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ASSESSMENT OF SOIL SUSCEPTIBILITY TO EROSION ON SMALL-HOLDER FARMS IN VANDEIKYA LOCAL GOVERNMENT AREA, BENUE STATE, NIGERIA

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ABSTRACT

The soils used for food production in Mbaityoug (Tsar) council ward are threatened by different factors, such as soil degradation due to erosion and lack of nutrients. This study assess soils susceptibility to erosion on small-holder farms in Vandeikya local Government area. This research is important because data on the soils from this area is needed for the

Introduction

Erosion is a natural phenomenon which occurs in all types of soils. Erosion is when soil particles are removed from its origin by water, wind or ice. Soil erosion is a global phenomenon. It is the world's biggest environmental problem, threatening both developed and developing countries (International Soil Conservation Organization, ISCO, 2002).

completion of the Universal Soil Loss Equation, soil erosion risk assessment, and design of conservation structures. Some soil properties and indices of erodibility were determined and an erodibility map was developed. Moisture content, porosity, and clay content were low while permeability and bulk density were high. Dispersion ratio and modified clay ratio were found to be averagely high while erosion ratio and water stable aggregates were low. Erodibility factor K was computed and found to range between 0.05 at Orange farm and to 0.24 at Maize and African pears farms respectively. Ogbono and Orange farm has St of 10.12 and 9.25(stable soil structure). Soil loss was also noticed to be highest at Maize and African Pears farms (49t/ha/yr). A correlation analysis between soil loss and the indices of erodibility was carried out where it was observed that DR, MCR correlated positively with soil loss while negative correlation existed between soil loss with Erosion ratio and Water Stable Aggregates. Based on known standards and values of Erodibility factor (K) obtained, an Erodibility map of the study area was made. Finally, this study also shows that at the 0.05 level of significance, there is a relationship between Dispersion Ratio(DR),Modified Clay Ratio(MCR),Erosion Ratio(ER) and, Water Stable Aggregate(WSA) when correlated with SL(Soil loss). The study recommends Orange and Ogbono farming practice with the least susceptibility of soils to erosion for soil management and conservation purpose. Improved productivity through research and extension, removal of tree crops should be discouraged and up-to-date information on the smallholder sector.

Keywords: *Susceptibility, small-holder farms, erodibility, soil, degradation*

According to the ISCO 12th conference, 65 percent of the soil on earth display degradation phenomena, such as erosion, desertification and salinization.

In Europe, 12 percent of the soil is threatened by water erosion and 4 percent by wind erosion. Erosion is also found on 95 million hectares of land in North America and 500 million in African. Economic losses from water and soil erosion, as well as, salinization in South Asia have

accumulated to 5.4 billion, 1.8 billion and 1.5 billion dollars, respectively. But China faces one of the most serious soil erosion problems in the world. The latest remote – sensing survey shows that China has some 3.56 million square kilometers of soil erosion areas, accounting for 37percent of China's total territory.

Further studies by (ISCO,2002), said that soil erosion affects not only economic development but climate change because the process of soil erosion releases carbonium ions into the air, while carbon dioxide is the primary cause of global warming.

In Africa, particularly in Nigeria; the story is no different. The Benue State Environmental Action Plan (1998) summed up soil erosion as a problem with the following effects: loss of lives and properties, cultural assault, destruction of aesthetic and the quality of the environment, displacement of persons, and declination of soil fertility.

In the study area (Vandeikya local government area of Benue state, Nigeria), which is mainly made of small holder farmers, is involved in farming arable and tree crops encounter the problem of soil erosion. Increase in population results in pressure on land and nature of land tenure system (Iorkua and Ikyennum, 2004), among other factor have led to serious soil deterioration with negative effects on agricultural yield, incidences of weed infestation, declining soil fertility and increase of soil erosion heighten((Durgin, 1985, Nyaba, 1995b).

Most importantly, the small holder farmers in the study area lack the large scale modern technology to combat erosion on farms. Therefore, assessing soil susceptibility to erosion and mitigating erosion is crucial to sustain agricultural yield and to reduce environmental damage. Spatial and quantitative information on soil erosion on local scale contributes to conservation planning, erosion control and management of the environment. However, neither accurate measurement of soil loss from crop field nor a documentation of sustainable land management practice is viable in the study area. This research work addressed this gap.

Materials and Methods

Study Area.

Mbaityough Ward is located between latitudes $7^{O}5'00''$ and $7^{O}15'$ $00''$N and longitude $9^{O}0'00''$ and $9^{O}6'00''$E, Vandeikya local government area

