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Advances in Bioresearch

ORIGINAL ARTICLE

Irrigation Groundwater Quality in PIPAR City Based On Hydro Chemical Study

[1]Sangeeta Parihar, [2]Jai Singh Kachhwaha, [3] Tarun Gehlot, [4] Krishan Kumar Saini, [5]Suresh Kumar Pachak

[1,2,5,]Department of Chemistry, JNV University Jodhpur, Rajasthan (India).
[3]Structural Engineering Department, JNV University Jodhpur, Rajasthan (India).
[4]Assistant Professor, Jaipur Engineering College & Research Centre, Jaipur, Rajasthan (India).

ABSTRACT

Samples were taken from 52 dug wells irrigation water in a PIPAR city area and analyzed for pH, conductivity, total dissolved solids, calcium, magnesium, sodium, potassium, total hardness, alkalinity (CO3-2, HCO3-), sulphate, chloride, nitrate, and fluoride to classify with the water quality parameters. From the primary constraint for irrigation water quality index(IWQI), secondary variables such as sodium adsorption ratio (SAR), residual sodium carbonate (RSC), Kelley's ratio (KR), sodium soluble percent (SSP), permeability index (PI), magnesium adsorption ratio (MAR), and CRI (Corrosively ratio index) were computed Based on their Water Quality Index, the IWQI graded groundwater quality as good to bad (WQI). a linear regression model was established between SAR/RSC, SAR/KR, SSP/CRI, PI/MAR, KR/PI and SAR/CRI. The predicted value by model and regression analysis was in close agreement with their respective measured value. The IWQI (83 percent +11 percent) indicates that ground water quality ranges from somewhat unsustainable to excellent. However, because to the degradation of the shallow aquifer's quality, an immediate support is required for sustainable growth.

Keywords; *Groundwater Quality, Irrigation Water Quality Indices, PIPAR City, Water Pollution.*

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INTRODUCTION

Pollution of water is related with any physical, chemical and biological change in quality of water. pollution in its broadcast sense include all changes that vital natural utility exerts deleterious effect on life. water function as on medium of transport for pollutants and they can be damaging both living organism and environment

Nishanthiny, *et al* [1] reported Hydro chemical examination of water quality and appropriateness for drinking, agriculture, and industry. Salt contamination of groundwater is a serious hindrance to agro-well farming in the Jaffna Peninsula. Overall, 20.6 percent of examined wells have good irrigation water quality, 44.1 percent have acceptable to questionable irrigation water quality, and 35.3 percent have unsuitable irrigation water quality, with bicarbonate danger recognized as a primary hazard owing to carbonate rock dissolution. Kumari, P. (2017) presented Hydro chemical analysis which indicates water quality and agricultural appropriateness. Salt contamination of groundwater is a serious hindrance to agro-well farming. Using low-quality water to irrigate the land might deplete its fertility. [1,2]

Lalitha, *et al* [3] studied that Groundwater quantity and quality vary greatly depending on local and regional natural and human causes, affecting its appropriateness for drinking and irrigation. This study aims to analyse hydrochemistry and estimate groundwater quality in the Cauvery river basin, Tamil Nadu, India. Water samples with higher Na+ and Cl concentrations from fluvio-marine sources or agriculture return flow are not acceptable for drinking or irrigation. Long-term effects of high salt irrigation water on soil hydraulic and nutritional characteristics. Zhang, H., Bian, J., & Wan, H. (2021) reported that Groundwater contamination concerns not only the growth of businesses but also the lives of inhabitants. Factor analysis and Kriging spatial interpolation methods were used to examine the geographical distribution features of pollution sources in Daqing city. The primary chemical type of shallow groundwater in this area was HCO-3 & Ca + Mg with a maximum salinity of 1.5 g/L. Groundwater for irrigation was only available in the west due to increased salinity. The study identified eight key impact components from multivariate statistical analysis utilizing factor analysis. [3,4]

Ismail, E. *et al* [4] studied that evaluation of groundwater quality requires the sustainable growth of groundwater resources and the assessment of their use for home, irrigation, or industrial applications. SAR, RSC, KR, MH, and salinity are all variables were supposed. Using ArcGIS maps, several groundwater quality indicators showed regional variation. Tarun Gehlot *et al* (2020) studied linear regression model which has been established between DO/BOD, COD/DO, BOD/COD, C O D /pH, BOD/pH and DO/pH. R2 ranged from 0.889 to 0.034 between these parameters. Than a multivariate linear regression model has been set up for BOD and COD as dependent variable and DO, TEMP, TDS and pH as four independent variables. Performance of MLR Model has been justified with statistical variables like average square root error (ASRE) and universal efficiency (UE). [5,6]

Ghazaryan, K., Movsesyan, H., Gevorgyan, *et al*. (2020) reported in their research study that in Armenia's Masis province, groundwater is used for agriculture. Hydro chemical parameters (pH, EC, and Cl) and several indices (SAR, Na percent, MH, RSC, and PI) were used to determine groundwater suitability for irrigation. Geostatistical analysis was used to determine spatial variation in province. The Irrigation Water Quality Index (IWQI) technique was utilized to combine and summaries the various data gathered. [7].

