Evaluation of Some Extraction Methods for Estimation of Corn Available Iron in Some Soils of East Azerbaijan Province

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ABSTRACT

This research was conducted to evaluate The extraction methods for determining the available iron (Fe) and active Fe in corn plant (*Zea mays* L.) in 21 calcareous surface soil samples in East Azerbaijan Province. In a greenhouse experiment, corn plant single cross 704 cultivar was cultivated in 3 replications. After 60 days past, the plant growth parameters were assessed. According to the results, DTPA and AB-DTPA had the highest linear correlation coefficient with such growth indices of corn as active Fe concentration, chlorophyll index, Fe content, fresh weight and shoot dry weight and as well with some physicochemical properties of soils. AB-DTPA due to a correlation coefficient greater than DTPA and simultaneous extraction of multiple nutrients was chosen as the most appropriate extractant. On the average, rapid ammonium oxalate and AC-EDTA extracted the maximum vs. minimum amounts of Fe, respectively. Both 1.5% o-phenanthroline and 1N HCl methods proved suitable for measuring corn active Fe concentration. Significant correlation ($r=0.66$,$p<0.01$) was observed between the active Fe measured through o-phenanthroline and HCl , but o-phenanthroline method as compared with HCl due to its closer correlation with growth indices and the extractable-Fe through DTPA and AB-DTPA methods was found as the superior ones.

Keywords: Available Fe, Corn, Extractant

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Effect of Thermal as well as Washing Methods on Remediation of a Clay Soil Contaminated with Gasoline

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ABSTRACT

Remediation of a gasoline contaminated clay soil was studied through experimental tests through thermal and washing methods. A natural clay soil was artificially contaminated by different percent contents of (5% and 10%) gasoline. The contaminated soil was remitted at different temperatures (50, 100 and 150^{o} C). In addition, washing method was conducted on contaminated samples by using two kinds of surfactants (SDS and Tween 80). The experimental tests included gradation, Atterberg Limits, compaction and uniaxial compression ones performed on samples of natural, contaminated as well as remediated soil. Experimental results showed that addition of gasoline to natural soil causes changes in physical and mechanical properties of soil and these changes are functions of percentage gasoline added. The results also revealed that both thermal and washing techniques are effective in remediation of soil, particularly soils contaminated with 5% gasoline but the effect, particularly of surfactants, is reduced by increase in the percent content of gasoline.

Keywords: Gasoline, Clay soil, Remediation, Thermal, Washing, Pollution

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Evaluation of the Efficiency of Microbially Induced Carbonate Precipitation for Fixation of Loose Sand Dunes

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ABSTRACT

Wind erosion is one of the main factors exacerbating soil and environmental degradation as well as air pollution particularly in arid and semi-arid areas. Existing methods of soil erosion control, including oil and chemical soil stabilizers, are too costly and introduce toxic materials into the soil with significant environment detrimental impacts. Therefore, this research was conducted to determine the effectiveness of Microbially Induced Calcite Precipitation (MICP) as a biological and environmentally friendly method to improve the erosion resistance of loose sand dunes. To follow the purpose, the erosion of bio cemented soil samples was experimentally measured in a wind tunnel under wind velocities ranging from 10 to 55 kmh^{-1} at a height of 10 cm above the tunnel floor. Results demonstrated that the weight loss of MICP-treated samples, relative to the weight loss of control treatment, was significantly decreased for all velocities. The effect of biological treatment on wind erosion control was even superior at the higher velocities. Erosion rate of MICP-treated samples was 2.13 against 240 $kgm^{-2}h^{-1}$ at the velocity of 55 $km.h^{-1}$. The penetration resistance of the MICP-treated soil samples was observed to be up to three times that of control treatment, indicating a significant improvement of surface resistance in biologically treated samples. The results of SEM and XRD analysis showed that CaCO3 was mainly precipitated as vaterite crystals forming point-to-point contacts between the sand particles, improving surface resistance against wind shear velocity.

