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# SUSTAINABLE AGRICULTURAL PRACTICES AND ARABLE FARMERS PRODUCTIVITY IN LAGOS STATE, NIGERIA

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**ABSTRACT**

Nigeria is one of the countries that may not meet up with the millennium development goals (MDGs) by 2015 especially the eradication of hunger and poverty. Beyond 2015, efforts towards food production sufficiency and hunger reduction may yield little or no efforts with land degradation and different unsustainable agricultural practices being used by farmers. Consequently, the paper evaluates the state of agricultural practices among arable farmers and assesses how sustainable is their use of land resource in the light of global practices that support sustainable agricultural production. The use of sustainable agricultural practices such as composting, mulching, crop rotations, inter-cropping, agro-forestry, biological pest control measures, green manures, erosion prevention and water harvesting were examined through administration of questionnaire and interview among the farming community in Ikorodu area of Lagos, Nigeria. Seventy farmers were selected by systematic random sampling but sixty responses were successful for analysis. The data were analysed using descriptive statistics, t-test and probit regression. The results showed that majority of the farmers have been using more than five of the nine sustainable practices. 48.33% of the farmers depend on the use of inorganic fertilizers. The farmers have been cropping their farmlands for an average of seven years. There is no significant difference between the outputs of the farmers that apply more than five and those that apply less than five of the sustainable arable farming practices. The probability of a farmer having higher yield increases with the use of sustainable agricultural practices. The paper concludes that awareness creation through the extension services of the State's Ministry of Agriculture and other stakeholders will promote the farmers' use of sustainable agricultural practices. The government should encourage educated individuals into farming to encourage the use of sustainable agricultural practices which reduce land degradation tendencies and encourage green society.

**Keywords:** Sustainable Agricultural Practices, Land, Arable Crops, Farmers Productivity.

## INTRODUCTION

Over a decade, attention and efforts have been on sustainable development in all spheres of life and most importantly in agriculture as rural livelihood anchors on land. Sustainable efforts recognize societal requirements and limitations in meeting the present and future socio-economic needs of the people[1]. In this connection, researchers have identified production methods tagged sustainable agricultural practices for the purpose of using land resources to meet the present demand without compromising the interest of the future generation in using the resources. The practices are mixed cropping, minimum tillage, cover cropping, mulching, integrated pest control, agro-forestry, improved variety, organic manure, crop rotation, green manure, alley cropping and water harvesting.

Sustainable agriculture is the capacity of a farm to produce continuously based on long-term effects of various practices on soil properties and processes that are necessary for farm productivity and the long-term availability of inputs[2]. This definition reflects sustainable farming as having three dimensions: environment, profitable farming and progressing farming groups ([2]and[3]). Also, [3]defines sustainable agriculture as the management and conservation of natural resources base and the orientation of technological and institutional change to ensure the attainment and continued satisfaction of human needs for the present and future generation. The consideration of these definitions guide the sustainable practices are that the focus in this study. But[4] states that there is no general agreement on the definition of sustainable agricultural practices but is can be defined as the combination of sustainable practices rather than a single practice used in isolation.

The use of sustainable farming practices, therefore pertains to the application of combination of farming practices from agro-forestry, biological pest control measures, composing, crop rotation, erosion prevention, green manure application, intercropping, mulching and water harvesting. These practices are mostly relevant in the Lagos environment. Minimum tillage and rotational grazing, for instance, are not considered as most of the farms are small holdings due to urbanisation while rotational grazing is mostly suitable for the savannah belt in the northern part of Nigeria. These practices have the advantage of leading to increased productivity that is pivotal to catalysing economic growth[5]. Since farmers production methods and outputs are affected by their socio-economic and demographic factors, the use of these practices by farmers have been of interest to many researchers. [4, 5, 6, 7]are some of the studies that have established the relationship between farmers socio-economic and demographic characteristics and the use of sustainable practices mostly in the rural areas. Their approaches include logit, chi-square and correlation analyses as well as multivariate and ordered probit model. This study uses probit model and dwells on the interrelationship and correlation in the use of the practices in urbanising tropical environment.

