Water and Irrigation Management
(Scientific Journal of Agriculture)
(College of Abouraihan – University of Tehran)
Vol. 3 ■ No. 2 ■ Autumn & Winter 2013-14

Considering the flood intensity of Karoun's sub-basins and effective parameters on it in lumped and semi-distributed management simulation of flood hydrograph

Fatemeh Karandish[1*], Kiumars Ebrahimi[2], Jahangir Pourhemmat[3]

1. Assistant Professor, Department of Water Engineering, Faculty of Water and Soil, Zabol University, Zabol, Iran.
2. Associate Professor, Department of Irrigation and Reclamation, Faculty of Agricultural Engineering and Technology, College of Agriculture and Natural Resources, University of Tehran, Tehran, Iran.
3. Associate Professor, Soil Conservation and Watershed Management Institute, Tehran, Iran.

Received: 19 April 2013 **Accepted:23 November 2013**

Abstract

The response of Karoun basin in Lumped and Semi-distributed simulation were compared. Also, the flood intensity of the sub-basins and the effects of physical parameters on flood hydrograph have been investigated. Results demonstrated that there was no significant difference between the characteristics of flood hydrograph in lumped and semi-distributed simulation. Also, results showed that the flood intensity of each sub-basins doesn't just depend on the area of each sub-basin and further parameters such as the distance of each sub-basins based to the basin outlet and some other physical or climatic parameters would affect the flood intensity of each sub-basins. Based on the results of prioritizing the intensity of each sub-basins in the study area, Barez and Dazakabad sub-basins are in the first and seventh priorities based on the share of sub-basins on flood discharge. However Barez and Soulekan sub-basin ranked in first and seventh proiorities based on the share of sub-basins per unit area. Sensitivity analysis has been done based on five important parameters including; main river slope, Gravelius coefficient, curve number, area of sub-basins and the average slope of basin. Results indicated that the curve number has been the most effective factor on the flood rates of each sub-basin. Therefore, a suitable management for the land use changes as the most effective factor on curve number would greatly control the basin flood intensity.

Keywords: curve number, flood hydrograph, gravelius coefficient, HEC-HMS, prioritizing.

Corresponding Author: Email: F.Karandish@uoz.ac.ir

Water and Irrigation Management
(Scientific Journal of Agriculture)
(College of Abouraihan – University of Tehran)
Vol. 3 ■ No. 2 ■ Autumn & Winter 2013-14

Assessing climate change impacts on Taleghan reservoir daily inflow using data fusion method

Behnam Ababaei[1*], Farhad Mirzaei[2], Teymour Sohrabi[3]

1. Ph.D. Graduate, Department of Irrigation and Reclamation Engineering, Faculty of Agricultural Engineering and Technology, College of Agriculture and Natural Resources, University of Tehran, Karaj, Iran; Research and Development Center, ETKA Organization.
2. Assistant Professor, Department of Irrigation and Reclamation Engineering, Faculty of Agricultural Engineering and Technology, College of Agriculture and Natural Resources, University of Tehran, Karaj, Iran.
3. Professor, Department of Irrigation and Reclamation Engineering, Faculty of Agricultural Engineering and Technology, College of Agriculture and Natural Resources, University of Tehran, Karaj, Iran.

Received: 8 June 2013 **Accepted: 23 November 2013**

Abstract

In this research, Data Fusion (DF) method was applied to simulate the hydrological process of Taleghan reservoir daily inflow. Two different DF algorithms were proposed and assessed based on K-nearest neighbors (KNN) algorithm. Four artificial neural network models and two Hammerstein-Wiener (HW) models were used as the individual simulation models. Comparison of the results between individual models and DF algorithms revealed the superiority of the DF method. The performances of the two DF algorithms were comparable in simulating monthly mean inflow values, but AL1 overestimated the monthly standard deviations. Then, the daily time series of Temperature and Precipitation were generated by a well-tested weather generator model and were used as the inputs to the individual models. The results showed that the individual models can result in different or even inconsistent variations under climate change scenarios. It was also revealed that the performance of the AL2 data fusion algorithm was proved by the best HW model and this algorithm resulted in more logical results. Moreover, regarding considerable diversity among the individual models, the DF method can increase the reliability of the simulations related to the predicted variations of reservoir daily inflow under climate change scenarios.

