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Spatial Analysis of Long Duration Droughts in Iran

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Extended Abstract

Introduction

Drought is one of the devastating hazards of human history. It can occur in all times and any places. Drought is a regional event that its occurrence in many world zones cannot be avoided. It is more important than other natural misfortunes due to loss of life and property and social factors. This event is more display in arid zones such as Iran for the sake of regional characteristics like small precipitation, intensity in oscillations of rainfall in different years, inappropriate distribution of the rainfall in a period of years and the great fluctuations inplace and time of the rainfall. For this reason this research has studied the severity and spatial organization of these droughts over the country.

Methodology

Important parameters that influences drought are temperature and precipitation. In this research, in order to make a spatial analysis of the long duration droughts in Iran, the precipitation data were used. For this reason the monthly precipitation of 70 long period stations during 1976-2005 were obtained from the Meteorological Organization of Iran.

Researchers all over the world offer different methods for study of the droughts. One of these is Standardized Precipitation Index (SPI). This method was developed by McKee, Doesken, and Kleist (1993) to analyze the impact of precipitation deficit on groundwater, reservoir storage, soil moisture, snowpack, and stream flow in different time scales for defining and monitoring the phenomenon. These time scales reflect the impact of drought on the availability of different water resources. Soil moisture conditions respond to precipitation

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anomalies in a relatively short time scale. Groundwater, stream flow, and reservoir storage reflect the longer-period precipitation anomalies. For these reasons, McKee et al. (1993) originally calculated the SPI for 3, 6, 12, 24, and 48 months time scales. The SPI computes the temporal frequency and anomalies of droughts. It can also be used to determine periods of anomalously wet events. The SPI is recognized as a better quality model compared to other models. The advantage of this index is that allows the analyzer to determine the number of occurrences of droughts in different stages of time. In the other words, it is, because of the non distance of this index that we could use of it to compare information of different zones and make carefully anextent of drought maps. The other advantage of this index is that it is measuring the drought function of probable density so that you can perform more analysis about that. The study has used the SPI method for a period of12 and 24 months during the 1976-2005. The spatial distribution of the drought was interpolatedvia ordinary kringingin the ArcGIS environment.

Results and Discussion

In this study SPI time series were calculated in time scales of 12 and 24 months. Then, the frequency and spatial distribution of droughts were prepared and analyzed using the Geostatistics methods (Ordinary Kringing). These results have showed that the intensive 12-months period droughts were frequent in the east, southwest, central, and western parts of the country (for example Birjand Station 8%, Ramhormoze Station 6% Ilam Station 5% and Sirjan Station 5%), while the southeast and northern parts experienced moderate and weak droughts. But the 24- months droughts were intensive in the eastern parts of the country(for example, Tabass Station 6%,Ramhormoze Station 6%,Iranshahr Station 6%, and Sirjan Station 5%). This means that the longer droughts are common in the east, where they affect the underground water resources.

Conclusion

Drought is one of the devastating hazards inhuman histories. The occurrence of the phenomenon is possible in any time and places. Iran as an arid country with fragile climate is prone to frequent droughts. For this reason this research has studied the severity and spatial organization of these droughts over the country. The study has used SPI method with the 12 and 24 months scales during the 1976-2005 periods. The spatial distribution of the drought was performed via Ordinary Kringingin the Arc GIS software.

The results have indicated that the 12-month period droughts were intensive in the east, southwest, central, and western parts of the country while the southeast and northern parts experienced moderate and weak droughts. But, the 24- months scale droughts were intensive on the eastern parts of the country. This indicates that the longer droughts are common in the east, where they affect the underground water resources.

Keywords: Droughts, Iran, Medium and Long Droughts, Spatial Analysis of Droughts, SPI Drought Index.

Detection of the Snow Cover Area Using NOAA-AVHRR in Shahcheraghi Dam Basin

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Extended Abstract

Introduction

Snow, as one of the basic factors of water supply, plays an important role in water resources management, especially in areas with cold winters and warm summers. The data obtained from snow gauges as well as temperature and precipitation time series data are generally being used to develop experimental models in order to estimate the spatial and temporal distribution of snow in watersheds. However, when reliable snow or other necessary climatic data records do not exist, using proper substitutes becomes essential. Hence, the snow cover area (SCA) derived from satellite images can be used as a representative of the amount of snow in a basin. Moreover, Remote Sensing (RS) is a useful tool in identifying snow and calculating SCA in mountainous regions with low accessibility and deficiency of snow gauges. Accordingly, the SCA time series data can then be used as input dataset in flow forecasting by hydrologic models.

