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Evaluating the Relationship Between Solid-Food Waste, Environment and Economic Security among Malnutrition in Nigeria

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Abstract

Solidfood waste generation is estimated at 126.2 million tonnes and 239.8 million tonnes of carbon dioxide equal by 2020 ending. This huge solid waste costs Nigeria $750 billion annually while millions of Nigerians are hungry and poor. Nigeria also ranks verylow in nutrition with the highest number of malnourished children under 5 years in subSaharan Africa. 37% of Nigeria children are stunted, 18% wasting and 20% under weight these stunning figures rank Nigeria as the second highest globally [1]. While developed countries have been able to manage waste properly for increased environment and economic security, this is far fetched in Nigeria. Since solid food waste can cause health, environment and socio economic problems, there is need to investigate the relationship between solid food waste, environment and economic security [2]. The main objective of this study therefore was to evaluate the relationship between solid food waste, environment and economic security among malnutrition in Nigeria. Data on waste management practices were obtained through structured questionnaires randomly administered on 210 households in Nigeria. Experts' workshops and interviews were organised for key officials within relevant industries to elicit technical and economic information. The relationship between: waste, environment and economic security in Nigeria was examined for years 1981 to 2017. While waste management practices were evaluated using descriptive and inferentialstatistics, Auto regressive distributive lag (ARDL) was used to determine the relationship between solid food waste, environment and economic security. Pollution/ Healthrisks (69.1%), limited resources/ funding (44.8%), lack of technical skill (23.8%) and inadequate management skill (18.1%) are some identified challenges. 94.3% and 96.2% supported polluters' pay principle and dissemination of public information on food packaging as well as waste reduction reuse recycling as part of waste management practices respectively. 97.1% of annually generated waste are solid waste, which confirms the Waste Habit of Nigerians as 57% organic/foodwaste, 27% plastics, 5% glass, 5% metal and 4% others. 126.2 million tonnes food waste equaling 239.8 million tonnes of carbondioxide and $750 billion is generated yearly in Nigeria. 95% are willing to pay for waste management. Hypothesistest yields a significant result at p value <0.05 which shows that waste management challenges has effect on health issues/ pollution in Nigeria [3]. ARDL model F statistics of 30.7805 confirms the long term relationship between measured variables related to solid food waste generation, environment and economic security. ARDL model also confirms the inverted correlation between economic growth and environmental degradation of Environmental Kuznet Curve's hypothesis. At 0.0048 pvalue, the estimates enjoy the support of statistical significance at 5%. Undertaking established waste management significantly limits the impacts on health environmentsocioeconomic wellbeing [4]. The research shows that improved funding and dissemination of public information on food packaging, as well as waste reduction reuse recycling enhance social acceptability of waste management practices. This research also shows that solid food waste has significant impact on environment and economic security.

Keywords: Environmental Quality, Health, Socioeconomic Wellbeing, Waste Management

Introduction

Waste generation and disposal is has become a basic part of any nation including Nigeria. Waste, both from domestic and commercial sources has grown significantly in Nigeria over the past decade (see table 1). This can be connected to increasing population growth: every time people shop in stores or open markets; they contribute to the mountains of waste generated in their environment and the country at large with attendant environmental health and socioeconomic implications [5, 6]. These implications of depict that waste management is both a national and global concern. In Nigeria, solid-food waste generation is estimated at 126.2million tonnes and 239.8 million tonnes of carbon -dioxide equal by 2020 ending. This huge solid -waste costs Nigeria $750 billion annually while millions of Nigerians are hungry and poor. Nigeria also ranks very-low in nutrition with the highest number of malnourished children under 5 years in Sub Saharan Africa. 37% of Nigeria-children are stunted, 18% wasting and 20% underweight - these stunning figures rank Nigeria as the second highest globally [7]. While developed countries have been able to manage waste properly for increased environment-and-economic-security, this is far-fetched in Nigeria. Since solid-food waste can cause health, environment and socioeconomic problems, there is need to investigate the relationship between solid-food waste, environment and economic security. The main objective of this study therefore was to evaluate the relationship between solid-food-waste, environment and economic security among malnutrition in Nigeria.

