Oyo state, Nigeria. *European Journal of Business and Social Sciences*, 1 (6): 1-8. Available on <http://www.ejbss.com/recent.aspx>.
- Afon, A (2017). An analysis of solid waste generation in a traditional African city: The example of Ogbomoso, Nigeria. Available on: <http://eau.sagepub.com/content/19/2/527>.
- Akerele, E.O., Ologbon, O.A., Otunaiya, A.O. and Ambali, I.O. (2015). Analysis of Beef Consumption Patterns among Rural Households in

Yewa South Local Government Area of Ogun State, Nigeria. *Journal of Sustainable Development in Africa* 17(8): 1520-5509.

- Association of African Entrepreneurs (2017). Remove, Reduce, And Recycle – The Waste Nylon Sachet Water in Nigeria. Available on <https://aaefr.org/home>.
- Earth Day (2018). End plastic pollution. Facts Sheet: Plastics in the ocean. Available on <https://www.earthday.org/fact-sheet-plastics-in-the-ocean/>.
- Geyer, R., Jambeck, J.R. and Law, K.L. (2017). Production, use, and fate of all plastics ever made. *Sci. Adv.* 2017, 3, e1700782. [Google Scholar] [CrossRef] [PubMed]
- Greene, W. H. (2000). *Econometric Analysis*. 4th Edition, Prentice Hall, Englewood Cliffs.
- Greene, W.H. (2003). *Econometric Analysis* 5th Stern School of Business, Prentice Hall, Upper Saddle River. New York University.
- Lynn, H., Rech, S. and Mantingh, M.S. (2017). Plastics, Gender and the Environment. Women Engage for a Common Future in The Netherlands / France / Germany www.wecf.org. ISBN 978-3-9813170-8-4
- Jefferson, H., Robert, D. and Edward, K. (2009). Plastics recycling: challenges and opportunities. *Philosophical Transactions of the Royal Society London. Biological Science*, 364(1526): 2115–2126. doi: 10.1098/rstb.2008.0311
- Kadafa, A.A.I., Ayuba, H.K.I. and Idris N.M.I. (2017). Mixed Plastic Waste As An Intractable Environmental Problem In Abuja, Nigeria. *International Journal of Science, Environment and*

- Technology*, 6(2):971–979.
- Norusis M.J. (2005). SPSS14.0 Advanced Statistical procedures companion, upper saddle river, NJ Prentices, PP92.
- Olanrewaju O.O. and Oyeboade, D. (2019). Environmental Menace Of Plastic Waste In Nigeria: Challenges, Policies And Technological Efforts,Conference: Transition Pathways To Sustainable Development Goals: Integrated Landscape Approach, Economic Well Being And Inclusive Climate Resilience. At: Akure, Ondo State, Nigeria
- Renburg, V.M., Nkomo L. and Dube T. (2020). The 'plastic waste era'; social perceptions towards single-use plastic consumption and impacts on the marine environment in Durban, South Africa. *Applied Geogrpny*, 114:102-132, DIO 10.1016/j.apgeoy
- Science for Environmental Policy (2011). *Plastic waste: redesign and biodegradability*. Brussels: European Commission. Pp. 1–8.
- Schultz, I. (2009). Gender aspects of sustainable consumption strategies and instruments. Policies to Promote Sustainable Consumption Patterns., Available on : <http://www.isoe.de/uploads/media/eupopp-genderisoe-2009.pdf>.
- Sridhar, M.K.C. and Hamed, T.B. (2016). Plastic Oceans: A New Way in solving Our Plastic Pollution The University of San Francisco USF Scholarship: a digital repository @ Gleeson Library | Geschke Center.. Master's Theses, Dissertations, Capstones and Projects.
- Zvanaka, E.M., Mazhandu, S., Tirivaviri, A., Belaid, M.M. and Trust Nhubu, T. (2020). Integrated and Consolidated Review of Plastic Waste Management and Bio-Based Biodegradable Plastics: Challenges and Opportunities. *Sustainability* , 12 (20): 8360; <https://doi.org/10.3390/su12208360>