Keywords: artificial neural network, daily inflow, Hammerstein- Wiener model, uncertainty.

Corresponding Author: Email: Behnam.Ab@Gmail.com

Water and Irrigation Management
(Scientific Journal of Agriculture)
(College of Abouraihan – University of Tehran)
Vol. 3 ■ No. 2 ■ Autumn & Winter 2013-14

Simulation of nitrate transport in Mazandaran paddy field during canola cultivation season for water resources management

Hasan Ali Bakhshi[1], Ali Shahnazari[2*], Ramezan Tahmasebi[3]

1. M.Sc. Graduated Student, Department of Water Engineering, Sari Agricultural Sciences and Natural Resources University, Sari – Iran.
2. Assistant Professor, Department of Water Engineering, Sari Agricultural Sciences and Natural Resources University, Sari – Iran.
3. Assistant Professor, Department of Water Engineering, Institute of Applied Scientific Higher Education of jahad-e agriculture, Tehran- Iran.

Received: 14 May 2013 **Accepted: 23 November 2013**

Abstract

In this research, the appropriateness of DRAINMOD-N model was evaluated for the simulation of nitrate transport with subsurface drainage in paddy fields. During a canola growing season from November 2011 to April 2012, the nitrate concentration of drainage water and soil saturation extracts of two depths of 30 and 60 cm was measured in consolidated paddy fields of Sari Agricultural Sciences and Natural Resources University. Drainage treatments included: three conventional subsurface drainage systems with mineral envelope including drainage system with drain depth of 0.9 m and drain spacing of 30 m ($D_{0.9}L_{30}S$), drain depth of 0.65 m and drain spacing of 30 m ($D_{0.65}L_{30}S$), and drain depth of 0.65 m and drain spacing of 15 m ($D_{0.65}L_{15}S$) and a conventional subsurface drainage system with artificial envelope with drain depth of 0.65 m and drain spacing of 15 m ($D_{0.65}L_{15}F$). The model was calibrated by adjusting nitrification and denitrification coefficients. In order to test the model results, five statistical indices including model efficiency (EF), percent error (PE), coefficient of determination (R^2), root mean square error (RMSE), and average deviation (AD) were used. The values of EF, PE, R^2, RMSE, and AD were, respectively, 0.71, 2.66, 0.72, 0.94, and 0.56 for the calibration phase. Based on the results, the DRAINMOD-N model performed well for nitrate loss simulation in the calibration phase, but at validation phase the values of EF, PE, R^2, RMSE, and AD were, 0.12, -19.89, 0.851/01 and 0.56 respectively, which was from the weak simulation accuracy.

Keywords: DRAINMOD-N, leaching, nitrification, subsurface drainage, water resources**.**

Corresponding Author: Email: aliponh@yahoo.com

Water and Irrigation Management
(Scientific Journal of Agriculture)
(College of Abouraihan – University of Tehran)
Vol. 3 ■ No. 2 ■ Autumn & Winter 2013-14

Assessment of climate change impacts on operation of Gorgan Rud basin's dams

Amir Hossein Shafaei[1*], Shahab Araghinejad[2], Ali Reza Massah Bavani[3]

1. Post Graduate Student, Civil Engineering, Azad University, Tehran Center, Tehran, Iran.
2. Assistant Professor, Irrigation and Civil Engineering, Agriculture Campus, University of Tehran, Karaj, Iran.
3. Associate Professor, Department of Water Resources Engineering, College of Abureyhan, University of Tehran, Pakdasht, Iran.

Received: 29 April 2013 **Accepted: 23 November 2013**

Abstract

In this study impact of climate change on operation of Gorgan Rud basin's dams was evaluated. In this regard temperature and precipitation of the basin for 2011-2035 periods were downscaled using SDSM model and CGCM3-A2 outputs. Results showed that annual temperature would increase 0.05°c and annual precipitation would decrease about 4percent. To predict streamflow of the Gorgan Rud basin in 2011-2035, joint probability distribution were employed. Results showed that the total annual streamflow will decrease about 4 percent. Afterwards the predicted temperature, precipitation and streamflow of the basin were introduced to the WEAP model and the allocations to each consumption nodes were calculated. Results showed that the total allocation will decrease from 92 percent to 90 percent and the total storage of the dams will decrease about 10 percent. The final results of this study showed that the water managements of the basin should be changed in the future periods.

