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Effect of long-term cattle grazing on root distribution and morphological characteristics of *Brachiaria decumbens* (Case study: tropical pasture, Malaysia)

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ABSTRACT

Root morphological and distribution responses of signal grass (*Brachiaria decumbens*) to long-term cattle grazing were examined in a tropical pasture in Malaysia. The treatments were no grazing by cattle and grazing at a moderate stocking density (2.7 animal unit/ha) under rotational grazing for 33 years. The method consists of taking soil core using a soil corer to a depth of 30 cm and extracting roots from cores by hand-washing and subsequent measuring of root morphological characteristics including length, surface area, average diameter and volume using WinRhizo Root Scanner. Root length density, mass density, surface area density, and volume density were calculated as indicators of root distribution pattern in the soil volume. Data were analyzed using repeated measure analysis of variance and independent *t*-test. Root diameter, length and length density were affected neither by grazing treatment nor the interaction between them ($P > 0.05$). Root diameters in the middle (10–20 cm) and lower (20–30 cm) soil layers of grazed site were 50% and 72% greater than that in the ungrazed site. Root volume, surface area and their densities were not affected ($P > 0.05$) by grazing and the interaction between grazing and soil depth. Mean root mass and mass density were affected ($P < 0.05$) by moderate grazing and soil depth, and the interaction between them. Mean root mass in all soil depths in grazed site was greater than that in the ungrazed site. Long-term rotational moderate grazing has no negative impact on root variables of signal grass in tropical pasture.

Keywords: root diameter, root length, root mass, root surface area, root volume, tropical pasture.

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Assessment of desertification potential using IMDPA model in Derakhte Senged water shed

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ABSTRACT

The Derakhte Senged area is located in south of Neishaboortown at Khorasan Razavi province. In this research, desertification intensity of Derakht senged area was evaluated using IMDPA, one of the newest methods to assess desertification potential in arid and semi arid regions of Iran. To evaluate desertification intensity, based on the primary research in this area, 4 criteria were selected including vegetation cover, soil, climate, geology and geomorphology. Each criterion was assessed based on the selected indices which result in qualitative mapping of each criterion based on geometric mean of the indices. Then, sensitive map of region was extracted using geometric mean of all criteria. By laminate of thematic databases layers and using geometric mean of main criteria intensity map was obtained. The results showed that 0.37 % of study area categorized in low class, 80% was medium and 19.63% involved high class of desertification. Analysis of desertification criteria in this region showed that among study criteria, vegetation cover criteria is a major problem with a geometric average of 3.05 which shows high class, while geology and geomorphology with a weighted average of 1.8, has moderate effect in desertification. Also, climate and soil criteria with a geometric average of 2.04 and 2.21 show medium class desertification.

Keywords: criteria, Derakhte Senged, desertification severity, IMDPA model, index.

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Semi –automatic method for geomorphometric classification of Lut Yardangs using artificial neural network

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ABSTRACT

In this study the land surface in western half of hyper-arid Lut desert, in south east of Iran, which is covered by Yardangs, a worldwide typical landform for Aeolian erosion, were classified by Self Organizing Maps (SOM) method. In the first step by using Digital Elevation Model with 10 m resolution and Matlab software, 22 morphometric parameters were calculated based on derivative of the surface elevation with first, second and third orders. In the second step most affective parameters for classification and the optimum number of classes were found through utilizing Optimum Index Factor and Davies Bouldin Index. Finally SOM classification was performed on seven morphometric parameters to result in seven classes. The results showed that most appropriate parameters in classification of area are plan curvature, rotor, hypsometric Integral, total accumulation curvature, slope steepness, extreme curvature and mean curvature. The study area were divided to seven classes including saddle valley, Concave ellipsoid, Gentle slope corridor, shoulder with concave slope, shoulder with convex slope, ridge, corridor channels. Sensitivity analysis results revealed that the most sensitive parameters are rotor, mean curvature and hypsometric Integral. Also the results of Jeffreys-Matusita Distance illustrated that parameter pair hypsometric integral / extreme curvature has the most ability in separation of classes in this area. Comparison of the separated classes with the landforms on aerial photographs confirms our classification results.

Keywords: D-B index, DEM, Lut desert, OIF, quantitative geomorphology, Self Organizing Maps (SOM).

