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**Contents**

- 1 **Study on the effect of soil chemical characteristics and crown canopy of *Ziziphus spina-christi* L. on soil seed bank characteristics** Moharram Ashrafzadeh; Reza Erfanzadeh
- 2 **Comparison of Stochastic Models and Conceptual Models in Hydrological Drought Forecast (Case Study: Karkheh River Basin)** Omolbanin Bazrafshan; Ali Salajegheh; Ahmad Fatehi Marj; Mohammad Mahdavi; Javad Bazrafshan; Somayeh Hejabi;
- 3 **Comparison of Geostatistical Methods for Prediction of Soil Parameter in Plant Community of *Nitraria Schoberi* (Arid Regions)** Hamid Toranjzar; Asghar Zare Chahouki
- 4 **Application of the Genetic Algorithm Technique for Optimization of the Hydrologic Tank and SIMHYD Models' Parameters** Hamed Rouhani; Mohsen Farahi Moghadam
- 5 **Compare of Changes Diversity and Richness of Species and Life Forms in Three Utilization Sites (Case study: Southern Slopes of Damavand Mountain Summer Rangeland)** Ghodratollah Heidary; Hamidreza Saeedi Goraghani
- 6 **Study of Grazing Behaviour of Hybrid Cows in the Rangeland of Tezkarab** Mohammad Fayaz; Hossein Piry Sahragard; Hassan Yeganeh; Anvar Sour; Mir Taher Ghaemi
- 7 **Modification of Reconnaissance Drought Index (RDI) based on the best Methods of Evapotranspiration Estimation and Probability Distribution Function** Mohammad Ghabaei Sough; Aboufazel Mosaedi
- 8 **The Effect of Grazing on Density, Diversity and Richness of Soil Seed Bank in Mountainous Rangelands (Case Study: Waz Watershed, Mazanderan Province)** Paria Kamali; Reza Erfanzadeh; Hassan Ghelichnia
- 9 **Suitability Determination for Sheep in Rangeland of Ferydounshahr, Isfahan** Ebrahim Gavili; Mohamad Reza Vahabi; Fazel Amiri; Hossain Arzani
- 10 **Estimating Topsoil Salinity from LANDST Data: A Comparison between Classic and Spatial Statistic** AliAkbar Noroozi; Mehdi Homae; Abbas Farshad
- 11 **Monitoring the Effects of Precipitation on Vegetation Cover Changes Using Remote Sensing Techniques in 12 Years Period** Fatemeh Hadian; Reza Jafari; Hossein Bashari; Saeed Soltani
- 12 **Determining an Appropriate Combination of Geochemical Elements to Investigate the Relative Importance of Lithological Units in Sediment Production of Khor-Sefidarak Basin** Sadat Feiznia; Soheila Youneszadeh Jalili; Hasan Ahmadi

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## Study on the effect of soil chemical characteristics and crown canopy of *Ziziphus spina-christi* L. on soil seed bank characteristics

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### ABSTRACT

This study was carried out to investigate the effect of crown canopy of *Ziziphus spina-christi* on seed bank characteristics (density and similarity with above ground flora) in two sites with saline-alkaline and alkaline soils. In each soil, forty plots were established, half in and half outside of *Z. spina-christi* cover. In each plot, soil sampling was done from 0-5 and 5-10 cm depths. Paired and un-paired t-test were used to compare soil seed bank characteristics between the depths, between two different soils and between in- and outside the tree canopy. The results showed that the density of seed bank in 0-5 cm depths was significantly higher than 5-10 cm depths in both soils. The density of seed in both depths was significantly higher in saline-alkaline than alkaline soils. The similarity coefficient between soil seed bank and above-ground was significantly different between under tree canopy of two soils in 0-5 cm. Soil seed density was highest under crown cover in both soils. The crown canopy of trees in dry rangelands can play an important role in reservation of soil seed bank. Therefore, the conservation of individual trees in these areas should be concerned of the managers.

**Keywords:** arid land, crown canopy, seed band density, similarity coefficient, soil seed bank, *Ziziphus spina-christi*.

