

Urban Farm Households' Willingness to Pay for Waste Disposal in Port Harcourt Metropolis

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Abstract

There is a nexus between urban migration, urban farming and waste generation, which seem to have affected waste disposal in major cities around the world. The study seeks to examine urban farm households' willingness to pay for waste disposal in Port Harcourt Metropolis. This was achieved with the use of primary data that were collected using structured questionnaires. Simple random sampling technique was used to select registered farms in Port Harcourt metropolis. The Krejcie and Morgan (1970) sample size (S) determination table was used to determine the sample (s) size which resulted in a sample size (S) of thirty (32) registered farm households out of the population size (N) of 35 under review. A total of 32 copies of the research instrument were distributed, while 30 copies were retrieved and analyzed using descriptive statistics and logistic regression model. The result revealed that 66.7% of the respondents were willing to pay for their farm waste to be properly disposed, while 40% of the waste generated by farm households is between 41-50kg. It recommended that urban farm households should practice an integrated system of farming, and adopt a zero waste system, to reduce the quantity of waste generated in the farm. The findings of the study will help Policy makers to make policies that will aim at developing a planned system of waste management, where all necessary components will be installed and managed to control and use by-product of farm production in a manner that will sustain and enhance the quality of the environment.

Keywords: *Willingness to pay, Waste disposal, Urban Farming*

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Background to the Study

Globalization, modernization and the struggle for economic survival are increasingly making people move to cities. This has tremendously increased the number of inhabitants in major cities globally and the city of Port Harcourt is not an exception to this trend. As a result, economic activities which has resulted to exploitation of natural resources beyond regenerative capacity, has led to resource depletion, poverty, soil degradation, food production failure, and inflation of the prices of basic commodities e.g. food. In order to meet up with the increasing need for food, urban dwellers have resorted to going into urban farming which encompasses crop production, animal production, fish farming and processing of agricultural produce into finish goods e.g. breeding and raising livestock, fish farming, non-food products such as producing seeds, cultivating seedlings, and growing flowers (Oyebola, 2009).

The problems associated with urban farming ranges from excessive use of inorganic fertilizer which tends to weaken the soil structure and can easily result in soil erosion and degradation to creation of problems for producers and possibly consumers, for example, through contamination of water supply and chemical residues in food products (William 1990); to excessive use of fertilizer, particularly super phosphate, which may damage the structure and the overall quality of soils (Costin & Coombs, 1981). Urban farming is a human activity that is born out of over exploitation of environmental resources, resource depletion, environmental degradation, poverty and urbanization. That is why Izeze (1999) submitted that many of the current problems associated with waste disposal have resulted from increasing urban population, rapid and haphazard industrialization, poverty cycle, changing consumption pattern' and inevitable increasing waste generation.

Based on the above, Dauda, (2003) stated that waste is the greatest physical problem that persistently poses a great challenge to man on earth in which Lee and Jones (1991) observed that decomposed waste emits carbon dioxide (CO₂) and methane gas (CH₄) which enhances global warming. Unfortunately, uncontained generation of waste and its disposal, coupled with poor collection services, poses a great threat to environmental quality and human health (Jin, 2006). The indiscriminate disposal of waste of refuse like animal dungs and plant materials from urban farm litter most part of the city (Isu, 2005), and it is truly a threat and humiliation to Port Harcourt city (the Garden city). Because, waste from urban farms if not properly disposed and can reduce the aesthetic value of the environment, and can also pollute ground water which can eventually lead to an outbreak of disease (Oyebola, 2009).

Existing studies have been sophisticated enough to account for urban farming, willingness to pay and waste disposal respectively (William 1990), but because of the relative paucity of data, none have been exhaustive and extensive enough to ascertain the willing to for proper waste disposal pay by urban farms in Port Harcourt metropolis. Given the observed gap in literature; our point of departure is to empirically fill this gap that has been observed. Hence, this study seeks to elicit willingness to pay (WTP) for proper waste disposal by farms in Port Harcourt metropolis which will in turn enhance better decision making that will lead to proper disposal of waste from urban farms.