Notably, the high rate of urbanisation and growing population in Lagos and other cities in Nigeria are rendering available arable land to be reducing. There is pressure on the farmers to continue to farm their land continuously as against the tradition practice of land fallowing for a relatively long time. This, according to[5], results into low farmers productivity and promotion of land degradation. Continuous cropping of any farm land without the application of sustainable farming practices aggravates poverty and hunger. These are the consequences of low land productivity which makes farmers to have lower income and smaller food for their households. [8]reports that the rate of urban development is one of the threats to sustainable development of agriculture in Nigeria because land is a limited resources and it is usually shared between agriculture and urbanization which is clearly rising at alarming rate. The paper therefore attempts to proffer answer the

following questions: Do the arable crop farmers use sustainable practices? What factors affect farmers' use of the sustainable practices? The study hypothesised that there is no significant difference between the outputs of farmers that apply more than five of the sustainable practices and those that apply less than 5 practices. The objectives of the study are to determine if arable crop farmers in Lagos State use sustainable practices and to analyse the factors that affect arable crop farmers' use sustainable practices.

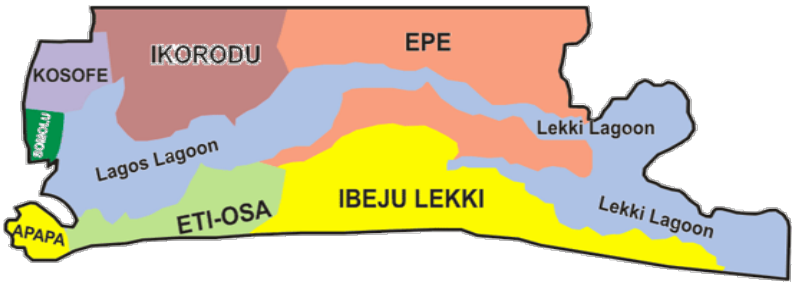
This study is necessary in view of the fact that Nigeria is one of the countries that may not be able to meet up with the millennium development goals (MDGs) by 2015 especially the eradication of hunger and poverty. Beyond 2015, efforts towards food production sufficiency and hunger reduction may yield little or no efforts with land degradation and different unsustainable agricultural practices being used by farmers. The problem of flooding that affects farm land, the rising unrest that displaced farmers and the increasing rate of urbanisation coupled with high population growth rate make a study like this to be relevant. If the use of all sustainable practices are common among farmers, there will be sustained increase in farm output and policy makers stands the opportunity of having the basis for evolving appropriate support for the farmers to improve their income. This study will also serve as basis for developing appropriate programmes for the farmers to appreciate and further improve their participation in the use of sustainable agricultural practices on their farm.

**STUDY AREA**

Lagos state is the commercial nerve centre of Nigeria. Though, the state was the official capital of Nigeria until the capital was moved to Federal Capital Territory (FCT), Abuja. Nonetheless, the state being an aquatic state with very good arable land located in the outskirt of the state, namely Ikorodu, Epe, Badagry, Alimosho etc. The choice of Ikorodu as the study area for this study is informed by the fact that a more organized farming communities cluster in a more coherent manner that enhances easy accessibility by researchers.

Figure 1.1 Map of Nigeria, Lagos State and Ikorodu, the study area.

Ikorodu Local Government Area, in the outskirt of Lagos metropolis, is situated at a distance of approximately 36 km north east of Lagos; between longitude $3.43^0$W and $3.7^0$W and latitude$6.68^0$N and $6.53^0$N north of the equator. The town is bounded on the South by the Lagoon. In the north, Ikorodu shares common boundary with Ogun State. While in the East, it has common boundary with Agbowa-Ikosi, a town in Epe Division of Lagos State.


**METHODOLOGY**

Ikorodu Local Government Area of Lagos State was purposely selected and seventy arable farmers were selected by systematic random sampling and administered with structure questionnaire and in-depth interview. Sixty responses were successful for analysis. The data collected included the socio-economic characteristics of respondents, crops grown, years of farmland usage, farm output, their awareness and use of sustainable agricultural practices: agro-forestry, biological pest control measures, composing, crop rotation, erosion prevention, green manure application, intercropping, mulching and water harvesting. Any farmer that applies more than five of these sustainable practices is considered to be using sustainable practices while farmers that use less than five is taken not to be using the practices. This is because the practices are inter-relatedly used and significantly correlated[5]. The data were analysed using descriptive statistics, T-test and Probit regression. The Probit model follows[10]. The model functional form is specified as:

$Y_i^* = \beta iXi + ... + \beta nXn + e_i$

$Y_i = 0$ if $Y_i^* \leq 0$,

$Y_i = 1$ if $Y_i^* > 0$

where,

$Y_i^*$ = an orderly latent variable that indexes use of sustainable agricultural practices

