



# Effect of Soil Management Practices on Income of Women Vegetable Farmers in Imo State, Nigeria

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## Abstract

This study analyzed the effect of the adoption of soil management practices by women vegetable farmers as a means of ensuring high productivity and income. It specifically looked at the types of soil management practices available and adopted by the farmers as well as the effect of the soil management practices on household farm income. Cross sectional data used for the study were collected by means of questionnaire from 64 women vegetable farmers selected for the study. The results showed that the farmers were mostly young, married small-scale farmers. The major soil management practices adopted by the farmers were weed management, use of organic manure, and mulching. Also, level of education, age of the farmer, household size dependency ratio and number of soil management practices adopted significantly influenced the level of farm income earned by the farmers. The study recommended that Government and other stakeholders should pay more attention to the provision of educational facilities in the rural areas where most vegetable farming activities are carried out as this will have positive effect on the women farmers' ability to adopt good soil management practices, which will in turn affect their output and income.

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## Introduction

In countries where the share of agriculture in overall employment is large, broad-based growth in agricultural incomes is essential to stimulate growth in the overall economy, including the non-farm sectors selling to rural people. Hence, the ability of agriculture to generate overall GDP growth and its comparative advantage in reducing poverty will vary from country to country [1]. In Nigeria, agriculture is the predominant activity in the most of the zones in the country [2]. Agriculture remains the dominant sector in the rural areas in Nigeria. It provides employment for about 60% of the workforce. The diversity of

climate conditions, the richness and the management of soil types and water resources and high population density, provide great potential for crop, animal, fish and tree production. In the 1960's and up to the early 1970's, Nigeria's agriculture flourished. Moreover, Nigeria has an enormous opportunity to promote a vibrant, competitive and technology-propelled agricultural sector, which today employs 70% of the population [3]. The population of Nigeria represents 2.4% of the world's total population. Nigeria was estimated to have a population of 178million as at July 1, 2014 with a current count of up to 182 million and estimated to hit 440 million come 2050 [4]. Out of these 178 to 182 million, about 87-90 million are women [4].



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With this statistics, women have the numeric advantage that will certainly create significant impact in nation building if empowered. However, these Nigerian women, due to societal issues have been relegated to a level at which their full potential is not harnessed. Most women do not have equal opportunities to get empowered like their male counterparts. This leads most of these young and industrious women into vices like prostitution in order to make ends meet. In recent times, the interests of Government and well-meaning people around the world have been ignited towards empowering women because of their outstanding achievements when given key administrative positions. According to Nyqvist and Jayachadran [5]; and Castilla and walker [6], report that increasing women's income can lead to a more efficient allocation of resources within households and increase the share of expenditures allocated to health, education, and nutrition. This in turn leads to massive poverty reduction in Nigeria. There are various ways of empowering Nigerian women and one of such ways is involving them in Green vegetables are a major staple in most parts of Nigeria. In the South-east, vegetables are a part of everyday meal. They are cultivated widely by both men and women. The commonest types are the fluted pumpkin (*Telferia occidentalis*) and the water leaf (*Talinum triangulare*). The fluted pumpkin (*Telferia occidentalis*) is regarded as a vegetable that is a native to West Africa but occurs mostly in its cultivated form in various parts of southern Nigeria. It is widely cultivated for its palatable and nutritious leaves. The plant is drought-tolerant dioecious perennial that is usually grown trellised.

It is widely cultivated for its palatable and nutritious leaves which are used mainly vegetable. The seeds are also nutritious and rich in oil which may be used for cooking and soap manufacture. It grows in many nations of West Africa, but is mainly cultivated in Igbo land and Calabar land. The plant is drought-tolerant, dioecious perennial that is usually grown trellised. Also, waterleaf (*Talinum triangulare*), is an herbaceous annual and perennial plant that has green leaves that are edible. This vegetable is mostly found in West Africa and Western North Africa. The leaves and stems of this plant are consumed as vegetables. In some part of the country, it grows as a weed and is usually more abundant in rainy season. It is considered to be a rich source of vitamins and proteins. The protein content could be likened to that of cashew nuts, millets and cowpeas. The consumption of waterleaf helps diabetic patients as it regulates blood sugar levels in the body. Another health benefit accrued to eating waterleaf is its ability to reduce blood cholesterol levels because of its soluble fiber content. Waterleaf also has antioxidant properties which makes it useful in the treatment of chronic inflammatory disease. Having known all these, it would be awesome to eat these vegetables often in order to stay healthy. The good thing is that they are quite affordable and can be gotten with little or no stress in the market.