Statement of the Problem

With increase in the number of births daily, waste disposal has emerged as one of the leading problem in many cities and towns across the country and Port Harcourt is not an exception, hence this challenge has become worrisome (Field & Field, 2017; Shastri 2015). This is because excess waste is being generated beyond the assimilative capacity of the natural environment (Hussen, 2004) and the capacity of the city authorities to handle in order to maintain a sustainable urban environment. The generation of excessive waste beyond assimilative capacity is as a result of the exponential increase in rural-urban drift in recent times all over the world due to resource depletion, soil degradation, poverty, food insecurity, inflation of food prices and search for greener pasture. This has further increased urban population to far outpace the rate of delivery of basic services, such as water supply, sanitation, and the removal of waste as the production and consumption activities of urban population generate large amounts of waste (Dauda, 2003). Thus one of the most significant issues facing many cities of the world is coping with urban waste generated. In order to survive in the midst of the above mentioned environmental problems, man has devised a means for survival by going into urban farming in order to produce food for the family and also generate income for himself which has further contributed to these problems by generating more solid, liquid and gaseous waste to environment.

Research Questions

- i. Are farm households in Port Harcourt metropolis willing to pay for their waste to be properly disposed?
- ii. What type of farm enterprise do farm households in Port Harcourt metropolis practice?
- iii. What are the quantities of waste generated by farm households in Port Harcourt metropolis?
- iv. To what extent are farm households in Port Harcourt metropolis aware of the problems of improper waste disposal on the environment?

Objectives of the Study

The general objective of this study is to elicit the willingness to pay of farms for proper waste disposal in Port Harcourt metropolis. The specific objective for this study is to:

- i. Find out the common farm enterprise practiced by the respondents.
- ii. Estimate the quantity of waste generated by urban farm household in the study.
- iii. Ascertain the level of awareness of the respondents of the problems of improper waste disposal on the environment.

Hypotheses

The testable null hypotheses guides our study

H₀: Willingness to pay for proper waste disposal is not significantly affected by the socio-economic attributes of urban farm households in Port Harcourt metropolis.

Review of Related Literature

In the words of Pongrácz (2006) the idea about waste disposal is tied to waste management; which involves the design of industrial practices and products from the dual standpoints of

product competitiveness and environmental interfaces, which is hinged on the theory of industrial ecology (Korhonen, 2004), being an approach of industry-environment interactions to aid in evaluating and minimizing environmental impacts, it is an ideal scientific covering to building waste management (Korhonen, 2004; Pongrácz, 2006). It has been pointed out that one of the limits of industrial ecology theory is that, beyond the vision of ecological sustainability, it is not giving practical suggestions to the firms on how to act (Korhonen, 2004).

Although Allenby (1999) has said that industrial ecology can offer valuable insights to a waste manager by pointing beyond factory walls, being a filter, to translate the goals of industrial ecology to waste disposal practices in an industry. With the help of tools that stem from various domains and represent principles, such as efficiency sufficiency, global effects, even morals and responsibilities. The goals to be achieved can be set and values to be followed can be highlighted. Graedel and Allenby (1995) further noted that the principle that these industrial processes operate on are to be considered in partnership with the environment that is sustainable in which waste disposal grows into. This is because; waste disposal serves as an instrument in enhancing resource use from raw to processed material, its usage, dumping and re-integration into the cyclical process (Bourg & Keitsch, 2006).

Conceptual Clarification

Urban Farming

Urban farming as a concept has been explained by several scholars but Axumite, Egziabher, Daniel and mougeot (1994) in their work indicated that it encompasses not only the growing of food crops and fruit trees but that it also covers the rearing of animals, poultry, fish, snails, bees, rabbits, guinea pigs, or other stock considered edible locally.

In the same vein, Mougeot (1994) stressed that urban farming encompasses the production of food and animal husbandry, both within (intra) and fringing (peri) built up areas. Mougeot (1994...p18) expressed further that informal urban farming is one livelihood strategy that the urban poor use in combination with other strategies. In order to meet a part of the food needs of poor urban dwellers, urban farming came into being, especially among the poor nations. Urban farming defined here as “crop growing and livestock keeping in both intra-urban open spaces and peri-urban areas” is becoming a common phenomenon in urban areas in the developing world. (Sanyal 1984; Wade 1986; Sawio 1993 and Tunde, 2011). Urban farming has recently become familiar, almost permanent feature all over tropical Africa and in many developing countries, however, research on this social pattern is limited.

Waste Disposal

United Nations Environmental Programme (UNEP, 2013) holds that a major part of waste generated is contributed by, but not limited to the households, because other major parties that generate wastes are shops, hotels, restaurants, institutions, markets, community halls, hospitals, slaughter houses and construction sites. What is important here, as far as municipalities are concerned, is the identification of sources of waste and its disposal. Waste disposal means the final process whereby the ultimate wastes that have no further use to the society hit the land (Albert, 2011).

