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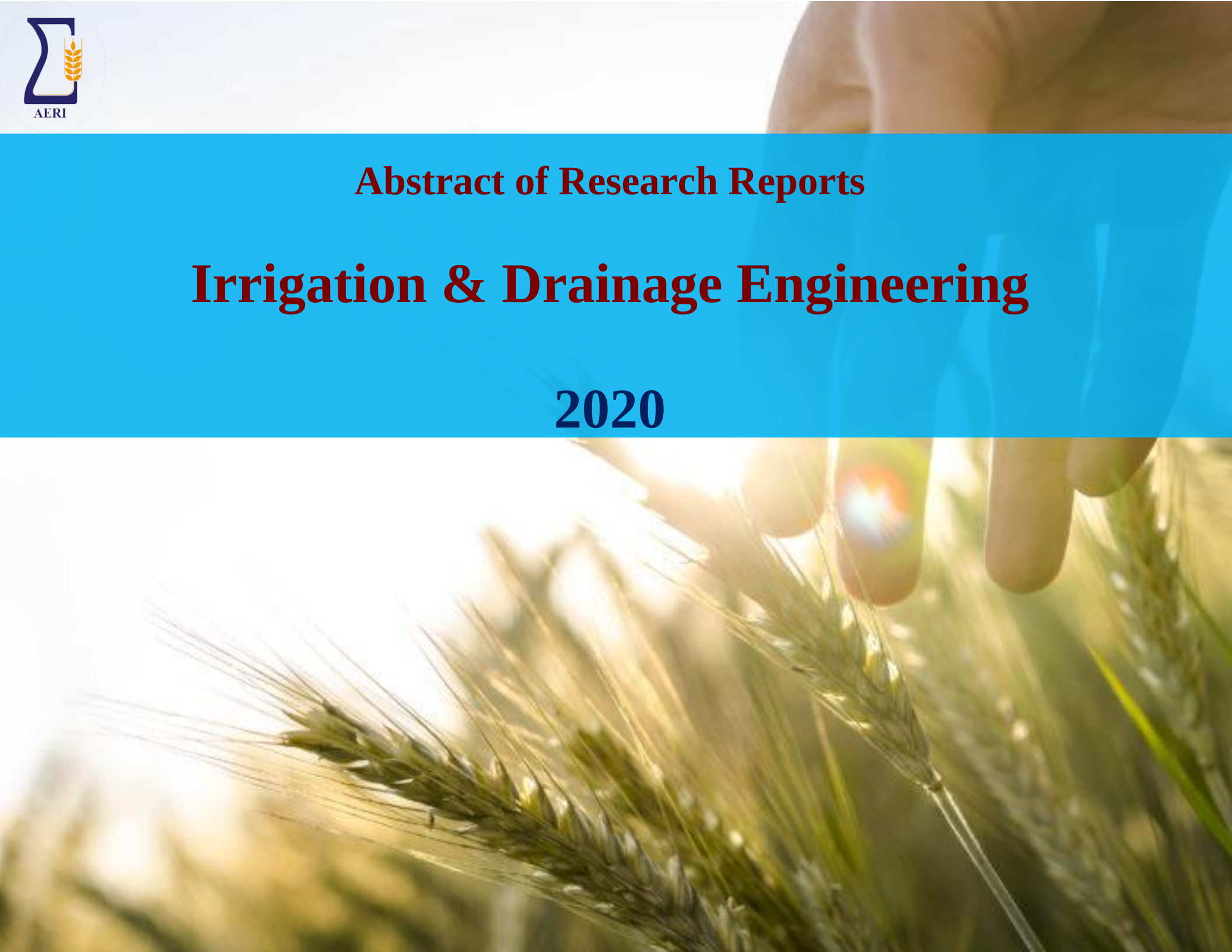

No.	Title	Page
1	Effects of Different Wheat Planting Patterns in Drip Tape Irrigation on Soil Chemical Properties, Yield and Water Use Efficiency of Bread Wheat	1
2	Technical and Economical Evaluation of Trickle Irrigation Systems under Farmer's Management	2
3	The Statues of Agricultural Water Productivity and its Improvement in Golestan Province	3
4	Improving of Water Application Efficiency in Furrow Irrigation	4
5	Study the Impact of Different on farm Technology on Water Use in Urmia Basin	5
6	Laboratory and Field Measurement of Emission Rate of The Porous Clay Pipe using Different Water Quality	7
7	Study of the Drainage Construction Effects on The Process of Soil Salinity Changes in Qazvin Plain Salt lands by Remote Sensing (RS) and Artificial Neural Network (ANN)	8
8	Technical Evaluation of Porous Clay Pipes for using them in the Subsurface Irrigation System	9
9	Studying of Micro Irrigation Methods and Water Use Productivity of Dwarf Apples Orchards in Urmia	10
10	Evaluation of Irrigation Management and Estimation of Sugarcane Water Consumption in Khozestan Sugarcane Agro-Industry Companies	11
11	Increasing the Water Productivity of Sugar Beet Using Drip Tape Irrigation System	12
12	Investigation of the Effect of Arranger of Conductor Tubes of Adjusted Subsurface Drip Irrigation (Ssdiadj) on Potassium Absorbtion and Pistachio Yield at Damghan Region	13
13	Determination of Saffron Water Consumption in Iran	14
14	Determination of Optimum Width of Drip Tapes and Water Use Efficiency for Wheat Crop in Medium and Heavy Textured Soils	15
15	Determination of Cotton Water Consumption in Iran	17
16	Determination of Olive Water Consumption in Iran	18
17	Determination of Apple Water Consumption in Iran	19
18	Determination of Vineyards Water Consumption in Iran	20
19	Quantitative and Qualitative Assessment of Local Cultivars and Salinity Tolerant Rice Lines under Irrigation Conditions using Fresh Water (Karoon River Water) and Sugarcane Fields Drainage Water in Southern Khuzestan	21
20	Determination of Potato Water Consumption in Iran	22
21	Increasing Water Productivity in Grain Corn using Drip Tape Irrigation System	23

No.	Title	Page
22	Investigation of Different Irrigation Round on Salinity Tolerant Rice using Sugarcane Drainage Water in the South of Khuzestan	24
23	Determination of Water Consumption of Garden Crops in Semnan Province	25
24	Determination of Nitrate Leaching to Soil Depth using Sugarcane Biochar and Slow-Release Fertilizer	26
25	Investigation of the Most Suitable Water Distribution Set of Mechanized Irrigation System in Poldasht Region	27
26	Determination of Crop Water Consumption in Semnan Province under Farmers' Conditions	28

Effects of Different Wheat Planting Patterns in Drip Tape Irrigation on Soil Chemical Properties, Yield and Water Use Efficiency of Bread Wheat