Table 1: Types and Sources of Waste

SOURCE	TYPE	COMPOSITION
Municipal Solid Waste (MSM)	Residential	Food wastes, paper, cardboard, plastics, textiles, leather, yard wastes, wood glass, metals, ashes, special wastes (e.g. bulky items, consumer electronics, white goods, batteries, oil, Tires), household hazardous wastes, e-wastes.
MSM	Industrial	Housekeeping, wastes, packaging, food wastes, wood, steel, concrete, bricks, ashes, hazardous wastes.
MSM	Commercial & Institutional	Paper, cardboard, plastics, wood, food wastes, glass, metals, special wastes, hazardous wastes, e-wastes.
MSM	Construction & Demolition	Wood, steel, concrete, soil, bricks, tiles, glass, plastics, insulation, hazardous waste.
MSM	Municipal Services	Street sweepings, landscape & tree trimmings, sludge, wastes from recreational areas.
Process Waste		Scrap materials, off-specification products, slag, tailings, top soil, waste rock, process water & chemicals.
Medical Waste		Infectious wastes (bandages, gloves, culture, swabs, blood & body fluids), hazardous wastes (sharps, instruments, chemicals), radioactive wastes, pharmaceutical wastes.
Agricultural Waste		Spoiled food waste, rice husks, cotton stalks, coconut shells, pesticides, animal excreta, soiled water, silage, effluent, plastics, scrap machinery, veterinary medicines.

Material and Methods

Survey Methods

Data on waste management practices were obtained through structured-questionnaires randomly administered on 210 households in Nigeria. Experts' workshops and interviews were organised for key officials within relevant-industries to elicit technical and economic information. The relationship between: waste, environment and economic security in Nigeria was examined for years 1981-to-2017. While waste-management-practices were evaluated using descriptive-and-inferential-statistics, Autoregressive distributive lag (ARDL) was used to determine the relationship between solid-food waste, environment and economic security.

Figure 1: Map of Nigeria (IITA)

Figure 2: Map of Southwestern Nigeria (IITA)

Results and Discussion

Pollution / Health risks (69.1%), limited resources / funding (44.8%), lack of technical skill (23.8%) and inadequate management skill (18.1%) are some identified challenges. 94.3% and 96.2% supported polluters' pay principle and dissemination of public information on food packaging as well as waste reduction reuse recycling as part of waste management practices respectively. 97.1% of annually generated waste are solid-waste, which confirms the Waste Habit of Nigerians as 57% organic/food-waste, 27% plastics, 5% glass, 5% metal and 4% others. 126.2 million tonnes food-waste equaling 239.8million tonnes of carbon dioxide and $750 billion is generated yearly in Nigeria. 95% are willing to pay for waste management [8]. Hypothesis test yields a significant result at p-value <0.05 which shows that waste management challenges has effect on health issues/pollution in Nigeria. ARDL model F-statistics of 30.7805 confirms the long-term relationship between measured variables related to solid-food waste generation, environment and economic security. ARDL-model also confirms the inverted correlation between economic growth and environmental degradation of Environmental Kuznet Curve's hypothesis. At 0.0048 p-value, the estimates enjoy the support of statistical significance at-5%.