Keywords: climate change, Gorgan Rud Basin, reservoirs operation, SDSM, WEAP.

Corresponding Author: Email: armassah@ut.ac.ir

Water and Irrigation Management
(Scientific Journal of Agriculture)
(College of Abouraihan – University of Tehran)
Vol. 3 ■ No. 2 ■ Autumn & Winter 2013-14

Simulation farmers' response to reducing available water policy

Abouzar Parhizkari[1], Mahmoud Sabouhi[2*]

1. M.Sc. Student, Department of Agricultural Economics, Faculty of Agriculture, University of Zabol, Zabol, Iran.
2. Associate Professor, Department of Agricultural Economics, Faculty of Agriculture, University of Zabol, Zabol, Iran.

Received: 25 July 2013 **Accepted: 23 November 2013**

Abstract

In this study, to determine the economic value of irrigation water and simulate the response of farmers to reducing available water policy of positive mathematical programming models (PMP) was used. By the proposed model, the economic value (shadow price) of irrigation water estimated in each of the areas of Western Rodbar Alamuot, Rajai Dasht and Eastern Rodbar Almuot. Then, the reactions of farmers in each region toward reduce water availability policy under scenarios of 10, 20, 30, and 40 Percent was investigated. To solve the model of data's 2011-2012 and software GAMS Version 23/5 was used. The results showed that the economic value of irrigation water estimated for each of the areas of Western Rodbar Alamuot, Rajai Dasht and Eastern Rodbar Almuot respectively 882, 716 and 845 riyals and there is huge difference between the economic value of irrigation water and water charge rates in the region Rodbar Almuot and by reducing the availability of irrigation water, the economic value of water increases and cropping pattern moves in each of the areas favor products that creates fixed income toward less water.

Keywords: CES production functions, cropping optimal pattern, positive mathematical programming, real value of water, Rodbar Almuot.

Corresponding Author: Email: Msabuhi39@yahoo.com

Water and Irrigation Management
(Scientific Journal of Agriculture)
(College of Abouraihan – University of Tehran)
Vol. 3 ■ No. 2 ■ Autumn & Winter 2013-14

Watersheds management ranking using Analytical Network Process (ANP) and a hybrid algorithm based on ANP- fuzzy TOPSIS methods

***Seyedeh Leila Razavi Toosi*[1], *Jamal Mohammadvali Samani*[2 *]**

1. Postdoctoral researcher, Department of Water Structures, Faculty of Agriculture, Tarbiat Modares University, Tehran - Iran.
2. Professor, Department of Water Structures, Faculty of Agriculture, Tarbiat Modares University, Tehran, Iran.

Received: 4 August 2013 **Accepted: 23 December 2013**

Abstract

Water is a main resource in sustainable development planning where the management of quality and quantity of these resources play an important role in public health and social welfare. On the other hand, due to social, economic and environmental values of this vital resource, water resource management is considered as a very important task. The long term water strategies are not only a useful guide in codification of water management plans in watersheds but also affect the optimal utilization of water resources through creating links among different management sectors. In national water allocation planning, ranking watersheds is a serious part of integrated water management which is less referred in the literature. In this study the ANP method and a novel hybrid algorithm based on ANP-FuzzyTOPSIS method are employed and compared. Different critical watersheds in Iran included Oroomeyeh, Atrak, Sefidrood, Namak and Zayandehrood are considered as alternatives. The results indicate that Oroomeyeh and Atrak show the highest and the lowest scores, respectively. It means Oroomeyeh is a critical watershed by considering water strategies and applying water strategies in this watershed is more important than others.

Keywords: ANP, Fuzzy TOPSIS, management, ranking, watershed.

Corresponding Author: Email: samani_j@modares.ac.ir

Water and Irrigation Management
(Scientific Journal of Agriculture)
(College of Abouraihan – University of Tehran)
Vol. 3 ■ No. 2 ■ Autumn & Winter 2013-14

Determination of planting date and supplemental irrigation for rainfed lentil in Qazvin plain by computerized model

Abbas Sotoodehnia[1], Behnoush Kamali [2*], Masoud Soltani[3]

1. Assistant Professor, Department of Water Engineering, Imam Khomeini International University, Qazvin, Iran.
2. M.Sc. Student, Department of Water Engineering, Imam Khomeini International University, Qazvin, Iran.
3. Ph.D. Student, Department of Water Engineering, College of Aboureyhan, University of Tehran, Pakdasht, Iran.