This paper aims to study the snow cover area of Shahcheraghi Dam basin in order to collect the necessary input data for developing dam inflow forecasting models. The basin is located in the north of Semnan province, Iran. The area of the basin is 1373km^2 and the annual precipitation and mean temperature of the basin are 124mm and 12°c, respectively. Since there

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is no active snow gauges within the basin and also there is only one weather station with reliable temperature records in the region, NOAA satellite images have been used for defining the SCA.

Methodology

In this paper snow cover area detection in Shahcheraghi dam basin has been studied using NOAA-AVHRR images in a 22-year period from 1986 to 2007. In order to improve the precision of calculated monthly SCAs, an image per 10 days was processed (3 images per month). The highest value of SCA among the three calculated values in each month is selected as the final SCA data of the month. Since during this period of time two different sensors of AVHRR-2 and AVHRR-3 have recorded data in different spectral bands, it is necessary to use different algorithms in separating snow from other phenomena including cloud and land cover. By employing the differences between the spectral characteristics of snow compared with other phenomena, the snow covered area can be separated. Therefore, two threshold algorithms are used to separate SCAs. These algorithms are based on grouped conditions of comparing albedo of bands 1 and 2 and brightness temperature values of thermal bands. The most significant difference between the conditions in these methods is using the albedo of band 3A (1.6μm) in AVHRR-3.

On the other hand, it is necessary to evaluate the numerical difference among the snow separation methods as they may significantly affect the statistic parameters of the time series. Moreover, two trend detection methods are used to examine whether significant trends in the time series exist. The hypothesis-based linear regression and non-parametric Mann-Kendall methods are applied to the maximum annual SCA data.

Results and Discussion

Based on the NOAA-AVHRR image properties, snow cover area is detected by the aforementioned threshold algorithms. The results show that the maximum amount of SCA occurs in January. Generally the snow settlement in the basin is from December to April while there is no record of snow from May to September, which is due to the abrupt air temperature rise in spring. Furthermore, the difference between the snow separation methods is analyzed by comparing two successive images of the basin, taken by different sensors on 5th November 2003. One of the images contains channel 3B which includes thermal infrared band and the other contains channel 3A that scans near infrared wavelengths. Accordingly, the SCA of AVHRR-3 sensor which contains channels 3A has been calculated 4% more than the SCA of AVHRR-2 which records channel 3B. Moreover, the result of applying trend detection tests shows that the SCA time series has no evident linear or monotonic trend.

Conclusion

The trend analysis on the SCA dataset has demonstrated that no significant statistic trend exists in the SCA time series. Moreover, the difference between calculated values of the SCA derived from two different AVHRR-2 and AVHRR-3 sensors does not affect the reliability of the SCA dataset, considering the area of the basin. Hence, as a representative of the snow in

Shahcheraghi basin, it is possible to consider the calculated snow cover area data as an appropriate input for hydrologic flow forecasting models.

Keywords: ***Brightness Temperature, NOAA-AVHRR, Remote Sensing, Shahcheraghi Reservoir, Snow Cover Area Trend.***

A Comparative Study on Empirical Methods for Estimating Effective Rainfall for Rainfed Wheat Crop in Different Climates of Iran

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Extended Abstract

Introduction

Among factors affecting crop production, especially rainfed crops, the rainfall and its distribution during crop season have a significant role. In addition, all the precipitation that falls during the growing season does not have the same effect on crop yield, and is not used in agriculture. So, quantification of Effective Rainfall (ER), as a portion of the precipitation which is stored in plant root zone and meets the needs of evapotranspiration requirements in different climatic zones is an essential component of water resources in rainfed wheat areas. Effective rainfall used in this study is "That portion of the total precipitation on the cropped area, during a specific time period, which is available to meet the potential evapotranspiration requirements in the cropped area. A precise estimation of effective rainfall is still needed not only for planning and management of rainfed wheat production, but also for risk management strategies in farms. Since a precise estimation of effective rainfall is necessary for increasing agricultural production, major challenge is to design a soil-water balance model that provides more accurate calculation of effective rainfall. The main goal of this study was to compare different effective rainfall estimation methods for rainfed wheat.