Moreover, the main issue with Nigerian agriculture is that of low productivity. Also with population growth, demand for land has increased resulting to intense cultivation with little or no fallow periods and the reliance on continuous cropping rather than conservation cropping systems [7]. Hence, under this environmental condition, good soil management practices are essential to maintain sustainable production to meet the current high demand for food and vegetable crops in Nigeria. Several indigenous local technologies in use with organic fertilizers have recorded huge successes especially among peasant farmers [8]. In spite of all these, recent evidences have shown that farmers have not been eager to adopt or invest in soil manage-

ment practices. Therefore there is a need to identify adopted soil management practices and assess them in order to address long term sustainability of Nigeria's soil resources which should be put in place by stakeholders and required to sustain yield increases in the major food and vegetable production systems in Nigeria and to increase the efficiency of farmers in the adoption of researched technologies. According to, one sector that has a critical role to play in poverty reduction in Nigeria is the agricultural sector as over 40% of the GDP comes from the sector and it employs about 60% of the working population. However, agricultural sector has the highest poverty incidence and tackling poverty entails tackling agricultural underdevelopment. Economic development has largely been accounted for by resilient agricultural growth associated with performance in four constituent sub-sector; crop, livestock, fisheries and forestry, while the agricultural sector may in recent years have contributed significantly to improved growth performance in Nigeria, its actual contributions appear to be much short of the overall potential. All these lapses in the nation could be attributed to some factors such as; gender inequality, low consumption expenditure, unequal standard of living among households in Nigeria and income inequality. According to, agricultural productivity accounts for improved welfare of farmers and effective agricultural growth. Many of the world's poorest people are women who must, as the primary family caretakers and producers of food, shoulder the burden of tilling land, grinding grain, carrying water and cooking. Equality between men and women is more than a matter of social justice—it is a fundamental human right. It also makes good economic sense. When women are equal access to education and go on to participate fully in business and economic decision-making, they are a key driving force against poverty. Women with equal rights are better educated, healthier and have greater access to land, jobs and financial resources. Their increased earning power in turn raises household incomes. From the foregoing, the study investigates the effect of the adoption of soil management practices on the income of women vegetable farmers in Imo State Nigeria. It specifically looked at the socioeconomic characteristics of the women farmers; the types of soil management practices available in the area and the effect of soil management practices on the income of women farmers in the study area.

### Methodology

This study was carried out in Imo State. Imo State is located in the humid tropics of south-East, Nigeria. It lies within latitude 40° 45'N and 70° 15'N, and longitude 60° 50' E and 70° 25' E. Imo State is bounded on the east by Abia State, on the west and south by the Rivers State and; on the north by Anambra State. The State covers a land area of 5,100 km<sup>2</sup>, with a projected population of 3,934 899 person. Rainfall is often at its maximum at night and during the early morning hours. However, variations occur in rainfall amount from year to year. The State has an average annual rainfall of 1800 to 2500 mm and an altitude of about 100m above sea level [9]. The State covers a land area of 5,100 km<sup>2</sup>, with a projected population of 3,934 899 person.

Multistage sampling technique was used for the selection of respondents and location for the study. Imo State has three Agricultural Zones, which are Okigwe, Owerri and Orlu zones. First, two agricultural zones were purposively selected from the three zones in the State which are Orlu and Owerri because of their comparative advantage in vegetable production. Next, two Local Government Areas (LGAs) were randomly selected from each of the two agricultural zones selected, giving a total

of four (4) LGAs for the study. In the next stage, two communities were also randomly selected from each Local Government Area, given a total of eight (8) communities for the study. Next, two villages were selected from each community, giving a total of sixteen (16) villages. Lastly, four female vegetable farmers were selected from each village, giving a total of sixty-four (64) respondents for the study. The data for the study were collected from respondents by means of structured questionnaire. The questionnaire was designed to obtain relevant information from the respondents. Data on age, household size, farming experience, level of education, sex of household head, annual income, marital status, soil management practices adopted in the area and the type of vegetables cultivated in the area were collected. Data were analyzed using descriptive statistical tools such as means, frequency distributions and percentage and the Ordinary Least Squares regression model. The Ordinary least squares multiple regression was used to determine the effect of soil management on the income of women vegetable farmers in the study area. The model is as shown below;