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Abstract

In order to investigate the effect of different planting paterns of wheat and the distance between drip irrigation tape in the country, a field experiment was conducted in Khorasan Razavi, Fars, south of Kerman (Jiroft), Hamedan and West Azarbaijan provinces in 2 years (2017 and 2018) . The treatments were: 1) 4 rows of planting 15 cm apart on both sides of the Tape, with a distance of 75 cm (T12) row spacing= 20 cm, with bar spacing 75 cm (T2). 3) plsnt row spacing= 20 cm, Tape spacing= 60 cm (T3). 4) plant row spacing= 15 cm, Tape spacing= 60 cm (T4). 5) plant row spacing= 30 cm, Tape spacing= 60 cm (T5). 6) Furrow Irrigation (control). The results showed that different planting arrangements had different effects on yield and WUE in all regions.in drip irrigation, the mean total of yield and WUE (based on water irrigation and effective rainfall) with 60 cm lateral distance were above 75 Cm. The average of yield and WUE (based on water irrigation and effective rainfall) in all drip irrigation treatments were 6000 kg/ha and 1.19 kg/m3, respectively and in surface irrigation were 5260 kg/ha and 0.77 kg/m3, respectively. The ratio of increasing irrigation water productivity and precipitation and wheat grain yield to drip irrigation to surface irrigation were 53.6 and 14%, respectively. Despite the benefits of wheat drip irrigation, in addition to soil salinity (which is removable by leaching), economic and environmental issues are the most important limiting factors.

Keywords: Drip Irrigation, Planting Pattern, Water Use Efficiency, Wheat, Tapes Distance

Technical and Economical Evaluation of Trickle Irrigation Systems under Farmer's Management

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Abstract

The use of pressurized irrigation methods such as drip irrigation In order to optimize the use of water seems to be necessary in the current situation of water crisis. Therefore, this research was carried out with the aim of investigating the technical and economic effects of strip drip irrigation in some fields of Hamedan province in products such as potato, sugar beet, watermelon, cucumber and tomatoes during 2017 to 2018. For this purpose, 29 fields were randomly selected and studied. The average volume of water consumed in potato, sugar beet, watermelon, cucumber and tomatoes was 9744, 11920, 6688, 7948 and 10255 m3.ha-1, respectively. The average of water productivity in the above mentioned products was determined 4.2, 6.6, 8.6, 8.7 and 7.2 kg. m-3 respectively. The results showed that despite the use of drip irrigation system in some fields, irrigation water volume was high due to the lack of correct implementation and proper management of the irrigation system. Evaluation of Soil Salinity showed that soil salinity increased at the end of irrigation season compared to the beginning of irrigation season under or between irrigation tapes. Comparison of water requirement with consumed irrigation water in some fields of watermelon, sugar beet and cucumber showed deficit irrigation in these fields. Economic analysis of the results showed that using drip irrigation system in products such as tomato and cucumber has high economic returns. In sugar beet, potato and watermelon, 25, 60 and 17 percent of the studied farms respectively, were not economically justified. The lack of economic justification of this system in some fields is due to a low level of technical and managerial knowledge.

Keywords: Benefit Cost Ratio, Pressurized Irrigation System, Water Productivity

The Statues of Agricultural Water Productivity and its Improvement in Golestan Province

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Abstract

One of the key factors in increasing production and food security is improving water productivity. Increasing water productivity can be achieved either by plant breeding or selection of varieties that may be more tolerant to water scarsity and by managing irrigation in the field to increase irrigation efficiency. As a result, two major ways to increase productivity are: reducing water consumption by maintaining previous production and increasing production per unit of consumed water that can be achieved by improving production management. Physical water productivity (ratio of yield to applied water) and economical water productivity (ratio of net income to applied water value) were estimated based on the water requirements of crops and orchards, average rainfall during the growing season and their production yield. Estimates of physical water productivity for major crops and orchards in Golestan province during the years ending in 2011 show that they did not have adequate water productivity (less than 0.8 kg/m3). However, in the period 2011-2011, according to the structural and non-structural measures, the average physical water productivity in agriculture and horticulture was about 1.06 and 1.47 kg/m3, respectively. An overall comparison between orchards and crops shows that the economic efficiency of orchards is almost twice that of crops. In other words, the per capita water in the garden is twice as much as the crop yields.

Keywords: Crops and Orchards, Economical Water Productivity, Golestan, Physical Water Productivity

Improving of Water Application Efficiency in Furrow Irrigation

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Abstract

Considering the level covered by surface irrigation systems in the country, using a scientific irrigation system and proper management of irrigation practices can significantly increase irrigation water efficiency and water productivity. In this regard, in order to improve water management and increase water application efficiency, a furrow irrigation extension- research project was carried out on potato crop with cutback method compared with the traditional irrigation. In the experiment under treatment, the water discharge was reduced by half by removing half the siphons after reaching the water to the end of the furrow. The amount of irrigation application efficiency was measured in three stages (first, middle and end of irrigation season). In this experiment, Combination tiller (sweep plow equipped with roller) was used in spring for the preparation of land. Inter-row tillage with chisel blade was used before hilling. The amount of crop yield in the treated and control treatments was determined by 37500 and 31450 kg. ha^{-1} respectively. The average amount of water application efficiency in the field at 3 stages, in the treatment and control treatments was 64.1% and 42% respectively. Irrigation water volume and water productivity in the field under test and control farm were 8135, 10913 cubic meters per hectare and 4.6 and 2.9 kg. m^{-3} respectively. Therefore, it can be said that the management of flow reduction in the furrow irrigation and Protective tillage, while reducing the amount of water consumed by 25.5%, has increased the water productivity by 59%.

Keywords: Conservation tillage, Potato, Water Management, Water Productivity

Study the Impact of Different on farm Technology on Water Use in Urmia Basin

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Abstract

The project " Contribution to restoration of Lake Urmia via modeling local community participation in sustainable agriculture and biodiversity" was one of the activities of Lake Urmia Restoration in which the National Environmental Agency, in cooperation with the Ministry of Agriculture Jihad, worked to educate and engage farmers to changes the traditional farming practices, while increasing water productivity on farms, protecting farmers' interests and incomes, reduce agricultural water consumption. In this project various farming and management techniques including conservation agriculture systems, irrigation systems modification, irrigation based on actual plant needs, selection of suitable cropping pattern, cultivars and orchards, planting date, deficit irrigation, irrigation management, intermittent irrigation, evaporation reduction, optimization of irrigation strips and plots, use of sprouted seeds and use of shorter-growing seeds, fertilizer modification, precision leveling operations, etc was used on a farm-scale during the years 1974-2014. The purpose of this study was to investigate the effectiveness of the techniques for reducing water withdrawal from water sources. To evaluate the effectiveness of the techniques using water use efficiency indexes (Ea), product performance (Yc), water use efficiency (WP) and water use efficiency (WUE) were considered. One of the most effective methods for proper management of surface, irrigation is the use of computer software and numerical models. In this study, WinSRFR software was used as a one-dimensional mathematical model for analyzing and simulating surface irrigation and selecting suitable farm dimensions. The results of the meta-analysis showed that the application of different techniques in the farms of the West Azarbaijan province pilot plants was effective by 24.1, 7.8, 38.7, 25.5 and 7.1%, respectively on reduced water withdrawal, increase in yield, irrigation water productivity, water application efficiency and water use efficiency. Also in East Azarbaijan province pilots, this effectiveness was evaluated at 25%, 20.2%, 60.3%, 34.5% and 20.4%, respectively. The results of evaluating the effectiveness of farming and breeding techniques in the pilots of West Azarbaijan and East Azarbaijan showed the highest reduction of irrigation water withdrawal in the third year with 29.1% effectiveness. In the second year, with 18.9% effectiveness, growth yields had better growth than in other years. Whereas the best effect on irrigation water productivity in the fourth year was 54.5%. Also, the highest effect on water application efficiency and water use efficiency was 40.1% in the fourth year and 20.3% in the second year,

