Topography Indicator Map Generation using GIS

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ABSTRACT

In this research a topography indicator map was produced to show slope and landforms. The process involved the use of appropriate software in the Geographic Information System (GIS) environment.

Different data was collected basically from Shuttle Radar Topography Mission (SRTM) and Global Positioning System(GPS) of the study area, these was integrated in the GIS environment using appropriate software.

The Digital Elevation Model(DEMs) from STRM was preprocessed, data analyzed and then colors were assigned to relevant features to make the map readable. These type of maps produced can be used in Environmental Management, Urban planning, Agriculture and Hydrology.

Keyword: Topography, GIS, Srtm

INTRODUCTION

Spatial information pertaining to the topography of an area is necessary for maintaining agricultural development. Spatial information pattern evaluation is one of the basic characteristics of GIS for envisioning (Comber *et al* 2008, Murad 2008, Papadimitriou 2009, Gao *et al* 2016, Mushonga *et al* 2017)

Slope is one of the results in producing topography map indicator map therefore Slope is said to be the degree of incline or steepness of an area and is computed by raster or Tin surfaces but cannot be computed directly from Lidar points Owais et al 2019

GIS enables the soil scientists, geologists, geographers and landscape investigators to examine the spatial arrangement and ascertain the correlation between human activity and physical environment. (Armitage *et al* 2000, Davydov & Timoshok 2010, Nichols *et al* 2014, Capizzi *et al* 2016)

GIS environment creates an environment for capturing data, analyzing and then displaying information. Ndidi et al 2014 explained that mapping and visualization of topographic setting as paramount for a better comprehension of the physical environment because of this, advanced method that produce accurate result must be adopted to ensure that the right decision is made.

GIS technique has proved itself to be a force for sustainable development that is why researchers worldwide frequently apply its procedure in their investigations. The applications of GIS in landscape and visualization has raised the assurance attributed to recent cartographic output.

Geographic information system(GIS) is used to examine topological relationships in the surface of the earth and also comprehend the relationship between the physical environment and human activity one of the basic characteristics in GIS is that it displays results of topography very well mainly in map format.

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Before GIS came about, cartographers depended on data from analogue and traditional survey for map production, this was time consuming and not very accurate. In GIS large volume of data can be recapped and interpreted in map format.

This study shows how GIS method can be used to spur topographical data by applying necessary GIS techniques.

In this study a topography indicator map was produced using ArcGIS software and data from SRTM and coordinates from GPS.

The DEMs from the SRTM was used to minimize the challenges in mapping and give better visualization avenue. One of the major benefits of the use of GIS in this study is that it is less tedious and more accurate unlike the analogue method.

The essence of the map production was to view at a glance the topography of the study area which includes slope and landforms, this will in turn assist in areas such as soil analysis, construction, watershed delineation etc.

Study Area

The study area is basically Taraba state, North -East Nigeria precisely Donadaa and Fadda. The climate is the regular wet and dry season in Nigeria. The people are predominantly farmers. The wet season is usually about 7 months while the dry season lasts for about 5 months. This research can be of great benefit to researchers, policy maker farmers etc.

METHODOLOGY

The main material used was 90 m spatial resolution DEM created by SRTM and coordinates from GPS Field data, ArcGIS 10.2 software was used to generate raster based indicators such as slope, topography and contours etc.

The slope was created using digital elevation model in raster format of the GIS environment, also the slope values was reclassified into required ranges according to the study area.

In addition to the above, the data acquired from STRM was preprocessed by importing the raster data, setting the projection and then carry out filling to minimize errors in DEMs, the DEM based topographic data of the study region was also inputted into the ArcGIS software and also algorithms for processing and capturing of terrain features, the important topographic features were pulled out and extracted, these was used to create a database consisting of features for mapping.

Then a 3D point display was generated to improve the visibility of the features in the terrain, additionally, colors were assigned to make the map readable.

These derivatives in digital map format are important for a better knowledge about the landscape which will in turn be useful in planning and policy making.

RESULTS

The map produced in this paper from data collected from srtm and gps coordinates will serve as a means of communication to different map readers and also provide information to researchers.

In this study GIS was used to extract information for visualization and mapping. The GIS software provides an up to date result that can be understood easily and is precise.

Slope parameter which was used to represent the topography of the area is shown in Figure 1a for Donadda Plantation and 1b for Fada Plantation