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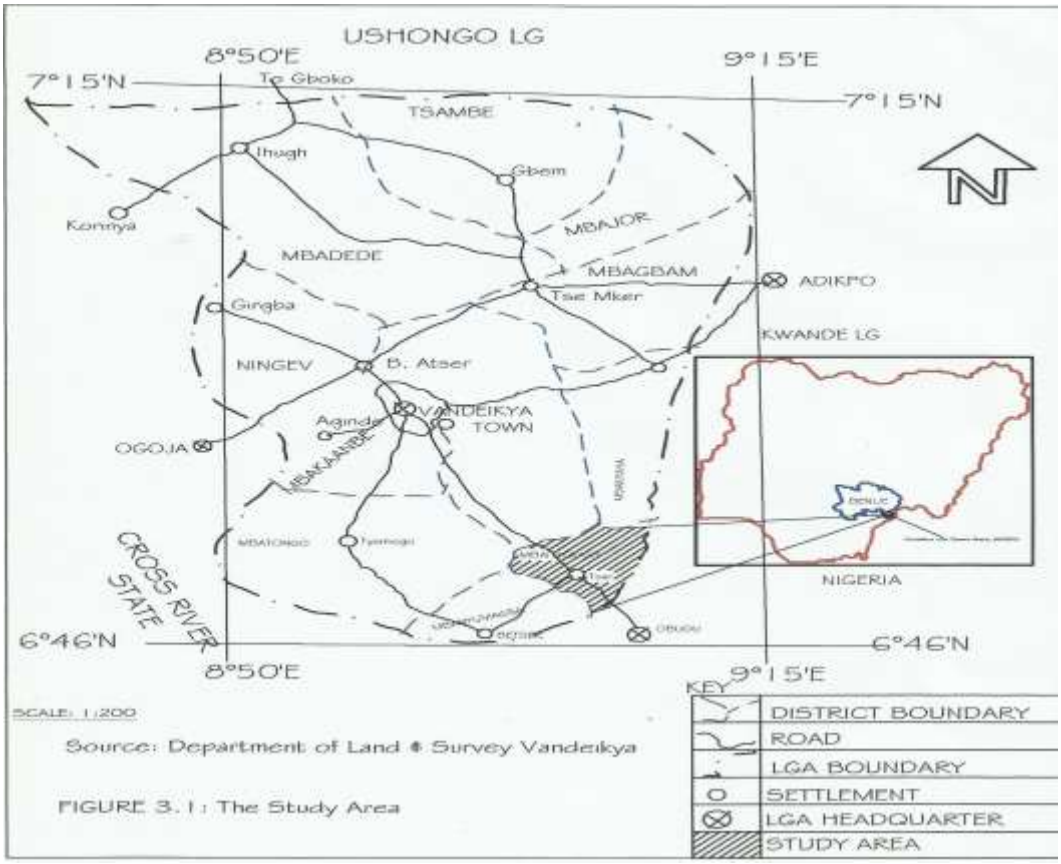
of Benue State Nigeria. The study area share boundaries with Kwande LGA on the eastern part and Oshongo LGA northern part.



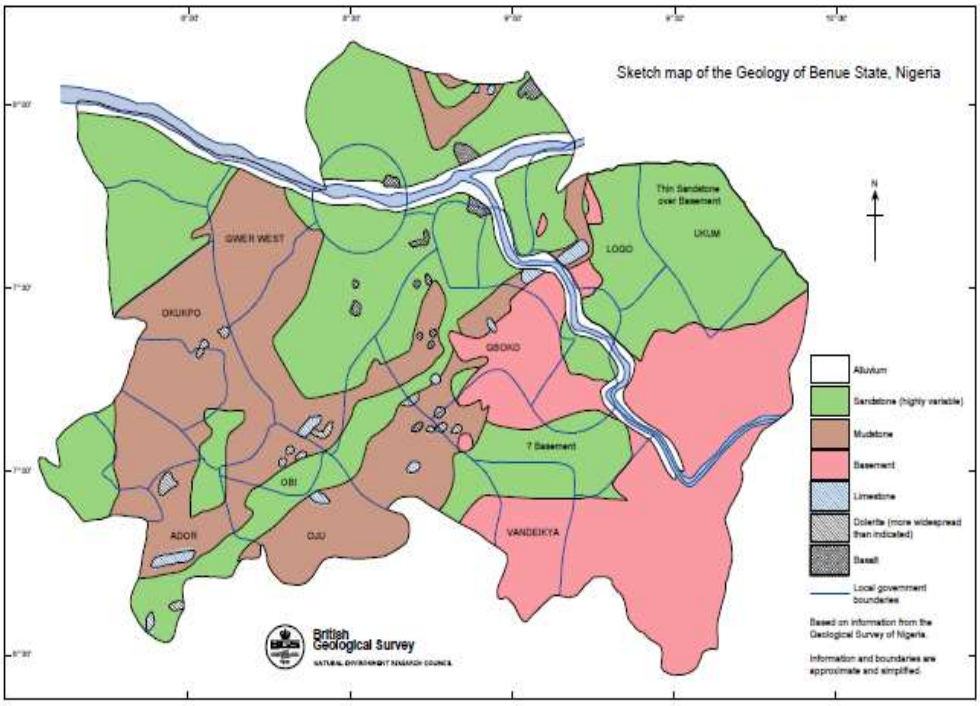
Source: Department of Land and Survey Vandeikya

The climate of the study areas is koppen's 'Aw' (tropical seasonally wet and dry). Rainfall duration averages seven months in a year with annual totals ranging from 1200mm to 2000mm (47" and 79") and generally higher in the southern part of the states than in the Northern parts and this is reflected in more lush and denser nature of the vegetation (Nyagba. (1995a).

Its mean daily temperature is 4.45 ^{O}**C,** diurnal range of temperature is 8.89^{O}C, mean annual temperature is 32.5^{O}C and annual range of temperature is 14.8^{O}C. Temperatures are constantly high throughout the year. Ranging's from 21°C - 27°C.

The study area lies within the tropical grassland zone which is specifically referred to as the southern savannah vegetation.

The study area has gentle undulating land scape interspaced with valleys and depression.



Scale : 1:200

Source: British Geological Survey Report, 2001.

Figure 3.3: Geology Map of the Benue State.

The main river that drains around the study area is River Dura on the north – eastern part of Mbajor. One interesting feature of the drainage system in the area is that, Dura River drains into the Katsina – Ala system while other rivers in Vandeikya drain in the cross river system.

The soil of the Southeastern Region of Benue State is predominantly made of tropical ferruginous soils (Nyagba, 1991; Olatunji 2007) and lies in the southern Guinea Savanna biome with its characteristic tall grasses. The dominant soil type in the study area is lateritic soil.

Much of Benue State falls within the Benue Valley/trough which is believed to be structurally developed.

Methodology

Sources of data

Primary sources

The primary sources of data are mostly soil samples taken from six (6) small-holder farmers in the ward and analysed in the laboratory.

