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LAND ANALYSIS TO SUPPORT SUGARCANE FARMING CASE STUDY: TANA RIVER COUNTY

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ABSTRACT

Current areas for sugarcane farming in Kenya not enough to produce enough sugar to support high consumption due to fast growing population. Enough scientific research is necessary to identify most suitable sites where less or non-chemical materials would be used. Geographical Information Systems (GIS), remote sensing and multi criteria evaluation (MCE) techniques are used for the analysis and the results show that 82.66% of Tana River County land is suitable for rice growing. The suitability classes are based on FAO 1976 guidelines.

Key words: Land, Sugarcane, Suitability, Tana River County.

INTRODUCTION

EPZ, (2005) report indicated that sugarcane farming was introduced by Indians who were constructing East African Railway early 1900 around Lake Victoria and currently it has spread to Western Kenya and slowly being practised in Coastal region. Kenya Counties (2016) indicate that approximately 12,000 tons of sugar are imported to meet consumption demand thereby making its price extensively exorbitant and there is need to fill the deficit gap by exploring more suitable areas for growing sugarcane especially in coastal region and Tana River is believed to be holding potential of its farming expansion. The GIS, remote sensing and MCE techniques are incorporated to achieve the objective of the study which was to determine suitable sites for sugarcane growth in Tana River County. Sudabe and Narges, (2010) and Malczewski, (2004) used the same techniques and found that GIS is an important tool which aid planning and decision making by people from different professions and a is powerful tool for land suitability analysis.

MATERIALS AND METHODS

Tana River County (Figure 1) was named after River Tana which is the longest river in Kenya and lies between latitudes 00°0'53" and 2° 00' 41" south of equator and longitudes 38°25'43" and 40°0′ East of Greenwich meridian. The major physical feature in Tana River County is an undulating plain that is interrupted in a few places by low hills at Bilbil around Madogo and Bura areas and it has a population of 262,684 according to Kenya National Bureau of Statistics of 2009 census report.

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Its land generally slopes south eastwards with an altitude that ranges between 20m to 200m above sea level at the top of the Bilbil hills. The most striking physical feature is the River Tana that traverses the county from the Aberdares in the North to the Indian Ocean in the South covering a stretch of approximately 500km. Besides the River Tana, there are several seasonal rivers in the county popularly known as laghas, which flow in a west-east direction from Kitui and Makueni Counties draining into River Tana and eventually into the Indian Ocean. Tana River receives annual relief rainfall varying between 400mm and 750mm with a mean annual temperature ranging between 30°C and 33°C (Kenya Counties, 2016).

Datasets

The datasets used are soil, hydrology, topographical (DEM), climate, Landsat imagery for land use map, interviews from experts and administrative boundary map 1:250,000 scale. All these datasets were obtained from different sources.

Datasets Preparation, Processing and Analysis Workflow

Figure 2 graphically summarizes procedural steps in land suitability analysis. To determine which criteria affect land-use suitability, experts are consulted to provide judgments on important of criteria and by integrating multi-criteria evaluation with the GIS to produce suitability map.

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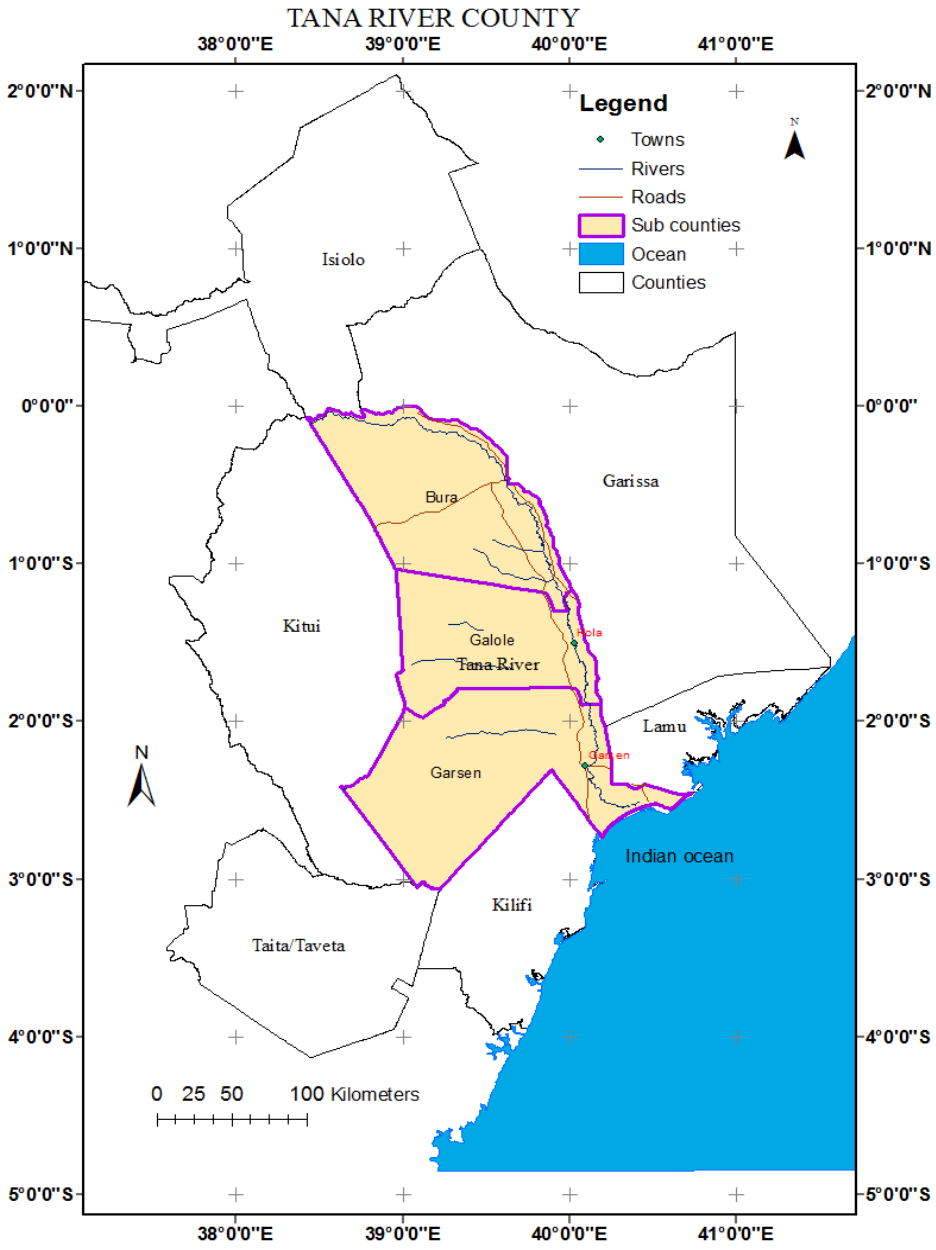