Keywords: Biocement, MICP, Wind erosion control, Penetration resistance

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Evaluation of Subsurface Drainage Performance (at a Physical Model Scale) as Related to a Second Crop of Paddy Field (Case Study: Triticale)

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ABSTRACT

In order to evaluate the performance of subsurface drainage, a study (at a physical model scale) in the condition of triticale as a second crop of paddy fields was carried out. In the physical model, drains were installed in two depths of 40 (D40) and 60 (D60) cm within two separate boxes with triticale cultivated following rice harvest. In the event of rain, drainage samples were taken and the parameters of: EC, SAR, pH as well as TSS determined in the laboratory. The water table was recorded through piezometer. The results indicated that EC increased while SAR value declining with increase in drainage depth. Trend of EC was decreasing throughout the experiment, so the EC value at the end of experiment period decreased 53% and 8% respectively as compared with the start of period for the two drainages of: D40 and D60. TSS values showed acceptable levels of performance in the role of covering of geotextile envelope. But changes in TSS values demonstrate the influence of soil behavior on envelope performance. It was finally found that the drainage at a depth of 40 cm can be more effective in the control of soil drainage and prevention of waterlogging.

Keyword: Environmental Effect, Drainage Performance Index, Drainage Response Factor, Salinity, Sodium Adsorption Ratio

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The Application of Social Network Analysis in assessment of the Capacity of Local Communities for the Establishment of Water Resources Co-management (Case Study: Sarab-e Shah Hossein village, Razin watershed, Kermanshah)

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ABSTRACT

Increasing demand on water resources has led to the challenges related to increased water stress and has exacerbated conflicts, disputes and lack of collaboration between various stakeholders there. The social evaluation of local beneficiaries according to the method network analysis as to identify the challenges and opportunities that advance planning and sustainable management of water resources is dearly required. The social capital of local beneficiaries using social network analysis approach is examined in Sarab-e Shah Hossein Village of the Razin watershed located in Kermanshah province. The results indicate a high level of social capital based on trust and Participation relations and as well the cohesion and stability of the network is very strong as regards the evaluation of tensions and crises. Also a high degree of unity and solidarity among the people will cause cost and time of implementation of cooperative water resources to be reduced. It can be estimated that, based on high levels of trust, collaboration, cohesion and social capital among the people of the village, a successful water resources co-management is expected to be in operation. Moreover, successful water resources at the local level would be impossible without the social monitoring of stakeholders with this method being effective in achieving successful water resources co-management at the local level.

Keywords: Social capital, Trust, Collaboration, Social solidarity, Sustainable management of water resources.

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A Study of Kinetics of Potassium Release by Ammonium Acetate and Sodium Tetraphenylborate Extractants from Selected Micaceous Minerals

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ABSTRACT

The objectives followed in this study were to compare the capability of ammonium acetate (NH4OAc) VS sodium tetraphenylborate (NaBPh4) in the release of potassium from micaceous minerals, namely biotite, phlogopite and muscovite. Non-linear regression of pseudo second-order, power function, Elovich and parabolic diffusion equation models were evaluated in describing potassium release from those minerals in a period of 5 to 11520 minute. The results indicated that the level of NaBPh4-extractable K was higher than NH4OAc-extractable K. NaBPh4 extractant released 56.15, 60.14 and 10.78% of total potassium from phlogopite, biotite and muscovite respectively, while those values were 0.81, 0.84 and 0.62% for NH4OAc extractant. The results also revealed that potassium was released from minerals in two different phases. The rapid phase occurred at the beginning of the experiment while the second phase occurred with a lower rate of release up to the end of the experiment. Parabolic diffusion and exponential function equations reasonably described the potassium release from micaceous minerals as very satisfactory, and according to R2 and SE indexes. Kinetics of potassium release from biotite and phlogopite minerals were described very well through power function equation (R2=0.98-0.99 and SE=1.20-2.43). The most fitted kinetic models for the phlogopite (R2=0.98 and SE=2.23) and muscovite (R2=0.87 and SE=1.26) minerals were found out to be Elovich and parabolic diffusion equations respectively. Therefore, it may be concluded that the release of potassium is controlled by diffusion process initiated from the surface of the studied minerals.