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## Comparison of Stochastic Models and Conceptual Models in Hydrological Drought Forecast (Case Study: Karkheh River Basin)

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### ABSTRACT

Drought is random and nonlinear phenomenon. Linear stochastic models, nonlinear artificial neural network and hybrid models are advantaged for drought forecasting. This paper presents the performances of autoregressive integrated moving average (ARIMA), direct multi-step neural network (DMSNN), recursive multi-step neural network (RMSNN), hybrid stochastic neural network of directive approach (HSNNDM) and hybrid stochastic neural network of recursive approach (HSNNRM) with time scale monthly and seasonally for hydrology drought forecasting and SDI selected as predictor in the Karkheh river basin. The results shown performances of HNNDAs was found to forecast hydrological drought with greater accuracy for SDI forecasting, so performances model in monthly scale was greater accuracy to seasonality scale.

**Keywords:** artificial neural networks, forecasting, hydrological drought, hybrid models, stochastic models.

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## Comparison of Geostatistical Methods for Prediction of Soil Parameter in Plant Community of *Nitraria Schoberi* (Arid Regions)

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### ABSTRACT

Geostatistical approaches have great importance because they include spatial correlation of geographic data. Present study evaluated the efficiency of geostatistical techniques and demonstrated their capabilities in studying the soil variables (soil texture (sand percent), EC and  $\text{So}_4^{-2}$ ) in the important plant community of *Nitraria schoberi* in Meighan desert, Arak. A regular grid on the map comprising rectangular cells was designed and situated over the experimental area with 98 points for vegetation type. The grid was laid out in the field using the global positioning system. Soil samples were taken between 0-20 and 20-100 cm layers for each point. Analysis using the best view at semi-variogram model were applied to select the Gaussian models of soil characteristics with  $R^2$  higher than 0.95. Among ordinary Kriging, simple Kriging and Inverse distance weighting methods, ordinary Kriging method showed the best cross-validation criteria (mean square error and average error) and had higher prediction accuracy than others. Finally, spatial estimates of the soil characteristics were performed using ordinary Kriging.

**Keywords:** interpolation methods, Mighan Desert, *Nitraria schoberi*, soil properties.

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## Application of the Genetic Algorithm Technique for Optimization of the Hydrologic Tank and SIMHHYD Models' Parameters

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### ABSTRACT

In the past decades, much effort has been devoted to simulation of the rainfall-runoff process. Hydrological models are simplified representations of the natural hydrologic system. In each case, the choice of the model to be applied depends mainly on the objective of the modeling but also on the available information. In this study, the relative performances of two lumped conceptual-based hydrology models (Tank and SYMHYD) were compared based on daily data of Chehel\_Chay catchment in the northeast region of Golestan province. As in Tank and SIMHYD models, parameter spaces are high dimensional, it is difficult to obtain optimal parameters using manual trial and error procedure. These parameters need to be estimated through an inverse method by calibration. Therefore, an automatic optimization procedure based on the Genetic Algorithm (GA) was tested for parameter calibration of two models. For testing the applicability of the model in gauged basin, the model was calibrated for a period of 1992–1996 and validated for a period of 2002–2005. The result showed that RMSE of discharge predictions were as low as 0.821 for a Nash-Sutcliffe coefficient of 0.599 for the Tank model, against 0.819 for a Nash-Sutcliffe coefficient of 0.602 for the SYMHYD model in calibration period. When evaluating the model performance in validation period, SYMHYD model is performing most accurately with RMSE=0.490 and E=0.617. It was found the RMSE for Tank model is 0.522, which is slightly higher than SIMHYD (RMSE=0.490). SIMHYD is performing most accurately with E equal to 0.602 and 0.607 in calibration and validation periods, respectively.