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Methodology

In this study, we adopted a two-layer soil–water balance (SWB) model. In the model,not only the portion of precipitation retained on root zone in current day is included, but a portion of the previous day's precipitation saved between the previous and current root-zone development is also added to the effective rainfall of the current day. In the model, the soil reservoir is divided into two layers;

1) an active layer in which roots are presented at any given time, t, and from which both moisture extraction and drainage could occur;
2) immediately below the active layer, there is a passive layer of depth (maximum root depth-root depth attained any day after sowing) from which only drainage would occur.

Because of a high cost associated with direct measurements, estimate of effective rainfall component is often based on empirical models. The aim of this study is to compare empirical methods of effective rainfall estimation with a proposed method based on soil-water balance equation. Following, six methods have been used to calculate effective rainfall for 21 agro-meteorological stations of Iran:

- Renfro Equation method
- U.S. Bureau of Reclamation method
- Potential Evapotranspiration/Precipitation Ratio method
- USDA-SCS method
- FAO method
- TR21/SCS method

For this purpose, four groups of data (including weather data, phenological data, soil characteristics, and wheat yield data) were used relevant to the 21 agro-meteorological stations representing arid, semi-arid, semi-humid, and humid regions of the country. Before using the weather data for estimating effective rainfall, data reconstruction was performed using Normal-ratio method (where required).

Results and Discussion

The results of calculating the effective rainfall for rainfed wheat crop at the 21 agro-meteorological stations, using selected methods and comparing the different methods of estimating effective rainfall, showed that: 1) in spite of data limitations, the new procedure had appropriate performance in estimation of that part of wheat yield which could only be explained by effective rainfall. Therefore, this method can be used as an efficient tool in computer-based programs developed for agricultural risk management of rainfed area. 2) It has been observed that the higher the values of de Martonne Aridity Index, the lower is value of "effective rainfall/rainfall during the cropping season". 3) The best result for arid and semi-arid climates was obtained by PET/P method (d-index= 0.8), and for semi-humid and humid climates by FAO method (respectively 0.9 and 0.8), and USDA-SCS method (respectively 0.8 and 0.7).

Conclusion

A soil water balance model for estimating effective rainfall is applied for evaluating the accuracy of six established effective rainfall estimation methods.

Renfro Equation provides an initial approximation based on aridity factor. The accuracy of this method is very low and it is exclusively empirical. USBR method considers only the runoff. The accuracy of this method is low and is not suitable for wide application. PET/Precipitation Ratio method takes the first approximation by runoff, soil and aridity factor. This method is suitable for preliminary plans, and is more effective than other methods, nearly in all regions. USDA- SCS method takes the first approximation of soil and crop beside aridity factor. This method is suitable for those areas that have low intensity of rainfall and high infiltration rate.

Keywords: Effective Rainfall, Empirical Methods, Iran, Rainfed Wheat Crop, Two-Layer Soil-Water Balance Model.

An Assessment on the Spatial-Temporal Patterns of Songhor's Archaeological Sites in GIS

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Extended Abstract

Introduction

Despite academic advances in spatial analysis within archaeology, primary uses of computer based GIS in archaeology were initiated by Cultural Resource Management (CRM) needs in the world. In conjunction with the development of environmental GIS data within several organizations, other federal agencies saw its potential for the management and spatial representation of archaeological data. Therefore, in other ways, developing methods of analysis and visual representation of data, previously impossible, were started. New methods of exploratory data analysis became possible and the efficiency within GIS environments for manipulation and analysis of spatial data contributed to exploratory and experimental use of data.

Developed in catchment analysis of the 1970 in archaeology was a byproduct of settlement pattern and cultural ecological studies in which archaeologists became interested in the types and spatial distribution of resources exploited by a given settlement. The concept is based on the assumption that resource use around a settlement is distance dependant and that sites will be located so that to maximize exploitation of resource. Typically, the area associated with the settlement was calculated through Euclidian boundary techniques. Yet Euclidian distance measures do not take into account aspects of the topography in consideration of distance. Today,

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more sophisticated models utilize cost distance to establish distance in the development of catchment areas.

Other improvements in spatial analysis can also be seen in settlement pattern analysis. With GIS, archaeologists are now able to explore and analyze multiple variables across a given landscape such as distance between archaeological site locations and particular types of architecture and/or artifacts. These variables can be used to discuss issues related to, for instance, mobility and socio-political development through time. At more micro-scales, GIS has been used to manage and analyze the distribution of artifact types at a given site. This type of analysis is useful for understanding the behavioral patterns at a given site and identifying specific activity areas within a site through time.

