

Policy Brief

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Soil erosion risks and farmers' adaptation strategies in Anambra State

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Summary

The study focused on soil erosion risks in Anambra State, Nigeria by assessing rainfall variability, soil attributes, in situ erosion measurement, erosion modelling using the Revised Universal Soil Loss Equation (RUSLE) and the farmers' perception of soil erosion and their adaptation strategies. Soil erosion is a severe problem in Anambra State that has degraded much of its land, thereby lowering the soil quality. Lots of tonnes of soil are eroded away into rivers. Soil erosion is severest toward the end of the rainy season. It is higher on bare soils than vegetated soils. It was more rapid on tilled plots than bare land at the onset of the experiment. It is worse on the high slopes of the central and southern parts of the State. Rainfall and erosion are rising with rainfall becoming more intense in the future. The RUSLE model is good for soil conservation planning in the State for it has a low mean bias error of $-3 \text{ t ha}^{-1}\text{yr}^{-1}$.

Key message

- Soil erosion is a threat to the State's soils and environment and the rate is increasing.
- It is worsened by high erosivity, slopes, and vegetation loss. It is severest toward the end of the season
- Increase farmers' awareness on the benefits of adopting new conservation measures
- Adopt minimal tillage or ensure soils are covered by vegetation or other covers
- Aggressive reforestation should be embarked upon
- Urban developers should integrate surface greening since bare land and settlement are

Introduction/Problem

Soil erosion is a major environmental problem in Anambra State. Croplands are susceptible to erosion due to some farming practices that leave the farmlands bare (Prasuhn 2022). Bare fallow areas following crop harvest are easily detached and dislocated by rainfall and runoff

(Panagos et al. 2016). In many developing countries, erosion is increasing due to increasing population and high rate of deforestation to grow more crops (Ebabu et al. 2019). However, improved conservation measures are effective measures of minimising erosion. Declining erosion is reported in several areas with improved conservation measures (Du et al. 2022; Day and Long 2023; Srivastava et al. 2023). Such conservation measures vary from minimal and zero tillage, grassed waterways, solid bunds, terraces to creation of wetlands (Srivastva et al.2023). Thus, a comprehensive assessment of soil erosion is key to effective erosion management. Soil erosion can be assessed in the field and with model for wider spatial coverage. However, in Anambra State, such studies are still limited and the few models in the State were not validated for lack of data.

“Soil is subject to erosion, and however rich, its fertility is constantly threatened by uses that exhaust its vitality. It needs constant reinvigoration if it is not to become poor and sterile”

[Elizabeth Drew, (1935-2013) but it is rephrased]

Approach

The study involved the assessment of soil erosion risks and the farmers’ adaptation strategies in Anambra State. This was achieved by assessing the rainfall variability using Mann-Kendall trend and Sen’s slope tests, the soil samples were analysed in the laboratory to understand their attributes and susceptibility, soil loss was measured in situ using runoff plots to understand the effects of vegetation, soils, slope, and tillage on soil erosion. Also, the ability of the RUSLE model to estimate soil erosion was tested and found suitable for soil conservation measures and planning in Anambra. The model was therefore used to assess a larger spatial scale covering the whole State. Also, it was used to assess the impact of climate and land use on soil erosion from 2017 to 2060. I also assessed the farmers’ perception of soil erosion and their adaptation measures using purposive sampling.

