Determining the effective determinants of rangeland performance using Analytical Hierarchy Process (AHP) (Case study: range manager community in the winter pastures of Semnan province)

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ABSTRACT

Owing to the oncoming needs and increasing the population of Lake Urmia Watershed, providing equilibrium between water supply and demand seems quite challenging and the Lake cannot be successful in meeting its ecological demands in this critical condition. In this unfavorable situation, water resources must be managed through a sustainable context. With this knowledge in hand, a multi attributes framework was applied to investigate the preference of supply or conservation alternatives. Preference of sustainable development attributes was calculated in a pairwise hierarchical structure and instead of time-consuming conventional procedure, Absolute Measurement was used that compares qualitative scales instead of alternatives and can overcome the problem of rank reversal in pairwise comparison. Ranks of the Alternatives were evaluated by VIKOR method which can provide a set of compromise solutions instead of one solution. Due to sensitivity analysis performance, VIKOR was introduced as a robust model in ranking the water resources alternatives. With regards to the results of this two-stage hierarchical-compromising approach, dealing with Watershed crisis is depended on organized indigenous collaboration, water use optimization and protecting available natural resources. On the other hand, supplying water by structural development without sustainability consideration would not be effective.

Keywords: absolute measurement, hierarchical structure, sustainability, VIKOR, water crisis.

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Assessment of aggregate stability and determination of instability mechanism of soils in Taleghan watershed

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ABSTRACT

Due to the constraints in determining of soil susceptibility to water erosion or soil erodibility through field tests, use of laboratory methods on small soil samples (<100 g), are easy to implement and far less expensive and time-consuming. Results of research conducted in this area indicate that among different laboratory methods based on the soil properties, those relating to aggregate stability have received much attention. In this study, by relying on observations and changes in the macroscopic scale of homogeneous work units in soils of taleghan watershed, with 3260 hectares in area, 84 points as the soil sampling points were selected. In order to distinction between aggregate breakdown mechanisms and assessing of soil structural behavior in different environmental conditions, aggregate stability is measured with respect to three treatments fast wetting, slow wetting and stirring after pre-wetting using Le Bissonnais method. Also, the effect of various types of water erosion on aggregate stability has been investigated using wet aggregate stability index. Results showed that aggregate breakdown mechanisms have a significant influence on aggregate stability. The instability mechanism of soils in Taleghan watershed is slaking that caused by the compression of entrapped air during fast wetting and this situation can occur during rain storms on dry soils. Also, the results showed that there is no significant difference between wet aggregate stability in various types of water erosion.

Keywords: aggregate breakdown mechanism, aggregate stability, Slaking, Taleghan.

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Evaluation of desertification based on climate and water criteria (Case study: Kashan plain)

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ABSTRACT

Desertification is a major problem in many countries. International efforts have been considered to combat and prevent this phenomenon. The most important cases of these measures are the United Nations Convention to Combat Desertification. In this study, IMDPA model and GIS were used to assess desertification phenomena in Kashan Plain. Some indices of Climate and water criteria were selected to consider for each condition of the region. Final desertification intensity was calculated based on geometric average of the selected criteria and their indices. The numerical value was classified in 5 classes including non-significant, low, medium, severe and very severe and desertification intensity map was drawn using GIS in the studied period. According to the results, among the studied indices, the groundwater level depletion, EC and Transu aridity index with 3.82, 3.04 and 3.01 numerical values are the most effective factors. The threshold of ground water level, EC and Transu aridity index were determined respectively: more than 50 cm/year, 2250-5000 (μmohs/cm) and 0.05-0.2. Also, the case study has classified in medium class of desertification with DS=2.4. Regarding the determined thresholds were specified the sensitive areas, and the required equipment are proposed to install on these areas for observing the thresholds.

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Investigation on the effects and costs of super absorbent polymer application on plants survival in planting projects (Case study: Semnan Province)

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ABSTRACT

In this study the effects and costs of application of two kinds of super absorbent polymer on the establishment and surviving of seedlings was investigated. Experiments were done in the field and on two kind of soil with different salinity (EC: 4.5 and 8 dsm^{-1}). The results showed: the establishment rate of seedling in control was about 40 percent. The percentage of seedling establishment in the hydrogel treatments significantly increased and statistically is equal to the optimal surviving of the seedling (80%). Soil salinity on seedling establishment in the same treatments did not produce significant differences. The results were compared with a similar project to determine the costs and benefits. Based on the results a 30 percent reduction in water usage per round and 33 to 50% reduction in the number of irrigation replicate were recorded. The costs in compare to the normal project varied from -2 to 29% respectively for treatment Herbosorb® 0.5% and Aquasorb 1%. The treatments Herbosorb® and Aquasorb with usage level of 0.5% caused about 2.5% for each one percent increasing in the cost. There is no significant increase in the percentage of seedling survival by using 1% super-absorbent compared to 0.5%.

