

Application of an optimization model to minimize soil erosion and maximize benefit in Abgelal basin

Chamheidar, H.¹ and Khorsandi, N.²

¹*Department of Soil Science, Shoushtar Branch, Islamic Azad University, Shoushtar, Iran. h.chamhydar@iau-shoushtar.ac.ir chamheidar@yahoo.com*

²*Department of Soil Science, Takestan Branch, Islamic Azad University, Takestan, Iran. khorsandi@tiau.ac.ir*

ABSTRACT

Soil as one of the most valuable natural resources, subject to erosion problems due to land mismanagement and natural factors and affected by many problems in the last few decades. Reduce environmental and economic impacts resulting from mismanagement of land use need to have measures in watersheds. The main objective of this research is determining the optimized level of land uses to minimize soil erosion and maximize the income of people living in Abgelal watershed in the north-east in Khouzestan province. For this purpose, linear programming model was used in three different scenarios including current land use condition without land management, existing land use condition with some degrees of land management and standardized land use condition. Results demonstrated that current land uses are not optimized for least soil erosion and high income. At optimized conditions, the area of forests increased from 8058.68 to 8490.62 ha (5.36 %), orchards increased from 537.16 to 769.85 ha (43.32 %), rangelands with no changes, irrigated lands decreased from 1695.72 to 1224.14 ha (72.19 %) and drylands decreased from 397.88 to 139.26 ha (65.00 %) in the first and second scenarios. At standard conditions, the area of forests increased from 8058.68 to 8841.69 ha (9.35%), orchards increased from 537.16 to 832.97 ha (55.07%), rangelands with no changes, irrigated lands decreased from 1695.72 to 729.66 ha (66.97%) and drylands decreased from 2678.91 to 2136.43 ha (20.25%). Also, results showed that land use optimization, in current land uses with no land management, decreases total soil erosion by 1.08% and increases total income by 59.91%, in current land uses with land management, decreases total soil erosion by 34.17% and increases total income by 91.36%, and in standardized land uses, total soil erosion by 46.33% and increase total income by 92.21%. Sensitivity analysis, also, showed that the change in the area of forests and orchards has the most effects on watershed income increase and soil erosion and nutrients losses decrease in Abgelal watershed.

Keywords: Land management, Linear programming, Sensitivity analysis, Multi-objective