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Analysis of Extent of Organic Waste Use in Urban Agriculture in Enugu State, Nigeria

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Abstract

Addition of organic manure to soils improves soil texture, structure and condition (aeration and temperatures) of the soil. Regardless of the importance of organic manure, organic wastes are carelessly dumped at dumpsites and on the streets, with government of the day, showing a lack of capacity to contain them. This underutilized resource can be utilized in urban farming, resulting in the reduction of the ever increasing waste volumes carelessly dumped on the streets by urban households. This paper was aimed at ascertaining the extent of organic waste (manure) use in urban farming and also determine the factors affecting extent of organic waste use in urban farming. Data were collected from Enugu and Nsukka urban centres, Nigeria. From the two centres, 120 household heads that use organic waste in urban farming were randomly selected and used in the study. The results show that extent of organic waste use (poultry and pig manure) was high; indicating that biodegradable organic waste from dumpsites can equally be used in farming, if they are sorted and bagged. Factors that affected extent of organic waste use in urban farming include household heads' number of years spent in formal school, farming experience, gender, occupation, age, income level and farm size. Other factors include price of organic manure, price of chemical fertilizers and availability of organic manure. The results of this study underscore the need for government to explore various cost-effective ways of treating wastes, so that farmers can use wastes from dumpsites more in their farm productions.

Keywords: Analysis, Extent, Organic waste, Urban agriculture, Nigeria.

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Ethical: This study follows all ethical practices during writing.

Contents

Contribution of this paper to the literature

The present study shows the need for effective management strategies to be adopted by the government to enable farmers utilize wastes from dump sites in their farm productions.

1. Introduction

Urban refuse has continued to litter our streets with government displaying a lack of capacity to contain it. Waste has always been regarded as something unwanted or undesired and has always been regarded as "waste"; a fact that needs not be so, rather it should be viewed as a resource which can be re-used to our own benefit. Urban agriculture which involves food production in and around cities has emerged as one of the options for tackling urban food insecurity and poverty especially in this era of economic recession in Nigeria. This practice can be enhanced, if the biodegradable content of wastes can be safely used as manure.

Several studies and reports point to the huge capital expended over the years as cost on fertilizer subsidy [1-4]. Farmers were therefore expected to consume more of this input to boost their production and to justify government's involvement in the input subsidy; however experience has shown that the supply of these fertilizers across the states has become erratic, abysmally low and very expensive [4, 5]. Meanwhile, the rate of solid waste generation in south-eastern zone of Nigeria, according to Onwurah, et al. [6] has greatly surpassed the rate of effective collection and treatment; hence large quantities of solid waste which could be used for agriculture, are accumulating in unauthorized areas: To this end, little or nothing has been done to find out the extent of organic waste use and factors affecting the extent of its use in urban farming; considering the inherent advantages in organic manure.

Specifically, the objectives of this study were to:

1. Ascertain the extent of organic waste use in urban farming.
2. Determine the factors affecting organic waste use in urban farming.

2. Method of Study

2.1. The Study Area

This study was conducted in Enugu State, Nigeria which lies approximately between latitudes 5° 55'N and 7° 08'N of the equator and longitudes 6° 55' E and 7° 08 'E of the Greenwich Meridian. The state has a tropical wet and dry climate or the AW climate of the Koppen's classification. Temperature is high all year round with an annual mean of 27°C. There is a long wet season from April to October, interrupted by a short, dry season, usually in August, followed by a long dry season – November to March. The rainfall total is 1580mm per year. The soils of Enugu state are mainly ferralitic and hydromorphic, together with a relatively more fertile lithosols in the escarpment zone. Like those of the rest of South Eastern Nigeria, the soils rank amongst the poorest Nigerian soils because of their low natural fertility. Furthermore, they are highly leached and are therefore suited to only a limited range of crops, chief among which is cassava. Though, the soils are light and easily worked, they are incapable of supporting the high-density rural and urban populations under rudimentary techniques of cultivation) [7].

The state had a population of about 3, 257, 298 persons as at 2006 [7] and estimated at over 3.8 million in 2012 [8]. The predominant agricultural practice in the state is crop farming; however, animals are reared in all parts of the state, though in small numbers. Food crops grown include yam, cassava, maize, melon, vegetables, sweet potatoes, cocoyam, groundnut, and cowpea. Among the perennial tree crops grown are oil palm, *citrus spp*, mango, pears and cashew [7, 9].

2.2. Data Collection

Multi stage random sampling technique was used to select the respondents. First, purposive sampling technique was used to select two main urban centres in Enugu state (Enugu and Nsukka). Also, purposive sampling technique was used to select three farming communities in each of the two urban cenres. From the list of urban farmers, provided by the Enugu State Agricultural Development Programme (ENADEP) staff, using simple random sampling technique, 120 household heads that used organic manure were selected for the study. The data which were collected from March 2017 to February 2018, included household composition, and characteristics, price or organic manure, price of chemical fertilizers and availability of organic waste use for farming.