Keywords: hydrogel, planting, Semnan Province, soil salinity, surviving.

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Effects of cement mulch combinations on sand dunes fixation

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ABSTRACT

Mulching is one of the methods of sand movement control to prepare condition for permanent fixation. Oil mulches have been used in Iran. Because of high cost and negative environmental impacts of oil mulches, changes in mulches type and mulching methods is vital. Therefore, for the first time in Iran, different combinations of cement and lime were examined as stabilizer. Sandy soil from the Yazd-Ardakan plain is used as bed treatment and Portland cement were used as the mulch in this research. The treatments were prepared using different ratios of the above mentioned materials. One liter of water was added to each mulch combinations and were sprinkled on the plot of 100 cm (length) × 30 cm (width) ×4 cm (height) sands. A completely randomized design is used as research plan with three repeating. Physical parameters, such as thickness, compressive strength, which are created by mulches, and wind erodibility of the treatments were measured. The measured data were analyzed using SPSS statistical software. Results show that by increasing the amount of cement, soil crust resistance increases. The combination mulch of cement 400 gr, sand 800 gr, and lime 10 gr is selected as the best treatment, because it can be prepare optimum physical conditions for sand dune fixation. In addition, the cost of field cement mulching estimated 30% lower than oil mulching.

Keywords: cement mulch, sand dune fixation, sand movement, wind erosion.

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Determining of land use effect on suspended and bed sediment yield using sediment fingerprinting technique in Taleghani catchment, Khorram Abad

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ABSTRACT

Soil erosion is one of the most destructive phenomena which cause significant ecological changes in many areas. Soil conservation and erosion control is essential because of the irreparable damage caused by soil erosion. Soil conservation programs will not achieve until to find adequate methods of combating land degradation and ways to reduce the sediment. Therefore, we need to have enough knowledge of the sediment sources and identify places to be at high risk to soil erosion. In this study we used fingerprinting technique in the Taleghani catchment, Khorram Abad city, Lorestan Province to determine the contributions of sediment sources including agricultural, rangeland, and forest in sediment yield. In view of this, 39 soils were collected from different sources: agriculture, rangeland, forest and channel bank and 19 sediment samples including 11 samples from bed sediment and 8 samples from suspended runoff, respectively. 11 tracers including C, N, P, Na, K, Cu, Zn, Mg, Mn, Fe and Ca were selected as the primary tracers. The results showed that discriminant function analysis were selected Mg, C, Zn and Ca as the optimum set of tracers that can discriminate 3 sediment sources. Mixing model results showed that the contribution of each sediment source is 53.37, 30.37, and 16.26 percent for agriculture, rangeland, and forest, respectively. These results were consistent with the evaluation results of nitrogen and organic carbon stocks. The results of this study can be used in selecting most appropriate erosion control method the study area and generalized to similar areas.

Keywords: geochemical tracers, sediment fingerprinting, sediment sources, soil erosion, Talaqani catchment.

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Development impacts analysis on landuse and demographic changes (Case study: Taleghan region)

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ABSTRACT

Human and natural systems have complex dynamic and any change in human system has a feedback on natural system. Environmental factors such as geographical conditions as well as human factors such as demographic changes will affect landuse changes. As landuse change is a combination of physical social and economical issues. Immigration strongly affect economic activities and it maybe a starting point for landuse changes. The present research has been conducted to analysis the effects of construction of Taleghan dam on population developments in a human system and also to analysis landuse changes in a natural system. In this research landuse map was prepared first and then with the calculation of the rate of landuse changes and population growth the result were analyzed. It can be said in general that before the construction of Taleghan dam the area's population has been decreasing and this resulted in the decline of the rate of pasture lands. But after the construction of Taleghan dam the cost of land and Seasonal population has increased.

Keywords: immigration, land use, pasture land, seasonal population, Taleghan dam.

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Assessing of interpolation method in the estimation of snow water equivalent

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ABSTRACT

Snow is one of the main components of hydrological cycle in most of mountainous basins. Since collecting the snow data (e.g. snow water equivalent data) is very difficult and time consuming, some effort is necessary to develop methods to estimate spatially variation of snow depth distribution. In the present study, the at-site SWE data of 14 stations located in the west of Isfahan providence for the period 1989-2010 were spatialized applying four methods composing the Kriging, the Co-Kriging, the Radial Basis Functions (RBF) and the Inverse Distance Weighting (IDW). In order to reach this purpose, first, the normality of data was checked using the Kolmogorov– Smirnov test. The homogeneity, the stability and the trend of data were tested employing the semivariogram approach. Then the appropriate data of each year was entered into the ArcGIS 9.3 to conduct the methods. Finally, the best method for spatializing the SWE data was selected based on the RMSE values. The results showed that the RBF method provided the best results for most of the years. Furthermore, it was found that the amount of SWE reduced from the south and west to the north and east of the basin.