Figure 1. Study Area

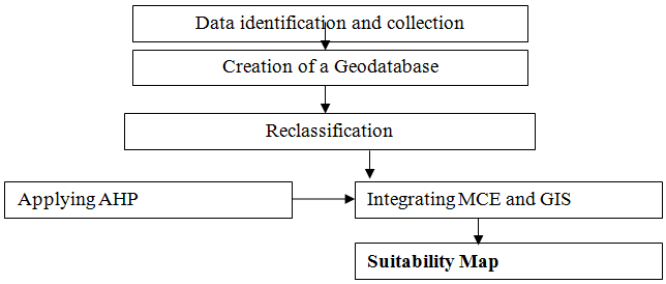

Figure 2. Processing Framework

Processing and Analysis Workflow

Figure 2 graphically summarises procedural steps in land suitability analysis. To determine which criteria affect land-use suitability, experts are consulted to provide judgments on important of criteria and by integrating multi-criteria evaluation with the GIS to produce suitability map.

RESULTS AND CONCLUSION

This section outlines the results, conclusions and recommendations of the study. Various results obtained from the analyses are shown in the Figures 3-5 below. The values 1 and 9 shown in figure 3 above represent the variance of slope degree obtained from reclassified slope map which indicates

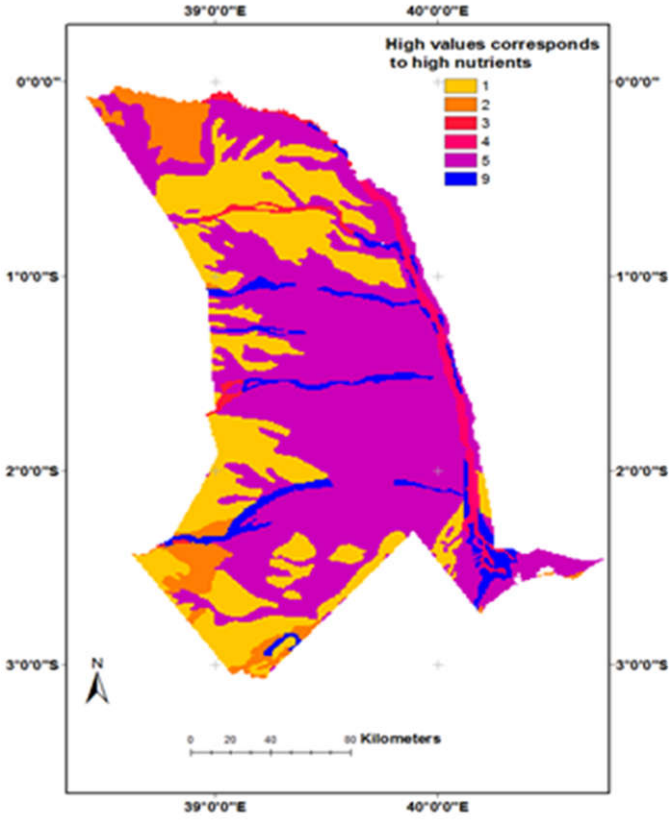

Figure 4. Spatial variation of soil nutrients map

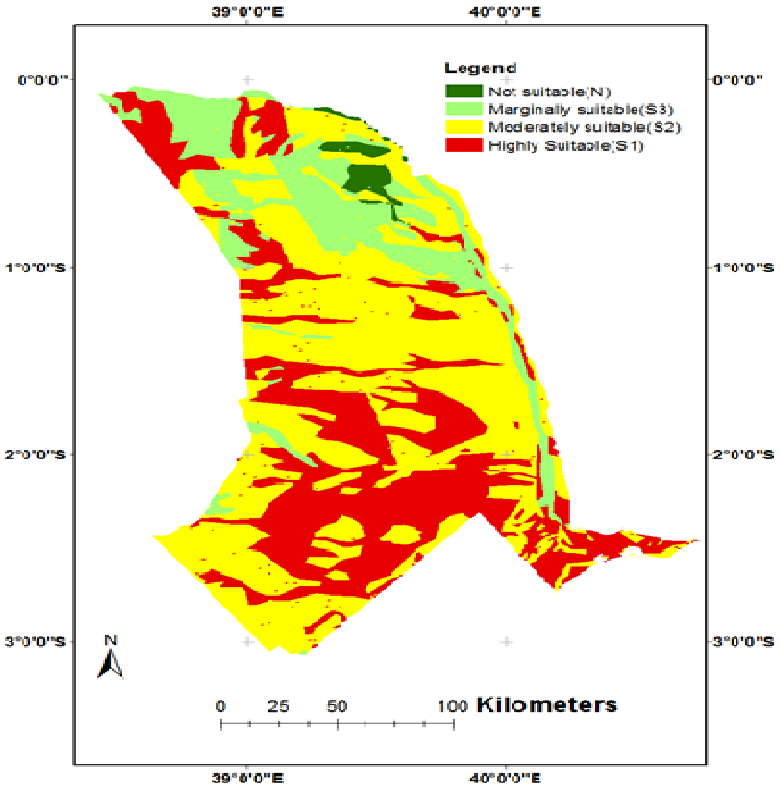

Figure 5. Suitability map

that the areas with value 9 represents the high altitude regions not suitable for sugarcane growing. The areas with value 1 are the regions which are relatively flat and are suitable for sugarcane growth.

The values 1 through 9 in figure 4 below indicate the spatial variation of soil nutrients map and higher values in the range indicate a higher suitable level and low values indicate low suitable levels. Suitability levels range as 1 is not suitable, 2-

3.as marginally suitable, 4-5 as moderately suitable and 9 as most suitable. The suitability ratings were based on (FAO, 1976) land suitability classification guidelines which classifies land as highly suitable (S1), moderately suitable (S2), marginally suitable (S3) and not suitable (N). Table 1 shows suitability levels, percentages and the acreages.

Table 1. Distribution of sugarcane suitability classes in Tana River County

Suitability Class	Area (ha)	Area (%)
Highly Suitable (S1)	1,246,529.6	32.62
Moderately Suitable (S2)	1,912,036.69	50.04
Marginally Suitable (S3)	604,439.54	15.82
Not Suitable (N)	58067.56	1.52

The highly suitable areas represent 32.62 percent of the total land of Tana River County while moderately suitable, marginally suitable and not suitable represent 50.04 percent, 15.82 percent and 1.52 per cent respectively. The figure 5 below shows the suitability map.

Conclusion

