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Multivariate Analysis of Non-Biodegradable Waste Disposal in Imo State, Southeast Nigeria.

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Abstract
Multivariate analysis of Non-Biodegradable Waste Disposal was conducted in Imo state, Southeast Nigeria. Data were sourced primarily through the administration of questionnaire to 180 sampled urban and rural farming households. Data were analysed using simple descriptive statistics as well as logit regression model. Open dumping as well as dumping in open sites were the commonest methods of disposing non-biodegradable waste in the study area. The mean size of farmlands dumped with non-biodegradable wastes was 1.08 hectares. The results of the logit regression analysis showed that residential area, manufacturing firms, nearness to road, nearness to public place, fallow length, income level, dump site and awareness should be adequately considered by farmers in locating their farmlands in the study area.

Introduction

The contribution of agriculture to gross domestic product though declining from the pre-independence level of about 60% (Famoriyo and Nwagbo, 1981), to the post structural adjustment level of about 48% in 2000 (CBN, 2001) is still significant. Inspite of this contribution, agriculture has suffered relative neglect by successive governments over the years. The environment for agricultural production is one significant area of neglect. The declining output and productivity of Nigerian agriculture has been attributed to a myriad of factors that include high cost of input, poor infrastructure, limited access to credit facility, fragmentations of holdings which constrains mechanization and lack of input facilities as well as lack of marketing infrastructures. In the past three decades, Nigeria has experienced rapid urbanisation, the growth of spontaneous settlement and industrialisation and waste management has become a problem. Even though legislation and other administrative checks have been developed to address the menace of industrial and domestic ties, the growing tide of waste generation and disposal in a manner that guarantees human safety and general friendliness of the ecosystem still pose substantial challenges. Solid waste is a form of waste from households and factories in the developing world that put environmental issues on the map (Cave, 1990) and includes refuse from household wastes, industrial, market, street (Schriller et.al., 1996). However, non-biodegradable wastes are wastes that are difficult to break and include solids, sludge, tars, containerised liquid and gases (FEPA, 1991). While waste generation from household daily activities block the streets, drainage and posing other aesthetic and health hazards. An estimated 20kg of solid wastes is generated per capita per annum in Nigeria (Nigerian Environmental Studies Action, 1991). As it stands, effective waste management in our urban centres need to be addressed to achieve sustainable development (Uchegbu, 1998). Moreover, the problem of poor disposal of non-biodegradable waste in generally recognised and appreciated, yet no serious study has been conducted to ascertain its effect on agricultural output and productivity. The objectives of the article include to identify the methods of waste disposal; estimate the size of the area affected by dumping of non-biodegradable waste and determine factors affecting waste disposal in the study area.

Materials and Methods

The study was conducted in Imo state. The three agricultural zones, Owerri, Okigwe and orlu were chosen. The Local government areas were purposively selected from each agricultural zone. These local government areas comprise both urban and semi-urban areas where wastes are discharged heavily and also where agricultural activities take place. The sampling frame consists of farmers whose farmlands are dumped with non-biodegradable materials and those whose farmlands are without any non-biodegradable wastes. The list of such farmers were obtained from the Agricultural Development Programme extension agents in the areas. From this list, a random sample of 20 respondents was selected from each local government area, an equivalent number of farmers whose farms were not exposed to non-biodegradable waste but adjacent to those with non-biodegradable waste were randomly selected as used for study, making a total sample size of 180 farmers.

Data were sourced primarily through the use of questionnaire. Data were analysed using simple descriptive statistical tools such as mean, frequency, percentages and multivariate logistic regression analysis.

The logistic regression model employed in this analysis is specified as follows:

Ln Y = Ln (P/1-P)

$Ln\ (e/1-P) = bo + b_1X_1 + b_2X_2 + ...b_8X_8 + e$ ……..eqtn$_1$

Where,

Y = dumping and non-dumping of non-biodegradable waste on farmland (D: dumping of non-biodegradable waste = 1; non-dumping of non-biodegradable waste = 0)

P = Probability of dumping of non-biodegradable waste

Ln = Natural logararithm function

bo = Constant

b_i - b_8 = Logistic regression coefficients

X_1 = Residential area (D: close to residential area= 1; 0 = not close to residential area)

X_1 = manufacturing firms (D: close to manufacturing firms = 1; 0= far from manufacturing firms)

X_3 = Nearness to road (D: 1= near to major road; 0= far from major road)

X_4 = Nearness to public place (D: 1= near to public place; 0= far from public place)

X_5 = Fallow length (years)

X_6 = income level (naira)

X_7 = Dump site (D: 1= available; 0=not available)

X_8 = Awareness (D: 1= aware of detrimental effects of dumping of non-biodegradable waste on farmland; 0= if otherwise)

e= Error term

Results and Discussion

Methods of waste disposal of the respondents

Table 1: Methods of waste disposal identified by the farmers are presented in Table 1.

Identified methods of	**FWN**		**FWTN**	
Waste disposal	**%Freq**	**%**	**%Freq**	**%**
Open dumping	180	100	180	100
Sanitary land filling	2	1.10	6.0	3.30
Incineration	14	7.80	23	12.80
Dumping in waste disposal bin	37	20.60	69	38.30

Source: Survey data, 2013

*Multiple response were recorded.