Keywords: Available potassium, Biotite, Phlogopite, Kinetic equations, Muscovite

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Depth Based Regional Flood Frequency Analysis

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ABSTRACT

By use of regionalization methods, information from gauged sites could be transformed in to the desired sites. Up until now a variety of regionalization approaches have been proposed. In every site, it is necessary to evaluate these methods and select the mast appropriate one. It is of interest to understand how spatial weighted Least Square Regression method as based upon depth function flood quartiles could be (SWLSR) compared with Multivariate Regression (MR) and Physiographical space-based Kriging (PSK) methods. In each iteration, the desired station is regarded as ungagged site, then using genetic algorithm depth functions, weights were optimized, finally by taking account of similarity between the desired site and other sites, flood quantities corresponding to different return periods could be estimated. By means of a leave-one-out cross-validation procedure, the performance of SWLSR was compared with MR and PSK methods for prediction of 10, 50 and 100 yr for 26 gauging stations in the Southern Alborz. . The results showed SWLSR approach yielded lower root-mean-square estimation errors and higher Nush Sutcliffe criteria than either the MR or the PSK approaches. Through PSK method flood discharge in ungagged basin was estimated in a more occur ate way than through MR. In depth based approach Nush Sutcliffe criteria, values for flood quintiles (Nash–Sutcliffe efficiency values for 10, 50 and 100 yr. floods were 0.64, 0.65 and 0.65 respectively) corresponding to different return periods were similar.In this method relative error to area figures in small catchments, were higher than those obtained for vast catchment areas.

Keywords: Data depth, Regional flood frequency analysis, Kriging, Multivariate regression, Canonical correlation analysis

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Accuracy of SEEP/W Model in Predicting Seepage Line and Discharge through Lengthy Coarse Porous Medium

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ABSTRACT

In this paper, subsurface water profiles through coarse porous media are investigated numerically and then compared with experimental data. Numerical simulations have been conducted using SEEP/W model which is based on the finite element method. Laboratory model of the porous medium is of: 6.4m length, 0.8m width and 1m height. Crushed materials were used to act as porous media. Modeling scenarios were conducted for different values of flow discharges and three bed slopes of: 0, 4, and 20.3 % and then flow profiles plus discharges were assessed and compared with those provided form the experimental ones. The results indicated that application of SEEP/W model for simulation of flow properties through coarse materials and rock fill structures do not always present satisfactory outputs, in a way that in most cases specifically in non-steep slopes underestimated subsurface water profiles (seepage line) are observed as compared with the other observed profiles. Also computed flow discharge gives a different behavior depending on bed slope and kind of material. The results related to numerical model showed good agreement in steep slopes as compared with moderate ones.

Keywords: Porous Media, Numerical Model, Laboratory Model, Flow Profile and seepage discharge

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Two Objective Design of Groundwater Level Monitoring Network, Using NSGA-II in Eshtehard Plain

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ABSTRACT

Groundwater monitoring plays a significant role in groundwater management to control aquifer behavior. Thus, a groundwater monitoring network is strongly required to control spatial as well as temporal fluctuations of groundwater characteristics. This study describes a new optimization method to design an optimum groundwater-level monitoring network and was implemented on Eshtehard aquifer. Database of the study was provided through Kriging interpolation. Optimization of groundwater monitoring network was implemented by Non-Dominated Sorting Genetic Algorithm II (NSGA-II) with two objective functions of minimizing the root mean square error (*RMSE*) and minimizing the number of network wells which represent the cost of construction, maintenance service and collecting data. Inverse Distance Weighting (IDW) was employed to compute the groundwater-level in the simulation part of the optimization. The results of the study include a Pareto front showing the number of wells and the corresponding *RMSE* which would be a guideline for groundwater monitoring network design. By selecting the required accuracy of the monitoring network data, the number of observation wells and their locations in the study area would be determined.