Methodology

This study has tried to analyze the spatial-temporal patterns of Songhor's archaeological sites in GIS. To conduct the research, the techniques applied for gathering data will be pervasive surface survey. Accordingly, all archaeological and historical evidence will be identified and then recorded, in details. The collected data, including 286 sites and monuments from Neolithic to late Islamic period, was reported in 2 volumes. Dating of the sites has been carried out based on sample recognition and comparing the studies of collected surface data. The material gathered were divided into six general groups, which are Neolithic, Chalcolithic, Bronze, Iron, Historic and late Islamic period. According to current research, from the total 286 sites, two of them belong to Neolithic periods, 32 of them belong to Chalcolithic period, 25 of them belong to Bronze period, 46 of them belong to Iron Age and 147 of sites present the culture of the Achaemanid, Parthian and Sassanian era. Finally, 214 sites and monuments have shown the traces of the Islamic period which some of them show only a particular time of Islamic era and mostly present the monuments and architecture of this period. Then these archeological sites are chosen as our materials and statistical population.

For achieving the research goals, we have used and analyzed geographical information, using Arc GIS 10 Software. By establishing a data bank, as Geodatabase, for the studywe carried out an analysis on spatial distribution of the sites. Thus, we focused on natural factors like height, slope, Landform, climate, flowing waters, rivers, flora (pasture), and rainfall to understand the role and efficacy of each factor in appearance of the sites. Our study made it clear that the ancient settlement patterns of Songhor was highly affected by natural factors such as flora, water sources, rainfall, and height.

Results and Discussion

In addition, according to this research it has been specified that each of the natural factors have played different roles in the distribution of the ancient sites and there is no same precept for all. Thus, it is necessary that the role of each natural factor to be studied separately. The analysis shows that the area under study is affected by Zagros mountain ranges, height, distance to the river and dense pasture cover.

Conclusion

This area has a cool climate and height and these factors have created special and different conditions in forming human settlements relative to other areas in central Zagros. Our study made it clear that the ancient settlement patterns of Songhor were highly affected by natural factors such as height and distance to the river.

Keywords: Ancient Sites, GIS, Songhor, Spatial-temporal Patterns.

Impact of Different Land-use / Land Cover Types on Soil Quality in Alandan Forest, Sari

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Extended Abstract

Introduction

Soil is the main source for human basic needs and land utilization. It makes a linkage between climatic and biogeochemical systems and meets a variety of human requirements (Young et al., 2004). An unsuitable land- use change may lead to a decrease in areas of pastures and forests, soil and water pollution, soil quality reduction and lossing land productivity (Islam *et al*., 1999). Forest destruction and its conversion into agricultural lands and reforestation by broad-leaved and coniferous species are the common forms of forest land-uses in the mountainous Hyrcanian forests in north of Iran. Soil quality as the combination of physical, chemical and biological properties of soil may be altered by changing in soil conditions affected by land use type (Brejda et al., 2000). Impact of different land – uses on soil quality was evaluated by measuring several soil properties. The present study aimed to investigate the effect of land use change on soil physical, chemical and biological properties and soil quality index in managed Beech stand, destructed forest stand, Pine plantation, Ash plantation, and agriculture land in Alandan forests.

Methodology

Our study was conducted in Alandan forest, a part of Hyrcanian region in the north of Iran

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(latitude, 36° 13′ N; longitude, 36° 10′ E). The experimental area was situated in 1000 m above sea level and average annual rainfall and temperature were 858 mm and 11.9 °C, respectively. Soil type is Brown forest soil. Five land-use types, here, are including managed Beech stand (*Fagus orientalis* Lipsky.), destructed forest stand (*Carpinus betulus L., Parrotia persica C. A. Meyer*) Pine plantation (*Pinuse nigra* Arnold.), Ash plantation (*Fraxinus excelsior* L.) and agriculture land (as rainfed farming with wheat and barley). Soil samples were taken in all sites in August 2010 using 8 cm core based on systematic random sampling design (n=6 in each land – use). The soil samples were transported to laboratory and their physical and chemical properties were measured. Calculation of soil quality index involves three main steps:

1) definition of a Minimum Data Set (MDS) by expert opinion method,
2) score assignation to each indicator by liner mathematical functions,
3) data integration in an index.