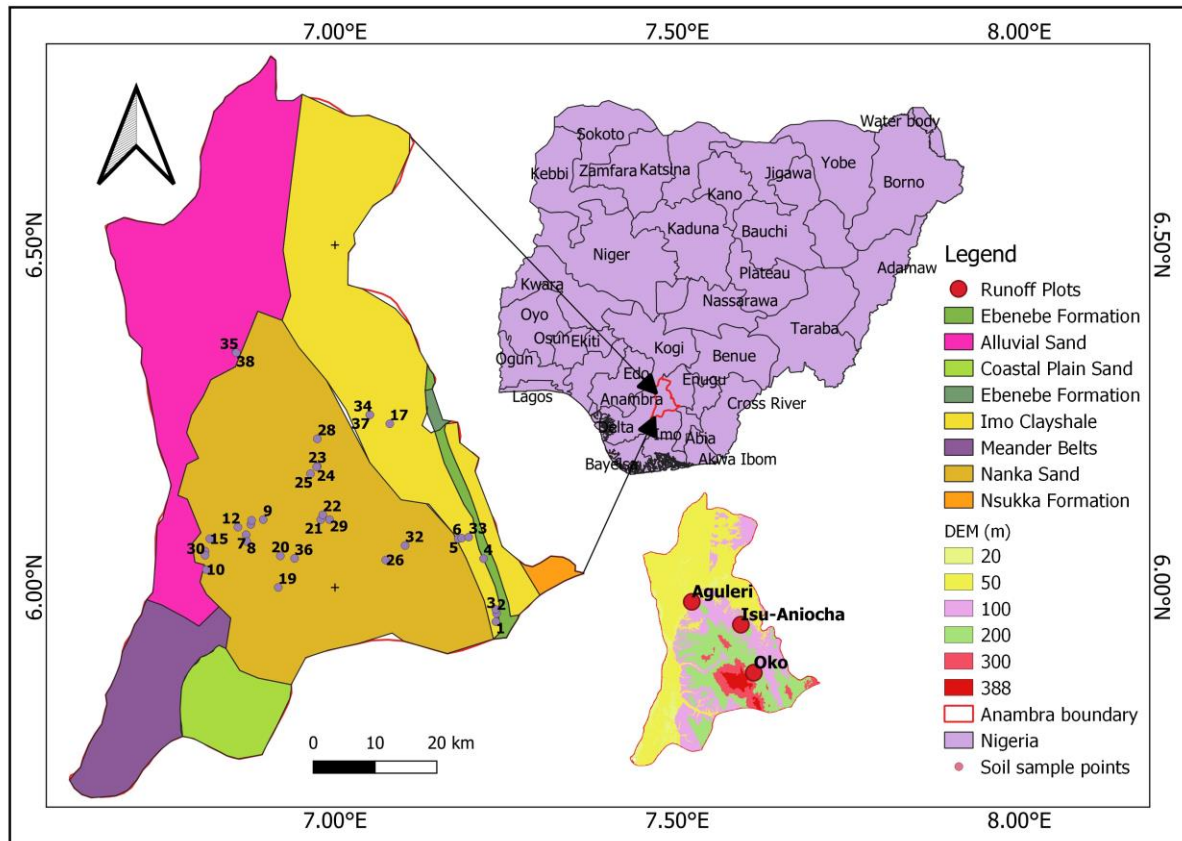


Figure 1. Anambra State showing the geology and elevation

Study results

The annual and seasonal rainfall of the area have a rising trend. The magnitude of the annual trend ranges from 1.63 – 4.22 mm per annum while the seasonal trend ranges from 0.29 – 2.00 mm for the SON season which has the highest seasonal trend. The rising trend implies a higher impact on soil erosion especially the SON rainfall. This is because soil erosion was highly correlated with rainfall and moisture with correlation above 0.60. Erosion is severe towards the end of the rainy season with over 50 % of the soil loss occurring in the last month in Awka but over 90 % in Aguleri and Oko. This showed that the post-little dry season rains are accompanied by severe soil erosion. Soil loss is six to fourteen times higher on bare plots than on vegetated plots depending on plots' size. Hence, bare soils are the most vulnerable to erosion than covered soils. The RUSLE model is good for soil erosion studies in Anambra with a good accuracy measure (mean bias error of $-3.00 \text{ t ha}^{-1}\text{yr}^{-1}$). That is, the model shows little underestimation which is within an acceptable range. The model shows that soil erosion is severe on bare lands ($70.91 \text{ t ha}^{-1}\text{yr}^{-1}$), settlements ($63.84 \text{ t ha}^{-1}\text{yr}^{-1}$), and agriculture ($19.84 \text{ t ha}^{-1}\text{yr}^{-1}$); a trend that continues into the future.

conclusions

- There are variations in seasonal and annual rainfall distribution in the State with higher rainfall trends in the south than in the north.
- Soil erosion rate was $27.76 \text{ t ha}^{-1}\text{yr}^{-1}$ with highest erosion in Oko (southern part).
- The RUSLE model is good for soil erosion studies and conservation planning. It has good performance based on the error metrics (mean bias error of $-3.00 \text{ t ha}^{-1}\text{yr}^{-1}$). The temporal variations in erosion are attributable to vegetal cover losses as erosion increases to 2060s.
- The farmers adaptation strategies include cover cropping, mixed cropping. However, they still practise slash and burn agriculture, conventional and continuous tillage, deforestation, and only a very belong to cooperative society or have remittances or a secondary income source. A new method of growing root crops in sacks but it is yet to be widely practiced.

Recommendations:

- Educate the farmers on the importance of soil conservation
- Promote local knowledge: Assist farmers on the integration of modern and effective traditional strategies like the growing of root crops in the sacks
- Invest in infrastructure: provide farmers with check dams, irrigation facilities to enable them plant and harvest crops early before the September to November storms associated with severe erosion
- Adopt minimal tillage agriculture and ensure soils are covered at all times
- Legislation: enforce aggressive reforestation across the State
- Developers should integrate surface greening in estate and urban development since erosion is lower on vegetated surfaces but severer on bare surfaces and settlements.

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