Secondary sources

Data was sourced from Nigerian Journal of Benue and Applied Science, Agriculture and Biological Journal of North America among others .Unpublished thesis, Commission studies of Food and Agricultural Organisation of the United Nation (FAO) and International Fund for Agricultural Development (IFAD) were used, and Soil Conservation Unit of Benue State Ministry of Water Resources and Environment, Makurdi.

Sample Collection

Six (6) farms were chosen, each under a different land use. They include: Orange, Ogbono, Sweet-potatoes, Cassava, Maize and African pears farms respectively.

Each of these plots of farmland measured 15m by 15m,and gridlines were super-imposed on each of the sampled farms before they were taken. Ten soil samples (5 top soil and 5 sub soil) was collected for each landuse using auger at depth of 0-15cm(crop rooting zone) and 15-30cm(zone of illuviation).

Core samples were also collected using cylindrical core (5cm in diameter, and 5cm high) for determination of bulk density and porosity. A total of sixty (60) soil samples were taken to the laboratory for analysis.

Table 3.1: Sampling Process

S/N	Landuse	Sample Site	Sample Size
1	Orange	1	10
2	Qgbono	1	10
3	Sweet potatoes	1	10
4	Cassava	1	10
5	Maize	1	10
6	African pears	1	10

Source: Survey, 2017.

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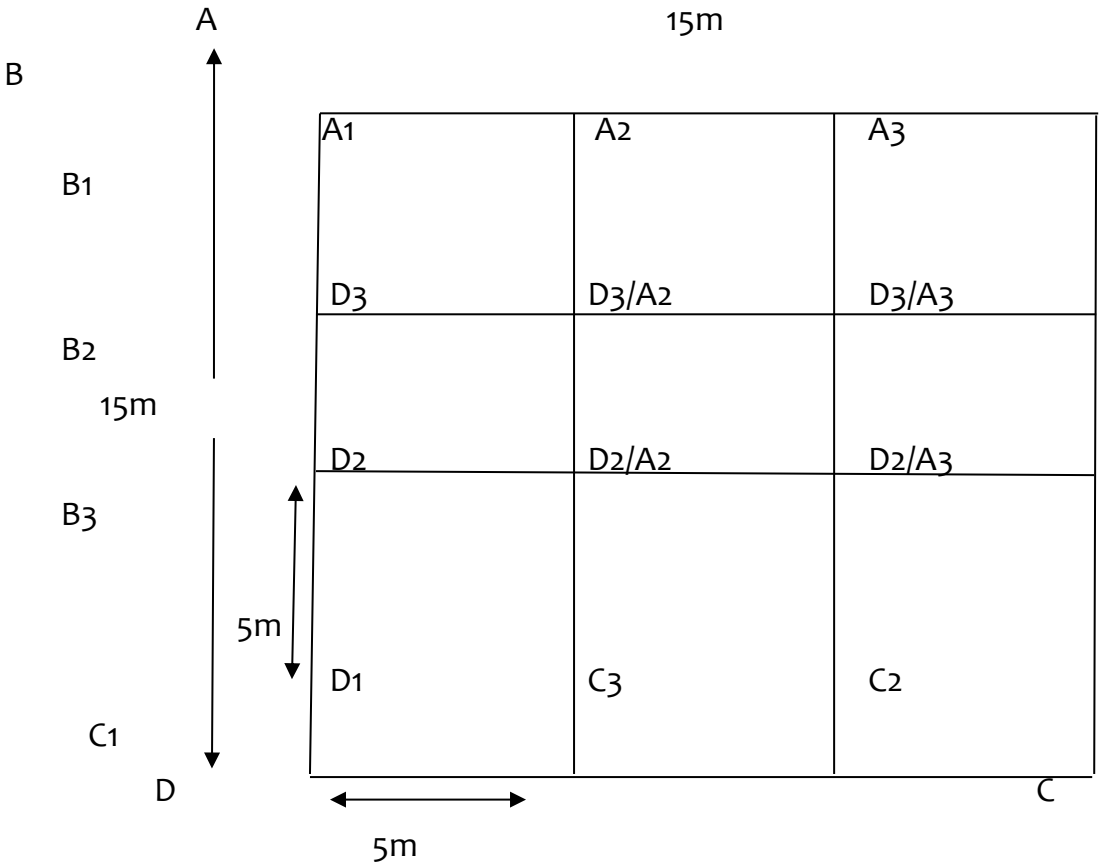

Figure 3.4: Spots where soil samples were picked on the farms

Laboratory Analysis

Laboratory analysis of soil samples were carried out in Soil Science and Civil Engineering Laboratories of the University of Agriculture, Makurdi, Benue State.

Statistical Analysis

A regression and correlation analysis was carried out on Dispersion Ratio (DR), Modified Clay Ration (MCR), Erosion Ratio (ER) and Water Stable Aggregates (WSA). From the analyses, equations of the linear relationship between these variables and soil loss was be derived and their correlation coefficients (R) determined.

Results and Discussion

Particle size Analysis

Moisture Content

MC is the amount of water in a soil during the time of data collection. Soil texture, structure, porosity, and organic-matter content determine soil moisture.

The result of moisture content test showed that most of the soils have low moisture ranging from4.1%-18.4% with soil on Maize farm having the least (see table 4.1).
The low moisture reduces the cohesiveness between the particles hence making them easily dispersible by erosive agents such as water, thus increasing its susceptibility to erosion.