The data were analyzed using one-way analysis of variance (ANOVA) after checking the assumption for parametric test in SPSS v.16 software.

Results and Discussion

Results showed that soil moisture were significantly ($P<0.05$) higher in managed Beech stand and destructed stand than other sites. Adding organic matter to soil may lead to increase in conservation of water in soil via reduction of evaporation and transpiration and increase in water infiltration rate. Ash plantation showed significantly greater pH compared with managed Beech stand. Ash litter has been shown to be easily decomposable and rich in nutrients and cause high base cation return to the soil (Norden, 1994b). The lower pH in beech forest compared with other land uses can be explained by slower litter decomposition of this species, which leads to production of organic acids and also delays the return of base cations to the soil (Hagen–Thorn et al., 2004a). The highest total nitrogen was found in Ash plantation and its lowest amount was observed in Pine plantation. The easily decomposable and nutrient-rich litter of ash may support large population of micro-organisms, which could contribute to an increase in soil N (Fried et al., 1989). The low amount of total nitrogen in pine monoculture may be related to slow litter decomposition in pine species (Neirynck, 2000). Agriculture land showed significantly greater K compared with other sites. The fertilizer application may result in increasing of K concentration in arable soil. The highest Ca concentration was observed in Ash plantation. A high content of base cations in the Ash foliage and its high susceptibility to leaching led to increased base cation input through fall to the soil (Hagen-Thorn *et al.*, 2004b). Beech stand and destructed stand showed significantly higher ammonium concentrations compared with other land uses. The higher ammonium concentrations may be related to higher rates of Net N mineralization (Garten, 1993). Increasing N mineralization rates and microbial activity have been reported as an effect of transient increase in temperature, water content, pH, and labile sources of C and N for microbes (Rutigliano et al., 2007). The highest soil quality was found in Ash plantation and destructed stand and its lowest amount were observed in pine plantation. The lower value of nutrient and organic C, total nitrogen and soil moisture caused reduction of soil

quality in Pine plantation (Zhao*et al*., 2005). In Ash plantation, the presence of herbaceous vegetation may be one of the reasons for better soil quality.

Conclusion

Results of our study showed that different land – uses can significantly affect soil quality. Soil quality in Ash plantation and destructed forest were the best whereas in Pine plantation was the worst. According to our findings it can be suggested that Ash trees should be admixed within Pine monocultures in order to cause an appropriate soil quality. In that destructed forest showed the highest soil quality compared with other sites. Thus, those areas should be fenced because they are capable to regeneration and forest reconstruction.

Keywords: Alandan, Land – use Change, Physical and Chemical Properties of Soil, Soil Quality.

Analysis of Ripple Mark Forms and Nebkha Barriers in Sirjan Playa

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Extended Abstract

Introduction

Study about quality and characteristics of wind erosion forms and also relationship between these forms with other environmental landforms is an important criterion in the assessment of natural resources. When wind blows on sandy beds, sand grains hop and roll into downwind shaping sand ripples. Morphometry is quantitative analysis of geomorphic characteristics of a region of landforms (Bayati Khatibi, 2010, 2). Study of surface sand grain size shows that larger ripples wavelength are created in the sands and coarse wavelength ripples in finer grain sands (Chorley et al 1985: 434). Ripples are common forms of roughness in desert areas. Ripples are created when the wind blows on the sand beds and sands move in the wind direction. In the fact ripples are gathering sand flows into waves on different landforms surface. Ripple marks are also the smallest and the most common forms of deserts, which are perpendicular to the direction of the storm winds and their cross-section is asymmetric (Mehrshahy and Nekounam, 2010, 8). Ripple scale is proportional to the wind speed (Tian-De Miao et al, 2001, 1). The wind velocity decrease in leeward of nebkha and this decrease in the wind velocity affectmorphometric characteristics of current ripple marks in leeward of nebkha (Danin, 1996, 7). This research tries to survey effects of nebkha morphometric characteristics on morphometric properties of ripple marks in Sirjan salt desert.

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The study area

Sirjan salt desert is in the south west of Sirjan City (located geographical coordinates 28° 46́ and 29° 59́ north latitude and 54° 57́ and 56° 27́ east longitude). Sirjan salt desert is one of the most important deserts in Kerman. This wilderness area with 1,625 square kilometers of the basin is largest basin in deserts of Isfahan. The basin has a triangular shape of fovea in the southwestern city of Sirjan. The study area is elongated from south western Sirjan to west of the cityin green belt (Klinsli D, 2002, 220).

