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INVESTIGATION OF WASTEWATER REUSE DISCHARGING FROM URBAN SEWAGE TREATMENT PLANT

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Abstract
Wastewater was considered as a source of contamination, while reuse of wastewater after treatment is as a new source of water supply in the world now. Wastewater effluent from different sources such as domestic, industrial and agricultural usage is produced and can be used as irrigation water after treatment. This study aimed to evaluate the reuse of the Dezful wastewater treatment plant in southwestern Iran. BOD, COD, DO, TSS, TDS, PH, phosphate, nitrate and turbidity was measured and investigated if it could be used for irrigation purposes. The measured data was used to compare with the environmental standards and environmental regulations to evaluate the possibility of using for irrigation. Results showed that measured parameters are in acceptable limits and it is possible to use wastewater for irrigation and also have suitable and fertilizing material for agricultural farm.

Keywords: Wastewater reuse, irrigation, wastewater treatment Dezful, environmental standards

1. INTRODUCTION

Water resources protection is increasingly considered in the international community. As a result of increasing population and over-exploitation of water resources on the one hand Untreated sewage and polluted water entering surface water due to various biological activities Agriculture and industry around the world has created many environmental problems.

Due to limited water resources and water use growing trend in recent years, new policies on water resources increases the amount of water available and replacement of water resources. Recirculating and reusing non-conventional waters as one of the highest levels of management systems and axial grand country and also one of the most important long-term strategies for water resources management in Iran is discussed.

Urban population growth on the one hand and higher levels of health awareness on the other hand, water consumption has increased. High consumption of water causes sewer rates will have rise. Release of raw sewage polluting the environment in the nature caused a bad effect on the quality of surface water and groundwater flow.

Urban wastewater treatment while protecting the environment would benefit from the sewer and water used is recovered and recycled. Especially in populated areas where the most water used as drinking water, it is an inevitable necessity. Since in arid and semiarid areas access to good quality water is restricted, it is important to the operation of sewage effluent for irrigation. Although the water sewage effluent compared to the volume of irrigation water needed is small but using this water causes to preserve higher quality water. Proper operation of municipal wastewater causes to resolve surface water pollution problem and protect water resources. Since the materials and nutrients of this water is very beneficial to plant growth. The availability of water near urban centers increase agricultural production around these areas.

Iran set wastewater standards based on three open environment (surface water, agriculture, groundwater) has published. Absorbing sewage sludge obtained from wells were used as an agricultural fertilizer in ancient Iran. Reuse of treated wastewater in Iran are: agriculture, aquaculture, industry, recreational purposes, groundwater feeding and household water.

2 STUDY AREA

Dezful city, the study region, is located in southwestern Iran with an area of about 4726 square kilometers. Distance of 721 kilometers from Tehran, the capital city of Iran. Dezful city has mild winters and pleasant and green environment in the late winter and early spring. Branch of sight longitude 48 degrees 24 minutes east longitude and 32 degrees 22 minutes north latitude is wide and its height is 140 meters from the sea. In addition Dezful weather is hot and humid, and the summers are hot and winters are Mediterranean. Average annual rainfall is 250 mm and the average temperature is 3 ° C in winter and 49 ° C in summer.

