



## Water and Irrigation Management

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### Comparison of regression tree, artificial neural network and Hargrives-Samani in estimation of reference evapotranspiration in Semi Region

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#### Abstract

The purpose of this study was to evaluate three models of artificial neural networks (ANN), regression trees (M5) and Hargrives-Samani (HG) in estimation of reference evapotranspiration. For this purpose was used climate information of Sistan va Baloochestan, Kerman, Yazd and Khorasan Jonoobi from 1998 to 2008. In addition to effect of wind (U) on evapotranspiration ( $ET_0$ ), estimation of  $ET_0$  was done based on wind change in tree groups including  $U < 2.48$  m/s ( $U_1$ ),  $2.48 < U < 3.67$  m/s ( $U_2$ ) and  $U > 3.67$  m/s ( $U_3$ ). The results showed that optimum result of each tree methods was in  $U_1$  group. The amount of RMSE and  $R^2$  in ANN were 1.41 mm/day and 0.84 respectively, in MS were 1.46 mm/day and 0.83 and in HG were 2.02 mm/day and 0.69. These results showed that both ANN and MS methods are better than HG model. Besides, the run of MS to ANN is easy.

**Keywords:** artificial neural network, evapotranspiration, Hargrives-Samani, regression tree, wind.

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### Risk assessment of climate change impacts on production and phenology of wheat (Case study: Ahvaz Region)

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#### Abstract

In recent years, human activities has resulted increases in atmospheric carbon dioxide (CO<sub>2</sub>) concentration. Increase in [CO<sub>2</sub>] has caused global warming and Climate change. The aim of this study was to assess potential climate change impact on production for one of the most important varieties of wheat (chamran) in Ahvaz Region. For this purpose, thirteen AOGCM models and two greenhouse gases emission (GHG) scenarios (A2 and B1) was selected. Daily temperature and precipitation data were calculated for two future periods (2015-2045 and 2070-2099) under five probability levels (0.10, 0.25, 0.50, 0.75 and 0.90). The combination of temperature and precipitation scenarios resulted in 50 climate change scenarios under each GHG emissions scenario (A2 and B1). Wheat growth was simulated for the baseline period (1980 -2010) and future periods (2015-2045 and 2070-2100) using calibrated and validated CERES-Wheat model. Results showed the length of growing season is shortened as a result of climate change affects, especially in the 2070-2100 periods. Comparing of Wheat yield in climate change conditions with base period, showed that wheat yield in 2015-2045 and 2070-2100 is decreased about 4 and 15 percent, respectively.

**Keywords:** CO<sub>2</sub>, CERES-wheat model, emission scenarios, wheat yield.

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### Development of a multi attribute decision making model for selection of automatic measurement systems in irrigation networks

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#### Abstract

Application of automatic systems, including discharge measurement technology is one of the effective methods for improving delivery management, water use efficiency, flexibility, and performance of irrigation networks. Several aspects such as hydraulic, technical, physical, environmental, economic, social, and managerial, have significant impact on these systems selection. Due to diversity of the alternatives and numerous affecting factors, suitable selection of automatic discharge measurement technology is a complex task, which makes it necessary to apply multi attributes models. In this paper, TOPSIS method is used for selection of automatic discharge measurement systems. At the first step, different alternatives for automatic discharge measurement and effective attributes on selection of these systems are identified, introduced and categorized. Afterward decision matrix, as the model input, is produced by scoring attributes for all alternatives. The decision making model that used TOPSIS ranking method and Entropy weighting method, is developed in MATLAB software and is run for L1 canal of Qazvin irrigation network. The results show that the discharge- depth and velocity-area automatic systems have higher ranking. In addition pressure and floating water level sensor are better than bubbler and ultrasonic options.

**Keywords:** automation, discharge measurement, entropy weighting method, Qazvin irrigation network, TOPSIS.

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### The efficiency of irrigation systems, sprinkler irrigation in Khorramabad

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#### Abstract

Today, productivity and efficiency of irrigation have been in the center of the many water-related issues. By using sprinkler irrigation systems in addition to watering easier and automatic, that is a device for raising water application uniformity and efficiency which ultimately will save water consumption and production increase. In this study, four fixed irrigation systems of Khorramabad city were selected, tested and evaluated. Values of application efficiency (AE), combination efficiency ( $E_c$ ), potential efficiency in low quarter (PELQ), application efficiency in low quarter (AELQ), adequacy irrigation ( $AD_{irr}$ ), wind and evaporation losses (WDEL) and deep percolation losses (DP) in solid set systems are 56.82, 59.86, 47.21, 45.71, 81.64, 13.12, 30.09, respectively. Measured parameters were less than expected. All systems have a low applicability and combined efficiency. High losses caused reduction of applicability and combined efficiency. In one system, the irrigation was done completed, but deficit irrigation in other systems caused equality of application efficiency potential with application efficiency.

**Keywords:** application efficiency, adequacy irrigation, application efficiency in low Quarter, combination efficiency, potential efficiency in low quarter.