MATERIAL AND METHODS

This research has been conducted for PIPAR City Jodhpur District of Rajasthan. Jodhpur district is situated between 250 51’08” & 270 37’09” North latitude and 710 48’09” & 730 52’06” East longitude covering geographical area of 22,850 sq km. Mean annual rainfall (1971-2021) of the district is 374 mm The temperature varies from 49 degrees Celsius in summer to 1 degree Celsius in winter.

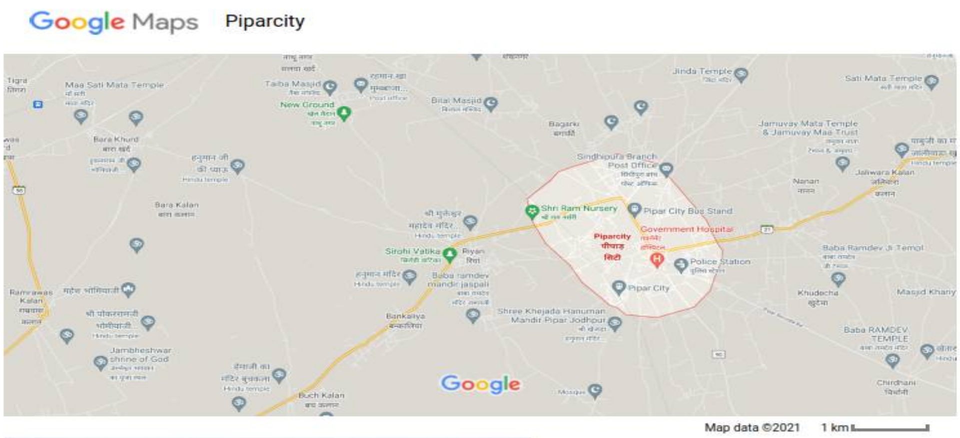

Figure 1: Map of PIPAR CITY Rajasthan

During the pre-monsoon season, 52 groundwater samples were collected and evaluated for key parameters (Table1). The samples were only taken from wells that are heavily utilized for drinking and irrigation. ground samples were promptly tested for pH and electrical conductivity using pH and EC meters. TDS was calculated via formula 0.64 * EC. It was determined by titrating using standard EDTA. The difference between TH and Ca values was used to determine Mg. Total alkalinity (TA) was determined by titrating with HCl. Standard AgNO3 titration was used to quantify chlorine (Cl), sodium (Na), and potassium (K). BACL3 technique for sulphate measurement. We measured nitrate via ion selective electrode.

RESULS AND DISCUSSION

Table 1 summarizes the findings.

Table 1: Analysis of PIPAR City Groundwater Sample

Parameter	pH	EC	TDS	Na+	K+	Mg+2	Ca+2	TH	HCO3	SO4-2	CL-	NO3-	F-
MIN	6.02	387	246.37	12	0.9	3.81	7	83	85	19	34	0.21	0.01
MAX	8.54	2567	1678	214	2.2	97.45	159	812	812	208	303	234.88	1.92
AVG	7.43	936.21	631.88	81.21	0.63	34.77	45.66	270.21	268.97	71.56	97.31	66.88	0.68

Note: *Apart from pH and EC, all variables are in mg/l.

Secondary water quality indicators such as SAR, RSC, SSP; KR, MAR, CR, and PI were evaluated for IWQI. Based on their Water Quality Standard, the scientific study of varied quality criteria IWQI was categorized from good to unsuitable state of groundwater quality (WQI). Based on the severity of the WQI, it may be further categorized as excellent to poor groundwater quality for sustainable development.