Bulk Density

Soil bulk density is defined as the ratio of a mass of dry soil (oven-dried at 105°C) of its field volume and usually expressed in terms of grams per cubic centimetre (g/cm^3). Bulk density is determined by the texture of the soil and by soil structure and the amount of soil pore space, which can be changed by management. Compaction increases bulk density by reducing soil pore space. It is an increase in bulk density and soil strength and a decrease in soil porosity by the application of mechanical forces to the soil. The action of tillage implements and similar physical forces crush soil aggregates and push soil particles closer together, especially under wet soil conditions. Compacted soils or soil layers restrict root growth, water movement, and air exchange.
The bulk density ranged from 1.70 g/cm^3– 2.26 g/cm^3(See table 4.1). This is high compared to the average standard value of 1.33gm/cm^3 as given by Esu (1999) and agrees with Wyle and Ray (1999) that, where the bulk density is high, plant roots find it difficult to penetrate the soils and this reduces infiltration and increases overland flow and results to erosion.
The high bulk density experienced in the study zone can be attributed to the long intense tillage of soils in the area which depletes soil organic matter and weakens soil structure thereby making it vulnerable to the forces of erosion.

Permeability

The permeability of the study area ranges from 0.0034 cm/s - 0.0083cm/s (see table 4.1). This is relatively high according to Bell (1983) classification. This high rate of permeability suggests high pore-pressure and agrees with Manyatsi (1998) that high permeability reduces the

shear strength of the soil and consequently makes the soil more susceptible to erosion.

Porosity

The porosity of soils ranged from 7.0% to 39%. The highest porosity is observed in Orange farm (39%) and the lowest at Ogbono(7.0%) (see table 4.1). The soil samples from Ogbono have porosity less that 10%. This low porosity is an indication that the soil is dense and contains low volume of voids relative to the volume of solids. Sandy soil which is mostly the predominant soil class of the area is more porous and less cohesive due to their divided individual soil particles. This lack of cohesion within the soil particles make them prone to the effect of erosive forces.

Particle Size

From Table 4.1, results from the particle size analysis indicate that most of the particles obtained from the study area belong to the category of fine sand and silt (0.2mm – 0.0002mm). This suggests that very little force is required to detach and transport the soil particles therefore making then more susceptible to erosion.

Clay Content

Most of the soil samples showed very little percentage of clay content with the highest being 16% and the lowest 4% (see table 4.1).
Since the presence of clay material provides the required bondage between the varying soil particles resulting to the formation of more stable aggregates which makes them less susceptible to erosion, the absence reduces the tendency of the soil particles to bind together and form aggregates that are resistible to the shearing force of flowing water thus making the soils vulnerable to soil erosion. This agrees with Parfitt, et al. (2000), who indicated that there was a positive correlation between aggregate stability and clay content of soils.

Erodibility Indices

Soil Erodibility Indices

Specific soil erodibility indices namely critical level of soil organic matter content, modified clay ratio, erosion ratio, dispersion ratio and water

stable aggregate were used to assess the degree of susceptibility of soils of the study area to erosion.

Critical Level of Soil Organic Matter Concentration (S_t)

Soil organic matter concentration plays a major role in forming and stabilizing aggregates (Dutartre et al., 1993, Alewell, *et al* 2009, Meersmans, *et al* 2009). Result in table 4.1 show that Critical Level of Soil Organic Matter Concentration (St) in the Orange, Sweet-potatoes, Cassava, Maize and African Pears-Cassava farm was 10.12%,,9.25%,7.34%,8.46% 6.3%and5.45% respectively . The implication of this result can be better appreciated by understanding Pieri's (1991) proposed concept of critical level of soil organic matter concentration (S_t) as measure of structural stability of tropical soils. St=< 5% indicates loss of soil structure and high susceptibility to erosion, S_t=5% to 7% indicates unstable structure and risk of soil degradation and S_t=> 9% indicates stable structure.

Soils under Sweet potatoes, Maize and African pears have values (7.34%, 6.34,and 5.45% respectively) indicating unstable structure and risk of soil degradation. Soils under the Orange and Ogobono farms have values of Critical Level of Soil Organic Matter Concentration as 10.12% and 9.25% respectively indicating soil stable structure.

Dispersion Ratio (DR)

Results obtained from the calculation of the Dispersion Ratio (DR) showed values ranging from 0.52 to 0.74 with average value of 0.60. While the lowest value of 0.53 (see table 4.2) was found in soil samples from Ogbono, the highest value of 0.74 was found from maize farm. According to Middleton (1930), soils having dispersion ratio greater than 0.15 are erodible in nature. In soils of eastern Nepal, Chakrabarti (1990) reported that susceptibility to erosion is

Significantly related to the dispersion ratio. This result therefore indicates that the soils from the study area are susceptible to erosion. From statistical analysis, dispersion ratio is positively related with soil loss showing coefficient of correlation (coefficient of dependence) of 85% (Figure 4.1)

Modified Clay Ratio (MCR)

The modified clay ratio (MCR) in soil represents the modification of clay ratio by incorporating the effect of organic matter in estimating soil susceptibility to erosion and resembles the results observed in clay ratios. Variation of the result could be attributed by the variation of the presence of organic matter in the topsoil. Modified clay ratio (MCR) in soils under Maize, African Pears, Sweet-Potatoes, Cassava, Ogbono, Orange land uses in the order of increasing of resistance to erosion is 15.84, 12.93,9.34, 6.6, and 4.06 respectively.

These results are considered low when compared with values obtained from stable soils like loamy soils. Low values of MCR are an indication of the low clay content of the soils in the study area. The graphical plot of soil loss and MCR (see figure 4.2) showed a positive relationship with a coefficient of correlation (high coefficient of dependence) of 96%.