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(Scientific Journal of Agriculture)  
(College of Abouraihan – University of Tehran)

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### Effect of soil matric potential and irrigation pipe layout on yield and water use efficiency of cucumber's in greenhouse

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#### Abstract

In order to investigate the effect of soil matric potential and tube layout on yield and water use efficiency of greenhouse cucumber, a field experiment was carried out during 2010 and 2012 growing seasons at an experimental farm in Jiroft territory. The treatments were laid out in strip split plot a Randomized Complete Block Design with three replications. The treatments were comprised of soil potential including 45, 55, 65 and 75 c-bar tension in main plot and sub plot consisted of two irrigation systems (surface drip irrigation system (S<sub>1</sub>), subsurface drip irrigation system (S<sub>2</sub>)) and two tape position patterns (conventional (L<sub>1</sub>) and alternative (L<sub>2</sub>)). The results showed that in comparison to 45 and 55 c-bar tension, parsimony of water usage equal 700 m<sup>3</sup> ha<sup>-1</sup> achieved. Moreover yield, LAI, height of plants, length and diameter of fruit decreased 1.2, 1.9, 0.35, 0.73 and 1.2 percent respectively but water use efficiency increased 10.5 percent. On the other hand yield and water use efficiency in subsurface irrigation increased about 6 and 6.13 percent respectively compared with surface irrigation. Also in conventional pattern yield and water use efficiency increased about 7.5 and 7.7 percent respectively compared with alternative pattern.

**Keywords:** irrigation system, Jiroft, potential point, tape position patterns, yield components.

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(Scientific Journal of Agriculture)  
(College of Abouraihan – University of Tehran)

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### Multi reservoir optimal operation using Shuffled Complex Evolution (SCE) algorithm (Case study: Karkheh basin)

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#### Abstract

In recent decades, Evolutionary algorithms have been applied successfully in various water resource engineering and management issue especially in optimal operation of reservoirs. In this paper, a model based on shuffled complex evolution (SCE) algorithm has been developed for modeling optimal operation of complex multi reservoir system of Karkheh basin. The system includes 4 different agricultural irrigation demands allocation with environmental prioritize in both short and long-term approach. In this study, Development, increment of performance and algorithm's resistance which are the main cause of having perfect mechanism of rull et-wheel and established preparation in the programming's structure. First, the accuracy of the developed model was evaluated by a number of standard functions. The results indicate good performance of the developed model. Next the developed model was used for solving complex multi-reservoir system operation Karkheh basin. Results of model was evaluated by some statistical criteria and compared with the GA standard results. Results show high performance and SCE algorithm fitness to optimal operation of reservoirs.

**Keywords:** evolutionary methods, Karkhe Basin, multi-reservoirs system, optimal operation, SCE algorithm.

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(College of Abouraihan – University of Tehran)

Vol. 4 ■ No. 2 ■ Autumn & Winter 2014-15

### Evaluation of hydraulic sensitivity indicators for Baffle modules (Case study: Varamin Irrigation and drainage network)

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#### Abstract

According to the low efficiency of irrigation and drainage networks and water distribution in Iran, simulating water flow and sensitivity structures and networks is considered as a new approach to evaluate the performance hydroelectric projects in the country. In this study, because of reduced water supply and distribution, especially in downstream irrigation and drainage networks Varamin to evaluate the sensitivity network in off takes structures. The sensitivity of the survey data by examining Water original data and compared them with the amount of water needed to grow the network. Network simulation and analysis using hydrodynamic model Sobek presented for sensitivity and relationships off take structures is done. Studies and sensitivity analysis for hydraulic structures Varamin irrigation system showed that baffle modules sensitivity are considerable. The study of equations, the sensitivity baffle modules occurred more than the depth upstream and valve patency rate in terminal structures. For optimal operation of the irrigation system in Varamin best way to provide for downstream water depth of each channel. In these conditions, the water supply and wastewater in all modules in the patency rate does not change.

**Keywords:** hydrodynamic model, off take, operation, performance network, sensitivity analysis.

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(Scientific Journal of Agriculture)  
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Vol. 4 ■ No. 2 ■ Autumn & Winter 2014-15

### Effect of pH adjustment and chlorination on water and effluent characteristics to prevent emitter obstruction

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#### Abstract

The aim of this study was to determine the concentration of free residual chlorine in the effluent at different concentrations of chlorine injection, between 50 to 350 ppm, at the pH levels of 6, 6.5 and 7 and the effect of chlorination on pH, electrical conductivity and the concentration of total dissolved solids in drinking water and effluent. The results showed that the concentration of free residual chlorine changes by changing the concentration of added chlorine in the effluent samples. To achieve the concentration of free residual chlorine to more than 1 ppm, 1, 150 and 200 ppm Chlorine was used at drinking water, effluent samples at pH levels of 6 and 6.5 and effluent at pH of 7. By reduction of effluent pH from 7 to 6-6.5 the amount of added chlorine to achieve free residual chlorine concentration at 1 ppm, decreases in 25 percent. Adding chlorine in liquid sodium hypochlorite form to drinking water and effluent samples at all pH levels, increased electrical conductivity, the concentration of total dissolved solids and pH. Although use of liquid sodium hypochlorite for chlorination of drip irrigation systems reduces the risk of biological obstruction but increased concentrations of dissolved solids, salinity and pH of irrigation water that increases the risk of chemical obstruction of emitters.

**Keywords:** biological obstruction, chlorination, drip irrigation, effluent, free residual chlorine.

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