respectively. In terms of product, the highest effect was obtained on the reduction of irrigation water use in tomato products of West Azarbaijan province by 44.2% and in East Azarbaijan plum product by 50.3%. In West Azarbaijan province, the highest increase in irrigation water productivity was observed in the order of maize> tomato> apple> grape> sugar beet and in East Azarbaijan province it was observed in the order of plum> tomato> walnut> wheat> almond. Over the past four years, farming and breeding techniques increased the average water productivity in the pilot farms of West and East Azerbaijan Province 38.7 and 60.3% respectively. This study supported by the Iranian Wetlands Conservation Project and reported based on the results of the joint activities of the Iranian Wetlands Conservation Project Office, Agricultural Engineering Research Institute, Irrigation and Drainage Department in Tarbiat Modarres University, Urmia University, East and West Azerbaijan Agricultural and Natural Resources Research and Training Center during 2015-2019. Finally, we would like to express our gratitude to the hard work of our partners in the Iranian Wetlands Conservation Project Office.

Keywords: Application Efficiency, Irrigation Water Application, Urmia Lake Basin, Water productivity

Laboratory and Field Measurement of Emission Rate of The Porous Clay Pipe using Different Water Quality

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Abstract

In arid and semi-arid areas of the world where water resources is confined, application of subsurface irrigation method is an option in order to reduce surface evaporation and consequently to improve the water productivity. As crop root intrusion to the emitters is one of the common problems in subsurface drip irrigation, application of porous clay pipes instead of drippers can be an option for subsurface irrigation. In view point of sustainable usage of the porous clay pipes for subsurface irrigating, application of different water quality may causes clogging problem for porous clay pipes. For this purpose three different water qualities of 0.34, 0.83 and 3.78 ds/m were used in the laboratory and field in order to determine percentages of clogging for the respective water qualities. Results obtained from this research showed that, emission rate of the clay pipe reduce with time in the form of logarithmic. Results obtained from laboratory and field experiments showed same trends in view point of clogging. This shows that, soil doesn't have any effect on the emission rate of the clay pipe. Results also showed that water quality doesn't have direct effect on the clogging problem.

Keywords: Clogging, Emission Rate, Porous Clay Pipe, Water Quality

Study of the Drainage Construction Effects on The Process of Soil Salinity Changes in Qazvin Plain Salt lands by Remote Sensing (RS) and Artificial Neural Network (ANN)

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Abstract

Soil salinity is one of the major problems in arid and semi-arid regions. Investigating soil salinity changes in conventional soil salinity map is expensive and time consuming. The purpose of this study was to applied artificial neural network and regression models to predict soil salinity in an area of 20,000 hectares in saline lands of Qazvin plain. Therefore, Landsat satellite imagery capabilities were used for soil salinity analysis and soil salinity index and vegetation cover over a 15 year period with 62 satellite images were analyzed on a seasonal scale. Also for modeling and prediction of soil salinity from groundwater level and soil electrical conductivity data in 99 observation wells in two years 2010 and 2012 and 40 vegetation percentiles data and 50 soil electrical conductivity data in 10 excavations constructed during years 2013 to 2016 were used. Results of correlation analysis of mean temporal data showed that vegetation index (GVI) had high negative correlation with salinity indices (BI, SI, SI1, SI2 and SI3). This index was correlated with SI salinity index based on a 3-way regression equation with an explanation coefficient of 0.79 and based on the Mann-Kendall test results, the trend of time series changes of the two indices in the 15 year period was significant. The outputs of the prediction models showed that the neural network was more accurate than the regression method in estimating soil electrical conductivity (EC) and SAR parameters and the neural network model with 13 input variables (soil salinity and vegetation index and Groundwater depth) had the highest prediction accuracy among the models studied. In general, the results showed that remote sensing and neural network techniques can be applied for a wide range of soil properties analysis.

Key words: Interceptor Drainage, Mann-Kendall Test, Qazvin Plain, Soil Salinity Index, Vegetation Index

Technical Evaluation of Porous Clay Pipes for using them in the Subsurface Irrigation System

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Abstract

Porous clay pipe is used for subsurface irrigation of different crops and considered as a low pressure system, acting at 1 to 4 meter hydraulic head. For measuring hydraulic characteristics of the porous clay pipe in the field and laboratory, standard equipment have not been developed yet so far. A standard laboratory and field equipment were designed and constructed for the measurement of emission rate of the porous clay pipe in this study. Without knowing hydraulic characteristics of the porous clay pipes, application of this device for subsurface irrigation may causes lots of problem in the field. Relationship between hydraulic head and emission rate of the pipes, its coefficient of variation as well as relationship between the temperature of water in the system and flow rate of the pipes were defined in this study. Results obtained showed that, Darcy's law is valid for flow through the pipe's body. As hydraulic head increases, emission rate of the pipe also increases according to the Darcy's law. Temperature of the water in the system has an important effect on the saturated hydraulic conductivity of the porous clay pipe's body. As temperature of the water in the system increases, the value of saturated hydraulic conductivity of the pipe's body also increases. Concentration of the plant roots at the external body of the porous clay pipe as well as soluble chemical mineral in the irrigation water are the major problem in view point of clogging of the clay pipe in pomegranate and olive gardens. Because of the clogging problem, porous clay pipe can be work efficiently for subsurface irrigation only 3 years. After that, used pipes should be replaced with new ones. In view point of sustainable usage of the porous clay pipes for subsurface irrigating, application of different water quality may causes clogging problem for porous clay pipes. For this purpose three different water qualities of 0.34, 0.83 and 3.78 ds/m were used in the laboratory and field. Results obtained from this research showed that, emission rate of the clay pipe reduces with time in the form of logarithmic. Results obtained from laboratory and field experiments showed same trends in view point of clogging. Almost 70 % of the flow rate of the porous clay pipe reduces after 800 hours working time. So, application of porous clay capsules/pipes are not suggested for subsurface irrigation of plants.