Wind characteristics in the study area

Dominant wind in the area during the year is mainly from south west and its average occurrence is two times per year and its average speed is 5 meters per second. The weakest wind is east wind with occurrence of 8.8 times, that its average speeds is 3.8 meters per second. Another important wind flow in the study area is tropical winds

Methodology

The study was designed by randomly tested for 60 samples of five species of nebkhas in Sirjan salt desert. At first, morphometry characterization of the five species of nebkhas including tamarixmascatensis, Seidlitzia Florida and Reaumeriaturcestanica, plant height, plant canopy cover, nebkha height, nebkha diameter, height barrier (total nebkha height and plant height) and also height and wave length of ripple marks and were measured. Then, regression analysis used to examine the correlation between morphometric parameters of nebkha and ripple marks.

Results and Discussion

The results about different nebkhas showed that barrier height has the most impact in length parameter of the area affected and plant canopy cover diameter has the most impact on a wide parameter of the area. There is also a strong correlation between the morphometric parameters of ripple marks and distance of barrier. These results indicate that the effect of distance of barrier on the ripple wavelength is stronger than the effect of that on the ripple wave height parameter.

Conclusion

Ripple wavelength and height is strongly related to the distance barrier. As the distance is slight and near to the barrier,the wind speed has dropped, and the height and the ripple wavelength is increased. But with increase in distance of barrier, the height and the ripple wavelength decreases. Moreover, nebkhas affectthe ripples in a domain. The domain is more dependants upon the plant canopy cover diameter and height of barrier. Almost length of the area is triple than height barrier and its width depends on canopy cover diameter and further more on nebkha diameter.

Keywords: Morphometry, Nebkha, Ripple Mark, Sirjan Desert, Wave Height, Wave Length.

Evaluation of Dust Effect on the Quantitative and Qualitative Growth of Sugarcane Varieties CP57-614

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Extended Abstract

Introduction

One of the natural disasters that affected Khozestan province's is the phenomenon undesirable of dust due to its geographical location and its neighborhood with a large expanse of desert regions. When dust sits on leaf crops, it can reduce the amount of light absorption and photosynthesis and the growth and production will suffer loss consequently (Abdali Dehdezi 1390: 19). The effects of dust on leaf surfaces are done in different ways:

a) Impact on the process of photosynthesis in plants; Reduction in photosynthetic leaf surface is a function of light intensity reduction. Hirano Takashi (2003: 275) studies in Japan show that plants exposed to dust are the major sources of risk facing chronic photosynthesis and consequently reduce the growth face. The 10-5g of dust particles per square meter of leaf area can reduce photosynthesis significantly.

b) The effects of dust on leaf stomata: Dust reduces stomata conductance due to stomata closure. The effect of dust on reduce the stomata conductance would be greater at time that the size of dust particles is smaller. Dust particles with a diameter less than (0.05mm) caused disruption of the mechanisms and functions of the openings leaves.

c) The effects of dust on leaf temperature: Dust increase leaf temperature of 4-2°C. Because of dust on the leaf surface will absorb more short waves. Increase in temperature of 3-2°C increase in light respiration of leaf in plants.

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d) The effect of dust on the amount of light hitting the plant: The light intensity and day length effect on the growth and production. Water absorption and evaporation is proportional to the light intensity completely. Mvchv and colleagues (1993) showed that during the linear growth phase, the accumulation of biomass per hectare is linearly correlated with solar radiation received.

Khozestan as one of the major poles of agricultural province, the epicenter of the injury is the loss of natural plants. Damage to the agricultural sector in this province, will account for a major share. Sugarcane crop with a cover nearly 80 thousand hectares of land under cultivation in this province are one of the vulnerable sectors. Thus the objectives of this study are:

1. Survey of relationship between quantities of sugarcane yield (weight of single, stem density per unit area and product yield) and dust.
2. Survey of relationship between the quality of sugarcane (Pol, Brix, purity, recovery and quality of white sugar cane) and dust.
3. Survey of relationship between leaf chlorophyll amount and dust density.
4. Survey on interactions between nitrogen and chlorophyll.