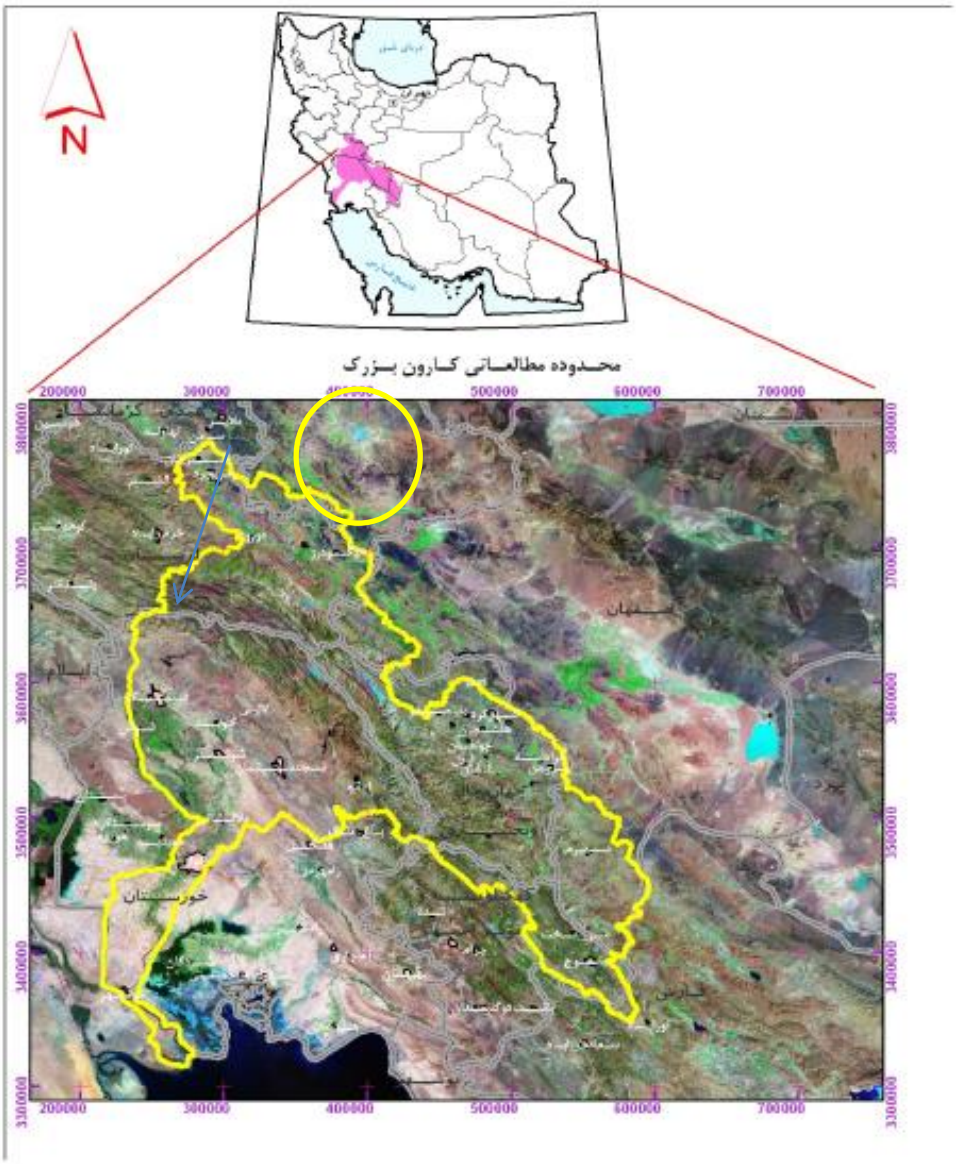

Figure 1. Dezful location in Iran

Transmission lines and sewage collection network : sewage network has a total length of 396 kilometers of transmission lines with 1600-250 mm diameter pipeline and wastewater transported into the lagoon entrance. Pumping stations: 5 pumping stations sewage treatment plant with a flow rate of 1850 liters per second to be transmitted.

Water treatment system is located in southwestern city of Dezful and about 53 hectares within the range of 2.5 to 3 km of along the Dez River.

The wastewater treatment system is lagoon aeration technique with EPA acceptable standards. Water treatment capacity is 76,176 cubic meters per day for the first phase.

Pool chlorination of wastewater discharge into Dez river. Due to the location of the wastewater treatment plant which is located in the vicinity of the Dez River in the city of Dezful and the presence of Forest Park in Southeast of treatment Plant, Waste Water Treatment Plant site makes it possible to discharge the wastewater into both of them.

Table 1: Average measured parameters by changes in the effluent during the sampling period.

Mean	maximum	minimum	December	October	September	August	Sampling time parameteres
7.73	7.98	7.26	7.26	7.84	7.85	7.98	**PH**
4.45	5.35	3.93	4.14	4.13	5.35	3.93	**DO**
33.45	48.83	20.33	20.33	29.83	34.83	48.83	**BOD**
75.03	96.66	57.5	57.5	68.33	77.66	96.66	**COD**
538.12	620.33	473.83	494.83	563.5	473.83	620.33	**TDS**
25.32	51.16	11.33	14.16	11.33	24.66	51.16	**TSS**
2.33	4.16	0	4	1.16	0	4.16	**nitrat**
2.27	2.53	1.85	2.53	2.4	2.3	1.85	phosphate
25.31	47.33	8.76	8.76	47.33	34.06	11.11	**Turbidity**
0.3	0.36	0.28	0.28	0.29	0.3	0.36	**Detergent**
306	461	190	361	461	213	190	**Total koliform**
27	33	22	22	23	33	28	**Fecal koliform**