Keywords: Clogging, Emission Rate, Field, Laboratory, Porous Clay Pipe

Studying of Micro Irrigation Methods and Water Use Productivity of Dwarf Apples Orchards in Urmia

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Abstract

In order to study of the apple roots' effects in surface and subsurface micro irrigation methods compared to the clogging of emitters, yield and water use efficiency, an experimental layout on Red Delicious apple variety on the root stock of MM106 was applied. It was complete randomized block design with three replication in seven years successively which was conducted on west Azerbaijan Agricultural Research Center's farms in 2012-2017. The main factor was irrigation method in 4 levels including: Surface drip irrigation, subsurface drip irrigation without herbicides, subsurface drip irrigation with injection of 150 mg of herbicide for each tree and subsurface drip irrigation with injection of 300 mg of herbicide for each tree. Lateral pipes were installed on the garden in the first year of the project and clogging the emitters (only on subsurface irrigation) from the third year of the project was recorded. Clogging emitters increased during 2014-2017 and in the sixth year of installation reached to 15.44 percent. In the sixth year of the project, Clogging of emitters with an injection of 300 mg of herbicide for each tree was reached to 26.65 percent and in the same year without injecting herbicide, Clogging of emitters was reached to 39.93 percent. Due to the gradual growth of the roots, allowing influence of them into the subsurface Emitters will further, therefore injection of 300 mg herbicide for each tree during the growing season is recommended. In 2017 the maximum amount of water use efficiency was 3.07 kg/m3 with an injection of 300 mg of herbicide for each tree in the growing season and the lowest amount of water use efficiency was 1.98 kg/m3 in surface drip irrigation. In other words, the water used in subsurface drip irrigation systems has decreased 31 percent compared to surface drip irrigation. The lack of moisture in the surface and decrement of weed growth in subsurface drip irrigation leads to a significant reduction in evaporation from the surface of the soil. The cost of agricultural operations and the use of agricultural machinery reduced due to lack of irrigation pipes on the ground.

Key words: Clogging Of Emitter, Injection of Herbicide, Surface Drip Irrigation, Subsurface Drip Irrigation, Water Use Efficiency

Evaluation of Irrigation Management and Estimation of Sugarcane Water Consumption in Khozestan Sugarcane Agro-Industry Companies

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Abstract

Sugarcane is a plant with long growth period and high water requirement. About 100 thousand hectares of Iranian agricultural land in Khuzestan province is under sugarcane cultivation. Therefore, it is necessary to accomplish a survey to quantify the volume of water consumed in different sugarcane agro-industry companies. Its results can be of significant assistance to decision makers in the field of water and agriculture. This study aimed to review the current situation of irrigation water management and estimate consumed water in sugarcane agro-industry companies. The amount of irrigation water used, irrigation scheduling parameters, irrigation application efficiency and water distribution uniformity of the studied farms was evaluated. A total of 37 cases were evaluated at different stages of growth in sugarcane agro-industry Company of Dehkhoda, Amirkabire, Hakim Farabi and Karoun. In each farm, soil texture, bulk density, advance and recession times, inflow rate, soil moisture content before and after the irrigation, two points of soil moisture characteristic curve, field slope, furrow cross section, and irrigation time were measured. Results showed that irrigation interval in studied farms was short, irrigation time was long, and water consumption in most of the evaluated farms was more than required water. Soil moisture before irrigation at depth of 33-66 cm and 66-100 cm and sometimes at depth of 0-33 cm in most of the studied farms was close to field capacity (FC) or even it was more than FC. Gross irrigation water depth ranged from 70 to 319 mm and application efficiency varied from 7 to 100 percent, average being 42.5%. Unlike application efficiency, water distribution uniformity in most of the studied farms was acceptable and its average was approximately 92%. Water losses in the studied farms was mainly due to deep percolation. Average of sugarcane water consumed was 30400 m3/ha by direct field measured data, 34334 m^3/ha based on volume of delievered water by Khozestan Water owner Authority (KWPA), 33200 m^3/ha by remote sensing estimation and 32501 m3/ha by updated national document. Overall, sugarcane water consumption was estimated to be of average 32528 m^3/ha.

Keywords: Distribution Uniformity, Natioal Water Document, Remote Sensing, Water Management

Increasing the Water Productivity of Sugar Beet Using Drip Tape Irrigation System

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Abstract

This research was carried out in the framework of a research-extension project in Balghchi village, located in Naghadeh, West Azarbaijan Province, in the catchment area of Lake Urmia for sugar beet production for Shokoofa and Ekbatan cultivars with a 25×50 crop arrangement. In this study, two irrigation systems including drip tape and furrow were implemented. The amount of water consumed during the growing season that was programmed in the drip tape irrigation system was measured by the flow meter. Also, the amount of water consumed by the farmer in accordance with local custom was measured by WSC flume in the furrow irrigation system. Using the root yield data (10 samples), gross sugar yield and amount of water used for each treatment, water use efficiency was analyzed. Statistical analysis and means were compared by t-test. The results showed that the root yield for Shokoofa cultivar in the irrigation system of drip tapes was 72.3 and in the furrow irrigation system was 72.8 ton per hectare respectively, root yield for Ekbatan cultivar in the irrigation system of drip tapes was 70.6 and in the furrow irrigation system was 71.2 ton per hectare respectively. Also the amount of water consumed in the irrigation system of drip tapes was 6875 and in the furrow irrigation system was 14120 cubic meter per hectare, the water use efficiency of root yield for Shokoofa cultivar in the irrigation system of drip tapes was 10.52 and in the furrow irrigation system was 5.15 kg/m3 respectively, the water use efficiency of root yield for Ekbatan cultivar in the irrigation system of drip tapes was 10.27 and in the furrow irrigation system was 5.04 kg/m3 respectively. The results of the comparison of the mean of root yield for Shokoofa and Ekbatan cultivars in two irrigation systems in t-test showed that their difference was not significant, but there was a significant difference between root and sugar water use efficiency. The results of comparison between root mean yield and water use efficiency for Shokoofa and Ekbatan cultivars in drip tape irrigation system in t-test showed that there was a significant difference between Shokoofa and Ekbatan cultivars were together. This result was also obtained in the furrow irrigation system. According to the results, use of drip tape irrigation system with a 25×50 crop arrangement to save more on water consumption and increasing water productivity is recommended.