Keywords: Two-Objective Optimization, Groundwater-Level Monitoring Network, Kriging, IDW, NSGA-II

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Effect of Arsenic Contamination on Soil Phosphorus and on Phosphorus Concentration in Soybean

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ABSTRACT

The study was aimed at investigating the effect of arsenic on phosphorus bioavailability in soil and total phosphorus concentration in soybean. A factorial experiment in a completely randomized design of 3 factors and 3 replicates was conducted in pots of the experimental soil media in the greenhouse of Nuclear Agricultural Research Center. The factors were comprised of soybean of two variety levels (L17 native variety and promising lines), arsenic at four levels (0, 10, 50 and 100 $mg.kg^{-1}$) and phosphorus at four levels (0, 25, 50 and 100 $mg.kg^{-1}$). Di potassium hydrogen phosphate and disodium hydrogen arsenate salts of phosphorus and arsenic were soil added. The results showed that by increase in the concentration of arsenic in the phosphorus treatment, phosphorus bioavailability in soil increased ($P\leq0.05$). 10 $mg.kg^{-1}$ of arsenic in soil increased plant germination by 6.4% as compared with control ($P\geq0.05$). High levels of arsenic (50 and 100 $mg.kg^{-1}$) decreased (16.11 and 76.68 %, respectively) the germination percentage in comparison with control ($P\leq0.01$). Adverse effects of excess concentration of arsenic stopped the growth and eventually death of the plant. Arsenic reduced shoot biomass while increasing total phosphorus in plant ($P\leq0.01$). The results of interaction of phosphorus and arsenic also showed that with increase in concentration of phosphorus in soil, total phosphorus concentration rose in plant ($P\leq0.05$).

Keywords: Contamination, Arsenic, phosphorus, soybean, Competitive effect

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The Effects of Climate Change on DeMartone Climatic Classification, Golestan Province, Iran

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ABSTRACT

Increasing trend of greenhouse gasses in recent decades has affected weather as well as climatic zones across the globe. The aim followed in this study is to investigate the effect of climate change on climatic classes in Golestan Province, Iran as based on the extended de-Martone index. Rainfall data related to 60 rain gauges and daily minimum/ maximum temperature data of 22 weather stations during the period of 1982-2010 were used as baseline observations. Besides, *HadCM3* model outputs were statistically downscaled using LARS-WG model under A1B ,A2و B1scenarios to project rainfall and temperature data for some three periods of 2011-2040,2041-2070 and 2071 to 2100.Generated time series of mean annual rainfall, mean temperature and minimum temperature of coldest month of the year were interpolated using Kriging Method. Based on extended de-Martonne index, climatic zones were worked out and drawn using GIS tools. Results indicated that Kriging method interpolated rainfall data with less error as compared with the other methods. According to the results both temperature and rainfall in the region would increase but the increase in magnitude may vary in different periods, such that in the near future (2011-20140) the rate of rainfall increase would be more than that of temperature leading to more humid climates. This will be reverse during 2071-2100 in which drier years are expected. Among the chosen scenarios, the A2 projects the worse conditions for the study region. Taking into account the temperature gradient, the Geographically Weighted Regression method is suitable for regionalization of temperature. Comparative examination of climatic zones of the province under climate change scenarios showed that warm semi-arid climatic class which does not exist at present, would cover about 5 % of the province within the last study period.i.e.2071-2100 and under A2 scenario.

Keywords: LARS-WG, HadCM3, Extended de-Martone, Climate Change, Climatic Classification, Golestan Province.

