

Abstract

Environmental degradation and excessive utilization of natural resources are the most important issues of Iran. The proper use of land and water resources using plant species adapted to the region is the most critical steps in advancing sustainable agriculture. Therefore, optimal utilization of natural resources using adapted plants with minimal reliance on external inputs can guarantee the health and survival of people and development of sustainable agriculture. Deforestation, desertification, depletion of natural resources, fertile soil salinization and destruction of farmland due to soil erosion are risks which threaten the environment by not paying attention to the issue of adaptable plant cultivation in the area. Therefore, this study aimed to enhance the awareness of farmers and agricultural experts from the possibility of cultivation of medicinal plants such as, Saffron, Damask Rose, Sesame and Cumin which was performed for the first time in East Azerbaijan province. In this paper, by using multi-criteria decision-making systems and advanced sensitivity and uncertainty analysis, tried to simulate feasibility of these plants in this region. In this study, the methods of Analytic Hierarchy Process (AHP), Monte Carlo Simulation (MCS) and the Global Sensitivity Analyzes (GSA) were taken into account for modeling processing. Based on the results, the climate of this province is arid and semi-arid, and the province had high and sufficient potential for cultivation of these plants, as Mianeh, Sarab, Sahand, Maragheh and Bonab were arranged in suitable class for cultivating of these four plants. In about saffron plant, the western half and southeast of province, in about damask rose, center, southeast and northeast of the province and in about cumin and sesame plants almost all the lands had high and moderate potential in this goal. Moreover, the Monte carlo and global sensitivity analysis were able to simulate the real environment and could identify the error of weights as well. In the meantime, some weights had a high correlation with real conditions and in some cases showed low correlations. Output models in the form of raster files could well demonstrate the reliability of output results. Global sensitivity analysis by reducing the variances of outputs could well simulate the behavior of the model and determined the actual importance of the parameters in the areas which are under cultivation of these plants now. The study also showed that, primary zonation methods couldn't predict model behavior certainly and properly. Thereby, implementing the advanced uncertainty techniques and sensitivity analysis is necessary. Then, the findings of this study are great of importance for the purpose of regional planning in East-Azerbaijan Province.

Keywords: Analytic hierarchy process, climate, sensitivity analysis, topography, uncertainty



University of Zabol
Faculty of Agriculture
Department of Agronomy and Plant Breeding

The thesis submitted for the degree of Ph.D in the field of
Agroecology

**Feasibility of some medicinal plants cultivation based
on Multi Criteria Decision Analysis (MCDA) and
Geographic Information System (GIS) in East
Azerbaijan province**

Supervisor:
Dr. Mohammad Reza Asgharipour

Advisors:
Dr. Ahmad Ghanbari
Dr. Bakhtiar Feizizadeh

By:
Behzad Shokati Amrollah

December 2016