**Keywords:** Chehel\_Chay catchment, genetic algorithm, SYMHYD model, Tank model.

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## Compare of Changes Diversity and Richness of Species and Life Forms in Three Utilization Sites (Case study: Southern Slopes of Damavand Mountain Summer Rangeland)

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### ABSTRACT

Assessment of diversity and species of richness in right understanding from ecosystem functions, protect and preserve genetic resources, evaluation and control of environmental change and help with the success or unsuccessful natural resource management programs. Intense grazing and without program of livestock one of the most common and perhaps the most of element rangeland degraded and reduced the diversity and richness of species. Given the importance and function of livestock grazing on qualitative and quantitative change of plant cover, the effect of grazing pressure in the three sites of Reference area, Key area and Critical area on the diversity and richness of species with different life forms in southern slopes of Damavand Mountain Summer Rangeland was studied. In each unit (site), sampling was done along three transects of 150 meters. 15 plots (square) with size of 10 meters located away from each other and in each plot type and the number of plant species and their percent have been noted. For evaluation of diversity criteria Past software used and computed Simpson, Shannon-Weiner diversity indices and Margalef and Menhng richness indices. Data analyses were performed in SPSS18 software and compare the various indices of diversity and richness between regions with different grazing intensities was performed via Duncan's tests. The results of this study showed that increasing the intense grazing, decreased from diversity and richness of species forbs and grass and shrubs were increased, so that in reference area forbs and grass with the highest and shrubs were lowest diversity and richness of plant. However, the duration and grazing repetition in the Critical area, shrub species has the highest diversity and richness and greatly reduced diversity of forbs and grass species. Overall, in studied region, with increasing grazing pressure significantly lower diversity and richness of species that due to its negative effect on the stability of ecosystems should be of interest to operators, managers and experts range.

**Keywords:** critical area, Damavand summer rangeland, diversity and richness of species, key area, life forms, reference area.

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## Study of Grazing Behaviour of Hybrid Cows in the Rangeland of Tezkharab

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### ABSTRACT

Having a comprehensive and correct understanding of grazing behaviour of livestock help to maximize livestock products. Moreover, a good understanding of livestock behavior allows us to predict the effects of livestock on rangeland and finally we can do livestock grazing management the best possible. Recognition of grazing behavior of animals can provide solutions enables the optimal use of rangeland forage and can also help in preventing the reduction of animal products and will prevent of Ranchers income loss. For this purpose cow grazing behaviour investigation was performed in Tezkharab rangelands for 4 years. Long distance path following day in the pasture, and livestock speed (maximum and minimum average) time for rest and time for the motion and applied grazing system were studied. To study for grazing cycle was used from the geographic position locator (Garmin GPS). Use the belt to the back of a cow's day package. At the end of the day, data was extracted in Elvis using in track mode. The results showed all traits in a significant level 1% Effect was significant difference in years and months (May, June, July, August, September and October) except average speed traits. This trait was significant at the 5% level. This study showed that environmental factors such as seasonal variations and therefore its temperature changes is one of the most important factors that influencing grazing behavior of livestock.

**Keywords:** grazing behaviour, hybrid cattle, pasture Tezkhrab, travel distance, time grazing, time rest.

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## Modification of Reconnaissance Drought Index (RDI) based on the best Methods of Evapotranspiration Estimation and Probability Distribution Function

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### ABSTRACT

Reconnaissance Drought Index (RDI) is based on fitting a Log-normal distribution to the ratio of precipitation to evapotranspiration ( $ET_0$ ) values in selected periods. In this index value of  $ET_0$  was calculated based on mean temperature by Thornthwaite (Th) method. Th method may underestimated  $ET_0$  values comparing to the actual in arid and semi- arid regions. The log-normal distribution may not be fitted to the ratio of precipitation to  $ET_0$  values of some regions. In order to investigate the effects of these two limitations on drought situations' changes, meteorological parameters have been used during 50 years period at 8 Synoptic Stations of Iran. In the first step, the values of RDI (Th) for any stations during the mentioned time were calculated. Then,  $ET_0$  values were calculated from best fitted empirical equation in any situation of lack of parameters. Subsequently RDI (select) index were established. The Kolmogorov-Smirnov (KS) test is used to assess the goodness of fitting most appropriate distribution function to the ratio of precipitation to  $ET_0$  values. Then, according to equi-probability transformation the values of RDI (Th) were modified to \*RDI (Th). The occurrence of different classes of drought according to RDI (select) and/or \*RDI (Th) comparing to RDI (Th) showed the elimination of any mentioned limitations may leads to changing the amount of occurrence of any drought classes in RDI (Th). Hence, the RDI (Th) modified to \*RDI (select) by estimating  $ET_0$  values from selected method and applying appropriate distribution function to the ratio of precipitation to  $ET_0$  values.