$Y_i$ = observable dummy variable that indexes use of sustainable agricultural practices (Use = 1, Non-Use = 0)

$\beta i$ = a vector of estimated parameter

$X_i$ = Socio-economic characteristics of farmers

i = 1, 2, ... , n

$X_1$ = Gender (Male = 0 and Female = 1)

$X_2$ = Age (Years)

$X_3$ = Marital Status (Single = 0 and Others [Married or Divorce] = 1)

$X_4$ = Farmer's education (Years)

$X_5$ = Farmer's experience (Years)

$X_6$ = Number of crops grown

$X_7$ = Main occupation (Farming = 0 and Non-farming = 1)

$X_8$ = Chemical fertilizer usage (Use = 0 and Non-use = 1)

$X_9$ = Period of land cropping (Years)

e = Error term

A priori expectations of the factors affecting use of sustainable practices: Farmer's education, number of crop grown, farming as main occupation, period of land cropping and farming experience should positively influence the use of sustainable agricultural practices while chemical fertilizer usage and age should have negative effect on the use of the practices ([4] and[6]).

## RESULTS AND DISCUSSION

### Socio-economic characteristics of respondents

**Gender, marital status and education level of respondents:** According to Table 1, 20 (33.33%), of the respondents are single while 40 (66.66%) are either married or divorce. Among those that are single, 10 (16.67%) respondents are males and 10(16.67%) are females. Of the married or divorce, 30 (50%) respondents are male and 10 are female. This shows that majority of the respondents are male representing 66.66% while female are 33.34% and tally with the studies of[6] and [5]. Also, from Table 1, 11.67 per cent of respondents have no formal education and same percent have primary education. 20%, 26.67% and 30% of the respondents have secondary, National Diploma and first degree respectively. This implies that majority or the respondents are well educated and they should have good understanding of the subject matter.

**Farming experience, age, number of crop grown and main occupation of respondents:**

As shown in Table2, 46.67% of the farmers have 1-5 years farming experience, 5.00% have 21-25 years experience and only 6.67% have more than 25 years arable cropping experience. The remaining 16.79% have 11 to 20 years farming experience while the average years of experience of the farmers is 9.55. This implies that the farmers have the potential for the application and non-application of sustainable practices on their farm especially if one considers this year of experience with the farmers level of education.

Table 1: Respondent's Gender, marital status and level of education

| | | Education Level | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Marital status and Gender** | | No formal education | Primary educ-Ation | Secon-dary education | National Dip./Cert. of education | Higher Nat. Dip or First Degree | Frequ-ency | Percent |
| Single | Male | Nil | Nil | 3 | 5 | 2 | 10 | 16.66 |
| | Female | 1 | Nil | 1 | 3 | 5 | 10 | 16.66 |
| Married or Divorce | Male | 5 | 6 | 7 | 5 | 7 | 30 | 50.00 |
| | Female | 1 | 1 | 1 | 3 | 4 | 10 | 16.66 |
| | **Total** | 7 | 7 | 12 | 16 | 18 | **60** | **100** |
| Percent | | 11.67 | 11.67 | 20.00 | 26.67 | 30.00 | **100** | |

Source: Field survey, 2013.

The age distribution of respondents from Table 2, shows that 36.67% are below the age of 30 years, 26.66%, 15.00%, 10.00%, 8.34% and 3.33% are between the age of 30 to 39, 40 to 49, 50 to 59, 60 to 69, 70 to 79 respectively and the mean is 37.68 years. This implies that the respondents are relatively young in their active age. On number of crops grown, only 1 respondents grows 9 crops. 26.67% grow 3 crops while 18.33 grow either 1 or 2 crops. The farmers grow 3 crops on the average. This shows that the farmers practice most of the farmers practice mixed cropping. A good proportion of the farmers, 48.33% use chemical fertilizer on their farm while 51.66% do not use the fertilizer. This perhaps implies that most of the farmers are applying sustainable practices. Also, majority of the farmers have cropped their land for 1 to 5 years, 8.33% and 6.67% have been cropping their lands for 11 to 15 years and more than 20 years respectively. The frequency distribution of years of land cropping provided 6.96, approximately 7, years on the average. However, 76.67% of the respondents have farming as their main occupation while 23.33% are into arable farming on part-time basis as they mentioned that non-farming is their main occupation which included civil and public service work. This observations implies that the farmers are of good experience and knowledgeable to understand sustainable practices. It is only 25 respondents that demanded explanation on water harvesting only to end up knowing that the practice is available.