Keywords: Co-Kriging, Kriging, Inverse Distance Weighting (IDW), Radial Basis Functions (RBF), Snow Water Equivalent (SWE).

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Sensitivity analysis of objective functions in linear programming model for land use optimization in the Adineh Masjed watershed

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ABSTRACT

Land use Optimization using linear programing is a method in watershed management for access to production sustainability and decreasing of soil erosion. The sensitivity analysis of the model can with investigation of results influence form changes in input parameters, lead to decrease the uncertainty in decision-making of management programs. So in this research, linear programming model using Lingo software was applied to land use optimization in the Adineh Masjed watershed, Markazi province. Then was investigated a sensitivity analysis in changes of -50 to +50 percent form area of land use type on based benefit maximization and soil erosion minimization variables. According to results, objective functions are sensitive very low in conditions of changes dry farm area maximum. So that with decreasing 10% from its, benefit rate reduced equal to 3.5%, 4.2% and 2.6% for current land use, management land use and standard land sue, respectively. Also soil erosion rate reduced equal to 0.18% and 0.19% for current land use and management land use, respectively; but it increased in standard land sue equal to 0.34%. Also the results showed benefit variability is related to dry farm area and erosion variability is related to rangeland area.

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Groundwater quality study for agricultural purposes by geostatistical analysis (Case study: Hashtgerd Plain, Alborz Province)

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ABSTRACT

Nowadays, with the increasing exploitation of groundwater resources, optimal use of these resources is more and more necessary. Geostatistical methods can be used to assess and monitor the quality of groundwater resources. Hashtgerd Plain is the case study of this investigation. In this study firstly, by using data from qualitative data which were harvested from 41 Piezometric wells, different qualitative parameters were evaluated, then by using the geostatistical methods such as: Kriging, Co-kriging and IDW the best model for mapping for aquifer quality classification was selected. Results showed that most of the indicators are better simulated by Co-kriging method, based on mutual evaluation and RMSE. The parameters of SAR and EC were selected in order to determine the irrigation water quality parameters according to Wilcox diagram. Based on these two parameters by using ArcGIS v.10 software zoning maps were prepared. Results showed that 99% of the aquifer is classified in the category of good quality irrigation water (C2S1) and 1% level in the aquifer is classified as middle class (C3S1) based on Wilcox diagrams. The results of the study can be used in aquifer management and irrigation management in the agricultural purposes.

Keywords: geostatistics, groundwater quality, Hashtgerd plain, Wilcox.

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Regional flood frequency analysis using multiple regression method (Case study: hydrometric stations of Qazvin province)

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ABSTRACT

One of the important parameters in the design of flood control structures is to determine flood peak discharge for various return periods. A primary issue of planners in the face with flood is lack of data or insufficient data. One of the most reliable strategies is generalizing the results from sites with observed data to ungauged locations. The main goal of this study is regional flood frequency analysis using multiple regression method for Qazvin province of Iran. 8 out of 23 existing hydrometric station were removed because of the short-term statistics and construction of storage dam at upstream. The results of factor analysis showed that perimeter, equivalent diameter, time of concentration, length of main waterway and area were the main variables affecting lfood magnitude. The remaining 15 stations☐ were divided into two homogenous regions using cluster analysis. Homogeneity of these two regions was confirmed using homogeneity and heterogeneity tests of L-moments. Based on the best-fit criteria of Z^{dist}, GNO distribution with the statistic of 0.29 has the best fit for the entire region but for one and two homogeneous regions, GLO and GPA distributions with the statistics equal to 0.09 & 1.56 have the best fit respectively. After calculating parameter values for selected distributions, discharges with different return periods were estimated for all stations. Then, regression relations were obtained between peak discharge and factors affecting flood peak for each return periods at two homogeneous regions. Peak discharges at ungauged locations can be estimated for different recurrence interval using these relationships.

Keywords: cluster analysis, L-moments, multiple regression**,** Qazvin province, regional flood analysis.

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Comparing plant functional types in the old-field and a natural rangeland vegetation

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ABSTRACT

This research was conducted to compare plant functional types (PFT) and traits in an old-field (abandoned for 28 years) and a control site, in the Baharkish rangelands, Quchan, Iran. In the both sites, 40 randomized quadrates were established. Floristic list, frequency, canopy cover and 20 vegetative, phenological and morphological plant traits were measured for all plant species, within each quadrate. According to the Pearson correlation analysis, and by using R software, 9 plant traits including life form, plant canopy, reproduction mode, reserve organ, root type, leaf phenology, growth form, life cycle, and regeneration mode, were known as the major plant functional traits. Data classification and ordination were applied on a matrix of 9 traits ×112 species, by using CANOCO and TWINSPAN softwares. It led to identification of 5 plant functional types. Total canopy cover of two PFT was significantly (70%) reduced and that of three PFT's were relatively (10-20%) increased in the abandoned field. In conclusions, plants being annual, therophyte, geophytes, and rhizomatus are tolerant, whereas those being perennial (phaneropyte, chemaphyte, hemicryptophyte), having tap root system, and wide canopy cover are known as sensitive to ploughing disturbance.

