

Research Paper

Assessment of Ecological Power to Determine the Land Use in Agriculture: A case study of Qaleh Ganj County

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ABSTRACT

Achieving sustainable development and using resources effectively and efficiently depends on a thorough and accurate knowledge of the available facilities and capabilities as well as the limitations that deter desirable situations. Development and maintenance of ecological power occurs when the land is used in proportion to its capabilities. In *QalehGanj* County, situated in Kerman province and with an area of about 10440 km², people experience different environmental conditions with different environmental potentials for agriculture. In this research, environmental power was investigated as a way of determining the agricultural capability of the region. The main goal was to specify a proper location for agriculture development, which would, in turn, bring about the most productive output both at the present time and in the long run. The process of ecological capability evaluation in the present study was conducted using a multivariate evaluation (MCE) method. Once the specific usages were defined, appropriate metrics for each use were selected using Moodood's evaluation models for macro applications and expert opinions. These criteria were divided into two categories, factor and limit. After that, the standardization of the maps was done based on two fuzzy and Boolean logics. Also, weighing the factors was done using the Analytic Hierarchy Process (AHP). The output of the weighted combinations would be indicative of the competence for locating each user. Applying this method, appropriate areas with high ecological power for agriculture (with an area of 34615.89 hectares) were recommended in *QalehGanj* County. The Expert Choice and IdrisiSelva software programs were applied in this study.

Key words:

Ecological capacity assessment, Cultivation, Multi-criteria evaluation, Location, *Qaleh-Ganj* County

Extended Abstract**1. Introduction**

Retention and development of ecologic power is possible when all the potentials of a piece of land are fully exploited. It is, therefore, incumbent to identify those potentials before any new activity starts. The present study was carried out in Qal'e-Qanj

County which is located in the southern part of Kerman province between '34-26' and '48'-27' latitudes and 53-57 up to 49'-58'longitude'. It is situated in a relatively desert area where weather conditions are dry and overcast. In this county, with an area of 10440 km², there are different environmental conditions and potentials for agriculture. Agriculture has been practiced traditionally based on trial and error, but the actual potential of the area has never been seriously studied. To this end, the present study was an attempt to appraise the environmental potential to de-

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termine the agriculture potentials of the region. In other words, the most appropriate site was sought for developing agriculture and earning the highest output and productivity for the time being and in the long run. Appraisal of ecologic potentials means measuring the latent potential of an area based on specified and predetermined criteria as an initial step for further environmental planning, pursuing sustainable development and preserving vested interests of future generations. Appraisal of environmental potentials (either the ecologic, economic, or social) is the estimation of the potential use of land as rangeland, forest, park (conservation and tourism), or for aquaculture, military, engineering, agriculture, urban development, industry, and rural purposes based on agricultural, industrial, service, and commercial frameworks. The assessment of ecosystem capacity involves considering land inventory and capability according to defined and pre-planned criteria as a basis for land allocation or environmental planning for countries. It seeks to achieve sustainable development, while preserving the interests of future generations. In fact, the assessment of the ecological capability of a land provides the necessary information about the land resources and the logic of decision making in choosing a certain land use. This is based on the relationships among the elements involved (systematic analysis). The ultimate goal is the distribution and deployment of activities on land plots in accordance with geographical features.

2. Methodology

Multi-criteria evaluation, as a structured method, was done to defining the objectives, formulate the criteria and assess and solve the decision making problems involved in the study. This method enables experts to adopt a fuzzy decision making strategy under uncertain conditions. One of the most common methods in multi-criteria decision making is weighted linear combination (WLC). What makes this method prominent is that the degree of importance and preference of each factor over the others matters in assessment. In this method, each different layer is weighted differently. The weight is estimated based on the Analytical Hierarchical Process (AHP) method according to what an expert prescribes. Afterwards, the layers are combined based on the existing model and the estimated weight, and a fuzzy layer shows the potential of the region for a specific use. Next, in this study, the maps were standardized based on fuzzy and Boolean logic, and the factors were weighted through AHP. The output of weighting the factors served as a guide to show the appropriateness of each site for a certain use.

3. Results

In this study, a final classified map indicating the ecologic potentials of the regions showed that, out of totally 139122027 ha, approximately 34615089 ha is highly potential, 10093104 ha has a medium potential, and 3574098 ha is poorly potential. Also, through the analysis of the agricultural status of Ghal-e-Ganj County within past decades, it was shown that agricultural development beyond the ecologic potential and capacity of an area leads to the gradual loss of agricultural lands in future. In this case, agricultural activities have to be done with an emphasis on higher productivity and accessibility of premium water and soil resources. In addition, a lower level of underground water and insufficient pumping, as compared to the past, has led to land shortage for those products that have to be cultivated in hot months (July and August) of the year.

4. Discussion

According to the results, the most suitable land is the one with the value of 180 or above. Therefore, in equal conditions, land allocation to agriculture is a priority when the land has a value of 180 or above and when the area is as large as 34615 89 ha. This, in general, represents the average potential of the area for agriculture.

5. Conclusion

On the whole, Ghal-e-Ganj suffers from significant limitations of soil and water resources in terms of both quality and environmental conditions, which may negatively affect the number of users in the future. One of the most important strategies for improving the living conditions of households in the region is the enhancement of agricultural productivity through initiatives such as intensive palm planting with an emphasis on adapting the product to the market and promoting wheat plantation with an emphasis on the use of modified seeds. It is also advisable to have intensive sesame plantations as well as intensive cultivation of those products which are critical to households living in poverty-stricken areas of the county, i.e. planting garlic and tobacco.

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Conflict of Interest

The authors declared no conflicts of interest