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Mineral element values of 8 rangeland species in highland pastures of Taleghan

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ABSTRACT

To achieve the desired level of animal performance providing animal food supplies containing mineral elements is essential. For this purpose, mineral elements of 8 important rangeland species, including *Ferula ovina*, *Prangus uloptera*, *Medicago sativa*, *Lotus goebelia*, *Trifolium montanum*, *Melilotus officinalis*, *Sanguisorba minor* and *Stachys inflata*, were measured at different growth stages in the summer pastures of Taleghan. Therefore, at each growth stage 3 samples were taken and for each sample at least five vegetable bases were removed from different vegetation types. Data were analyzed using one-way ANOVA and to see the sources of variation within groups the Duncan test was utilized. Moreover, T-test was used to compare the values of mentioned elements with the critical level to provide the daily requirements of an animal unit in the maintenance mode. The results show that the values of minerals at the early stages of growth are more than those at the final stages of development (seeding stage). Moreover, the mentioned values in each stage of the growth are not uniform among the studied species. In general, the studied species are in good condition in terms of the calcium, iron, copper, cobalt and manganese values for meeting the daily needs of animals. However, they are not in optimal condition in terms of the highly consumed elements such as sodium and magnesium values at different growth stages, especially at later stages of growth, for meeting the daily needs of animals. This indicates that the desirability of grassland forage at different times of grazing is not identical regarding the mineral elements. It is normal that depending on the year's conditions the values of plant mineral elements may change slightly; however, due to the cost of determining mineral elements, the results can be used to estimate the daily animal needs in different years.

Keywords: mineral elements, daily animal need, critical level, growth stage, pastures of Taleghan

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Spatial variability of rainfall erosivity indices using geostatistics in Khuzestan Province

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ABSTRACT

Rainfall erosivity is the ability of rainfall to detach the soil particles. This study was conducted to evaluate spatial variability of rainfall erosivity indices in Khuzestan Province. The point data of indices (EI_{30} , AI_m , $KE>1$ and Onchev indices) in 74 stations were used to generate spatial erosivity maps through deterministic and geostatistical interpolation methods (Radial Basis Functions, Inverse Distance Weighted, Kriging and Cokriging). Results indicate that cokriging have least error and most correlation with determining coefficient of 0.89, 0.89, 0.48 and 0.49 for EI_{30} , AI_m , $KE>1$ and Onchev indices. Based on the correlation relationships between the basins specific sediment yield (in basins dominating the sedimentation stations) and mean indices of EI_{30} , AI_m , $KE>1$ and Onchev, EI_{30} index with correlation coefficient of 0.98 ($P<0.01$) is selected as the appropriate rainfall erosivity index. Based on the prepared map on the basis of Cokriging method with secondary variable of maximum mean monthly rainfall, the east and northeastern regions presented the highest values of EI_{30} index, while the southern and western regions showed the lowest values of EI_{30} index. The annual rainfall erosivity (EI_{30}) ranged from 404 to 3064 $Mj.mm.ha^{-1}.h^{-1}.y^{-1}$.

Keywords: Cokriging, geostatistics, interpolation, rainfall erosivity.

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Quantity assessment of water erosion intensity using regional model of erosion and sediment yield (Case study: Nir watershed, Ardebil)

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ABSTRACT

The aim of this research is to describe the development of a methodology based on present knowledge and available data for evaluation of water erosion behavior and risk as well as modeling and estimation of soil erosion, which is compatible for other similar areas of Iran. Accordingly, the conducted research was based on four major types of water erosions including: sheet, rill, channel and riverbank which have considerable role on sediment yields of Baleghli Chay Watershed, Ardebil Province, were separately and spatially studied. In order to determine the inter-effects of effective factors, the study was conducted using stepwise multivariate statistical tests. For each erosion type, an individual model was then presented. In the next step, after determining of relations between sediment yield and environmental factors (fixed & variable) through statistical analyses and selecting of effective factors on erosion and sediment yields, was created an empirical structure for modeling erosion and sediment yields based on MPSIAC erosion model. In formulation of the new model, were used of eight effective factors on erosion in the area. These factors are susceptibility of geological formation, soil erodibility, rainfall erosivity, runoff erosivity, topography, hydrographic drainage, Normalized Difference of Vegetation Index (NDVI) and field conditions of erosion features. In the presented model, with summation of the scores of mentioned eight factors, obtains the M value, which can estimate the amount of erosion and sediment yields of the area, using exponential formula between sediment yield and M values. In addition, in order to obtain the confidence of presented model, it was used in "Nir" catchment for evaluation the precision. The results showed 11 percent difference. With accepting of this error value, the water erosion hazard map of the area was provided and presented using new model.

Keywords: Ardebil, hazard map, modeling, Nir, water erosion.

