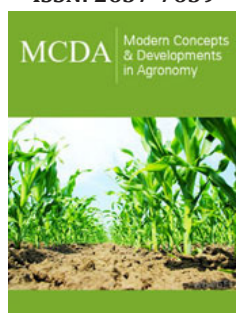# Geographic Information System and Remote Sensing for the Evaluation of the Aptitude of Rice Lands in the Mayarí Agroecosystem, Holguín

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Abstract

The objective of the research presented is to expose the research carried out for the evaluation of the suitability of land for rice cultivation, given its economic importance for the world and Cuba. A review of the research carried out on the subject was carried out and they provide a wide variety of methods that use remote sensing and geographic information systems for soil suitability studies. The studies carried out in Cuba with the use of these geomatic techniques have been focused on the cultivation of sugar cane and soil salinity, the management of water for irrigation and the distribution of plant species in forest lands. It is concluded that the application of this type of study will be able to obtain with a high accuracy the soils with greater aptitude for rice and its replication towards other crops of economic importance.

Keywords: Geographic information systems; Rice; Remote sensing; Soil suitability

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Introduction

Rice in Cuba is the most consumed cereal by the population [1]. Its cultivation has spread to almost all regions of the country, however, despite the existence of adequate conditions for its production, the demand for this cereal is not satisfied and a reduction in yields is observed due to the effect of different biotic factors and abiotic, among which is drought [2]. According to Dominguez et al. [3] despite the importance of cultivation, it is mostly cultivated in a traditional way, tillage is used based on disc harrows and permanent flooding, which contributes to soil degradation. In the current conditions of climate change, rice production in Cuba must adapt to provide food to the population in a sustainable manner and at the same time it needs to conserve and improve the soil. Due to the foregoing, it is necessary to carry out a large-scale study of the soils with greater aptitude for cultivation, and to propose the use of remote sensing and GIS as an alternative as an objective of the investigation.

Discussion

The suitability of a given soil is the capacity that is analyzed based on agricultural use, specifically for agriculture [4]. The literature accumulates various methodologies for the evaluation of soil suitability, where biophysical characteristics of crops are used by collecting qualitative and quantitative parameters that are parameterized by various methods [5]. The methodology proposed by the FAO in 1976 [6] makes an approach to the evaluation of the suitability of crops with the use of water, soil and climate requirements for land uses that are integrated and validated with the implementation of GIS [7]. Akpoti et al. [8] classifies the modern methods of suitability of land for cultivation and makes in it, a combination with the

GIS, in which it integrates the variables in maps by homogeneous zones through evaluation algorithms: those assisted by computers, by artificial intelligence, by geo-computation, multi-criteria evaluation and multi-criteria decision making, this being one of the most reliable and used methods in agricultural research [9].

The use of remote sensing for the analysis of land suitability for rice through the use of GIS and satellite images of 10 and 30 meters of spatial resolution has been addressed in various investigations [10] and its suitability has been studied by determining the availability of, the type of soil, the incidence of climatic factors, the evaluation of the physical-chemical fertility of the soil and the topography [11]. The investigations carried out in Cuba on the subject of remote sensing have been directed mainly to relate the salinity of the soil with the Normalized Difference Index of the Vegetation (NDVI) in the cultivation of sugar cane [12], analysis of drought [13], spatio-temporal distribution of land use [14], supervised classification and evaluation of the spatio-temporal dynamics of the change in vegetation cover on land under forest management [15,16] and the determination of the water demand of crops to forecast the time of irrigation application [17].

Conclusion

The analysis of the bibliography in studies carried out referring to the use of remote sensing and GIS for the evaluation of the suitability of soils for rice cultivation shows that they are diverse and highly reliable. Its application in the study region will allow researchers on the subject to obtain reliable information capable of being replicated to other crops of economic importance in the country.

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