2.3. Estimation Procedure

An ordered logit model was employed to elicit those factors that affected the extent of organic waste use in urban farming. This was done because the dependent variable was of ordinal categorical nature derived through a likert rating scale which required the respondents to indicate the extent of organic waste use in farming under three categories as: High = 3, medium = 2 and low = 1

The ordered logit is built around a latent regression in the same manner as the binomic probit model. Let $y^* = \beta' \times + \varepsilon_i$ where y^* is the underlying latent variable that indexes the level of organic waste use in urban farming, x is the vector of parameters to be estimated and ε is the stochastic error term. The latent variable exhibits itself in ordinal categories, which could be coded as 0, 1, 2, 3.....j. The response of category j is thus observed when the underlying continuous response falls in the jth interval as:

y = 0 if $y^* \leq 0$

= 1 if $0 > y^* \leq \beta^*_1$

= 2 if $\beta_1 > y^* \leq \beta^*_2$

= 3 if $\beta_2 > y^* \leq \beta^*_3$

=j if $\beta_j - 1 \leq y^*$

which is a form of censoring with the $\beta's$ being unknown parameters to be estimated with β [10, 11].

3. Result and Discussion

3.1. Extent of Organic Waste Use in Urban Farming

The result of the extent of organic waste (manure) use in urban agriculture was presented in Table 1.

Table-1. Result of extent of organic manure use in urban farming.

S/No	Descriptions	Percentage extent	Mean extent	Remarks
1.	Organic waste (manure) use only	50.88%	2.89	High Extent HE
2.	Organic + Inorganic fertilizer use	30.5%	1.73	Low Extent LE
3.	Inorganic fertilizer use only	18.62%	1.06	Low Extent LE

The result in Table 1 showed that more than half of the respondents (50.88%) used organic waste only as manure. Its mean extent was 2.89 indicating high extent. 30.5% of the respondents used organic waste in combination with inorganic fertilizers. Its mean extent was 1.73, indicating low extent. Finally, 18.62% of the respondents used inorganic fertilizers only. Its mean extent was 1.06, indicating low extent. The probable reason for the above result could be because of ready availability of organic waste to farmers and its relative cheapness when compared to the price of chemical fertilizers.

3.2. Factors Affecting Extent of Organic Waste in Urban Farming

The result of estimates of the parameters of ordered logit regression on factors affecting extent of organic waste use in urban farming was presented in Table 2.

Table-2. Ordered logit regression result for factors affecting extent of organic waste use in urban farming.

Variable	Coef.	Std. Err.	Z
Education	.1482021	.0468963	3.16**
Farming experience	.01803222	.0029517	3.66**
Gender	.0888013	.0368855	2.41**
Household size	-.1555707	.0837851	-1.77
Availability of organic waste	.3728624	.1432416	2.60**
Occupation	.7877486	.2570203	3.06*
Price of organic waste	.0088928	.0041505	2.14**
Price of Fertilizer	.0005254	.0002484	2.12**
Age	.0800522	.0371858	2.15**
Income	.0083277	.0041544	3.00**
Distance To Waste	.3484601	.3415941	1.02
Farm Size	.3627530	.1422414	2.55**
Cut 1(∂^1)	-3.49883094	2.844578	-1.23
Cut 2 (∂^2)	1.2797451	2.843878	0.45**
Statistics:			
Number of observations =	120		
LR Chi^2 (12) =	16.37		
Prob > Chi ^{2} =	0.01		
Log Likelihood =	-80.790518		
Pseudo R^2 =	0.68		

Note: *, ** denotes significance level of 1% and 5% respectively.

The explanatory power of the factors as reflected by pseudo R^2 was relatively high (0.68). The overall goodness of fit as reflected by Prob > Chi^2 (0.01) was good. Thresh hold parameters of ∂^2 (0.45) was significant at 5% level of probability, implying that the three categories in the response were indeed ordered. With regard to consistency with *a priori* expectation, on the relationship between the dependent variable and the explanatory variables, the model seems to have behaved well.

Education level of Household Heads: Education level of household heads was positively and significantly related to extent of organic waste use in urban farming at 5% level of probability. Higher levels of education according to Enete and Okon [12] enable farmers to acquire and process relevant information more effectively. It also equips them with better managerial skills which eventually lead to improved methods of production and hence higher level of output.

Farming Experience of Household Heads: This had positive relationship with extent of organic waste use for urban farming and was significant at 5% level of probability; implying that extent of organic waste use was dependent on years spent in farming. Experience they say, is always the best teacher; and as a result experience should enhance skill and use of inputs to increase productivity/output. Enete and Okon [12] reported that farming experience was positively related to vegetable output in Uyo, Akwa-Ibom State, Nigeria.

Gender of Household Heads: This had positive coefficient indicating positive relationship with extent of organic waste use in urban farming and was significant at 5% level of probability. This implies therefore that use of organic manure in urban farming will increase as the number of male urban farmers increased. Ugwoke [13] reported a positive relationship of gender with willingness to use organic waste (manure) in yellow pepper production in Nsukka L.G.A., Enugu State, Nigeria.