In essence, they are all the activities and actions that are required to effectively manage waste from its inception to the point where it is being discarded or thrown away (Albert, 2011). Gandy (1994) noted that the usual method of disposing waste is land filling and incineration, prior to which recycling, energy recovery, and volume reductions are done. Generally, engineered or sanitary landfills are used for final disposal of waste. But these landfills create minimum nuisance to public health.

Willingness to Pay

Willingness to pay as a concept reflects ability of an individual to pay for goods or services he she values. A person, who is well informed about the ill effects of a polluted ambience, and values life, would be willing to pay and take all necessary measures to keep the surroundings clean. The amount he is willing to sacrifice to keep the environment clean for him to be healthy explains the concept of willingness to pay. Studies have revealed that there are various socio-economic factors which impact WTP. Lal & Takau (2006), Hagos & Mekonnen (2009) and Khorshiddoust (2004) showed in their studies the income level of a person acts as one of the main determinants of WTP. It is to this end that Begum et al (2006), submitted that a contractor having higher returns on investment shows higher WTP for waste disposal and management. Another socioeconomic key factor that has been identified to impact on WTP is Education. It has been revealed in the works of Rahman, et al. (2005) and analyzed by Lal & Takau (2006) and Khorshiddoust (2004). Rahim Anjum (2013), has also pointed out that waste disposal has become a critical public health and environmental issue worldwide.

Empirical Review

In an empirical study conducted in kota Bharu, Malaysia by Rahim, et al (2012) to assessed community acceptance rates regarding integrated urban solid waste management and their willingness to pay, the results revealed that 66.7% of respondents find waste disposal management ineffective which results in environmental problems (70%) and 72% health problem and 55% of the respondents were willing to pay for integrated urban solid waste management. Ali, et al (2012) also examined willingness to pay for enhanced urban solid waste management in Bangi Malaysia, and the results revealed that 85% of the respondents were willing to pay for better urban solid waste management.

In the localities of Broga, Semenyih and Cheras in the state of selangor, Darul Eshan, in Malaysia, ChenKhee and Othaman (2012) conducted an economic analysis of household urban solid waste management services estimating the population's willingness to pay for waste disposal. They reported that an increase in Pro Ex value would increase WTP and identified that respondents with lower WTP had lower preference for incineration of waste disposal. Another study conducted in a district in Enugu metropolis in Nigeria, ichoku et al (2009) investigated the willingness to pay of citizens applied to urban waste management. Among the respondents, 215 reported paying \$1.6 Nigerian Naira, while 200 were willing to pay \$1.6 Nigerian Naira amount actually charged for waste collection at local company (ENESPA). The determining factors of willingness to pay were positively and significantly related to gender, family income and respondent's perception of environmental quality.

Methodology

The study was carried out in Port Harcourt metropolis. The study area was selected because it is capital and center of administration of Rivers state and by this status has experienced expansion due to population increase. It lies along the Bonny River and it is located in the Niger-Delta region. As of 2016, the Port Harcourt urban area has an estimated population of 1,865,000 inhabitants, up from 1,382,592 as of 2006. It lies on the 4°49'N 7°2'1"E coordinates. This study adopts the quasi-experimental research design and the cross sectional survey design respectively. The quasi-experimental research design is applicable since the urban farms are not controlled by the researcher, while the cross sectional survey design was used because the research took place in different locations. Primary data for this study was collected using structured questionnaire. However, information from textbooks, journals articles, periodicals, and research dissertation as a secondary source was also helpful. The questionnaire was divided into two parts. The first part is the section A which comprised of questions on the demographic details of the respondent with respect to their age, gender, marital status, etc. and the second part is the section B which had questions on type of farm practiced, level of awareness of the problem of improper waste disposal on the environment and willingness to pay. The population of this study captured all registered farm households in Port Harcourt metropolis which was estimated to be 35 registered farm households

Sample size (S) was determined using the Krejcie and Morgan (1970) sample size (S) determination table resulting in the sample size (S) of thirty (32) registered farm households out of the population size (N) of 35 registered farm households under review. In order to get samples representative of the population a simple random sampling technique was used, a sampling technique, which gives every sampling units equal chance of being selected as the first member of the population (Baridam, 2008). Descriptive statistics such as frequency distribution tables, mean and standard deviation, alongside logit regression were used to analyze the data collected.