Survey Pictures

Figures 3-9: Pictures for Fieldworks and Experts Workshops

Results in Diagrams

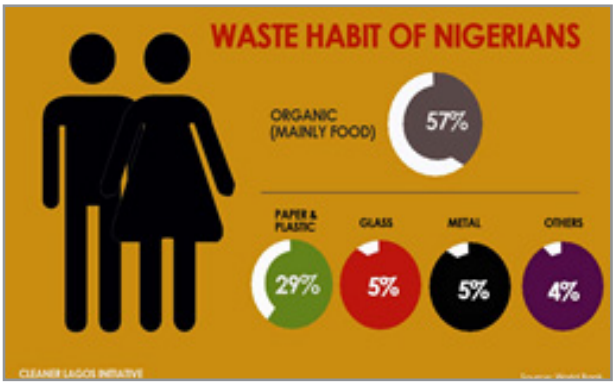

Figure 10: Waste Habit in Nigeria

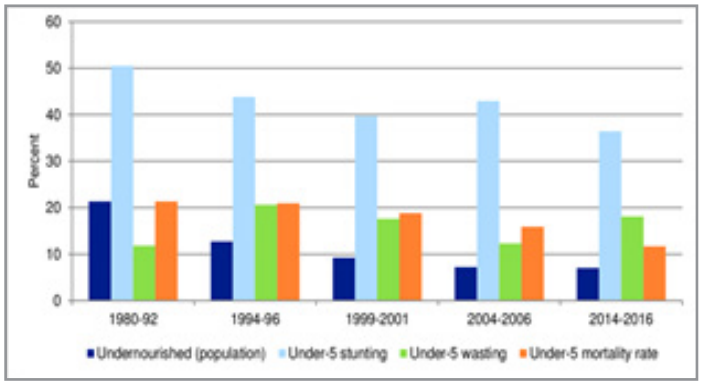

Figure 11: Under 5 Malnutrition in Nigeria (NISER)

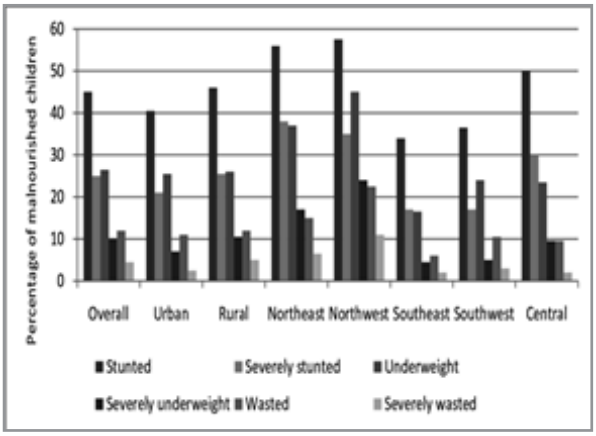

Figure 12: Nigeria Malnutrition Categorization (UNDP, BO)

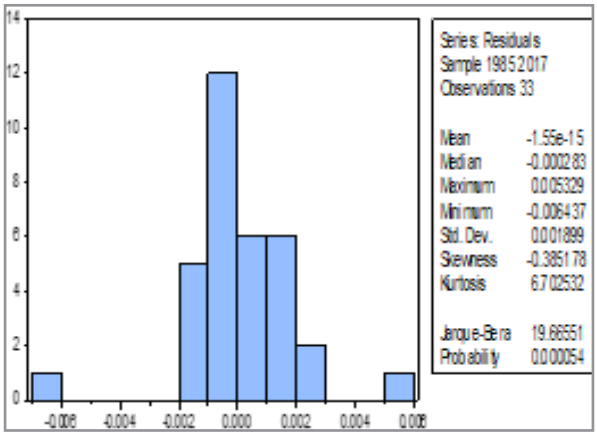

Figure 13: ARDL Normality Test

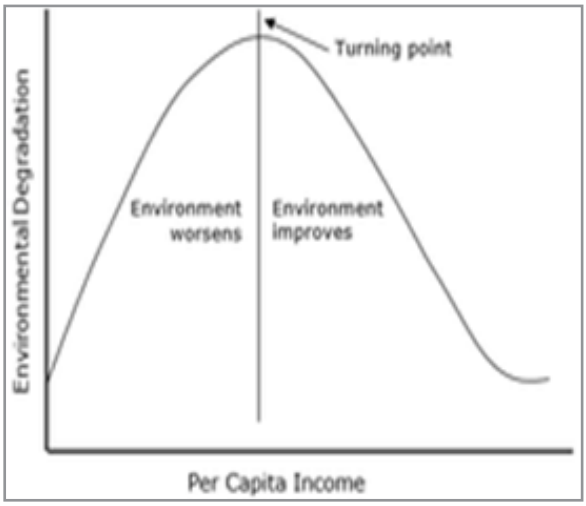

Figure 14: Environmental Kuznet Curve (EKC)