Table 2: Comparison of quality parameters of wastewater treatment plant for irrigation standards. *Permissible.**Nonpermissible

FAO Standards		WHO Standards		Environmental Protection Agency United States of America Standard		IRAN EPA Standards		effluent treatment plant	Parameters
standards	Value	standards	Value	standards	Value	standards	Value	Mean	
Permis.	8-6.5	Permis.	8-6.5	Permis.	8.4-6.5	Permis.*	8.5-6	7.73	**PH**
-	-	-	-	-	-	Permis.	2	4.45	**DO**
-	-	-	-	NP**	30	Permis.	100	33.45	**BOD**
-	-	-	-	Permis.	120	Permis.	200	75.03	**COD**
NP	450	NP	450	-	-	-	-	538.12	**TDS**
-	-	-	-	NP	5	Permis.	100	25.32	**TSS**
Permis.	50	Permis.	5	Permis.	30	-	-	2.33	**nitrate**
-	-	-	-	Permis.	10	-	-	2.27	**phosph**
-	-	-	-	NP	2	Permis.	50	25.31	**Turbidi**
-	-	-	-	-	-	Permis.	0.5	0.3	**Deterge**
-	-	Permis.	1000	NP	200	Permis.	1000	306	**Total**
Permis.	1000	Permis.	1000	-	-	Permis.	400	27	**Fecal**

3 RESULTS AND DISCUSSION

Twelve important water quality parameters was measured in two seasons from water treatment systems. And the measured data is summarized in Table 1. Measured data was compared with various standards value comprising standards derived from Iran Environmental protection agency, Environmental Protection Agency United States of America, World health Organization and FAO. Figure 2 and shows comparison of quality parameters of wastewater treatment plant (PH) for irrigation standards from different organizations.

The wastewater could be used as economically irrigation water for agricultural land in downstream, but in some months the measured parameters did not fulfill the permissible requirement which should be investigated.

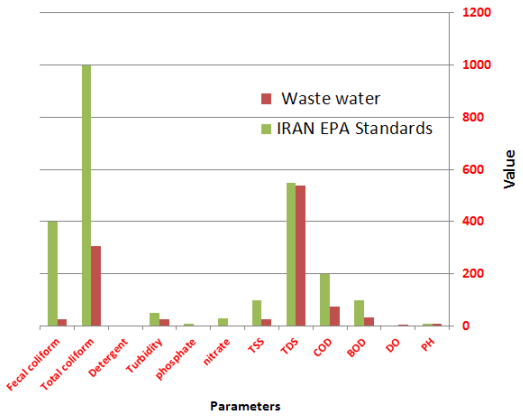

Figure 1: Comparison of quality parameters of wastewater treatment plant for irrigation standards.

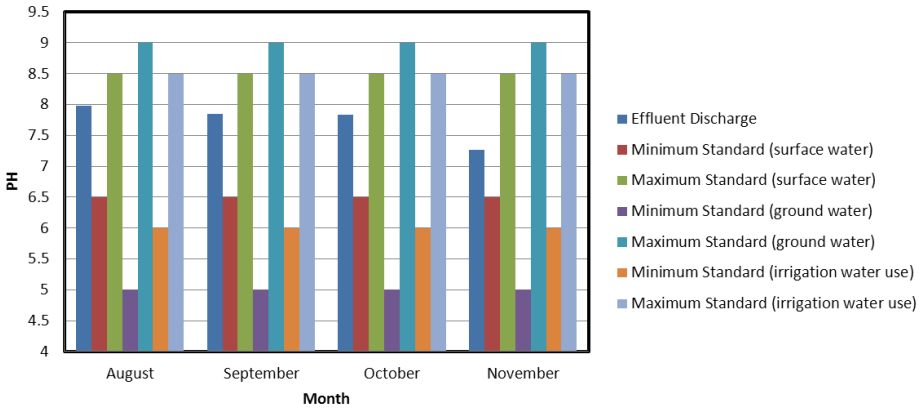

Figure 2: PH comparison of wastewater and standard for discharge to surface and groundwater and irrigation usage.