Methodology

The location of field experiment was Da'bal Khazaei Agro Industry Co. The experiment carried on varieties 614 CP57-L09-06. Soil type was Silt loam. The test community consists of washing the leaves and failure to wash the leaves that carried out after dust occurrence each with 21 repetitions on each community. Each plot had 7 Farrow. To eliminate the side effects caused by dusts from car traffic on the farm road and irrigation, farm plots was at a distance of 20 m from the edge of farm. Plot size was segmentation 200 sqm for each treatment. Chlorophyll leaves were by chlorophyll meter by 502-Spad Minolta models. This process is performed after each dust. The plots should be washed. This process carried out after each wash. Plots in each phase were washed with car wash tank. Cane growth and Lamina sheaths nitrogen and moisture was measured each time after vigorous dust at an intervals period time.

Results and Discussion

Results on quality performance show that there are significant different on level of %1 for purity and on level of %5 for getting amount of sugar and straw quality for test treatments that indicate on excellence of treatments wash. On the other hand survey of treatment means also show that washing treatment is superior. Based on the results of treatments, there are no significant differences on quantitative factors. Student t-test showed that there is no effect of the washing operation factors on increased performance. Survey of relationship between amount of chlorophyll and dust density show that student t-test were significant at 1% for both treatments. This means that the presence of dust on the leaves is effective on chlorophyll readings. The amount of chlorophyll in treatments wash the leaves are higher than failure to wash the leaves consistently that it due to impaired gas exchange system, carbon dioxide and water vapor and oxygen respectively. The stomata closure with decreasing in sunshine hours has slowing the rate of photosynthesis. This process disturbances the gas exchange and download of sun light that

lead to reduce in photosynthesis and yellow leaves. Finally, it shows as the poor quality of cane juice.

The relationship was examined between nitrogen and chlorophyll content of flag leaves. According to the requirements of sugarcane to nitrogen during the growing season, the amount of nitrogen fertilizer is very important. So, we can by measuring of chlorophyll in the plant to estimate the nitrogen concentration. In table and graph, the correlation between chlorophyll and nitrogen lamina clearly shows that this correlation is statistically significant at the 5% level. Using the linear equation and only by reading chlorophyll Machine, we able to achieve nitrogen levels in each stage of growth.

Conclusion

The results of experiments on wash the leaves and failure to wash the leaves treatments show that washing treatments had higher purity and higher concentration of sugar and straw quality is better. Thus, dust has a negative effect on cane quality (yield and quality of sugar cane). Dust had been affected on the amount of sunlight received by the leaves. Chlorophyll content in leaves has been decreased in the occurrence of dust. So, absorbed nitrogen also has been decreased. Finally, yield quality is reduced consequently. However, dust has no negative effect on quantitative growth of sugarcane because many factors affect quantitative performance of sugarcane.

Keywords: Dust, Qualitative Performance, Quantitative Performance, Sugarcane.

Investigation about the Effective factors on Pressure Drop in Hydraulic Data in Guilan Plain

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Extended Abstract

Introduction

Groundwater is one of the essential resources for supplying requirements of drinking water, agriculture and industry. This resulted in establishment of civilization in plains and lands where are far from rivers of freshwater.

Regarding low amount annual rainfall in Iran and loss of water as a result of evaporation, volume of water production is about 128 billion cubic meters. From this volume about 83 billion cubic meters form surface water resources and 45 billion cubic meters join the groundwater by penetration. In recent decades, the growth of population and the need for water resources have led to an increase in exploitation to these essential sources hidden in the heart of the earth.

Study area of this research is located in southern coast of Caspian Sea in Guilan Province. The research problem is that in some wells the coefficient of pressure drop shows negative figures whereas in some other wells these figures are positive. It is not clear that what is the effect of these changes on exploitation of water resources of the aquifer and how much this effect is and in what field it may be. This research tries to recognize the factors that affect this phenomenon besides recognizing the effective reason in negative coefficient of pressure drop in aquifer and lining of wells and determining scientific results and its applied effects.

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Methodology

In this research, field method and using step back test has been applied to find the reason of the negativeness of pressure coefficient in available wells in the plain. Thus, through providing necessary conditions, digging operation and pumping of more than 600 deep wells have been supervised and controlled. More than 300 regions were directly controlled. Geographical features in some of sample wells in the region were taken and the selected points were specified on the map by using ArcGIS. Statistics and information related to geographical and geomorphologic conditions and geology of location of the wells and testing scope of pumping in the selected wells were collected and was analyzed in the form of graphs by SPSS program. Then, the results were analyzed and all wells were classified in separate groups and those with similar situation in the view of pressure drop coefficient were assigned in the same groups. Finally, the selected wells have been classified in three different groups.