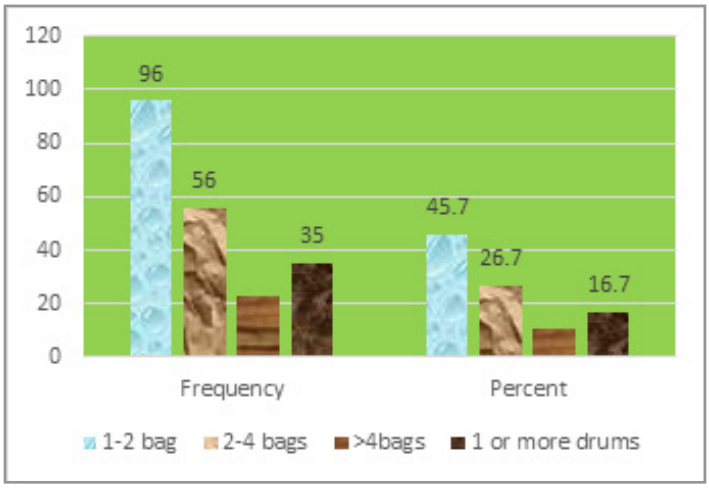

Figure 14: Household Weekly Waste Generation

Table 2: ARDL -Descriptive Statistical Technique was Used to Analyze the Data &Following Results Obtained:

	LOG(GDPC)	LOG(WTE)	CO2	EXC	LOG(FDI)	LOG(GCF)	LOG(LAB)
Mean	7.394468	4.339318	0.597777	149.6606	21.21665	23.99739	2.684883
Median	7.263262	4.333679	0.587523	99.25265	21.18917	23.64689	3.685940
Maximum	7.848970	4.388360	0.873822	531.2015	22.90268	25.02718	5.978633
Minimum	7.048496	4.288979	0.325376	48.96753	19.05813	22.98240	-1.819208
Std. Dev.	0.274093	0.030311	0.170759	120.0366	1.091789	0.635659	2.757666
Skewness	0.499828	-0.055610	-0.045578	1.781252	-0.144698	0.438650	-0.448909
Kurtosis	1.607913	1.602206	1.866957	5.315758	2.058158	1.718454	1.761186
Jarque-Bera	4.528215	3.031220	1.991980	27.83350	1.496677	3.718523	3.608636
Probability	0.103923	0.219674	0.369358	0.000001	0.473152	0.155788	0.164587
Sum	273.5953	160.5548	22.11775	5537.441	785.0160	887.9034	99.34067
Sum Sq. Dev.	2.704576	0.033075	1.049709	518716.7	42.91208	14.54624	273.7700
Observations	37	37	37	37	37	37	37

Conclusions and Outlook

Without mincing words, solid-food waste can be minimized for nutritious food security and recycled sustainably through food packaging and circular economy technologies respectively [9, 10]. The appropriate technologies must be climate-&-environment friendly and economical. Policies that would enhance both minimization and sustainability of solid-food waste through circular economy are also are also required.

Undertaking established waste management significantly limits the impacts on health-environment-socioeconomic well-being. The research shows that improved funding and dissemination

of public information on food packaging, as well as waste reduction reuse recycling enhance social acceptability of waste management practices. This research also shows that solid-food waste has significant impact on environment and economic security. It is recommended that emphasis should be placed on following "REDIPODI" to foster effectiveness in circular economy and unlock the potentials in waste as a viable resource;

- R – reduce process waste
- E – encourage recycling
- D – develop markets for recycled materials
- I – invest in infrastructure
- P – promote reuse
- O – optimize lifecycle through alternative consumption
- D – design better products
- I – improve collection

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