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DEVELOPING A LAND USE OPTIMIZATION MODEL FOR ENHANCING THE LAND PRODUCTIVITY OF SALINE WATER AFFECTED AREA: BENTOTA IN SRI LANKA

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ABSTRACT

Land degradation in coastal area due to seawater intrusion and coastal salinity is a critical problem affecting the sustainable development of Sri Lanka. Coastal salinity risk is increasing in Bentota area while diminishing the land productivity which poor for yielding considerable food production and making several socio economic issues for the community in the area. However, no any strategy has been implemented or introduced so far regarding for utilizing degraded lands in the area. This study was conducted to develop a land use optimization model for enhancing the land productivity of Bentota DSD where facing the natural phenomena of saltwater intrusion. The factors apply in evaluation of land use suitability, which includes land use, topography, climate, soil, surface and ground water, and flood inundation areas were analyzed by applying spatial analysis methods in Arc GIS 10.5 and suitable statistical methods. Land use change during the period of 1983-2013 was explored by calculating 'entropy' values. Rainfall and Temperature during last 30 years were analyzed applying time series, correlation and Manna Kendall trend test methods. The temporal and spatial distributions of five parameters of soil (moisture, EC, pH, chloride, nitrate) and eleven parameters of ground and surface water (pH, EC, TDS, DO, chloride, nitrate, sulfate, calcium, magnesium, sodium and SAR) were analyzed considering the sample data collected from July 2016 to June 2017. Flood simulation model was developed to identify flood vulnerable areas. Coastal salinity and land use suitability was evaluated by integrating all above factors. Future demands of land use were predicted applying population growth models, the theory of land carrying capacity and ecological footprint. Development objectives and strategies for optimizing the land productivity of salinized lands were identified on stakeholder perception based approach. All these factors were integrated to develop land use optimization model applying linear programming method. Optimized extent of salinized lands for paddy, coconut, vegetable, fruits, tea, rubber and cinnamon cultivations and identified strategies for land use management can be utilized by Development Planners and Agricultural Scientists to enhance the land productivity of highly (3.4%), moderately (39.6%) and slightly (57%) salinized areas.

Keywords: coastal salinity, land productivity, optimization