Received: 1 October 2013 **Accepted: 23 December 2013**

Abstract

Planting at the right time and supplemental irrigation are considered as the effective management practices in increasing rain productivity and rainfed lentil yield and have been discussed in several studies. In this study, the suitable planting date and supplemental irrigation time for lentil in Qazvin weather conditions were examined in a computerized model. In this model, soil water content and water requirement of lentil crop were calculated by meteorological and geographic data, information of slightly soil and plant and according to FAO relations and then were compared. Finally, the planting date with the least amount of stress to the plant during the growth period and sensitive stages was identified as the most suitable planting date. The time of supplemental irrigation also was determined in order to minimize the amount of stress to the plant in the intermediate stage of growth. Based on the results of the model among the planting dates (March, 15th; March, 24th; April, 3th and April, 13th) the suitable planting time for spring lentil was March, 15th from the review times and the suitable time for supplemental irrigation was 10-15 days after the start of the sensitive growth stage (intermediate stage).

Keywords: computerized model, lentil, planting date, rain productivity, single irrigation.

Corresponding Author: Email: kamali_behnoush@yahoo.com

Water and Irrigation Management
(Scientific Journal of Agriculture)
(College of Abouraihan – University of Tehran)
Vol. 3 ■ No. 2 ■ Autumn & Winter 2013-14

Evaluation of yield, yield components and water use efficiency of Shahri and Shirazi balangu (*Lallemantia sp*) under drought stress for irrigation management

Mina Abdolahi[1], Saeedeh Maleki Farahani[2*], Mohammad Hosein Fotokian[3], Abdollah Hasanzade Goorut Tappe[4]

1. M.Sc. Student of Crop Production, Departemnt of Crop Production and Plant Breeding, College of Agricultural Science, Shahed University, Tehran, Iran.
2. Assistant Professor of Department of Crop Production and Plant Breeding, College of Agricultural Science, Shahed University, Tehran, Iran; Faculty member of Medicinal Plants Research Institute, Shahed University, Tehran- Iran.
3. Associated Professor of Department of Crop Production and Plant Breeding, College of Agricultural Science, Shahed University, Tehran – Iran; Faculty member of Medicinal Plants Research Institute, Shahed University, Tehran- Iran.
4. Assistant Professor of Department of Biology, College of Science, Urmia University, Urmia- Iran.

Received: 07 August 2013 **Accepted: 23 November 2013**

Abstract

To evaluate the effect of water stress on yield and Water Use Efficiency (WUE) of *Lallemantia* sp, an experiment was conducted as split plot factorial in randomized complete block design with three replications in the field of Medicinal Plants Research Center of Shahed University, Tehran in 1390-91. The first factor was irrigation system including 40 and 60 percent depletion of available soil water (ASW), the second factor was *Lallemantia* species including, *Lallemantia. iberica* and *L. royleana* and the third factor was the origin of ecotypes, Urmia and Mashhad. Water stress decreased leaf area index (LAI) 31.07 percent of *L. iberica* significantly, but *L. royleana* didn't change. The highest grain yield with an average of 208.4 kg.ha^{-1} obtained at 40 percent depletion of ASW and related to *L. iberica* with an average of 189.4 kg.ha^{-1}. Grain yield decreased by 28.03 percent in Shahri species but Shirazi species showed11.11 percent reduction of yield. Significant difference was seen in *L. iberica* ecotypes and Mashhad ecotype in terms of grain yield, harvest index and water use efficiency with 38.76, 36.63 and 37.32 percentage, respectively showed the highest means compared with Urmia ecotype but any significant changes was not seen in ecotypes of *L. royleana*. Significant positive correlation was between WUE and LAI (0.44), seed weight (0.53), grain yield (0.98), biological yield (0.61) and harvest index (0.91).