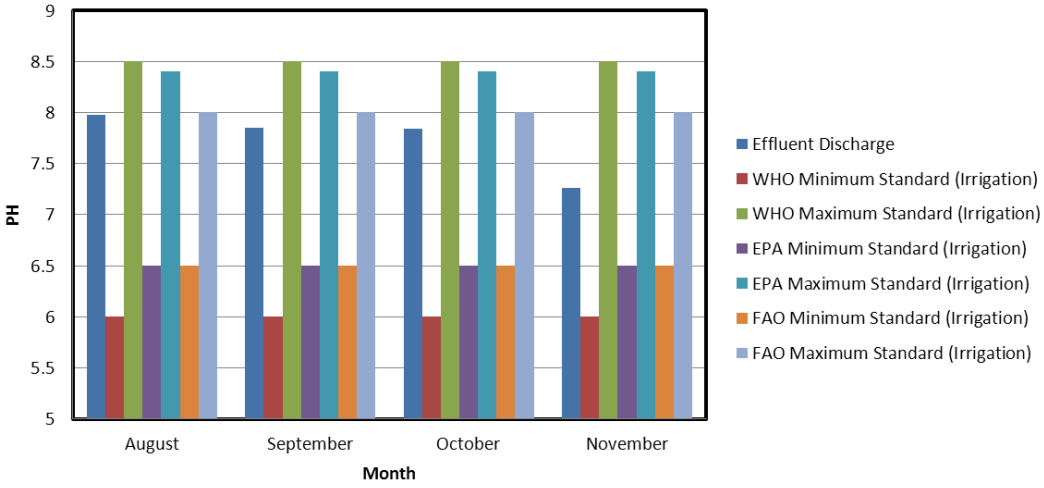

Figure 3: PH comparison of wastewater and standard from WHO, EPA and FAO.

PH indicates the acidity or alkalinity of the wastewater and PH in all stages is good for biological treatment processes. Inappropriate PH could disrupts biological treatment.

In terms of quality, an important factor causing restrictions on the use of treated wastewater is landscape irrigation, sanitary standards that require a high quality of coliform, coliform and parasite nematodes are fecal. But the amount BOD5 and DO of effluent was so much more than the standard amount and slightly higher than the standard. If you lower the effluent BOD5 and bring it up to standard can be used for urban purposes. High DO reduces treatment operating costs, energy can be also controlled by controlling the dissolved oxygen. If DO is low, the operation will be an aerobic biological treatment and the high dissolved oxygen in the effluent will be generated Pint point floc. According to the measured dissolved oxygen, it can be concluded that the efficiency of the aerated lagoon treatment is appropriate and desirable.