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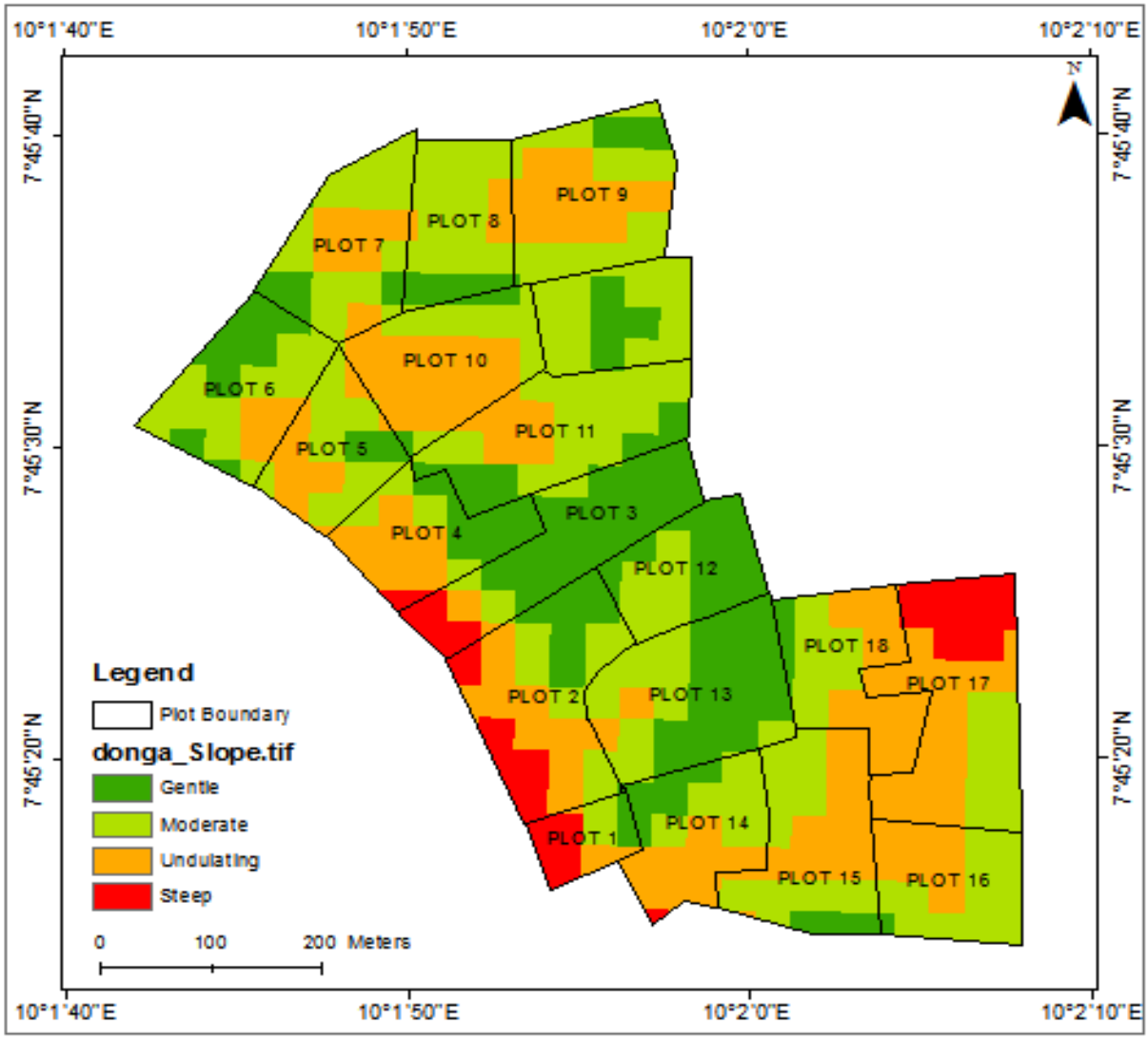

Figure 1a: Indicator of Topography over Donadda Plantation

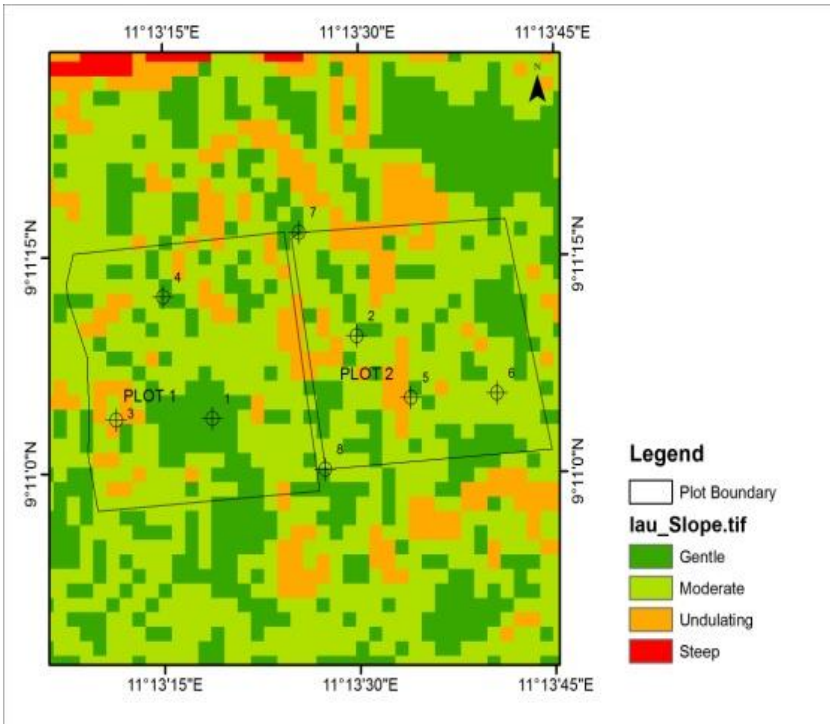

Figure 1b: Indicator of Topography over Fadda Plantation

CONCLUSION

In this study the maps show the gentle, moderate, undulating and steep slopes. Slope is very significant in forecasting the direction of flow, then GIS and other necessary tool are used for evaluating slope from elevation data.

This maps can be applied in environmental management for flood prone areas, Urban planning, and agriculture,

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