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8) \quad (1)$$

Where

Y= Household farm income (Naira)

X<sub>1</sub>= education level (years)

X<sub>2</sub>= age (years)

X<sub>3</sub>=farm size (ha)

X<sub>4</sub>=household size (number)

X<sub>5</sub>= dependency ratio (number)

X<sub>6</sub>= the soil management practices (number adopted)

X<sub>7</sub>= cost of labor (naira)

X<sub>8</sub>= farmer's farming experience (years)

### Results & discussion

The socioeconomic characteristics of the respondents are presented in Table 1. The results show that majority of the respondents (50%) were between the ages of 21-40 years. It is evident that the women were mostly youthful, energetic and should be able to perform their farm work with some level of efficiency. Vegetable farming in the area is labour intensive and the various cultural practices including soil management practices would require the consumption of much energy, energy which only the youthful and middle aged may be able to supply. This result agrees with that of Ben-Chendo et al. [10] who reported that female vegetable farmers in Ahiazu Mbaise area of Imo State were middle aged. A huge majority of the respondents (73.44%) were married. Marriage may confer on these women farmers the advantage of having spouses and members of households who could help with tasks on the farm. The married women will also have access to land owned by their spouses and thus be able to expand their production. The vegetable farmers had fairly large household sizes. Majority (about 64%) had household size of between 3-6 persons. The average household size was six persons. The large household size could be an advantage if there are more active adults who could supply needed labour for tasks on the farm. However, the age of the respondents may be an indication that their households may consist more of young children than adults and this may be a disadvantage. The average farm size was 0.6 hectares and ma-

**Table 1:** Socioeconomic characteristics of the respondents.

Socioeconomic Variable	Frequency	Percentage
<b>Age (years)</b>		
21-30	7	10.94
31-40	25	39.06
41-50	24	37.50
51-60	5	7.81
61-70	2	3.13
71-80	1	1.56
Total	64	100
Mean	43	
<b>Marital Status</b>		
Single	6	9.38
Married	47	73.44
Divorced	2	3.13
Widowed	9	14.06
Total	64	100
<b>Household Size (Number of persons)</b>		
1-2	3	4.69
3-4	15	23.44
5-6	26	40.63
7-8	16	25
9-10	3	4.69
11-12	1	1.56
Total	64	100
Mean	6	
<b>Farm Size (Ha)</b>		
0.1-0.5	39	60.94
0.6-1.0	20	31.25
1.1-1.5	3	4.69
1.6-2.0	1	1.56
2.1-2.5	0	0
2.6-3.0	1	1.56
Total	64	100
Mean	0.6	
<b>Years in school</b>		
6-Jan	5	7.81
12-Jul	21	32.81
13-18	29	45.31
19-24	9	14.06
Total	64	100
Mean	14	
<b>Farming Experience (years)</b>		
10-Jan	48	75
20-Nov	12	18.75
21-30	1	1.56
31-40	2	3.13
41-50	1	1.56
Total	64	100
Mean	9	
<b>Membership of social group</b>		
Non Members	12	18.75
Members	52	81.25
Total	64	100

Source: Field survey, 2018.

majority (about 61%) of the vegetables had farm size of not more than 0.5 hectares. This is indicative of the fact that the women are smallholder vegetable farmers and may be practicing subsistence agriculture. The practice of subsistence farming and the attendant low income yield may affect the ability and capacity of the women to adopt efficient soil management strategies that could enhance their output. Ben-Chendo et al. [10] reported that female vegetable farmers in Ahiazu Mbaize were small holder farmers. Majority (about 77%) of the vegetable farmers had acquired between 7-18 years of formal education. This is a strong indication that they are literate and informed enough to know the importance of adopting soil conservation practices on their farms. An educated farmer is better positioned to take advantage of innovations and technologies that will enhance his output and subsequently income. Also, majority of the vegetable farmers (75%) had between 1-10 years of experience in vegetable farming. Thus, they may be regarded as being moderately experienced. These may therefore be spared the practiced whereby older farmers insist soil management practices that they have got used to over time. They may also be more likely and ready to adopt new and improved practices that will improve output and income. A huge proportion of the farmers (81.25%) were members of social groups in the area. This is a strong indication that the vegetable farmers may be benefitting from advantages that accrue to members of these groups, which may include access to credit, grants, subsidies, useful information, access to cheaper inputs and access to market for their produce.