Household Size of Respondents: This had negative relationship with extent of use of organic waste in urban farming and was not significant at 5% level of probability. This could be because organic manure application tends to increase farm labour since it increases weed infestation and also prolongs harvesting period. Ugwoke [13]

reported an inverse relationship of household size with willingness to use organic manure, which resulted because productive youth labourers in the households were scarcely available for farm works as majority of them were in pursuit of higher education, a privilege arising from the sitting of a university in the study area. Even currently, the increase in the number of motorcycle and tricycle "keke NAPEP" drivers has affected availability of farm labourers negatively.

Availability of Organic Waste (manure): This positively related to extent of use and was significant at 5% level of probability; implying that due to ready availability of organic waste, farmers to a large extent used organic waste for farming. Kwa [4] reported that due to inconsistent government policies, chemical fertilizer supplies have been erratic and insufficient with consequent high retail prices, which makes the commodity highly inaccessible and unaffordable. To this end, urban farmers resort to use of organic waste which is usually available, hence its positive relationship with extent of use.

Occupation of Household Heads: This had positive relationship with extent of organic waste use for farming and was significant at 1% level of probability. This indicates that extent of organic waste use increased as the farmers engaged more in full time urban farming. This is expected because full time farmers are expected to have more plots of land; hence they use more of the input (organic manure) for increased yield since they do not engage in other off farm activities. Ugwoke [13] reported that occupation of respondents was a very important determinant of use and showed a positive relationship with use.

Price of Organic Waste: Price of organic waste had positive coefficient (positive relationship) and was significant at 5% level of probability. This could be because, since the average price of 30kg poultry manure/35kg pig manure (fertilizer bag filled with organic manure) was ₦465, even with higher prices, it will still be cheap relative to chemical fertilizers whose average unit price was ₦6980 or more when available in the open market and as a result farmers would use more of it even with relative price increase. Abah [14] reported that the cost of organic solid waste had positive coefficient with WTP and hence extent of use.

Price of Chemical Fertilizers: This had positive relationship with extent of organic waste use in urban agriculture and was significant at 5% level of probability. The reason is obvious, because the high price of chemical fertilizer resulted in the increase in the demand for organic manure to improve farmlands; hence increase in the extent of its (organic manure) use. This is in agreement with Igben and Eyo [15] who opined that if two farm inputs can be substituted one for the other, an increase in the price of one would cause an increase in the demand for the other. Also Ebong and Ebong [5] in a study on the demand for fertilizer Technology by Small holder Crop Farmers for Sustainable Agricultural Development in Akwa Ibom State, Nigeria, reported that the coefficient of the price of manure (a substitute) to chemical fertilizer was positive and statistically significant at 1% level of probability.

Age of Household Heads: This had positive coefficient on the extent of organic waste use in urban farming and was significant at 5% level of probability. Ugwoke [13] in a study of organic manure use in yellow pepper production in Nsukka Local Government Area of Enugu State, Nigeria reported that age of the farmers was positive and significant of 5% level of probability; showing that older farmers were more knowledgeable about traditional practices such as organic manure use in agriculture.

Income of Household Heads: Income had positive coefficient (positive relationship) with the extent of organic waste use for urban farming and was significant at 5% level of probability. This means that as urban farmers' income increased, there will be a corresponding increase in the extent of organic waste use for urban farming, as most of the farmers will be able to procure organic waste for use hence increase in the extent of use. This is in line with *a priori* expectation, as demand is only effective when it is backed up with the ability to pay Subba, et al. [16]. Arene and Mbata [17] reported that with improved income, farmers can afford to pay for any venture that can improve their living and working conditions.

Distance from Farm to Point of Waste Collection: This had positive coefficient (though not significant) at both 5% and 1% levels of probability, implying that distance was not a barrier to waste collection and use; hence the positive relationship with extent of organic waste use in urban farming. The positive effect of distance from farm to waste collection point, suggests that far distanced farmers are even more likely to source for and use organic waste. Chukwuone [18] reported that the positive effect of distance to forests suggests that those whose homes are located far from forests are more likely to be involved in non wood forest products (NWFP) production.

Farm Size of Household Heads: Farm size was significant at 5% level of probability and positively related to the extent of organic waste use in urban farming. This means that as farm size increased, the extent of organic waste use as manure increased. Umoh [19] reported that farm size was positive and significant with organic manure use in urban farming in Uyo, Akwa Ibom State, Nigeria. It is expected that the larger the land size cultivated, the more the quantity of input that will be invested and the larger the extent of use of that input.

4. Conclusion

Use of organic manure in urban farming was identified to be high. This shows that organic wastes dumped at dumpsites, if sorted and bagged, can equally be useful in urban farming as a source of manure. Factors affecting extent of organic waste use in urban farming identified in this study were household heads' number of years spent in formal school, farming experience, gender, occupation, age, income level and farm size. Other factors include price of organic manure, price of chemical fertilizers and availability of organic manure. It is therefore recommended that farmers should increase their use of organic manure in urban farming to achieve the twin goals of urban food security and environmental sanitation.

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