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Selection of the best empirical formula to estimate time of concentration in urban watersheds (Case study: Mahdasht town)

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ABSTRACT

In order to decrease the risks associated with the management of urban watersheds, the use of proper methods is an essential task to estimate the runoff with a high degree of confidence. Time of concentration is one of factors that impacts on peak discharge and runoff volume. The objective of this study is to select the best method among the empirical formulas for estimating the time of concentration. In this study, for determination of actual time of concentration, the field method based on measuring the travel time by using floating-object method was employed. To select the best empirical formula of the time of concentration, the statistical criteria including percentage Relative Error (RE), Root Mean square error (RMSE), Average percentage Relative Error (RME), Nash - Sutcliffe criteria (NS) and determination coefficient were used. Then, differences among the estimations obtained from empirical equations were compared with the actual values. The results of this study based on comparison of the relative error in each interval showed that in the reach No. 2, empirical formulas of California, Chow, Carter and Federal Aviation, with percentage error of 2.7, 2.9, 4.4 and 4.4 have showed the best estimation, respectively. The equation proposed by Kirby with percentage error of 1 in the reach No. 3, the equation of Ventura with percentage error 8.5 in the reach No. 9 and the equation of rational hydrograph with percentage error 4.8 in the reach No. 10 have showed the best estimates. Therefore, it is recommended to use the empirical formula that has the lowest percentage of error for areas with features similar to the studied reaches. In general, the results show that only rational hydrograph method in all of the reaches has the lowest error and then provides the most proper estimates compared than others.

Keywords: empirical formula, rational hydrograph, time of concentration, travel time, urban watershed.

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Effects of pre-cooling treatment, osmotic potential and water stress on seedling growth of some population in two savory species (*Satureja bachtiarica* and *S. sahendica*) in laboratory and greenhouse conditions

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ABSTRACT

In order to study, the effect of pre-cooling treatment, osmotic potential and water stress on some population of two species of *Satureja bachtiarica* and *Satureja sahendica* was studied by a factorial experiment based on completely randomized design with three replications in laboratory and greenhouse conditions during one year in the gene bank of Institute of forests and range lands by the years of 2010-2011. In laboratory, treatment were including: cold and osmotic potential making of polyethylenglycol (PEG) 6000 Da in 5 concentrations (0, -0.3, -0.6, -0.9, -1.2 Mgapascal) compared with control. In greenhouse, treatment were including: cold and drought stress in five levels of field capacity (100,80,60,40,20) compared with control. Result showed that seed germination and seed emergence were decreased as rate of 33% and 6% in order of laboratory and greenhouse condition with increasing of osmotic potential and water stress while the ratio of root to shoot and ratio of dry weight to fresh weight was increased. In both experimental conditions, the most of the seed characteristics were higher with pre-cooling than other treatments. In response to osmotic potential in germinator, and dry stress in greenhouse, Bijar 2 population from Sahandy savory and piranshar from bachtary savory showed more tolerant to dry stress due to have more vigor index and ratio of dry weight to fresh weight and they introduced as superior population. Comparing of the population showed that population of the takestan of Sahandy savory had lower tolerance.

Keywords: cold, field capacity, germination, osmotic potential, PEG6000, *Satureja Sahendica*, *Satureja bachtiarica*.

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The changes in monthly and seasonal values of carbon emission in different grazing intensities (Case study: Ghoosheh, Semnan)

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ABSTRACT

This study investigates monthly and seasonal variations of carbon emission from the soil at different grazing intensities. Three areas of enclosure, low and high grazing intensities were selected in Ghoosheh region of Semnan province. Carbon emission was measured monthly, in each treatment applying alkali traps (CSC) during a year. Emission and grazing data were analyzed, using a factorial experiment in a completely randomized design with four replications. To investigate the relation of soil moisture and air temperature with carbon emissions in each area, Pearson correlation was used. Results showed that the emission levels under different grazing intensities had significant difference. The highest emission occurred in high grazing intensity, in August (3.34 g C m⁻² day⁻¹) and lowest in February (0.033 g C m⁻² day⁻¹) in enclosure. The seasonal distribution of emission showed the highest amount, in summer, autumn, winter and spring respectively. There was also a negative correlation between carbon emissions and soil moisture.

Keywords: alkali trap, enclosure, carbon emission, Ghoosheh, grazing, Semnan.