#### Soil management practices adopted by female vegetable farmers in the study area

The soil management practices adopted by female vegetable farmers in the study are presented in Table 2. Table 2 shows all available methods of preserving the soil to ensure optimum fertility and minimum degradation such as erosion in the area. The results show that the three most important soil management practices among the vegetable farmers in the area were: weed management (84.38%), use of organic manure (65.63%) and mulching (54.69%). It can be deduced from the result that the farmers mainly adopted less capital-intensive soil management practices to enhance their output. The adoption of weed management involves the removal of weeds, which are in essence unwanted plants in the farm using cutlass, hoe, or any other farming implements. Weeding minimizes the competition for nutrients between the vegetables planted and the weed, thereby allowing the vegetables have better access to these nutrients. Also, the use of organic manure was a dominant soil management practice among vegetable farmers in the study area. Here again, the basic reason for this may be due to the cheaper price and easier accessibility of organic manure when compared with inorganic manure. This result agrees with the findings of and Ojeniyi et al. [11] who noted that the use of different organic manures individually are good alternatives of inorganic fertilizer for improved vegetable production in Nigeria, owing to the fact that the use of inorganic fertilizer in Nigeria is limited because fertilizer distribution has become highly political, scarce and unaffordable by resource poor smallholder farmers. Mulching is also widely used by the vegetable farmers in the study area. This involves the use of grasses and legumes that are cut off to cover-up the topsoil around the crops to reduce transpiration and stop excessive run-off. Mulching and organic manure are predominantly used because of how cheap they are to adopt. Grasses and the animal droppings are cheap to acquire and the only cost incurred may be those of labor.

**Table 2:** Distribution of respondents according to the soil management practices adopted in the study area.

Soil management practices	Frequency*	Percentage
Crop rotation	20	31.25
Plant residue	14	21.88
Zero tillage	10	15.63
Green manure	22	34.38
Ridging	20	31.25
Bedding	34	53.13
Inorganic manure	34	53.13
Organic manure	42	65.63
Mulching	35	54.69
Soil biology	0	0
Trap crops	5	7.81
Weed management	54	84.38
Soil liming	4	6.25
Compost manure	21	32.81
Bush fallow	23	35.94
Level terraces	1	1.56
Integrated plant mgt	4	6.25
Buffer strips/contour plough	2	3.13
Double cropping	32	50
Intercropping	9	14.06
irrigation	15	23.44
Manure management	15	23.44
Salinity	2	3.13
Pesticides	24	37.5
Drainage	16	25

#### Effects of soil management practices on the income of female vegetable farmers

The effect of soil management practices on the income was estimated using Ordinary Least Squares Multiple regression technique. The four functional forms of the multiple regression analysis were estimated and the linear functional form provided the best fit (lead equation) and was chosen and used for further analysis. The choice was based on the magnitude of the coefficient of multiple determinations ( $R^2$ ) which was 0.631(63.1%). This implies that the independent variables explains at least about 63.1% of the total variability in the income of female farmers in the study area while 36.9% of the total variation is explained by other variables not included in the work. The equation is stated thus;

$$Y = 78599 (\text{bo}) + 34272.49 (\text{edu.}) - 916.67 (\text{age}) + 101.48 (\text{farm size}) - 2099.92 (\text{hhs}) - 3667.46 (\text{dep. ratio}) + 6.990.78 (\text{SMP}) - 0.12542 (\text{labor cost}) - 220.31 (\text{fam exp.})$$

The F-ratio value (11.9893) is statistically significant at 1% level of significance which implies that the model is adequate for use in further analysis.

**Education level ( $X_1$ ):** the education level was found to be positively related to the income of female farmers and significant at one percent level of probability. This implies that the higher their educational level the higher their income. A higher educational attainment will enable the women decipher and adopt those soil management practices that are best suitable for the production of vegetables and thus be able to produce and earn higher income. Mwangi and Kariuki [12] reported a positive relationship between education and adoption of agricultural technologies respectively. Furthermore, posit that the level of education the farmers attains has a positive influence on agricultural productivity as education increases her productivity by enhancing her ability to understand and evaluate new production techniques and technologies.