**Keywords:** equi-probability transformation, evapotranspiration, probability distribution function, reconnaissance drought index (RDI).

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## The Effect of Grazing on Density, Diversity and Richness of Soil Seed Bank in Mountainous Rangelands (Case Study: Waz Watershed, Mazanderan Province)

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### ABSTRACT

This study aimed to investigate the effect of animal grazing on soil seed bank characteristics in the northern slopes of Alborz. For this purpose, soil seed bank characteristics were compared between grazed and ungrazed areas. Therefore, four transects perpendicular to the sides of enclosure inside and outside of it were established. Then soil samples were collected within 28 plots inside and 28 plots outside of enclosure along the transects from two different depth: 0-5 and 5-10 cm. Soil samples were then spread in the greenhouse and the plant species germinated in the greenhouse were identified and removed one time per 12 days. General linear model (factorial design) was used to study on the effect of grazing, depth and interaction between grazing and depth on soil seed bank characteristics. In case that the interactions became significant, unpaired t-test was used to compare seed bank characteristics between grazed and ungrazed in each depth, separately. In addition, paired t-test was applied to compare seed bank characteristics between two depths in grazed and ungrazed areas, separately. The results showed that all seed bank characteristics were significantly higher in ungrazed than grazed area particularly in upper layer of soil. All seed bank characteristics were also significantly higher in upper layer than the deeper layer of soil. The results implied that soil seed bank is a reliable source to recover the over grazed degraded points in the study area.

**Keywords:** animal grazing, density, diversity, richness, soil seed bank, Vaz enclosure.

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## Suitability Determination for Sheep in Rangeland of Ferydounshahr, Isfahan

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### ABSTRACT

To determine the rangeland suitability in order to permanent conservation, we must regard capability and capacity of the rangeland's ecosystem. This research was conducted to recognize Sibak-Sardab watershed rangeland potentials, evaluate and determine of suitability classes for sheep grazing. In this research, we used the proposed method of FAO (1992) and for information layers crossing used in Geographical Information System (GIS). In this research, sensitivity to erosion, water resources and forage production are three basic components of this study. We used the MPSIAC model for the sensitivity to erosion. The model of water resource suitability consists of three parameters, quantity, quality and water resource's accessibility. In the forage production model, we estimated the ratio of available forage to the whole produced forage in each vegetation type. According to the result 96% of the rangeland was in low suitability class ( $S_3$ ) and only 4% were in medium suitability class ( $S_2$ ). The most important factors causing the decrease in suitability were lower rates of available forage for the livestock, low forage production of classes, I, II and low palatability percentage. According to Actual use (22170 animal units in season grazing); and grazing capacity (15989 animal units) and also according to the high destruction because of heavy grazing; using a management method that can help to improve the rangeland condition is suggestion.

**Keywords:** Feridonshahr, forage production, GIS, MPSIAC, rangeland suitability, sheep, water resource.

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## Estimating Topsoil Salinity from LANDST Data: A Comparison between Classic and Spatial Statistic