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Comparisons of different models for landslide susceptibility mapping in Zangvan watershed, Ilam province

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ABSTRACT

Distinguishing the susceptible areas to landslide using different landslide susceptibility mapping (LSM) models is one of the primitive and basic works to reduce probable damages and reduce risk. The main purpose of this research is the efficiency evaluation of four methods including Information value (WINF), Valuing area accumulation (Wa), Analytical Hierarchy Process (AHP), Kopta-Joshi proposed method (LNRF) for LSM in Zangvan watershed, Ilam province. At first, all the effective factors in landslide occurrence were inspected. By analyzing the parameters, nine factors including slope, aspect, elevation, precipitation, distance from road, distance from fault, distance from drainage, land use and lithology were distinguished as the effective factors in landslides occurrence in the studied area. After preparing the information of these nine factors in GIS environment, the location of landslides were determined using areal photographs and satellite images and LSM performed by the above four methods. Finally, the landslide index was used for evaluation the ability of appropriate LSM model. Based on this Index, the information value method classified more 52 percent of occurred landslides in very high danger class. Therefore, this method is more efficient and proposed as the best LSM method in the Zangvan watershed because of compatibility of landslides with high danger classes and ability of differentiation of danger classes.

Keywords: GIS, Landslide Index, mapping, model, Zangvan, Ilam.

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Investigation of morphological changes and nebkha formation in *Capparis deciduas* and *C. spinosa* in arid lands

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ABSTRACT

This study aimed to investigate morphological changes of *Capparis deciduas* and *C. spinosa* and their effects on nebkha formation. In order to examine the morphological changes of these plants, nine *C. spinosa* nebkhas of varying ages were randomly selected and size and number of adventitious roots, number of shoot and buds were counted. Results showed that the dead and green parts of *C. spinosa* in nebkha were significantly more than control plants. These showed that nebkha in *C. spinosa* stimulated growth by increasing bud and shoot at first and then there was a steady mortality when the volume of nebkhas increased. In *C. deciduas*, nebkha caused stimulation of adventitious roots in buried shoots. Increasing nebkha volume did not increase the number of shoots and buds in *C. decidua*. Control plants did not produce adventitious roots. Formation of nebkha in *C. decidua* happened in two ways. In the first, *C. decidua* plants in middle age produced root stock in base of stems. Root stocks continued to grow, trap sand, and form nebkha. Root stock in nebkha produced adventitious root. In consecutive years root stocks continued to grow, trap sand, and form larger nebkha. In contrast, growth of main stems stopped and they were finally dried. *C. decidua* also formed nebkha like *C. spinosa* in the second way. It is concluded that *C. decidua* stimulated better adaptive morphological changes compared to *C. spinosa* in facing nebkha formation.

Keywords: Nebkha, *Capparis decidua*, morphological changes, *C. spinosa*.

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Forecasting of runoff and sediment using neural network and multi regression in Aghajari Marls

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ABSTRACT

Erosion and sediment movement phenomena are one of the most complex issues in management of rivers drainage areas that in water projects are very important. That its measurement wants high time and cost. Issue of surface runoff in river basin is a complex issue that human knowledge and understanding about its physical laws a viewpoint of some mathematical formulas is limited. In this study to investigate modeling runoff and sediment production in different land uses of Aghajari formation deposits, part of Margha watershed in Izeh city with area 1609 hectares was selected. In this study, some soil physical and chemical characteristics such as percentage of sand very fine, sand, clay, silt, pH, electrical conductivity, moisture, calcium carbonate and soil salinity in different land uses of Aghajari formation were used. Then the rain simulator in 7 point and with three replicated in different intensities 0.75, 1 and 1.25 mm in minute in three land use range, residential areas and agricultural lands, were used the amount of runoff and sediment. And the same of number were sampled in 0-20 cm in soil layer. In totally, 126 times sampling runoff and sediment were done. And 189 soil experiments were done. In order to perform all statistical analysis were used 11.5 SPSS and EXCEL and MATLAB 2008 software. The results showed that multi regression analysis in conditions with high input and little output data shows more favorable results than neural network. And in high intensities owing to data homogeny, neural network operation than to low precipitation intensities is better. But in multi regression in high and low precipitation intensities showed acceptable operation. The average of relative error in three land uses in sediment production in precipitation intensity 0.75 mm in minute were in multi regression 7.2 percent and root mean square error 0.06. And in neural network in same precipitation intensity the average of relative error 146.9 percent and root mean square error 0.41 were. The average of relative error in three land uses in sediment production in precipitation intensity 1 mm in minute were in multi regression 8.5 percent and root mean square error 0.19. And in neural network in same precipitation intensity the average of relative error 96.36 percent and root mean square error 0.85 were. The average of relative error in three land uses in sediment production in precipitation intensity 1.25 mm in minute were in multi regression 1.8 percent and root mean square error 0.38. And in neural network in same precipitation intensity were the average of relative error 37.6 percent and root mean square error 0.73.

Keywords: soil erosion, formation Aghajari, artificial neural network, Margha watershed.

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