In the next step, the features of wells in each level such as geographical and geomorphological conditions, geology of constituting sediment layers in location of the wells, texture of surface water and layers in location of them, technical and expert characteristics of the company, the quality of digging and supervising system were all evaluated and compared. Common aspects of well was distinguished in each group. Then, after recognition and regarding the common aspects of the wells belonging to each group it had been concentrated on the wells which had negative coefficient of pressure drop.. Being sure about the result, besides repeating considerations on the ground, they have been controlled and evaluated and in some cases the test has been performed again.

Results and Discussion

Doing pumping test for determination of hydraulic features of groundwater aquifer and well is one of the usual methods. In this case, the pumping test has been done in two different methods: one is pumping by fixed rate (shuttle test) for determining aquifer coefficient and pumping by varying rate (step pumping) for determining well's coefficients. Therefore, the well's coefficient specification has been possible just by using the result of pumping with varying rate (step pumping). So, in this research by paying attention to the importance of the coefficients, the data of step pumping is used for determining features and situations of well and aquifer. Before starting test first the water level in the wells has been measured. Then, by doing the operations of digging and tubing of a well, washing and exiting of the fine-grained materials remained in it has been done by pure water and pumping method. After providing suitable condition for water arrival from aquifer layers into the well, water pumping operations has been continued with different engine turn until the water level became fixed. During this period water level was measured based on a predetermined timetable. The process of water level changes and its constancy was distinguished and from the results (result related to the first step of the test) the coefficient related to aquifer has been computed. After being sure about the constancy of the water level (reaching the water level to the dynamic level), well's rate and in another word engine's turn has been increased and the act of measuring water depth from the surface up to the constancy of water level in well has been continued as before. This plan has been implemented

at least in four steps with 4 different rates as 4 engine's turns. In the next step, the result of step pumping was analyzed and after finishing field operations and recording figures it was abstracted in related table.

After designing the mentioned table, the coefficient of pressure drop in aquifer (B) has been obtained by using the curve of especial drop to the rate that the mentioned crossing point of the curve connect with the widths axis with drawing the related curve. From obtaining pressure drop in aquifer, the pressure drop in lining network of well (C) was obtained by using y_2-y_1 (x_2-x_1) that is, in fact, the slope of especial drop curve to the rate. Finally, after calculating B and C, the table of brief result of pumping is provided.

Conclusion

Considerations show that available problems in taking groundwater in Guilan Plain is related to the nature of the region in terms of sediment texture and hydrologic characteristics of the plain, humanistic factor, the performance of feeding, unsuitable quality of digging and also exploitation methods. The groundwater feeding is through different sources such as rivers and networks of irrigation channels, floodgate and pools of growing fish that are extensively in the plains, and also free aquifers situated on semi-confined aquifer that have hydraulic balance state. These sources were useful and can have positive function at increasing the age of economic exploitation of a well. However, due to unfamiliarity of most experts with the mentioned phenomenon and varying performance of this phenomenon in different seasons, the wells affected by the mentioned elements will be faced with damages and sometimes it is so severe that may destroy the well.

Considering the effective factors on the pressure drop of hydraulic data in Guilan's Plain by pumping method indicates that the step back method is better for determining hydraulic coefficient of well. It is suggested that to use this pumping method instead of step pressure. Because for determining the features and real situation of wells and aquifers especially in plains and coast region, implementing step pumping through step drop is suitable. The data gained from pumping which has been done on more than 600 wells were tested by step drop and approved these results. The lack of observing technical principles for digging leads to the increase of pressure drop in well's lining network and causes a speed at the entrance of water to the wells. Therefore, this will change the physical conditions of water. This may lead to transformation of sodium bicarbonate soluble in water to insoluble carbonate which by sedimentation on the well's lining and general pack of the back of lining's tube and tracks of lining network (shell investing) will increase pressure drop of lining network. Moreover, it decreases discharge of the wells and intensifies shell investing action which leads to a decrease in economic life time of exploitation.

Keywords: Aquifer, Feeding, Groundwater, Guilan's Plain, Hydrology, Pressure Drop.