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### ABSTRACT

Soil salinity is a limiting factor for plant growth and a serious cause of land degradation. Field sampling and statistical analysis for estimating soil salinity is expensive and time consuming. Estimating soil salinity by spatial statistical models and Geographic Information System (GIS) is recommended, because it saves labor and time. This study was conducted to evaluate the performance of spatial statistics with ordinary least square (OLS) incorporation with LANDSAT data to predict soil salinity. The electrical conductivity (EC) of 236 soil samples were collected from Garmsar plain at south east Tehran, Iran and were measured and correlated to 27 variables derived from LANDSAT images, including vegetation indices, salinity indices, bands 1 to 7, principal component analysis and tasseled cap indices. Using factor analysis and similarity index, these variables were divided into three components. Furthermore, two models for soil salinity estimation were derived, using the best correlation coefficient (0.58 and 0.60) method. Simultaneously, soil salinity map was produced in ArcGIS by spatial statistics model OLS followed by derivation of the error map, calculated using Moran's index. The error map indicated that the spatial statistics models are superior to classic statistics methods, due to high accuracy in estimation and the fact that it doesn't require exchange information between different software programs.

**Keywords:** classic statistics, Morans' index, ordinary least square (OLS), spatial statistics.

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## Monitoring the Effects of Precipitation on Vegetation Cover Changes Using Remote Sensing Techniques in 12 Years Period

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### ABSTRACT

Precipitation is one of the most effective factors on vegetation changes especially in arid and semi-arid ecosystems. Because soil moisture condition affects vegetation changes, monitoring of drought and vegetation changes are among valuable management tools in these ecosystems. Nowadays, satellite images are used as a low-cost and fast method for vegetation study in different scales. Vegetation change is assessed using vegetation spectral characteristics. This study aimed to analyze and monitor the vegetation cover changes in 4 rangelands sites and also one forest site in south of Isfahan and southeastern of Chaharmahal and Bakhtiary province during 1997-2009. Field sampling was used for measuring the percentage of canopy cover in all vegetation types using step-point method in radial direction (6000 points per vegetation type) and also regression analysis technique was used to ensure if vegetation cover can be measured properly using a Landsat images from 2009. Then, NDVI indices were derived from 12 Landsat images between 1997 to 2009 (all images were taken from 22th of May to 5th of June each year) to monitor vegetation changes. According to results, there was significant correlation between NDVI indices and canopy cover in all vegetation types. The analysis of canopy cover changes indicated that the precipitation had various effects on different vegetation types based on their plant form and ecological condition. Vegetation cover in rangeland types was mainly correlated with spring precipitation but in forest type, it was more correlated with annual precipitation. Also the effects of precipitation on studied sites were different based on their dominant vegetation types. The highest relationship was found between precipitation and vegetation indices in rangeland types dominated by grasses and this highlights the efficiency of NDVI indices in drought assessment and management programs.

**Keywords:** landsat, precipitation, Semirom, vegetation cover.

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## Determining an Appropriate Combination of Geochemical Elements to Investigate the Relative Importance of Lithological Units in Sediment Production of Khor-Sefidarak Basin

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### ABSTRACT

Due to difficulties in the application of traditional methods for identifying sediment sources, fingerprinting techniques, based on physical, chemical and organic properties of sediment and source materials are increasingly being used as a valuable and effective alternative approach to obtain such information. The first step in this method is using an appropriate combination of diagnostic properties that is able to differentiate sediment sources. In this study, a combination of properties was used in different subbasins of Khor-Sefidarak Basin, located in Savojbolagh Township, Alborz Province and the share of each lithological unit on production of suspended load was estimated. By preparing lithological map, lithological units are considered as sediment sources and sediment behind the small dams are considered as depositional areas. About 43 samples were taken from lithological units and trap sediments of small dams in outlet of different sub basins. Then particle sizes finer than  $62.5 \mu$  were separated and concentration of nine geochemical elements in the samples were obtained. After being certain about absence of outliers' data and after using analysis of variance and Kolmogorov-Smirnov Tests, discriminant analysis is used for finding the final proper combination. Among different elements, Ca is the most important element for differentiating geological units in different subbasins of Khor-Sefidarak Basin. Finally, relative importance of each geological unit in producing suspended load was calculated. Results have shown that Zagun and Shemshak Formations have the highest share in sediment production of the area.

**Keywords:** discriminant analysis, geochemical elements, Khor-Sefidarak, lithological units, sediment sources, sediment tracing.

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