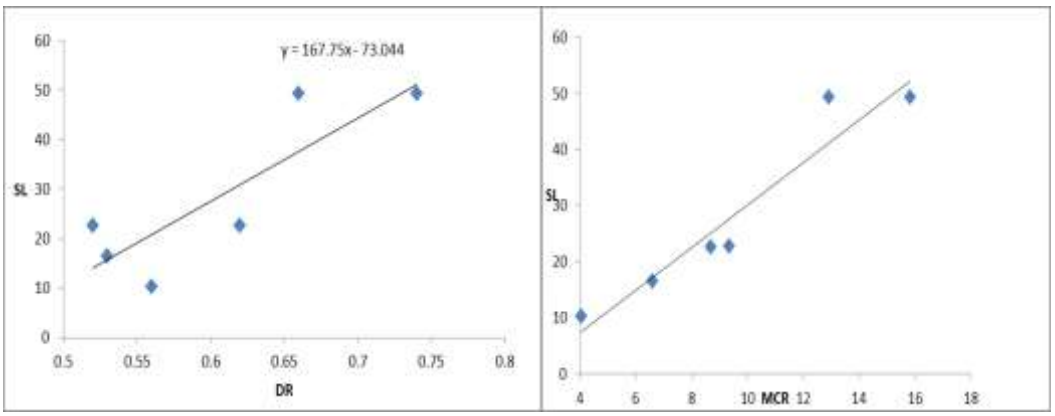

Figure: 4.2 Relationship between Soil Loss (SL) with Modified Clay Ratio(MCR)

Source: Fieldwork, 2017

The graphical plot of soil loss and MCR (see figure 4.2) showed a positive relationship with a coefficient of correlation (high coefficient of dependence) of 96%.

Erosion Ratio (ER)

The Erosion Ratio (ER) of the soil samples was calculated and found to range between 0.29 at Sweet potatoes farm to to 1.16 at orange farm with an average of 0.43 (see table 4.2). These values can be considered

as high compared to standard values given by Khera and Kahlon (2005) that soils having erosion ratio > 0.10 are erodible in nature.

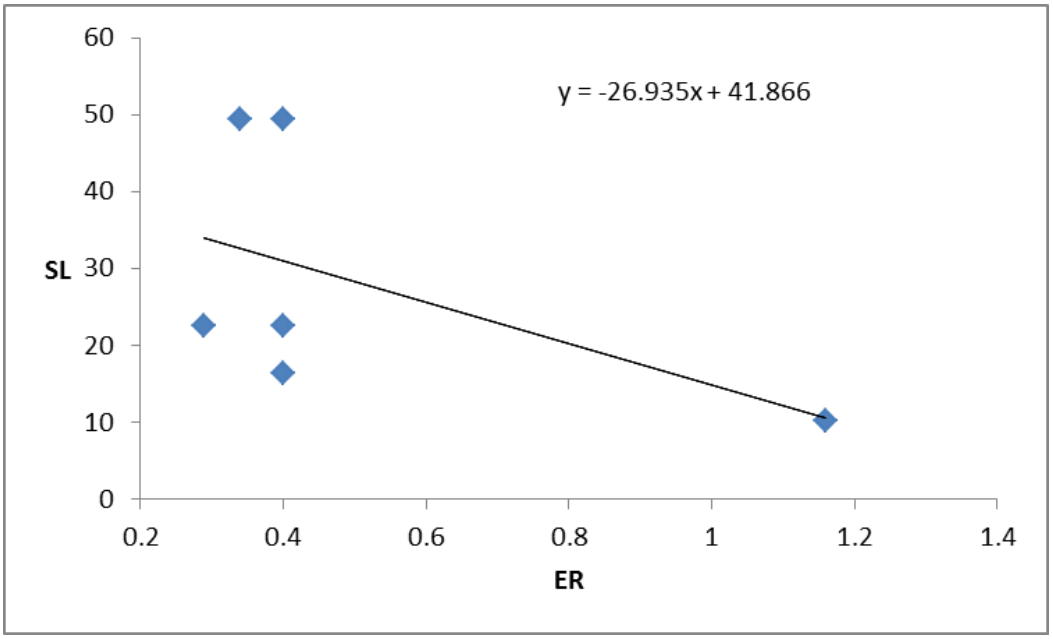

Figure: 4.3 Relationship between Soil Loss (SL) with Erosion Ratio(ER) in Mbaityough
Source: Fieldwork, 2017

The above figure (4.3) shows that dependence of soil loss on erosion ratio is low as the coefficient of dependence is 52% (Figure 4.3).

Water Stable Aggregates (WSA)

Erosion by water and wind is also related to the number and stability of aggregates against abrasive effects of running water or blowing wind. Results obtained from the determination of water stable aggregates (soil aggregates > 2mm) showed that while the soil samples considered had as low as 3%, soil samples obtained from orange and Ogbono had the maximum 12% and9 % (Table 4.4) of water stable aggregates respectively. With this low value of WSA the resistance of soils from the study area is considerably reduced thus increasing their vulnerability to erosion. Figure 4 shows a very high negative coefficient of dependence of 94%. This shows that the higher the water stable aggregates the lower the resistance to erosive forces.