Model Specification

The logit model which is based on the cumulative probability function was adopted because of its ability to deal with a dichotomous dependent variable on a well-established theoretical background. Logistic regression, according to (Roopa, 2000) is a uni/multivariate technique which allows for estimating the probability that an event will occur or not through prediction of a binary dependent outcome from a set of independent variables. The model specified by (Whittington, Briscoe, Mu, Barron 1990) was adopted for this study as used by (Branka & Kelly 2001) in a study on willingness to pay for improved conservation of environmental species in the USA and (Yusuf, Ojo, & KK 2007) on willingness to pay for improved household solid waste management in Ibadan North Local Government Area, Oyo State. Logistic Regression is used to capture the effects of various factors on the willingness to pay for proper waste disposal in Port Harcourt metropolis. WTP has been considered as dependent variable. Following is the model employed for results estimation.

$$WTP = 1 / (1 + e^{-\ln Zi})$$

Where,

$$\ln Z_i = \beta_0 + \beta_1 \text{Sex} + \beta_2 \text{Age} + \beta_3 \text{Ms} + \beta_4 \text{Edu} + \beta_5 \text{Jp} + \beta_6 \text{Hs} + \beta_7 \text{Nem} + \beta_8 \text{Po} + \beta_9 \text{Ami} + \mu$$

β_0 = the intercept which is constant

$\beta_1 - \beta_9$ = coefficient of the price that the urban farm households are willing to pay for proper waste disposal

Sex = Sex (Dummy: Male=1, Female= 0)

Age = Age of respondents (years)

Ms= Marital status. Dummy variable (married =1, single=0)

Edu = Educational level (number of years spent in the school

Hs= Household size (number)

Nem = Number of Employee

Po= Position Held

Ami= Average monthly income generated by farm enterprise

U= Stochastic Term.

Results and Discussions

Table 1: Willingness to Pay for Proper Waste Disposal

Willingness to Pay					
Willingness to Pay		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Not Willing	10	33.3	33.3	33.3
	Willing	20	66.7	66.7	100.0
	Total	30	100.0	100.0	

As shown by table 1 above, findings revealed that majority 66.7% of the respondents are willing to pay for proper waste disposal while 33.3% are not willing to pay for proper waste. Some of the reasons they were not willingness to pay was because some use their poultry waste to fertilize their fish pond, some dispose their waste in secondary receptacle of which they were not charged for. Others believe it is the responsibility of the government to pay for them and so dump their waste at waste collection centers.

Determinants of Willingness to pay and willingness to pay for proper waste disposal
Table 2: Logistic Regression showing the Socioeconomic Determinants of Willingness to Pay for Proper Waste Disposal

Variable	B	S.E.	Wald	df	Sig.	Exp(B)
Step 1 ^a Gender	-2.697	2.197	1.508	1	.219	.067
Age	.691	.713	.938	1	.333	1.995
Marital Status	-2.156	1.453	2.200	1	.138	.116
Education	.323	1.281	.063	1	.801	1.381
Job position	3.231	1.986	2.648	1	.104	25.309
Household size	-2.450	1.508	2.642	1	.104	.086
Number of employee	.163	.573	.081	1	.775	1.178
Primary occupation	1.541	1.002	2.363	1	.124	4.668
Average monthly revenue generated by the enterprise	.813	.763	1.134	1	.287	.444
Constant	2.392	4.704	.258	1	.611	10.931

a. Variable(s) entered on step 1: sex, age, ms, edu, jp, hs, nem, po, ami.

Source: Field survey 2018

Table 2 presents the logit analysis of the factors that determine the willingness to pay for proper waste disposal in Port Harcourt. The results showed that at $P < 0.1$ all the variables i.e. respondents' age, marital status, household size, job position, number of employees, primary occupation and monthly income generated by the enterprise do not significantly influence the willingness to pay for proper waste disposal. This was as a result of the fact that majority of the respondents were highly aware of the already existing problems of improper farm waste disposal on the environment. And said they were not willing to add to these environmental problems and as such were willing to pay for their farm waste to be properly disposed.