Keywords: Ekbatan cultivar, Irrigation of sugar beet, Shokoofa cultivar, Urmia Lake, Yield

Investigation of the Effect of Arranger of Conductor Tubes of Adjusted Subsurface Drip Irrigation (Ssdiadj) on Potassium Absorbtion and Pistachio Yield at Damghan Region

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Abstract

Pistachio trees have deep and main root, in the case substitution of surface irrigation by drip system, due to the soil moisture profile of the drip irrigation; water distrubuted of the root zone is not uniform. Due to the occurrence of soil moisture stress in the lower layers of the root, the system used and fertilizer, inefficient and caused problems for the growth of trees and production. In order to increase the productivity of water and fertilizer, this research was carried out by adjusted subsurface drip irrigation (SSDIadj) system in pistachio of Damghan region (Semnan province) in a randomized complete block design with split plot arrangement in three replications for three years. The potassiume fertilizer amounts (Fertigation) at three levels (100, 70 and 50% of requierment) were considered as the main plot and the designe of conductor tubes of the SSDIadj system in seven levels as sub plots. The irrigation guide tubes were arranged for sand tube irrigation (control,), 40-40-40-40, 40-40-50-50, 40-40-60-60, 40-40-50-60, 40-40-50-70 and 40-40-50-80. Meteorological data from the nearest meteorological station was collected and analyzed. Yield, water consumption, irrigation water productivity index and growth conditions of Shahpasand pistachio cultivar were determined in different treatments. Data were analyzed using MSTATC software and based on the analysis of surplus costs and aerial data, the best treatment including combination of potassiume fertilizer and arranged tubes of SSDIadj system was determined. Substitution of surface irrigation by SSDIadj system without worrying about the underlying irrigation constraints will add only less than 15 percent to the total cost, which will be much more effective than subsurface irrigation. The full irrigation treatment consumes less water from 40 to 30 percent than the surface irrigation. The recomended treatments are including of full irrigation, full potassiume fertilizer and guide tubes 40-40-50-70 / 40-40-50-80. The treatments with stratified conductive tubes in the optimal distribution of water, improving productivity and reducing inefficient consumption water. In addition, there are no restrictions on subsurface irrigation such as root accumulation, root penetration into pores pf drippers and as well as accumulation of salts.

Keywords: Adjusted Subsurface Drip Irrigation (Ssdiadj) System, Conductive Tubing, Pistachio, Potassium Fertilizer, Water Productivity

Determination of Saffron Water Consumption in Iran

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Abstract

The main purpose of this project was to measure the amount of saffron consumed water in farms managed by farmers in Razavi and South Khorasan provinces. One hundred and twenty six farms in two provinces were selected in two years (2017 & 2019). The amount of water consumed by saffron in the selected farms was measured by visiting the farms, completing the questionnaire, recording the irrigation program and measuring the water source discharge. Water requirement of saffron in different regions was calculated and compared with the amount of water consumed by farmers. Analysis of variance was used to investigate possible differences in yield, irrigation water and water productivity in saffron production. Analysis of the results showed that yield, volume of applied water and water productivity of saffron in two provinces was not significantly different. The average saffron yield, water productivity and water productivity plus effective rainfall were 8.3 kg/ha, 1.9 and 1.37 g/m3, respectively. The average irrigation water consumption was 4628 and 4594 m3/ha in the Razavi and South Khorasan provinces, respectively and the average of water consumed in two provinces was 4603 m3/ha. The range of water use changes in selected farms was high and ranged from 1543 to 8914 m3/ha. In order to improve water productivity in saffron production in Iran, it is possible to increase yield per unit area or reduce water consumption per unit area with appropriate solutions. The average irrigation efficiency in the saffron farms of the two provinces was 55 percent.

Key words: Consuming water, Razavi and South Khorasan, Saffron yield, Water productivity

Determination of Optimum Width of Drip Tapes and Water Use Efficiency for Wheat Crop in Medium and Heavy Textured Soils

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Abstract

For wheat crop irrigated with drip tapes, water use efficiency, and optimum tape spacing and environmental as well as soil conservation considerations are critical unknowns with marked impacts on farmer's livelihood and soil resources sustainability. An experiment was conducted on two soil textures to study the effect of drip tape spacing on wheat yield and its components, water use efficiency, and variations in the soil salinity. A randomized complete block design consisting of four treatments, viz., three drip tape spacings (45, 60, and 75 cm; denoted by A, B, and C, respectively), and a basin-irrigated treatment (as the Control; represented by D) was carried out on silty clay loam (Location 1) and loam (Location 2) soils for two years from 2017 to 2019. Thetreatments were replicated three times each. The volume of applied water for treatments A, B, and C was identical in each irrigation event, whereas the applied irrigation water for treatment D was controlled by the farmer. The result of composite variance analysis for both soil textures revealed that the treatments had significant impact on grain yield and biological yield at 95% level of confidence. In location 1, the effect of treatments on water use efficiency and harvest index was significant at 95% level of confidence, whereas in location 2, the treatments showed no significant effect on the foregoing parameters. In location 1, the year showed significant effect on the said four parameters at 99% level of confidence; while in location 2, excepting watr use efficiency, it had significant effect on the rest of the parameters. According to the resultsin location 1, the average volume of applied water over 2 years of the experiment with Considering effective rainfall, within the drip-irrigated treatments and the basin-irrigated one was 7295 and 10140 m3ha-1, respectively; whereas, in location 2, it was measured 7396 and 10703 m3ha-1, respectively. The average water use efficiency for treatments A, B, C, and D in location 1 was 0.79, 0.79, 0.73, and 0.78 kgm-3, respectively; from which, A, B and D were ranked as the superior, and C was ranked second in the class. In location 2, the foregoing parameter measured 0.72, 0.71, 0.66, and 0.64 kgm-3 for treatments A, B, C, and D, respectively; where all the treatments were ranked in the same class. Based on the findings from economic analysis, the benefit-cost ratio for treatments A, B, C, and D was 1.11, 1.21, 1.19, and 2.14, respectively. It was revealed that for both soil textures, treatment D outperformed the drip-irrigated treatments in terms of crop yield and benefit-cost ratio; however, in terms of water use efficiency, all irrigation treatments showed similar performance. However, the

basin-irrigated treatment did not increase the soil salinity, hence more efficient compared to the drip treatments. Soil salinity for drip irrigated treatments in both locations over the two years showed an increase at the end of each cropping season when compared to the soil salinity at the beginning of the season. Consequently, this method of irrigation is not capable of effective salt leaching, hence not recommended particularly for regions with saline soil and water. For situations where drip tape is used for irrigation of wheat crop, annual leaching and appropriate spacing of drip tapes is of crucial importance. According to the statistical results obtained from this experiment, optimal tape spacing of 60 and 75 cm are recommended for silty clay loam and loam soils, respectively. However, since the difference in water use efficiency as well as the benefit-cost ratio for tapes spaced 60 and 75 cm apart were not significant (approximately 7 and 1.5%, respectively); and on the other hand, treatment B used 3300 m longer tapes than did treatment C. This is important in terms of volume of field operations. In view of the above, in situations where the use of strip drip irrigation is mandatory, a distance of 75 cm with annual leaching by surface or sprinkler irrigation systems is recommended for both soil textures.