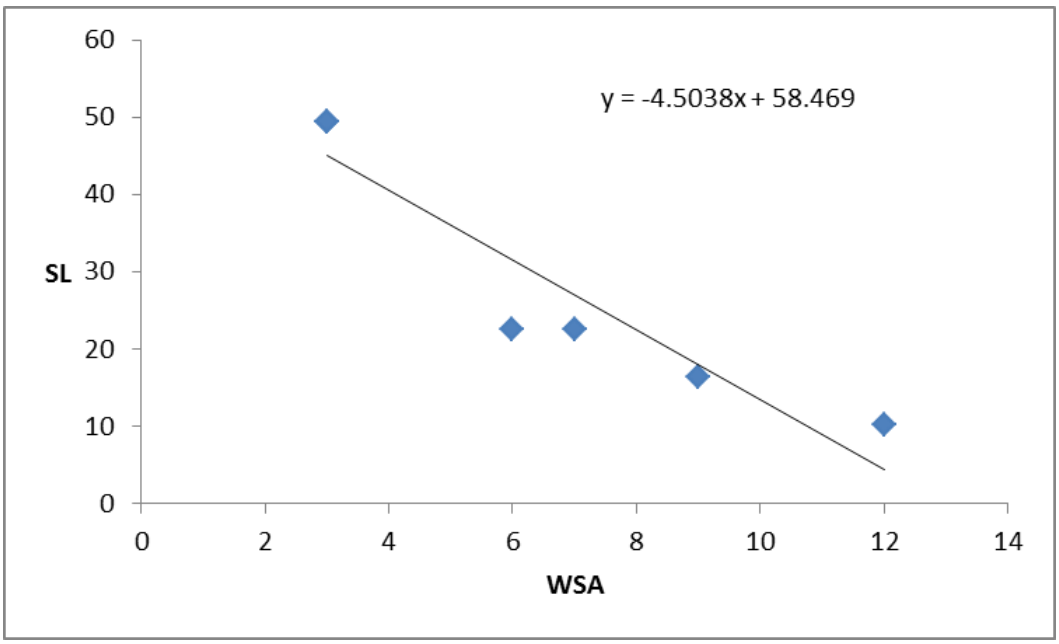

Figure: 4.4 Relationship between Soil Loss (SL) with Water Stable Aggregate (WSA) in Mbaityough Ward
Source: Fieldwork, 2017

. Figure 4.4 shows a very high negative coefficient of dependence of 94%. This shows that the higher the water stable aggregates the lower the resistance to erosive forces.

Erodibility Factor (K)

From Table 4.3, it can be observed that the soils in Maize and African pears farms are most erodible having erodibility factor (K) of value of 0.24. The least predicted losses were found in soils in Orange and Ogbono farms with both having K values of 0.05, respectively. This low erodibility factor value could be attributed to the more clay content present in the soils which has provided higher binding and inter binding forces which increases cohesion of soil particles and helps in resisting detachability of soil by water.

Erosion Prediction

From the results of the predicted soil losses in the various farms under the study area (Table 4.3) and using the standard erodibility indices as given by Chouliaras (2000), maize and African pears having the highest value of K factor has the highest predicted soil losses of 49 tons/ha/yr.

This could be as a result of the highly silty nature of the soils from this area, and silty soils are known to lack cohesion as their particles are loose therefore require little drag force to be transported by the force of moving water.

These results agree with findings of Chouliaras (2000) that most erodible soils are silts and fine grain sands. High erodibility of silty soils is due to small size and weight of the grains

Soil Erodibility Mapping

The erodibility map (Figure 4) of the study area was produced based on the estimated values of the soil erodibility factor K and the corresponding soil losses which were determined based on the Revised Universal Soil Loss Equation (RUSLE).

From the erodibility map, it can be observed that Maize and African pears have high Erodibility factor K with high predicted soil loss of 49 tons/ha/yr. The area made up of Orange and Ogbono with K factor ranging from 0.0- 0.10 has low erodibility. Moderate susceptibility of soils to erosion is noticed on the map for areas like Sweet potatoes and cassava. While Maize and African pears farms with K factor values ranging from 0.18 – 0.28 are observed to be highly prone to erosion.

Generally in Vandeikya area of Benue State, erosion problem is basically socio-economic and ecological in nature. Erosion reduces the production of food production by small farmers.

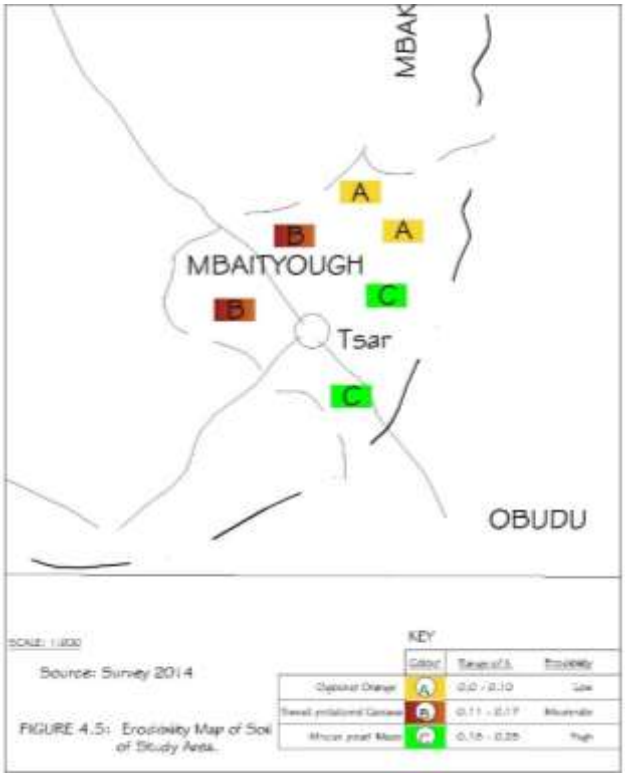

Figure 4.5 Erodibility Map of Soils of Study Area.
Source: NAGIS, 2017

Hypothesis Test

In testing the hypothesis, the t-test for significance of r (correlation coefficient) was used to test the hypothesis. The formula is:

$$t = \frac{r\sqrt{N-2}}{\sqrt{1-r^2}}$$

The degrees of freedom = N-2, where N = the sample size and r =correlation coefficient.

Decision Rule:

The basic rule of this technique is if absolute value of correlation (r) is less than the critical values obtain from the Pearson's correlation coefficient table under the assumed level of significance, the null hypothesis (H_{o1}) is accepted. But if the calculated value is more than the critical value from distribution table, then the null hypothesis (H_{o1}) is rejected and the alternate hypothesis (H_{A1}) is accepted.