Keywords: ecotype, irrigation, LAI, *Lallemantia iberica, Lallemantia. royleana.*

Corresponding Author: Email: maleki@shahed.ac.ir

Water and Irrigation Management
(Scientific Journal of Agriculture)
(College of Abouraihan – University of Tehran)
Vol. 3 ■ No. 2 ■ Autumn & Winter 2013-14

Development complex crop model based on CSM-CERES-Maize model for irrigation management and evaluating the maize growth simulations

Hamzeh Dokoohaki[1], Mahdi Gheysari[2*], Seyed Farhad Mousavi[3], Shahrokh Zandparsa[4], Greet Hoogenboom[5]

1. Former M.Sc. Student, Department of Water Engineering, College of Agriculture, Isfahan University of Technology, Isfahan, Iran.
2. Assistant Professor, Department of Water Engineering, College of Agriculture, Isfahan University of Technology, Isfahan, Iran.
3. Retired Professor, Department of Water Engineering, College of Agriculture, Isfahan University of Technology, Isfahan, Iran.
4. Associate Professor, Department of Water Engineering, College of Agriculture, Shiraz University, Shiraz, Iran.
5. Professor of Agrometeorology, Washington State University, Washington, USA.

Received: 2 June 2013 **Accepted: 23 November 2013**

Abstract

In this study, a complex crop model was developed that integrates the various components of SWAP and CSM-CERES-Maize (DSSAT V4.0) model with the purpose of developing a more efficient model and according to the internal requirements. In the hybrid model, CERES-Maize supplies SWAP model with daily leaf area index and root depth and on the other hand SWAP model supplies CERES-Maize with daily weather data, soil water content, actual and potential soil evaporation and plant transpiration calculated from Penman-Monteith equation and finally the actual root water uptake. For assessing the performance of new model the data collected from maize cultivated in Varamin region were used. According to the comparison of the both models in many different aspects, it seems that both models can simulate very well the maize production. A significance difference was found in their prediction of average and total simulated biomass. The average and summation of Absolut error in simulation of final biomass for developed and original version of model were 1021, 4207 Kg/ha and 1271, 5978 Kg/ha respectively. Generally, because the simulation of target parameter (biomass) was fairly successful, it can be concluded that the model is enough ready for more deep research on maize production related topics.

Keywords: CERES-Maize-hbased, DSSAT, evapotranspiration, soil water, SWAP.

Corresponding Author: Email: gheysari@cc.iut.ac.ir

Water and Irrigation Management
(Scientific Journal of Agriculture)
(College of Abouraihan – University of Tehran)
Vol. 3 ■ No. 2 ■ Autumn & Winter 2013-14

Effect of salinity on performance of smart sensors in determination of soil moisture content

Javad Rahmani Soghayeh[1], Ali Asghari Ghaemi[2*]

1. Former M.Sc. Student, Department of Water Engineering, Faculty of Agriculture, Shiraz University, Shiraz, Iran.
2. Associate Professor, Department of Water Engineering, Faculty of Agriculture, Shiraz University, Shiraz, Iran.

Received: 16 September 2013 **Accepted: 23 November 2013**

Abstract

The accuracy and effectiveness of precision agriculture is highly depending on accuracy and time analysis of the soil moisture conditions. Monitoring of the soil water status is a proper method for optimizing the agricultural irrigation. Automation irrigation, based on soil moisture measurement by smart sensors has the potential to provide maximum water use efficiency by maintaining soil moisture at optimum levels. The salinity of the soil solution has a great impact on sensibility of the smart sensors the soil moisture content is determined. Therefore, in this study the performance of 4 smart sensors were compared to common methods in order to estimate the amount of soil water content under saline water at 30 and 60 cm depth from soil surface. The smart sensors used in this study were Watermark 200ss-v, Watermark 200ss, ICS 9101 and ICS9001 and the common methods which used to determining the soil moisture content were tensiometer, gypsum blocks, neutron meter and gravimeter method. The results showed that the Watermark 200ss-v was introduced as a highest accurate method to determine the soil moisture content. Among the conventional methods, the neutron meter showed a reasonable accuracy of soil moisture measurement. Using the gypsum block and tensiometer were not the appropriate method for soil moisture measurement. The results indicated that the performance of Watermark 200ss-v and tensiometer for measuring the soil moisture content under low soil moisture tension is better than in high soil tension condition.

Keywords: neutron meter, sensor, soil suction, tensiometer, water use efficiency.

Corresponding Author: Email: ghaemi@shirazu.ac.ir