Table 2: Respondent's farming experience, age and number of crops grown (n=60)

| Respondent Characteristics | Frequency | Percentage | Mean |
|---|---|---|---|
| **Farming Experience (Years)** | | | |
| 1 - 5 | 28 | 46.67 | |
| 6 - 10 | 15 | 24.87 | |
| 11 - 15 | 06 | 10.13 | |
| 16 - 20 | 04 | 06.66 | |
| 21 - 25 | 03 | 05.00 | |
| More than 25 | 04 | 06.67 | |
| **Total** | **60** | **100.00** | **9.55** |
| | | | |
| **Age (Years)** | | | |
| 20 – 29 | 22 | 36.67 | |
| 30 – 39 | 16 | 26.66 | |
| 40 – 49 | 09 | 15.00 | |
| 50 – 59 | 06 | 10.00 | |
| 60 – 69 | 05 | 08.34 | |
| 70 – 79 | 02 | 03.33 | |
| **Total** | **60** | **100.00** | **37.68** |
| | | | |
| **Number of crops grown** | | | |
| 1 | 11 | 18.33 | |
| 2 | 11 | 18.33 | |
| 3 | 16 | 26.67 | |
| 4 | 10 | 16.67 | |
| 5 | 07 | 11.67 | |
| 6 | 04 | 06.67 | |
| 9 | 01 | 01.67 | |
| **Total** | **60** | **100.00** | **3.15** |
| | | | |
| **Chemical fertilizer application** | | | |
| Yes | 29 | 48.33 | |
| No | 31 | 51.66 | |
| **Total** | **60** | **100.00** | |
| | | | |
| **Years of land cropping** | | | |
| 1-5 | 41 | 68.00 | |
| 6-10 | 07 | 11.67 | |
| 11-15 | 05 | 08.33 | |
| 16-20 | 03 | 05.00 | |
| >20 | 04 | 06.67 | |
| **Total** | **60** | **100.00** | **6.96** |
| | | | |
| **Main occupation** | | | |
| Farming | | | |
| Non-farming | 46 | 76.67 | |
| **Total** | 14 | 23.33 | |
| | **60** | **100.00** | |

Source: Field survey, 2013.

Table 3: Respondents awareness and use of sustainable practices (n=60)

| Sustainable practice | Number of respondents | | | |
|---|---|---|---|---|
| | Aware | Not-aware | Apply | Not-apply |
| | Freq. (%) | Freq. (%) | Freq. (%) | Freq. (%) |
| Composting | 45. (75.00) | 15. (25.00) | 32. (53.33) | 28. (46.67) |
| Mulching | 46. (76.66) | 14. (23.33) | 46.(76.67) | 14. (23.33) |
| Crop rotation | 55. (91.66) | 5. (8.33) | 49. (81.67) | 11. (18.33) |
| Intercropping | 53. (88.33) | 7. (11.67) | 46. (76.67) | 14. (23.33) |
| Agro-forestry | 26. (43.33) | 34. (56.67) | 18. (30.00) | 42. (70.00) |
| Biological pest control | 33. (55.00) | 27. (45.00) | 14. (23.33) | 46. (76.67) |
| Green manure | 40. (66.67) | 20. (33.33) | 37. (61.67) | 23. (38.33) |
| Erosion prevention | 40. (66.67) | 20. (33.33) | 38. (63.33) | 22. (36.67) |
| Water harvesting | 35. (58.33) | 25. (41.67) | 26. (43.33) | 34. (56.67) |

Freq. = Frequency

Source: Field survey, 2013

**Awareness and use of sustainable practices:** From Table 3, majority of the respondents are aware of all the practices except agro-forestry for which only 26 respondents know about it. However, it is only a proportion of those that are aware of a particular sustainable practice that apply it. For instance, out of 45 (75%), 55 (91.66%) and 40 (66.67%) respondents that are aware of composting, crop rotation and green manure, only 32 (53.33%), 49 (81.67%) and 37 (61.67%) respectively apply the practices on their farms. All the farmers that are aware of mulching apply it while the 14 that do not know about it are among the 28 farmers with 1 to 5 years arable farm experience. This result is contrary to[6] that reports a positive correlation between awareness and use. Observations and interview reveals that the every farmer applies at least one sustainable practice. Also, some of the respondents report that extension agents have not been forthcoming to educate them on sustainable arable farming practice. This implies that the farmers could have been applying the practices through learning from fellow farmers and growing up to know about them. This is line with [6] that farmers obtain information on sustainable practices mostly from fellow farmers.