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Modeling of Water Table Rise between Two Canals in an Aquifer Making Use of Differential Quadrature Method

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ABSTRACT

In many of agricultural lands, water table is raised because of seepage from canals and from surface recharge. This rise gradually causes such problems appear in land as waterlogging and salinity, ultimately leading to land degradation, therefore endangering development of agriculture and economy in the region. It is necessary, before problems appear; engineers and researchers consider the variations in the groundwater table. In this article the problem has been so selected which shows an aquifer lying on a sloping impervious barrier discharged through a constant discharge from the surface and as well through two canals of (L) horizontal distance. The initial water table is located horizontally at h0 above either the horizontal or sloping bottom. Following recharge and canal commencement, water table starts to rise. The rate of rising depends on the rate and duration of recharge and a well through seepage from canal. Application of DQM in discretion of governing equations for the chosen case study and formulation of the problem is presented in the present article. For further comparison and to find a more reliable answer there are used three methods for discretion of governing equations: 1-Explicit Scheme, 2-Implicit Scheme, 3-Semi Implicit Crank Nicholson Scheme. The investigation confirms that DQM is of vast capability and simplicity to produce accurate results satisfactorily compatible with Finite Difference numerical model and as well with analytical solution while at the same time highly efficient in time and cost of running. The discretion scheme in the method does not establish large sets of simultaneous equations to be solved and is not sensitive to the number of grids in its mesh. Therefore with a very small number of grids compared with a very large number of required grids in Finite Difference Scheme it produces very accurate results close to analytical solution ones and creates exactly the same results as Finite Difference scheme.

Keywords: Boussinesq equation, Numerical modeling, DQM

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Analysis of Physicochemical Properties of Sediments Trapped in Successive Check Dams

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ABSTRACT

Check dams have been widely used in erosion control projects of upland areas especially in arid and semi-arid regions. These structures control and reduce the amount of sediments entering main rivers by trapping the sediment load of floods. Trapped sediments by check dam systems reduce the slope of gully and provide ideal condition to starting some such biological measures of erosion control as vegetation cover establishment. Physical and chemical properties of check dam sediments play a major role in determining the different aspects of their behavior like water holding capacity, water infiltration rate, and controlling nutrient loss and as well pollutants, transportation. This study aims at analyzing the physicochemical properties of sediments in some successive check dam systems. The study was carried out in four seasonal waterways from two different regions of Urmia city, northwestern Iran surroundings. Results indicated that the average sand content of the sediments in waterways lies somewhere between 54.4 and 88.4 percent. Sediment samples with sandy and loamy sand texture were coarser in size than the original soils of the adjacent hillslopes. Sediments were poor in macronutrients in comparison with the original soils with the enrichment ratio of the N, P, and K being 0.53, 0.66 and 0.60 respectively. In the partially filled check dam systems, as a result of selective sediment deposition, sediment characteristics change in a regular trend and the amounts of clay and macro nutrients were higher in the downstream dams than those in the upstream dams. Results indicated that the check dam systems are not able to trap all sediment sizes and a great amount of particles smaller than 2 micrometer in diameter, passed through the system in the form of suspended load. Principle component analysis of sediment properties including pH, EC, organic matter, N, P, K, sand, silt, and clay; strongly suggested the importance of macronutrients (N, P, K) with sand and silt content in characterization of sediment properties.

Keywords: Enrichment ratio, Particle size distribution, Fredlund model, selective deposition

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Developing a Modified Conceptual Model for a Plant's Response to Simultaneous Salinity and Water Stress (Case Study: Basil)

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Abstract

In arid and semi-arid regions, in addition to water quality, water quantity would also limit agricultural production development. In this situation, plant is put under simultaneous water and salinity stress conditions. Modeling agronomical plant response to simultaneous water and salinity stress can in a way help operation management of the country's limited water resources. The objective followed in the present study was to model agronomical plant response to simultaneous water and salinity stresses. To accomplish the purpose first the important water uptake reduction functions were investigated using basil greenhouse data in southeast Tehran in year 2014. The results of the investigations indicated that there existed no relationship between matric potential at readily available water (h_3) vs osmotic potential in any mathematical model. Throughout the paper, a new mathematical model for an investigate on of the agronomical plant response to simultaneous water and salinity stress was given by modifying conceptual model of Homaee *et al.*, at h_3 arm (branch). Based on statistical analysis, the results of evaluating this new model using basil observed data indicated that model is of the capacity to simulate plant response to salinity stress, water stress, as well as simultaneous water and salinity stress to a reasonably accurate level. (ME=12.4%, NRMSE=8.5% and R^2=0.97).

