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Full Length Research Paper

Using geographic information systems (GIS) to determine land suitability for rice crop growing in the Tana delta

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This research gives an evaluation of Tana delta with regard to areas that are suitable for rice growing. The study area lies on the Eastern delta area of the Tana river of which 16000 hectares have been earmarked for commercial rice farming. The evaluation of land in terms of the suitability classes was based on the method as described in FAO guideline for land evaluation for rain fed agriculture. A land unit resulting from the overlay process of the selected theme layers has unique information of land qualities for which the suitability was based on. The selected theme layers include landforms, agricultural lands, soil texture, soil sodicity and salinization of the soils. Soil texture, soil sodicity, soil salinity, were formulated using soil maps from Kenya soil survey. Landforms of the area were prepared from Landsat TM data. Overlay operations on the layers were done on these layers according to weighted significance of each of the factors. A land suitability rating model was developed using model building techniques in ArcGIS. From the results of this research, a rice suitability map was prepared identifying the various areas as four classes: most suitable, suitable, less suitable and unsuitable.

Key words: Geographic information systems (GIS), land evaluation, land suitability, land use, model building.

INTRODUCTION

Rice is the most important food source for half of the world's population. Rice is equally an important food crop for Kenya. Rice crop area is not extensive in Kenya thus giving a low produce leading to importation of the commodity to satisfy the market demand. A number of organizations are interested in the suitability area for rice so as to estimate the production and expand the extent of rice farming such as the Tana and Athi river development authority (TARDA). It is therefore necessary to develop a systematic approach to facilitate the production of land suitability information. The information can be separated into layers to model suitable area as a set condition.

Food and agriculture organization (FAO) guideline on the land evaluation system is widely used. The system is based on defined land qualities as related to landuse requirement. In Kenya land classification activities have been conducted since post independence. Two land classification systems are used: land capability for field crops and land suitability for rice. Landuse planning requires dynamic land evaluation system. The conventional map production is not such a dynamic tool. Recently with the advent of satellite remote sensing and geographic information systems (GIS), a number of pilot projects have been undertaken to test the capability of this new technology. So far the spatial database of land resources is being established by digitally encoding the existing maps. In an effort to apply this technology, this research proposes to model land suitability for rice using GIS. This can provide the key in improving yield to feed an expanding world population at a time of increasing restraints on agriculture.

The Tana river is the longest in Kenya being over 1000 km long and it has a catchment area of 95,000 km² (or 120,000 km² according to other estimates), starting on Mount Kenya and entering the Indian ocean in north

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