Table 4: Comparison of the outputs of farmers that applied 5 or more sustainable practices and famers that applied less than 5 practices.

| Farmers Group | Observation | Mean Output (Naira) | Hypothesis and T-Statistic |
|---|---|---|---|
| Farmers that applied $\geq 5$ sustainable practices | 45 | 263,711.10 | $H_o$: Difference between mean outputs = 0 |
| Farmers that applied $\leq 5$ sustainable practices | 15 | 265,466.70 | $H_a$: Difference in mean outputs $\neq$ 0 |
| | | | Pr(/T/ > /T/) = 0.9740 |

Degree of freedom = 58; t = -0.0328

Source: Authors' computation from field survey, 2013.

**Factors that affect use of sustainable practices**

The farmers that applied more than 5 practices were 45 while those below 5 practices were 15. The mean outputs of the two groups measure in naira value in terms of revenue, ₦263,711.10 and ₦265,466.71 respectively do not differ significantly through T-test. The Pr(/T/ > /t/) value is 0.9740 as shown in Table 4. However, the probit regression shows that the values follows the apriori expectations even though none of the variables are significant at 5 per cent level. The

significance of the variables at higher percentage levels may be due to the application of one or more of the sustainable practices by all the farmers. However, the signs of the coefficients provide some revelations on the effect of the variables on the use of the sustainable practices by the farmers. As shown in Table 5, the probability that a farmer uses more of the sustainable practice increases as one move from male to female. As years of education, farm experience, number of crop grown and period of land cropping increases, the probability of using sustainable practices also increases. [6]reports that farming experience positive influence farmer's use of sustainable practices. But with age of farmer increasing, as one move from single to marital status, farming to non-farming, use to non-use of chemical fertilizer, the probability of using sustainable practices decreases. These agree with [4] that full-time farming, education and farming as main occupation positively influence the use sustainable practices while age negatively affects it. Also[7] reports that education positively influences the use of sustainable practices.

## CONCLUSION

Arable farmers in Lagos, Nigeria do use sustainable agricultural practices which are agro-forestry, biological pest control measures, composing, crop rotation, erosion prevention, green manure application, intercropping, mulching and water harvesting. 66.66% of the farmers are male and 76.67% have minimum of secondary education. However, only 35% are aware of water harvesting. The sustainable farming practices are used together selectively by the farmers as majority, 75%, applied 5 or more of the sustainable practices. The farm output do not differ significantly between the farmers that use more than five of the practices and those that use less than five. Nevertheless, none of the factors that affect the use of the sustainable arable farming practices is significant at 5%, the sign of the coefficient follows the apriori expectations. Formal education and farming as main occupation positively affect the use of the practices while age negatively affects it. The farmers mentioned that they rarely come across extension agents to educate them on sustainable farming practices. The paper recommended that government and stakeholders in agricultural production should encourage educated individuals into farming and step up extension services delivery to the farmers. This will promote the use of sustainable agricultural practices for the reduction of land degradation tendencies and encourage green society. Farm productivity will also improve thereby boosting the efforts of development in Africa.

Table 5: Probit regression of factors that affect the use of sustainable practices

| Variable | Coefficient | Std Error | P>/Z/ |
|---|---|---|---|
| Gender | 0.563 | 0.489 | 0.249 |
| Age | -0.011 | 0.021 | 0.587 |
| Marital status | -0.937 | 0.604 | 0.121 |
| Years of education | 0.020 | 0.037 | 0.583 |
| Farm experience | 0.020 | 0.036 | 0.574 |
| Number of crop grown | 0.088 | 0.170 | 0.605 |
| Main occupation | -0.471 | 0.479 | 0.326 |
| Use of chemical fertilizer | -0.088 | 0.317 | 0.781 |
| Period of land cropping | 0.065 | 0.058 | 0.264 |
| Constant | 1.427 | 1.251 | 0.254 |

Log likelihood = -26.44 No. of Obs: 60, LR Chi Square (9)= 14.60

Pro> chi square = 0.103, Pseu $R^2$ = 0.216

Source: Estimates from field survey, 2013.

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