Keywords: Combined stress; Uptake reduction function; Evaporative demand (h_3)

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Assessment of Groundwater Vulnerability using Modified DRASTIC, Logistic Regression and AHP-DRASTIC (Hashtgerd plain)

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ABSTRACT

Parts of a plain act differently as regards pollutant's velocity to reach the groundwater. Land assessment and its proper management for a variety of land uses, due to its susceptibility to transfer of contaminations is essential. DRASTIC method as an overlying way bears some seven influencing parameters for contamination susceptibility mapping. Due to local effects on DRASTIC model parameters, coefficients modified for the input data are required. . According to multiple studies in Hashtgerd Plain, to assess the aquifer vulnerability, modified DRASTIC method, logistic regression-DRASTIC and hierarchical analysis process DRASTIC were employed. In addition to the DRASTIC input parameters, land uses were made use of in the analysis considering the role in the production of contaminations. The western part of the study area, there is an aquifer that is charged from the eastern part of the plain. DRASTIC model as output of the model is validated as with nitrates and while the eastern areas are excluded. In validating indicators of vulnerability, Spearman correlation parameters, are calculated respectively as 0.79, 0.84, 0.86 and 0.91 for DRASTIC, modified DRASTIC, logistic regression-DRASTIC and hierarchical analysis process –DRASTIC with Analytical Hierarchy Process carrying the highest correlation coefficient.

Keywords: Groundwater Vulnerability, Drastic, Logistic Regression, Hierarchical Analysis Process

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Quality Variations of Biochar Produced from Cow Manure during Slow Pyrolysis Process and at Different Temperatures

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ABSTRACT

Biochar has recently received great attention due to its potential in improving soil productivity and immobilization of contaminants. It is also proper as a way of carbon sequestration in soil. Throughout the present study, biochar prepared from cow manure through slow pyrolysis at different temperatures (300, 400, 500, 600, 700 °C) and the physicochemical properties were analyzed. Experiments were conducted to examine the effect of pyrolysis temperature on the cow manure biochar and to identify the optimal pyrolysis temperature for converting cow manure into biochar of agricultural usage. The results indicated that with increase in temperature incrementally from 300 to700°C, biochar yield, total N content and organic carbon (OC) decreased while pH, EC, ash content and OC stability increased. The produced biochar treated samples yielded 22.14-44.36 % of feed mass and stable OC of 35.63-72.36 %. To produce agricultural-use cow manure biochar, 300°C temperatures is suggested in pyrolysis process and while for biochar carbon sequestration 500°C of temperature is recommended.

Keywords: Biochar, Carbon Stability, Slow Pyrolysis, carbon sequestration, Cow manure

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Implementation of Shannon Entropy Method to Determine Areas Suitable for Artificial Ground Water Recharge, Case Study: Sarkhoon Plain

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ABSTRACT

Artificial recharge of groundwater plays a pivotal role in the sustainable management of this vital resource. Sarkhoon plain in Hormozgan was studied using geographic information system, combining it with the Shannon entropy and a pair-wise comparison test. To follow the purpose, 9 affecting elements of: water quality, water depth, permeability coefficient, thickness of alluvium, land use, transfer capability, land morphology and drainage density were selected and worked out. Then, using entropy method and pair-wise comparisons, the weight of each standard and the class of each layer were determined The areas with flood spreading were removed and finally the entire area was divided and zoned into four classes making use of GIS analytical functions and Jencks algorithm. Results indicated that drainage density factor weighing 0.211 is the most important factor for locating flood spread in Sorkhun plain. Areas susceptible to flood spreading are mostly located at the morphological units of alluvial fan in the northern part of the plain, with slopes of less than three percent, occupying approximately 17.70% of the plain. Evaluation of the results by a comparison of the successful implementation projects in the region led to 78 percent overlap of the model which can lead to weight each criterion by considering the impact of the uncertainty, which can help enhance the accuracy of the model output.