Keywords: Drip Tape Irrigation, Soil Salinity, Tape Spacing, Water Use Efficiency, Wheat

Determination of Cotton Water Consumption in Iran

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Abstract

The main purpose of this project was to measure the amount of cotton consumed water in farms managed by farmers in the top provinces producing this crop. The experimental farms were selected to cover various factors including irrigation method, soil texture and irrigation water quality. One hundred and twenty one farms in Khorasan Razavi, Fars, Golestan, Khorasan Shomali, Ardebil, Semnan and Alborz provinces were selected in 2018. The amount of water consumed by cotton in the selected farms was measured by visiting the farms, completing the questionnaire, recording the irrigation program and measuring the water source discharge. Water requirement of cotton in different regions was calculated and compared with the amount of water consumed by farmers. Analysis of variance was used to investigate possible differences in yield, irrigation water and water productivity in cotton production. Analysis of the results showed that yield, volume of applied water and water productivity of cotton in seven provinces was significantly different. The average amount of water consumed in Khorasan Razavi, Fars, Golestan, Khorasan Shomali, Ardebil, Semnan and Alborz provinces was 9830, 9945, 5070, 6815, 7543, 10536 and 8393 m3/ha, respectively. The range of water use changes in selected farms of the country was high and ranged from 3130 to 17620 m3/ha. The average water use of cotton in surface and drip irrigation methods was 9097 and 7245 m3/ha, respectively.The average cotton yield, water used and water productivity were 3383 kg/ha, 8980 m3/ha and 0.43 kg/m3, respectively. According to the NBPD index, Fars, North Khorasan and Ardebil provinces had the highest and Semnan and Alborz provinces had the lowest economic productivity of cotton production, respectively.

Key words: Farm, Required water, Water Productivity, Yield

Determination of Olive Water Consumption in Iran

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Abstract

As a general role, having precious data base is the main and most effective factor for improvement of current situation. This is more important in improvement of water use indices inclouding; volume of water consumed, water use efficiency and irrigation efficiencies. This project was implemented with the aim of measuring consumed water of olive under the management of farmers in Iran. Thus, the volume of irrigation water provided by gardeners in 102 olive orchards were measured in the provinces of Zanjan, Qazvin, Fars, Gilan, Golestan and Semnan in different irrigation methods, various water sources, different salinity of irrigation water and soil and different olive varieties during the growing season of 2018- 2019. The measured values were compared with the net irrigation water requirement estimated by the Penman-Monteith method using the last 10 years meteorological data and also with the national water document values. The results showed that the average volume of water consumed, yield and irrigation water productivity, and irrigation water plus effective rainfall productivity in the selected provinces were significant at 1% probability level. The volume of irrigation water used in the olive orchards varies from 2848 to 11463 m3/ha and the average was 6011 m3/ha. The two-year average yield of olive varied from 1.5 to 11 tons/ha and its average was 4.867 tons/ha. Irrigation water productivity varied from 0.2 to 2.40 and average was 0.95 kg/m3. Irrigation water plus effective rainfall productivity varied from 0.18 to 1.45 in the selected provinces and its average was 0.63 kg/m3. The average net irrigation water requirement in the study areas by the Penman-Monteith method using meteorological data for the last 10 years as well as the national water document were 5500 and 4860 m3/ha, respectively. Furthermore, except Zanjan province, in other province the volume of cosumed water for olive orchards were lower than crop water requirement which indicate deficit irrigation in those olive orchards.

Keywords: Irrigation Water Requirement, Olive Orchards, Water Consumption, Water Productivity

Determination of Apple Water Consumption in Iran

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Abstract

Providing food security in scarcity conditions of water resources requires the optimal management of water use in the agricultural sector. The most basic component for optimal water management is the awareness of water consumed in the production of various agricultural products under the farmers' management conditions. Annual production of apple in Iran is 3.4 million tons from 247000 ha cultivated areas. According to the production, a significant amount of surface and groundwater resources are consumed for apple production. This research was conducted with the aim of determining the amount of consumed water in apple orchards in selected provinces under the management of gardeners at the national level. The provinces were East Azarbaijan, West Azarbaijan, Ardabil, Isfahan, Tehran, Khorasan Razavi, Fars and Semnan. The water productivity in 145 sites was estimated, in addition to direct measurement of water consumption and crop yield. The factors such as irrigation systems, apple cultivars, gardeners' education, soil texture; and salinity of soil and irrigation water were also measured or recorded in apple orchards. The ANOVA was used to investigate the possible difference between the volume of consumed water, yield, and water productivity in apple production. The results showed that the difference between the volume of water consumption, crop yield and water productivity was very significant in the orchards from provinces. The volume of consumed water and crop yield in apple orchards over the country averaged 9814 m3/ha and 23.2 t/ha, respectively. The water productivity and water-effective rainfall productivity indices were respectively 2.73 and 2.45 kg/ m3 in apple orchards over the country. The lowest and highest water productivity and water-effective rainfall productivity indices were obtained from the orchards of Fars and Khorasan Razavi provinces. Some strategies have been proposed to optimize the consumption of water resources; and to improve apple yield and water productivity in the country's level.

Keywords: Irrigated Areas, Water Consumptions, Water Use Efficiency

Determination of Vineyards Water Consumption in Iran

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Abstract

This project was implemented with the aim of measuring consumed water of vineyards under the management of farmers at the production hubs of this crop in Iran. Thus, the volume of irrigation water provided by gardeners in 164 vineyards were measured in the provinces of Qazvin, Fars, Khorasan-Razavi, Zanjan, Azarbayjan Gharbi, Azarbayjan Sharghi, Hamedan, Markazi, Khorasan Shomali, and Semnan in different irrigation methods, various water sources, different salinity of irrigation water and soil and different grape varieties during the growing season of 2019-2020. The measured values were compared with the net irrigation water requirement estimated by the Penman-Monteith method using the last 10 years meteorological data and also with the national water document values. The results showed that the average volume of water consumed, yield and irrigation water productivity, and irrigation water plus effective rainfall productivity in the selected provinces were significant at 1% probability level. The volume of irrigation water used in the vineyards varied from 4318 to 10103 m3/ha and the average was 6669 m3/ha. The two-year average yield of grapes varied from 9.9 to 34.6 tons/ha and its average was 18.4 tons/ha. Irrigation water productivity varied from 1.88 to 6.87 and average was 3.27 kg/m3. Irrigation water plus effective rainfall productivity varied from 1.22 to 6.27 in the selected provinces and its average was 2.67 kg/m3. The average net irrigation water requirement in the study areas by the Penman-Monteith method using meteorological data for the last 10 years as well as the national water document were 6645 and 6456 m3/ha, respectively. The average of application irrigation efficiency in the studied vineyards was 89.4%, indicating deficit irrigation in the studied vineyards.