**Age ( $X_2$ ):** Age had a negative relationship of -916.66 with the income of female farmers and significant at five percent level of probability. This implies that as the farmers get older, the less the amount of farm income they earn. This also implies that old age may translate into low or reduced productive activities on the farm which in turn may affect income. Also, as the farmers get older, they tend to practice less conservation practices which in turn may affect their farm income. Averred that age has a negative influence on agricultural productivity because the older the farmers the lower their productivity. With declining productivity comes fall in farm income.

**Household Size ( $X_3$ ):** the household size of female farmers had a negative coefficient of -2099.92 and significant at ten percent level of probability. This implies that as the household size increases, the income of the women farmers tend to fall. This may be attributed to a large proportion of the household members being dependents, like children and the elderly who are unproductive and yet take a big proportion of the household income in terms of clothing, medical bills, food, school fees etc.

**Dependency Ratio ( $X_4$ ):** this had an inverse relationship of -3667.46 and was significant at one percent level. This implies that the higher number of dependents member in the household, the lower the farm income of the household. This is because dependents like children and the elderly do not engage in any productive economic activity yet a considerable proportion of the household income which otherwise could have been invested in the farm firm to attain higher levels of productivity, output and income is used to cater for their needs.

**Soil Management Practices ( $X_5$ ):** this had a positive coefficient of 6990.78 and significant at one percent level of probability. This implies that the more conservation and management practices the women adopted on their farms, the higher their income. This is because the adoption of soil conservation practices are effective in reducing water runoff, improve soil quality by enhancing soil organic matter reserves, strengthening nutrient recycling mechanism and increasing activity and species diversity of the soil fauna (e.g earthworm, termites, micro-organisms). All these tend to improve soil condition and enhance productivity and output of the farms and these invariable translate to higher farm incomes [13,14].

**Table 3:** Estimation of the effects of soil management practices on income of female vegetable farmers.

Variable	Linear+	Exponential	Semi-log	Double log
Constant	78599.9	10.94701	215330.6	14.16625
	(3.388)***	(18.406)***	(3.078)***	(7.968)***
Level of education	34272.49	0.663026	21356.19	0.359823
	(4.478)***	(3.380)***	(4.254)***	(3.293)***
Age	-916.664	-0.02575	-41154.7	-1.06157
	(-2.349)**	(-2.574)**	(-2.571)**	(-2.610)**
Farm size	101.4754	0.028434	6686.774	0.183399
	(0.043)	(0.471)	(1.527)	(1.648)
Household size	-2099.92	-0.03635	29011.47	-0.36833
	(-1.828)*	(-1.234)	(3.323)***	(-1.604)
Dependency ratio	-3667.46	-0.07919	-18904.8	-0.13381
	(-5.237)***	(-4.411)***	(-4.396)***	(-1.258)
Soil management practices	6990.778	0.220081	18618.43	0.965448
	(4.325)***	(5.311)***	(2.063)**	(4.352)***
Cost of labor	-0.12542	-96.1E-06	2918.69	0.064298
	(-0.132)	(-0.377)	(0.741)	(0.643)
Farming experience	-220.309	-0066.01299	-100.38	0.472841
	(-0.644)	(-1.483)	(-0024)	(3.706)***
R <sup>2</sup>	0.631372	0.606728	0.599957	0.580706
Adjusted R <sup>2</sup>	0.578711	0.550546	0.542808	0.520807
F-stat	11.9893282	10.79938045	10.49812943	9.694745664

Source: Field Survey, 2018. \*\*\*: Significant at 1%; \*\*: Significant at 5%; \*: Significant at 10%; +: Lead Equation.

### Conclusion & Recommendations

The study concludes that the level of education and soil management practices available to the farmers positively affect the income of the farmers in the study area which shows that education will increase their knowledge of soil management while the adoption of these soil management practices will increase their income as a result of higher output.

The study recommends that:

1. Government and other stakeholders should pay more attention to the provision of educational facilities in the rural areas where most vegetable farming activities are carried out, as this will have positive effect on the farmer's awareness of and ability to adopt good soil management practices, which will in turn affect their output and income.
2. Government and other stakeholders should encourage young school leavers to venture into vegetable production, as it will provide them with a source of income for sustenance.
3. Government and other stakeholder can strengthen the income of rural farming households through the provision of subsidies in form of improved inputs. The income earned would be useful in enabling the farmers acquire productive assets and adopt many soil management practices.

4. Government and other non-governmental organizations should encourage the production of more organic fertilizer as it serves as an important resource for soil management practice among vegetable farmers.

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