Keywords: Water resources, Flood water, Drainage density, Interpolation, Hormozgan province

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An Investigation of Qazvin Marshland Interceptor Drain Effects on Water Table Using Seep/w Model

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ABSTRACT

The drop in groundwater level has caused many serious problems. One of the most important ones is the advance of saline groundwater to in the upper levels of the plains. Also, decreasing of saline water through the groundwater is another problem that occurs. The interceptor drain is a method suggested for solving some of these problems. In this study, the effect of Qazvin marshland interceptor drain is simulated. To monitor the effectiveness of these drains, wells of 99 loops were excavated in 9 sections perpendicular to the drain (A to I). Seven wells per section were excavated in the upstream at 10, 25, 50, 100, 250, 500 and 1000 meter distances from the drain and 4 wells' in the downstream at 10, 25, and 50 and 250. The wells water level was measured in once a month and a water sample taken from each. Chemical analysis of the samples, and chemical changes in drainage water were determined. The condition of the cases affected by drainage was simulated through software package Geostudio. Model, the hydraulic conditions (model Seep/ w) is taken as the model. The numerical model used in section B was calibrated using observations related to August 2010 with the data collected four months following their verification. In the calibration phase, values of modeling efficiency and coefficient of determination were obtained as 0.91 and 0.97, respectively. These values amounted to 0.87 and 0.91 in validation phase, respectively. These values of validation show reasonable efficiency of the model in groundwater level prediction.

Keywords: Saline groundwater advance, Geostudio, Hydraulic conductivity.

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Evaluation of Temporal Variation of Soil Water Infiltration Coefficients in Furrow Irrigation

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ABSTRACT

Recognition of soil water infiltration process is essential for improving irrigation efficiency, decreasing water losses and management of surface runoff. The aim followed in this research was to evaluate temporal variation of the Kostiakov-Lewis infiltration equation parameters during a corn growing season. Sixteen irrigation events for 8 large scale furrow experiments were analyzed by the volume balance method for evaluating the Kostiakov-Lewis infiltration parameters. The length of the experimental furrows used in the study was120 meters. The results indicated that temporal variation of the Kostiakov-Lewis parameters during the growing season for each irrigation event was not significant, the possible error being less than 5%. Infiltration parameters were sensitive to inflow rate variations with the effect being non-linear. The effects of inflow rate variations on infiltration parameters need further more supplementary studies.

Keywords: Corn, Kostiakov-Lewis, volume balance.

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Use of Soil Compaction Curve Characteristics to Estimate Water Content through Van Genuchten Model

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ABSTRACT

Van Genuchten model is a well-known and most widely used in the estimation of soil water retention curve. The parameters of this model have been estimated by such different estimation factors as soil texture. But, so far the properties of compaction curve have not been used to estimate the parameters of van Genuchten model. Compaction curve is one of the soil mechanical properties revealing the relationship between stress-strain and the elasticity modulus. There are similarities existing between water retention and compaction curves. Measurement of soil water retention curve is time-consuming and costly while the determination of compaction curve is less costly and in need of less time. For this study, 150 soil samples (distributed and non-distributed) were collected from five different provinces of Iran. Soil water retention was measured at 12 suctions and the compaction curve obtained using uniaxial apparatus within the confined sample. Throughout the research, 6 levels of estimators including compaction characteristics and equation coefficients were made use of to estimate the water content. In general, results indicated that the use of compaction curve was useful in estimation of the soil water retention curve. The second and sixth levels with the estimators of Pc-Cc-Cs and parameters of stress-strain model (indirectly), respectively along with basic soil properties were of higher estimation accuracies as compared with other estimator levels. The reason for the excellence of these estimators can be due to their correlation with van Genuchten model parameters and mechanical accept of estimators. Moreover, the similarity between the two curves was one of the reasons for the appropriate estimation of soil water retention curve.

Keywords: Compression curve, Model, Pre-compaction stress, Soil water retention curve.

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