Keywords: Productivity, Application Efficiency, Irrigation Water Requirement

Quantitative and Qualitative Assessment of Local Cultivars and Salinity Tolerant Rice Lines under Irrigation Conditions using Fresh Water (Karoon River Water) and Sugarcane Fields Drainage Water in Southern Khuzestan

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Abstract

Optimal use of sugarcane field's drainage water and increasing its productivity in rice farming of Khuzestan province requires studying cultivation of local cultivars and saline resistant lines and comparing their response to the existing conditions. The purpose of this study was to evaluate the potential of production of common cultivars and salinity resistant lines in two separate and adjoining experiments in a randomized complete block design with three replications for one year at Amir Kabir agro-industrial farm in Khuzestan province, 45 km from Ahvaz city. Main factor consisted Irrigation treatments of sugarcane fields drainage water (Experiment 1) and Karoon River water (Experiment 2), respectively, and sub-factors, province local cultivars, Tarom Hashemi international cultivar of salinity and drought tolerant rice lines. In experiment (1), all cultivars and lines were destroyed due to high salinity of water (7–8 mmol/cm). In experiment (2), due to high ambient temperature and high sterility, drought tolerant lines, Tarom Hashemi and S4 line were removed. Therefore, analysis of variance was performed with 4 common cultivars of the province (Champa, Red Anburi, Havizeh, and Danial High-yielding cultivar) and 3 salt tolerant rice lines. The results showed that the highest grain yield (3880 kg/ ha) was obtained from common cultivars in the province and the lowest was for salt tolerant lines with an average of 2011.2 kg /ha. This proves that the grain yield in these lines is relatively 48% lower than in common cultivars. Among the common cultivars, Daniel had the highest (4733.3 kg) and S2 (1900 kg / ha) the lowest. Monitoring of salinity and changes of exchangeable sodium percentage soil during the growing season showed that in Irrigation treatments with Karoon river water, Soil conditions were compared to pre-cultivation in a completely saline state (ECe=7.5 dS /m), non-saline sodic soils conditions (ECe =2.6 dS /m , ESP<12 meq /lit). However, in the irrigation treatment with drainage water, although the soil condition was not sodium, it remained saline (ECe =6 dS /m). This was due to continuous irrigation during the growing season and the existence of underground drainage of the field, which caused the salt to drain out of the soil profile.

Keywords: Drainage System, Saline Resistant Lines, Rice Yield, Soil Monitoring, Unconventional Water

Determination of Potato Water Consumption in Iran

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Abstract

As the world's population grows and the demand for food increases, the shortage of irrigation water has become the world's main limitation on agricultural production. The most important way to compensate for water scarcity is to make better use of available water resources, increase yield and improve water productivity. Iran is not immune from this problem either. However, detailed information on how and how much water farmers use to produce potatoes in the country is not available. Therefore, there is no choice but to conduct field studies to obtain accurate data. In order to determine the amount of water consumed and the yield of potato under farmers management, in the provinces of East Azerbaijan, Semnan, Fars, Khorasan Razavi, North Khorasan, Chaharmahal and Bakhtiari, South Kerman, Isfahan, Hamadan, Ardabil, Golestan, Zanjan, Lorestan and Khuzestan , 259 farms were selected and measurements were performed . Analysis of the results obtained from farmers' farms showed that the water productivity, water productivity of water with considering effective rainfall of past 10 years and water productivity of water with considering effective rainfall of research year of potatoes in selected provinces, had significantly different. Changes in potato yield in the country from 10.2 to 70 tons per hectare, changes in water volume from 1125 to 14000 cubic meters per hectare and changes in water productivity from 1.43 to 16.9 and changes in water productivity with considering effective rainfall of research year was from 1.41 to 12.6 kg per cubic meter. Weight averages of yield, consumed water and water productivity were 35.2 tons per hectare, 5899 cubic meters per hectare and 5.64 kg per cubic meter, respectively. The lowest and highest average productivity (water with considering effective rainfall of past 10 years) of potatoes in Hamedan provinces (8.74 kg/m3) and Semnan (3.45 kg/m^3) and the total average weight of all province was 4.89 kg/m^3.

Key words: Irrigation Water, Water Productivity, Yield

Increasing Water Productivity in Grain Corn using Drip Tape Irrigation System

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Abstract

This research was carried out as a research-extension project in Koseh Kahrizeh village of Mahabad city in West Azarbaijan province located in Urmia Lake catchment for early grain corn Single Cross 410 (Tahaei) cultivar with two-row cropping arrangement. In this study, two irrigation systems including drip (tape) and furrow were implemented as treatment and control. The amount of water consumed during the growing season that was programmed in the drip tape irrigation system was measured by the flow meter. Also, the amount of water consumed by the farmer according to the local custom was measured by the WSC Flume in the furrow irrigation system. Water productivity was determined by using grain yield data (12 samples for treatment and 12 samples for control) and water consumption for treatment and control. Statistical analysis and means were compared using t-test. The results showed that grain yield in the drip irrigation system was 11.57 ton/ha and in the furrow irrigation system was 11.63 ton/ha. The amount of water consumed in the drip tape irrigation system was 6100 m3/ha and in the furrow irrigation system was 11700 m3/ha, water productivity in the drip tape irrigation system was 1.9 kg/m3 and in the furrow irrigation system was 0.99 kg/m3. Comparison of mean grain yield in two irrigation systems showed that their differences were not significant but their water productivity was significant. According to the results, using a drip irrigation system with double row crop arrangement is recommended to save more water consumption and increase water productivity.

Keywords: 410 (Tahaei) Corn Cultivar, Furrow Irrigation, Irrigation of Grain Corn, Urmia Lake

Investigation of Different Irrigation Round on Salinity Tolerant Rice using Sugarcane Drainage Water in the South of Khuzestan

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Abstract

In order to optimize the use of drainage in rice farming in Khuzestan province and increase the productivity of low-yield land, development of cultivation of salt tolerant cultivars can be considered as a suitable platform. Therefore, this study was conducted to determine the interaction between rice lines and aquatic rounds from sugarcane drainage as split plots in a randomized complete block design with two factors and three replications for one crop year in summer 1397 The L08-20 sugarcane farming was conducted in the south of Khuzestan province, about 75km from Ahvaz. Three saline irrigation roundes(sugar cane drainage) included daily and two- and three-day alternations as the main factor And seven cultivars and saline tolerant rice varieties including three selected lines from the 30th International Treasury of Stress tolerant rice cultivars , Three breeding lines (derived from mutations and other breeding methods)endured by drought, salinity and The local cultivar of Havizeh was subdivided into plots. Drought-tolerant lines were removed because of their sensitivity to regional conditions and high sterility. Therefore, analysis of variance was performed with three lines tolerant to salinity and cultivar Hoveizeh. The results showed that grain yield response curve was linear-curve with significant decrease of water from daily diet to two and three days intervals The rate of grain production increased from I0(daily irrigation round) with an average of 2139.3 kg to 2248 kg in I1(two days irrigation round) and then declined sharply. Among the cultivars, Hoveizeh had the highest and S1 and S5 lines had the best yield. Also, soil salinity monitoring during the growing season showed that salinity changes in all three irrigation regimes increased. The rate of increase in salinity varied from 50% in daily irrigation round (I0) to 100% in three days round (I2) irrigation. Monitoring of soil sodium uptake percentage showed that in both daily (I0) and two-day(I1) irrigation rounds, the research field soil was not in the state of sodium and remained in saline condition. However, in the two-day or three-day (I2) irrigation round, the soil is close to the sodium state, requiring adequate leaching at the end of the cultivation season and solute removal from the soil profile by underground drainage.