Type of farm Enterprise Practiced

Table 3: Frequency distribution according to the types of Farm enterprise practiced

S/N	Farm enterprise practiced	Frequency	%
1	Poultry farming	18	60.00
2	Fish farming	24	80.00
3	Livestock production	4	13.33
4	Crop production	0	0.00
	Multiple response		

Source: Field survey 2018

The type of farm enterprise practiced was revealed to have a higher percentage (80%) of the respondents that are into fish farming, which explains the fact that enterprise is one of the most lucrative aspect of agriculture in the area, as a result of the fact most of its residents have grown to love fresh fish since it was one of the key occupation of the Rivers people. They further

explained that the waste water are been channeled to the gutters around, which make their neighbours complain most of the time as these waste waters have offensive odours. The study further revealed that 60% are into poultry farming, which proves to be the second most lucrative agricultural venture in the metropolitan area, with animal production as the least practiced enterprise with a percentage distribution of 13.33%. The study also revealed that there was a case of multiple responses as most of the farm households that were into fish farming were also into poultry and livestock production.

Quantity of waste generated

Table 4: Frequency distribution according to the quantity of waste generated Per Week

S/N	Estimated waste generated per week	Frequency	%
1	1 - 10 kg	2	6.67
2	11 - 20 kg	3	10.00
3	21 - 30 kg	5	16.67
4	31 - 40 kg	8	26.67
5	41 - 50 kg	12	40.00
	Total	30	100.00

Source: Field survey 2018

From the results it shows that majority (40%) of the waste generated by farm households is between 41-50kg, with 1-10kg have the least frequency of 6.6% and 31-40kg and the second most generated quantity of waste. This implies that with these quantities of farm waste generated per week, there is need for proper waste disposal in order to have a clean and sustainable environment. This finding is in conformity with the finding of Ikebude (2017) which showed that the pie chart presentation of percentage per mass of the physical component of wastes generated in Port Harcourt Metropolis reveals that 41% accounts for garbage which includes waste food items that decomposes with time, some contains liquids which causes the offensive odour and acts as leachates. Ikebude (2017) went further to suggest that in order to protect human health and environment from the potential hazards arising from inappropriate waste management and disposal and be able to get the wealth out of our waste, a systematically supervised and controlled management of waste is necessary through government implementations, communication.

Level of Awareness of the problem of Improper waste Disposal on the Environment

The findings revealed that farm households in Port Harcourt metropolis are highly aware of the problem of improper urban farm waste disposal on health and the environment, with a mean score of 3.57 approximately 4. Other problems like pollution of underground water, resource depletion, soil degradation, air pollution had a mean score of approximately 3, showing that urban farm households are aware of the problems of improper waste disposal on the environment. This is supported by Chan's (1998) report that people's environmental knowledge was highly specific to issue and geographic scale.

Table 5: Level of awareness of the problems of improper Waste Disposal on the Environment

S/N	Environmental problem of improper waste disposal	Level of awareness		Remark
		Sum	Mean	
	Pollution of underground			
i	water	100	3.33	A
ii	Resource depletion	95	3.17	A
iii	Soil degradation	87	2.90	A
	Air pollution (ordour emission caused By ammonia (NH ₃),			
iv	Volatile Organic Compound (VOCs) and hydrogen sulphide (H ₂ S)	102	3.40	A
v	Underground water pollution	103	3.43	A
vi	Health	107	3.57	H A
	Grand Mean		2.83	A

Source: Field survey 2018

Conclusion

The findings show that majority (66.7%) respondents are willing to pay for proper farm waste disposal in Port Harcourt Metropolis, to ensure a clean and sustainable. The findings from the logit regression analysis revealed that none of the socio-economic attributes of respondent significantly affected their willingness to pay which due to the fact that they were highly aware of the problems of improper waste disposal on the environment, and would not want to contribute more to these problem knowing that deterioration of the environment can also affect their production. The study further revealed that majority (40%) of the waste generated by farm households is between 41-50kg, implying that with these quantities of farm waste generated per week; there is need for proper waste disposal in order to have a clean and sustainable environment.

Recommendations

From the analysis and conclusion reached, the study recommends as follows

1. Urban farm households should practice an integrated system of farming, and adopt a zero waste system where all the production units (crop, animal, fisheries and processing) will depend on each other and then, such that what is regarded as waste in a production unit will be seen as a raw material in another production unit, so as to reduce the quantity of waste generated in the farm.
2. Government of Rivers state should develop a policy that will help its waste management agency to develop a planned system of waste management, where all necessary components will be installed and managed to control the use of by-product of farm production in a manner that will sustain and enhance the quality of the environment.

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