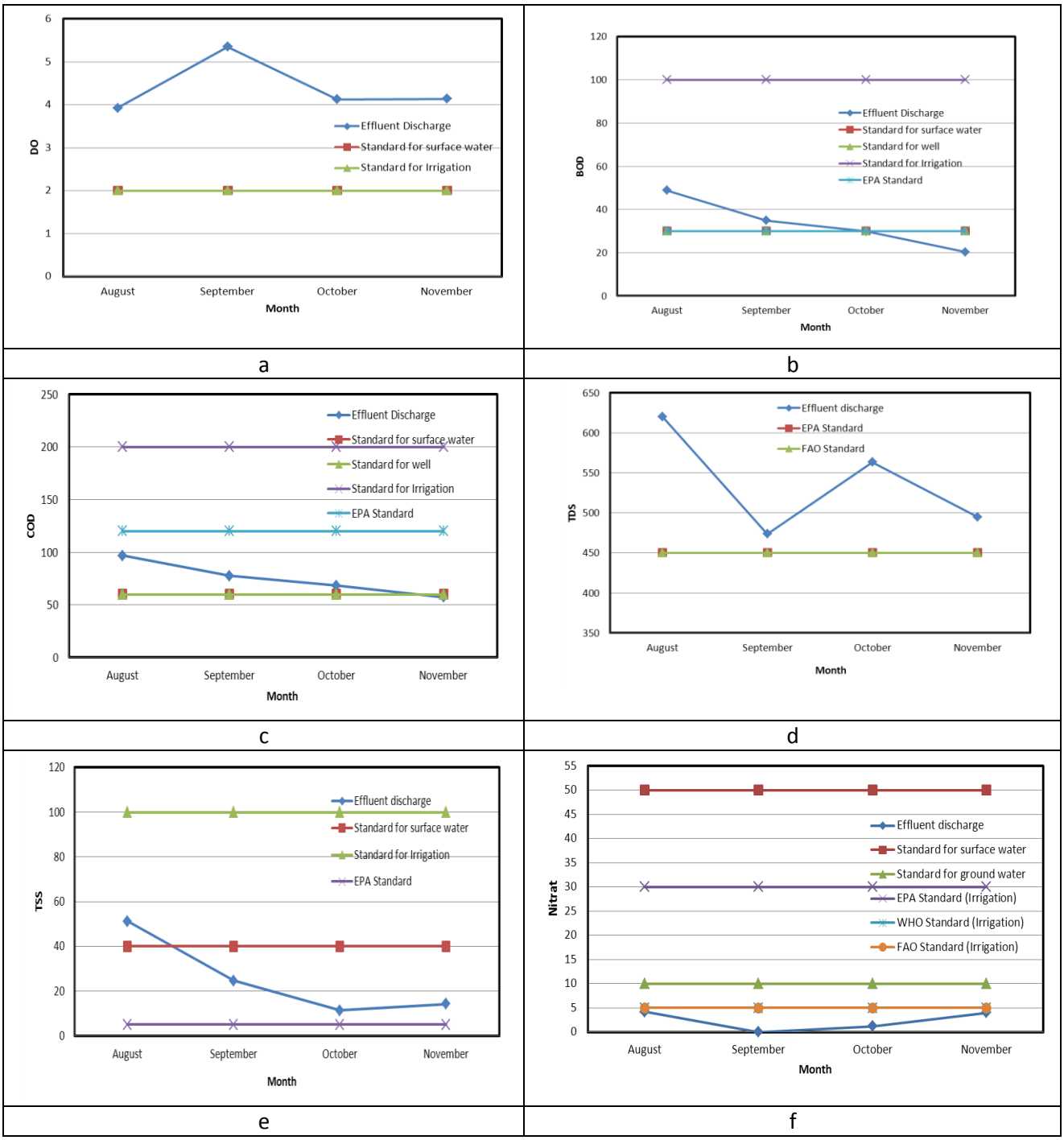

Figure 4: comparison of quality parameters of wastewater treatment plant with different standards: a) DO, b)BOD, c)COD, d)TDS, e)TSS, f)Nitrat.

In December, the average COD concentration conforms with the proposed standards, but the rest of the month is close to standard. However, according to national and EPA standards for agricultural and irrigation purposes are very reasonable and much lower than the standard limit. wastewater average TDS is higher than the EPA and FAO irrigation standards, especially in September, but in October is much more than the allowed threshold and slightly higher than standards.

Nitrate and phosphate levels in accordance with national standards is consistent for agricultural and irrigation purposes and surface water discharge permit. Coliform are an appropriate parameter for monitoring wastewater reuse because some of them were able to grow out of the intestine, especially in hot climate. The number of E. coli bacteria is the most suitable parameters for the use of wastewater in agriculture. Average total coliform discharge of effluent for agricultural purposes and irrigation wells and surface water absorbent consistent with national standards. The average number of fecal coliform effluent treatment plants in all months were below the limit of national standards and the standards of WHO, EPA, FAO. Use of wastewater as drinking water is not permitted because it does not fulfill the standard criteria.

It is recommended to use this wastewater for irrigation since the plant species found in the area and their high resistance against water and soil salinity and sulfate in soil and groundwater. BOD must be also reduced before usage for irrigation purposes. The use of wastewater for agricultural and irrigation use because of existing agricultural land in downstream is economical.

The following suggestions are offered to continue this research:

1. Increasing the amount of water recycling and minimizing waste of water in normal and abnormal situations in any way possible.
2. Enhanced productivity and security, political and economic value of water supply, and conservation and water harvesting.
3. Full documentation quality and quantity of wastewater Statistics Branch as statistically reliable and documented various courses available.
4. Due to legal issues in the supply of products irrigated with wastewater, etc. Reduction or elimination of industrial effluents, agricultural, urban rivers Doses.

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