Keywords: Grain Performance, Intermittent Irrigation, Promising Lines, Rice, Sugarcane Fields Drainage, Tolerance to Salinity

Determination of Water Consumption of Garden Crops in Semnan Province

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Abstract

Semnan province consumes a lot of water in agricultural sector, but the volume of water consumed in agriculture sector has not been accurately measured. To measure the amount of water consumed by garden products (without interfering in the farmers' irrigation programs), research was conducted in 2016. In this study 9 horticultural products including pistachio, grape, olive, apricot, pomegranate, apple, almond, cherry and walnuts were considered. In this study, the farms were selected and introduced by local authorities and the water consumption was measured by proper devices. The net irrigation requirement was calculated based on meteorological data using the Penman-Monteith method for each crop. Water productivity was calculated for each crop. The results showed that the average volume of water consumed by pistachio, grape, olive, apricot, pomegranate, apple, almond, cherry and walnuts were 7394, 7013, 4937, 7622, 6210, 8311, 6739, 7155 and 7049 (m3/ha), respectively. These results showed that water consumed by stakeholders for each crop was lower than the net water irrigation requirement (without considering irrigation efficiency). This indicates that in all crops studied in Semnan province, they are under mandatory deficit irrigation. Deficit irrigation at sensitive stages of growth can affect crop yield. The average of water productivity in horticultural products of pistachio, grape, olive, apricot, pomegranate, apple, almond, cherry and walnuts were 0.23, 5, 0.7, 5.5, 4.9, 5.6, 0.58, 2.9 and 0.43 (kg/m3), respectively.

Keywords: Garden Products, Water Consumption, Water Productivity, Yield

Determination of Nitrate Leaching to Soil Depth using Sugarcane Biochar and Slow-Release Fertilizer

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Abstract

Improper use of chemical fertilizers and over-irrigation causes leaching of pollutants such as nitrate to groundwater and its discharge through drains to the environment. Therefore, by using some modifiers such as biochar and slow-release fertilizer, it could be expected to reduce the intensity of pollutant emissions. In this study, the effect of using biochar obtained from sugarcane bagasse and slow release fertilizer were studied on the rate of nitrate leaching and nitrogen plant uptake and some chemical properties of the soil. Experiments were carried out on drainage lysimeters with tomato cultivation. The statistical design was completely randomized in the form of factorial experiment in which biochar values including zero, one, two and three percent by weight of biochar (0B, 1B, 2B and 3B) in surface soil and two kind of fertilizers (normal urea and sulfur coated urea or SCU) were considered. A total of 8 treatments were applied in three replications, which resulted in the preparation of 24 lysimeters for the study. The results showed that with increasing the amount of soil biochar, the rate of nitrate nitrogen leaching (N-NO3) was decreased. The amount of leached nitrate at the application levels of biochar 1B, 2B and 3B compared to no biochar (0B), were dedreased with in the amounts of 6.2, 10.1 and 18.3% in the use of normal urea fertilizer, and 8.6, 22.7 and 24.14% in the application of slow-release urea (SCU) fertilizer, respectively. The highest rate of nitrate leaching was observed in the application of normal urea in soil without biochar, and the lowest in the application of 3% by weight of biochar and the use of slow-release urea. The difference in nitrogen uptake by the plant was not statistically significant in the application of SCU and normal urea fertilizers, but with increasing biochar content in the soil, the amount of nitrogen uptake by the plant increased in both fertilizers. Soil nitrogen retention at biochar levels increased significantly compared to soil without biochar ($P > 0.05$), and increased in the application of SCU compared to normal urea. Also, the simultaneous use of biochar and SCU significantly increased soil organic matter and electrical conductivity of the soil ($P > 0.01$), but no significant effect on soil pH was observed.

Keywords: Biochar of Sugarcane Bagasse, Drainage, Leaching, Nitrate, Sulfur Coated Urea, Urea Fertilizer

Investigation of the Most Suitable Water Distribution Set of Mechanized Irrigation System in Poldasht Region

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Abstract

Climate conditions governing the country, Climate change in recent years, In addition Extreme development of agricultural sector And need to consume more water, Has put the country's water resources at risk. Negative Balance of Water Resources, While contrasts with sustainable agriculture, has been under effect overshadowed Food security And there will be many environmental, economic and social consequences. Therefore, the only way to overcome the above-mentioned risks is saving water in the agricultural sector, as the largest water consumer in the country. In this regard, the replacement of traditional low-water irrigation methods with new high-efficiency methods have been proposed as one of the main and practical ways to reduce water consumption. Continuous evaluation of implemented projects, Selection of a suitable and efficient method and improvement of implemented systems and localization of new irrigation methods based on field conditions are the important issues in this topic. Due to short life of development of pressurized irrigation systems, it is necessary to develop and apply these methods based on climatic conditions, knowledge level of farmers, land area, cultivar pattern and other factors involved. In this project, the performance of three sprays systems of travelling machine including 1. Spray booms, 2. Gun sprinklers, and 3. Localized water distribution were evaluated. Indicators of evaluation of three water distribution systems in irrigation mechanized machine showed gun sprinklers have less irrigation efficiency compared to other types of water distribution. Irrigation efficiency in gun sprinkler, boom spray and localized water distribution model was 67.6%, 85.7% and 93.2%, respectively. Also, uniformity of water distribution and uniformity coefficient were the lowest in gun sprinklers and highest in the native system. Wind draft and evaporation losses in gun sprinklers were significant more and led to a decrease in irrigation efficiency in this system. Finally, the localized distribution system and boom spray for irrigation of the agricultural lands of the Poldasht area are proposed as the best options.

Determination of Crop Water Consumption in Semnan Province under Farmers' Conditions

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Abstract

Semnan province consumes a lot of water in agricultural sector, but the volume of water consumed in agriculture sector has not been accurately measured. To measure the amount of water consumed by crops (without interfering in the farmers' irrigation programs), this research was conducted in 2016. In this study 11 crops which including wheat, barley, alfalfa, silage corn, cotton, sugar beet, melon, watermelon, potato, tomato, and onion were considered. In this study, the farms were selected and introduced by local authorities and the water consumption was measured by proper devices. The net irrigation requirement was calculated based on meteorological data using the Penman-Monteith method for each crop. Water productivity was calculated for each crop. The results showed that the average volume of water consumed by wheat, barley, alfalfa, silage corn, cotton, sugar beet, melon, watermelon, potato, tomato, and onion were 7555, 6910, 12783, 6327, 10536, 11968, 6822, 8360, 12257, 8300 and 14555 (kg/m3), respectively. These results showed that the volume of water consumed for most of the crops was lower than the net irrigation requirement (without considering irrigation efficiency). This indicated that in all the crops in the province, they were under mandatory deficit irrigation.

Keywords: Irrigation Method, Water Consumption, Water Productivity, Yield

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