Table 1 showed that all (100%) of the farmers with and without non-biodegradable waste on their farms identified open dumping of waste as the commonest method of waste disposal in the study area. About (20.6%) of the farmers with non-biodegradable waste on their farms identified dumping of refuse in waste disposal bins as another method of waste disposal in the study area. Incineration were identified by (7.8%) and (12.8%) of the farmers with and without non-biodegradable waste on their farms respectively. Sanitary land had (1.1%) and (3.3%) of the farmers with and without non-biodegradable waste on their farms respectively. Good waste management of waste recovery /recycling has not been embraced as recommended in the area (Wilson, 2001).

Farm size dumped with non-biodegradable wastes.

Table 2: Distribution of farmers according to farm size dumped with non-biodegradable wastes is presented in Table 2.

Farm size

Farm size (Ha)	Frequency	Percentage
0.2 – 0.5	32	17.80
0.6 – 0.9	93	51.70
1.0 – 1.3	37	20.50
1.4 – 1.7	18	10.00
Total	**180**	**100**
Mean	**1.08 hectares**	

Source: Survey data, 2009

Table 2 showed that (51.7%) of the farmers had 0.6 – 0.9 hectares of their farmlands dumped with non-biodegradable waste while (20.5%) of them had 1.0 – 1.3 hectares of their farms dumped with non-biodegradable wastes. The mean farm size dumped with non-biodegradable wastes was 1.08 hectares and the mean farm size is 2.8 hectares in the area (Onyenwe, 2006). This implies that out of the mean farm size of 2.8 hectares cultivated by the farmers, 1.08 hectares of it was dumped with non-biodegradable waste which represents 38.6% of the mean farm size cultivated by the farmers in the study area. The farm size dumped with non-biodegradable wastes is large enough to attract attention of agriculturists and policy makers in the study area.

Factors affecting the influence of selected variables on the dumping of non-biodegradable waste on farmland in Imo state.

Table 3: Estimates of the influence of selected variables on the dumping of non-biodegradable waste on farmland in Imo state.

Variables	**Logistic Coefficient**	**t-ratio**
Residential area X_1	0.0794	3.8544**
manufacturing firms X_2	0.0814	3.7685**
Nearness to roadX_3	0.0824	2.5912**
Nearness to public place X_4	0.0582	2.8325**
Fallow length X_5	0.0884	3.8603**
Income level X_6	0.0981	3.1242**
Dump siteX_7	-0.0729	-3.4225**
Awareness X_8	-0.0914	-3.0981**
Constant	-23.0526	6.4952**
Ch1-square	73.0824**	
Sample size	180	

Source: survey data, 2013

** sig at 1% level

Table 3 showed that the variables related to residential area, manufacturing firms, nearness to road, nearness to public place, fallow length, income level were positive and significant at 1% level, indicating that the higher they are the more the dumping of non-biodegradable wastes of farmlands and vice versa. However, dump site, awareness were negative and significant at 1% level implying that the less they are, the more the dumping of non-biodegradable wastes of farmlands and vice versa, ceteris paribus. This implies that these variables are important factors influencing the dumping of non-biodegradable wastes of farmlands in the study area leading to the rejection of the null hypothesis.

The logistic regression model gave Chi-square value of 73.0824 which was significant at 1% level, indicating that the model gave a good fit to the data.

The coefficients of residential area was positive, implying that farmlands located close to residential areas were more exposed to the menace of dumping of non-biodegradable wastes.

The coefficient of manufacturing firms was positive indicating that farmlands located close to manufacturing firms were more exposed to the menace of dumping of non-biodegradable wastes. The coefficient of nearness to road was positive implying that farmlands located to major roads were more exposed to the dumping of non-biodegradable wastes.

The coefficient of nearness to public place was positive implying that farmlands located close to public place were more exposed to the dumping of non-biodegradable wastes.

The coefficient of length of fallow was positive implying that farmlands that have long fallow length had more problem of dumping of non-biodegradable wastes.

The coefficient of income was positive implying that farmlands located close to people with high income level had more problems of dumping of non-biodegradable wastes on farmlands as they can afford canned foods and other non-biodegradable wastes to dispose.

The coefficient of dump site was negative implying that farmlands located close where there are no dump sites would be more exposed to the dumping of non-biodegradable wastes.
The coefficient of awareness of consequences of dumping of non-biodegradable wastes on farmlands was negative implying that the more unaware people are of the detrimental consequences of dumping of non-biodegradable wastes, the more the farmlands in such areas have problem of dumping of non-biodegradable wastes on farmlands.

Conclusion

From the study, the methods of waste disposal mainly used were open dumping and dumping in waste disposal bins. Again, farmlands dumped with non-biodegradable wastes were large. Residential area, manufacturing firms, nearness to road, nearness to public place, fallow length, income level, dump site and awareness were factors influencing the dumping of non-biodegradable wastes on farmlands.

Recommendation

Residential area, manufacturing firms, nearness to road, nearness to public place, fallow length, income level, dump site and awareness should be adequately considered by farmers in locating their farmlands in the study area. There is need for strict enforcement of laws on technologies that would come up with containers as well as materials that can be re-used or recycled for the packaging of other goods, or disinfecting and rebranding them again for use instead of the present trend of using them once and discarding them.

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