The objective of this study was to carryout soil suitability analysis for sugarcane growing sites in Tana River County. The resultant spatial information has been portrayed on the land suitability map in figure 5. The suitability classes, such as, highly suitable, moderately suitable, marginally suitable, and not suitable classes were adopted to categorize the land. Integration of GIS with MCE for the assessing sugarcane growth suitability by matching the characteristics of an area with attributes most appropriate for sugarcane growth was performed after identifying the variables for sugarcane growing. Data assembling was possible using GIS to build a spatial database holding all the datasets.

The results from this study shows that Tana River County has a great potential for sugarcane growing that should be utilized in improving the economic well-being of the people living in the county. Most suitable areas were found to be relatively flat with high nutrients value, pH or acidity and alkalinity level which is low with value of pH is greater than 5 and well drained, while not suitable sites are characterised by low nutrients value and high acidity and alkalinity values. The regions under present crops cultivation was found to be in highly suitable and moderately suitable sites. This study has proved that GIS and Remote Sensing when combined with MCE is an important tool for decision making and should be embraced in all counties in order to improve the economic well-being of Kenyans.

Recommendation

I recommend this method for future mapping of land suitability of various crops in Tana River County and when applied effectively, livelihood of dwellers would improve due to high production of both food and cash crops in the county.

REFERENCES

EPZ, 2005. Kenya's Sugar Industry Nairobi, EPZ

FAO, 1976. A Framework for Land Evaluation Soils Bulletin, 32

Kenya Counties, Tana River, 2016. Accessed from www.kenyacountyguide.com on September, 2016.

Malczewski, 2004. GIS Based Land Use Suitability Analysis: A Critical Overview, Elsevier, pp 3-6

Sudabe and Narges, 2010. Land Suitability Analysis Using Multi Attribute Decision Making Approach. *International Journal of Environmental Science and Development*.

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