Keywords: Baharkish, grassland, old-field, physical disturbance, plant functional trait.

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Mapping Soil degradation based on geopedological method and GLASOD model using GIS in East Qazvin Province

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ABSTRACT

Nowadays, the importance of soil conservation in agriculture and natural resources, with the goal of preventing its deterioration and degradation are necessary. Soil and land degradation as a direct cause of the threat to the global environment and human welfare is evident. In this study soil degradation mapping was carried out in East Qazvin. Soil map using geopedological method by integration of information layer of lithology, geomorphic and pedogenic was prepared in ArcGIS9.3 software. Data from soil maps with field studies was used as input in GLASOD model and the soil degradation map was prepared. In this study soil map units was used as basis of soil degradation status investigating in the region. Results showed that less than 25% of the study area has a low degree of degradation and in the present circumstances do not require specific management actions, but in other parts of the region, with various degrees of soil degradation was observed. Soil chemical properties degradation include decrease of soil organic matter, loss of soil nutrients and soil salinity are the most important aspects affecting on soil degradation of region. At total of 16,630 hectares of land, about 4028, 5987, 5128 and 866 respectively low, middle, high and very high soil degradation class are located. Thus according to the results to prevent the spread of this process in this area, management actions are recommended.

Keywords: geopedological method, GLASOD model, management of soil resources, soil degradation, soil degradation class.

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Autecology study of *Platychaete aucheri* Boiss. in arid ecosystems, south of Fars province

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ABSTRACT

In this study autecology of an endemic shrub species *Platychaete aucheri* Boiss. was investigated in south parts of Fars province belong to the Khalij-Omani region. Climatic data, topography, soil characteristics and vegetation attributes (density using nearest neighbor method, canopy cover using point-transect method) and phenology of desire species were studies. The forage quality in three major stages, including vegetative, flowering and seeding was determined. The results showed that *P. auchri* Boiss. is able to grow under conditions of low rainfall (maximum 285 mm/y) and high temperature (maximum 49.6°C), but has little tolerance to cold and frost weather. The habitat altitude ranges from 543 to 1120 meters above sea level, slope aspect of south and southeast and 7 to 80 slope percent. Average canopy cover of species is between 15.8 to 29 percent. The soils of habitats were sandy loam, non-saline and poor in organic matter and nutrients. The protein content (%) decreases during phenological stages (at high level 4.53% in flowering stage), also this protein content alone do not satisfy the livestock protein requirements. Due to the essential oils, the deep root system, woody aerial parts and as well as hairy leaf and stem, grazing pressure could be tolerated. Generally, *P.aucheri* has several benefits such as adaptation to hot and dry habitats of southern Fars, grazing resistant of life form, attractiveness of beekeeping, uses in traditional medicine and valuable role in controlling water and wind erosion may be introducing and considering as a multiple use species in combat desertification projects and reclamation of winter south rangelands of the country. Knowing of best methods to propagation and successful establishment of this endemic species requires further research.

Keywords: autecology, endemic species, Fars province, Khalij-Omani region, *Platychaete aucheri* Boiss.

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Investigation of the role of temporal distribution of precipitation on forage production value of the rangeland

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ABSTRACT

Plants cover composition, condition, trend, production, and grazing capacity of the rangeland change annually. These changes are affected by two factors: the alternative climate and decision management. In this research, the role of temporal rainfall distribution on rangeland production in ragelands of Ilam, Qom and Markazi provinces was assessed. By attention on plant cover maps 10 types of plant cover in Ilam, 8 types in Qom and 10 types in Markazi were selected. In these sites, relative factor to plant cover and soil contains: canopy cover, density, production, germination and, soil cover were measured along four 400 m transects into 60 plots .the production of the graze able species was measured by clipping and weighting method. The regression techniques and correlation coefficient were used to the relation between production and precipitation. to determination the role of the temporal distribution of rainfall of the rangeland production, the relationship between rainfall and production was calculated in seven time steps contains: annually, March to July, February to July, March to June, March to May, March to April and March. The results show that only 4% of the total forage production is explained by annual precipitation but in 96%, cases there were related with start of growth season and growth season .This result shows the importance of growth season precipitation on the forage yield in rangelands.

Keywords: forage production, growth season, Ilam, Markazi, Qom, temporal distribution of precipitation.

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