HYPOTHESIS

Hypothesis focuses on the first objective **"To determine the soil erodibility indices of small holder farms in the study area in order to ascertain areas (farms) prone to severe erosion". Hypothesis is tested using the tables 4.1, 4.2 and 4.3 below respectively.**

Computation of 't' values as follows.

$$t = \frac{r\sqrt{N-2}}{\sqrt{1-r^2}}$$

(1)Tests of Pearson's Correlation between (DR) and (SL):

r = 0.85, t =3.23, df (degree of freedom) = n-2 =4.

At 5% level of significance (that is, 95% confidence), probability value for a 't' of 3.23 with df is 0.811(i.e. critical value in table).

Decision:

The probability computed above is compared to the significant level stated above, and probability value 0.811 is less than the significant level 5% (0.05), the correlation is statistically significant. Since the effect is significant, the null hypothesis (H_{o1}) is rejected.

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Conclusion:

It is concluded that the correlation between DR and SL is greater than zero. That is, there is a small but significant relationship between DR and SL. r = 0.85, t(4) = 3.23,and p = 0.811.

The calculated data suggests that Soil erodibiliy index (DR) is effective (100%) in determining the susceptibility of soil to erosion on small-holder farms..

(2).Tests of Pearson's Correlation between (MCR) and (SL):

r = 0.96, t =9.6, df (degree of freedom) = n-2 =4.

At 5% level of significance (that is, 95% confidence), probability value for a 't'of 9.6 with df is 0.811(critical value in table).

Decision:

The probability computed above is compared to the significant level stated above, and probability value 0.811 is less than the significant level 5% (0.05), the correlation is statistically significant. Since the effect is significant, the null hypothesis (H_{01}) is rejected.

Conclusion: It is concluded that the correlation between Modified Clay Ratio and Soil loss is greater than zero. That is, there is a significant relationship between

MCR and SL. r = 0.96, t(4) = 9.6,and p = 0.811

(3).Tests of Pearson's Correlation between (ER) and (SL):

r = -0.52, t = -1.22, df (degree of freedom) = n-2 =4.

At 5% level of significance (that is, 95% confidence), probability value for a 't'of -1.22 with df is 0.811(critical value in table).

Decision:

The probability computed above is compared to the significant level stated above, and probability value 0.811 is less than significant level 5%(0.05),the correlation is statistically significant. Since the effect is significant, the null hypothesis (H_{01}) is rejected.

Conclusion:

It is concluded that the correlation between Erosion ratio and Soil loss is strong correlation.

r = -0.52, t(4) = -1.22,and p = 0.811

The calculated data suggests that Soil erodibiliy index (ER) also better way of determining the susceptibility of soil to erosion on small-holder farms.

(4).Tests of Pearson's Correlation between (WSA) and Soil (SL):

r = -0.94, t = -5.53, df (degree of freedom) = n-2 =4.

At 5% level of significance (that is, 95% confidence), probability value for a 't'of -5.53 with df is 0.811(critical value in table).

Decision:

The probability computed above is compared to the significant level stated above, and probability value 0.811 is less than significant level 5%(0.05),the correlation is statistically significant. Since the effect is significant, the null hypothesis (H_{01}) is rejected.

Conclusion:

It is concluded that the correlation between WSA and SL is a strong correlation.

r = -0.94, t(4) = -5.53,and p = 0.811. The calculated data suggests that Soil erodibiliy index (ER) is better way of determining the susceptibility of soil to erosion on small-holder farms

Table 4.1:Summary of Results of Soil Test

			C						
S/N	A	B	Sand%	Silt%	Clay%	D	E	F	G
1	Orange	18.4	63	21	16	$4.4x10^{-3}$	1.78	39	10.12
2	Ogbono	6.6	62	27	11	$8.3x10^{-3}$	1.96	7	9.25
3	Sweet/potatoes	4.1	79	13	8	$3.4x10^{-3}$	1.7	19	7.34
4	Cassava	7	58	34	8	$5.5x10^{-3}$	2.26	17	8.46
5	Maize	4	68	28	4	$5.0x10^{-3}$	2	28	6.34
6	Africa pears	5.4	65	31	4	$5.0x10^{-3}$	1.78	20	5.45

Source: Survey, 2017

KEY:A=Sample Farm, B=Moisture Content, C=Sieve Analysis, D=Permeability(cm/s),E=Bulk Density(g/cm^2), F=Porosity and G=Soil Organic Matter Content.

Table 4.2: Calculated Values of Erodibility Indices in Mbaityough Ward.

S/N	Farm	Dispersion ratio (%)	Modified Clay ratio (%)	Erosion ratio (%)	Water Stable Aggregate (%)
1	Orange	0.56	4.06	1.16	12
2	Ogbono	0.53	6.6	0.4	9
3	Sweet/potatoes	0.62	9.34	0.29	6
4	Cassava	0.52	8.68	0.4	7
5	Maize	0.74	15.84	0.34	3
6	African pears	0.66	12.93	0.4	3

Source: Survey 2017

Table 4.3: Erodibility Factor(K)and Predicted Soil Loss(Hudson,1995) in Mbaityough

S/N	Farm	Erodibility Factor(K)	Soil Loss(ton/ha/yr)
1	Qrange	0.05	10.28
2	Ogbono	0.08	16.45
3	Sweet potatoes	0.11	22.62
4	Cassava	0.11	22.61
5	Maize	0.24	49.35
6	African pears	0.24	49.35

Source: Survey 2017

Plate 3: cassava farm

Plate 4: Stem of cassava in a farm

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Conclusion

Based on the analysis of research findings the following conclusion can be deduced:

- Most of the soil samples were predominantly of sand and silt making the soil to be classified as silty sand soil.
- Permeability results showed that the soils were highly permeable, making them vulnerable to shear stress of water.
- Dispersion Ratio (DR), Modified Clay Ratio (MCR) and Erosion Ratio (ER) were high , while Water Stable Aggregates (WSA) which can offer resistance to the shearing force of water was low suggesting that soils from the study area are vulnerable to erosion (with various degree of susceptibility).
- Erodibility factor (K) results and annual soil losses in this areas where predicted showed that Maize and African pears have the highest value of erodibility factor (K) of (0.24) and the highest predicted soil loss, while areas like Orange and Ogbono had the lowest (K) values and lowest predicted soil loses.
- A strong positive correlation was found to exist between Soil loss, Dispersion Ratio, Modified Clay Ratio, while a negative correlation existed between Soil loss, ER and WSA.
- The high correlation coefficient noted between MCR, DR, WSA and soil loss appears to indicate that MCR, and DR are better indices of soil erodibility.
- An erodibility map made up of three classes was drawn showing low, medium, and high classes in terms of susceptibility to erosion. It thus implies that some of the areas are highly vulnerable to erosion, while some moderately vulnerable with some having little tendency to be eroded.

Recommendations

Based on the analysis of research results obtained and conclusions arrived at, the following recommendations are considered appropriate:

- It is suggested that control measures be put in place in areas that are highly susceptible to erosion to avoid more soil losses and further development of erosion spread. This can be done by

planting more of Orange crops and Ogbono rather than planting crops that increase the rate of erosion. This type of practice enhances food security in the study area and her environs.

- Removal of tree crops should be discouraged in this area as removing this natural soil cover which also provides organic matter and cohesion of soil particles leaves the soil more exposed to agents of erosion.
- To sum up, the research calls for a "new deal for smallholders". Smallholders constitute the majority of farm families in the world and their contributions to household, national and global food security are monumental and 2014 declared by the UN as the International Year of Family Farming, I emphasize that small farmer(s) be given: Improved productivity through research and extension**:** There is an urgent need to upgrade and finance national research and extension systems targeted specifically to the needs of smallholders, with supporting financial mechanisms. The main objective would be to increase productivity and resilience through diversification of the production system with a high concern for the self-provision of diverse foods with a high nutritional value. Combining increased productivity and resilience will require a high level of investment in research to develop productive land-use systems with minimal ecological risk such that biodiversity may be used productively and conserved. Agricultural research and extension should support the *in-situ* and *ex-situ* conservation of agricultural biodiversity in the context of climate change. Agro-ecological approaches and production ecological principles may be instrumental. Smallholder farmers need appropriate seeds as well as machinery for field operation, food processing and other value-adding transformations. International, local collaboration and the sharing of experiences in technology development for smallholder farmers in different regions of the world should be promoted with a strong engagement, if not leadership, of smallholder organiations.
- Up-to-date information on the smallholder sector**:** In order to better inform National Smallholder Investments Strategies, international agencies and especially FAO, in cooperation with

national and state governments, need to better document the evolution of smallholder agriculture and its contributions to various outcomes. These outcomes include measurement of non-market food production and of the diversity of diets. The World Census of Agriculture [WCA] and other data collection efforts should be harmonized to strengthen the evidence-base for investment decisions. International funding should support countries in implementing censuses and related surveys.

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ADOPTION OF *DStv* PARENTAL CONTROL FOR TELEVISION MEDIATION AMONG PARENTS IN ETI-OSA LOCAL GOVERNMENT AREA, LAGOS STATE

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ABSTRACT

Unmonitored media exposure has been linked with negative psychographic development in children. This is a concern especially with television viewership. In 2011, the Digital Satellite Television (DStv) – the foremost satellite TV provider in Africa introduced the Parental Control (PC) feature enabling parents totally control viewership by restricting and monitoring

Introduction

Modern technology continues to make it easier than ever before for children to have access to varied forms of media content that highly influence how they perceive the world as well as shape their behaviour. The curiosity of a child while exposed to one form of media or the other often leads to exploring a variety of content that are age inappropriate. This necessitates the need for Parental Mediation – the intentional act of monitoring and or restricting media interaction with an intent to limit exposure to age appropriate media content.

Parenting appears to be more challenging in these times as the world now revolves around technology which has paved the way for a multimedia generation. Beyond ensuring the safety of a child, it is the responsibility of every parent to ensure the transmission of positive values. Parental mediation amongst other things is a step in the right direction towards the

attainment of this responsibility. Bas ically, Parental Mediation seeks to empower parents by proffering strategies via which parents are in charge of exposure to the mass media (television, internet, mobile phone) by their ward(s).

Steele and Brown (1995), posit that young people often spend more time with the media than they do with their parents. Parents and other socialization agents have arguably shirked their responsibilities when it comes to directing the youth away from risky forms of behaviour; thereby allowing the media a more fundamental influence. For instance, Children who are exposed to media content that depict violence and crime are most likely to exhibit violent behaviour amongst their peers.

Television is a common mass medium among children. It is often utilized by parents to pacify children while they focus on work, domestic chores, or get some rest. It is a captivating medium that provides numerous channels with a variety of content. The advent of cable television broadcasting in Nigeria in the 1990's gave rise to the assortment of channels via which media audiences (children

access to TV stations whether or not they are home. Anchored on social learning theory, this study empirically determined the extent to which awareness of DStv's PC and perceptions among parents in Eti-Osa Local Government Area, Lagos state results in its use. 400 parents were Purposively surveyed from Ikota/Ikate Village, Igbo-Efon/Ikota Housing Estate, Victoria Island, Ikoyi II. Awareness of DStv PC was found to have a strong positive significant relationship with parents' perception of DStv PC ($r = 0.932$, $p<0.05$), and their use of DStv's PC ($r = 0.897$, $p<0.05$). However, the use of PCs among parents was found to be insignificant. There is a need for parents to be intentional about the need to mediate their children's television viewership and also, they should combine restrictive mediation with active mediation or co-use mediation.

Keywords: *Parental mediation, Digital Satellite Television, Parental control, Awareness, Perception, Use*

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