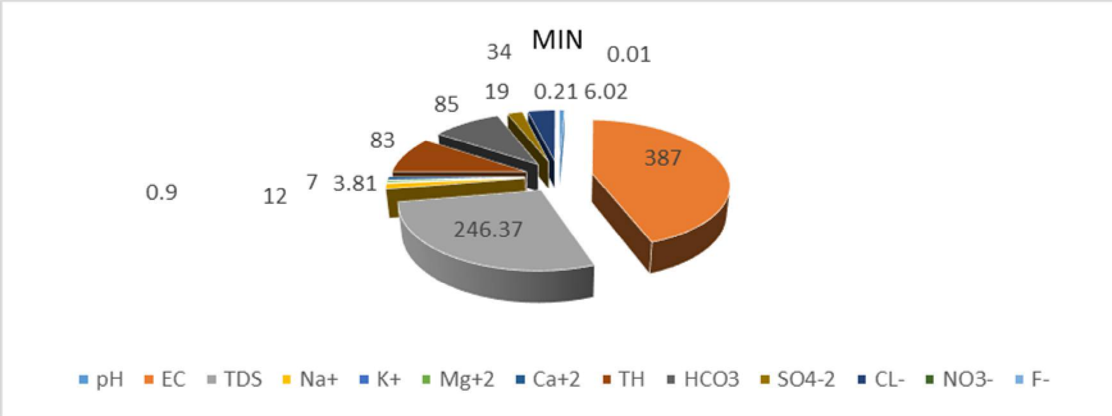

Figure 2: Minimum value for all parameters

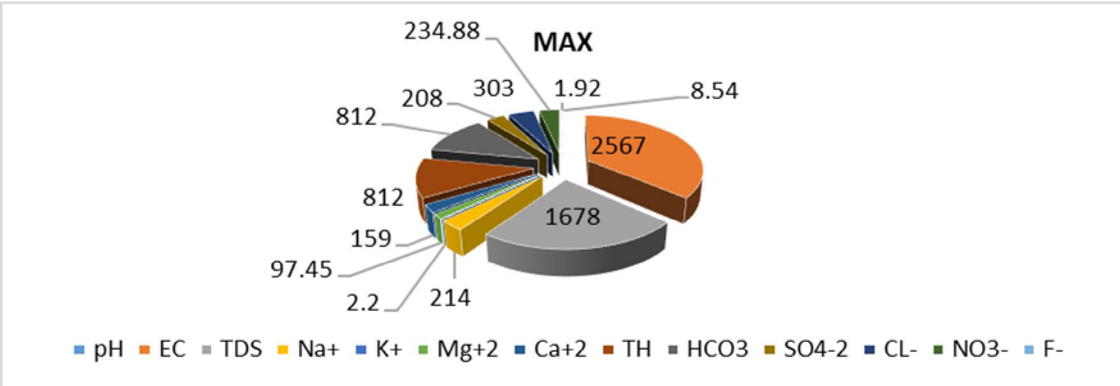

Figure 3: Maximum value for all parameter

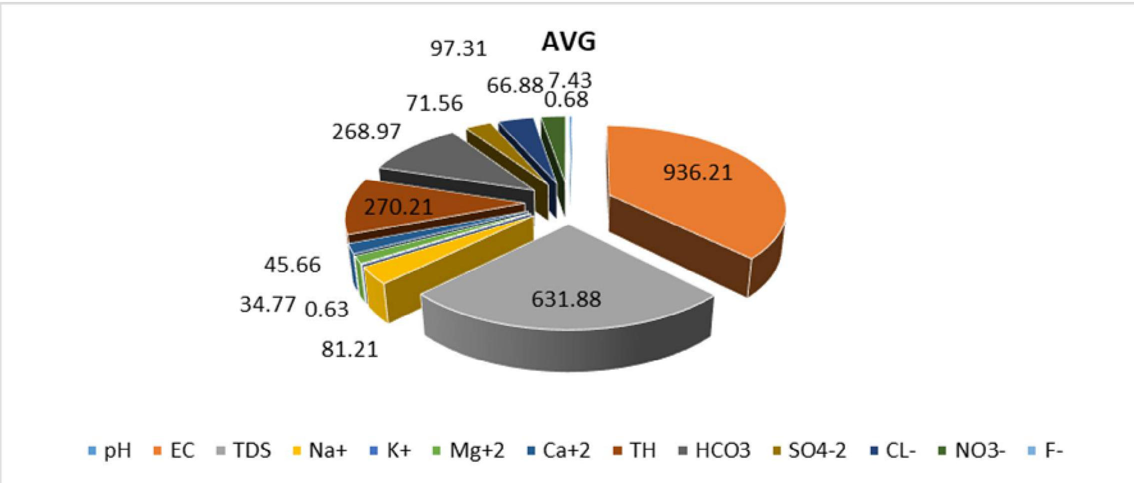

Figure 4: Average value for all parameters

IRRIGATION WATER QUALITY INDICES (IWQI)

The fundamental criterion of drinking water quality was used to create the different irrigation water quality indices. Irrigated crops' productivity, yield, and quality are all influenced by the amount of groundwater used for irrigation. The presence of dissolved salts and their concentrations determine the quality of irrigation groundwater. The sodium adsorption ratio (SAR) and residual sodium carbonate

(RSC) are the two most important quality determinants that influence groundwater quality and irrigation suitability. The total salt concentration, sodium soluble percentage (SSP), residual sodium carbonate (RSC), sodium adsorption ratio (SAR), and Kelley index (KI) are all essential factors to consider when determining whether or not water is suitable for irrigation. The fundamental criterion of drinking water quality was used to create the different irrigation water quality indices.

Table 2: Characterization of Water Quality Using the Water Quality Parameters Value

Sample no	SAR	RSC	KR	SSP	PI	MAR	CR	IWQI
1	2.22	0.41	0.88	3.32	75.58	89.43	0.03	182.09
2	1.73	-2.49	0.56	2.78	56.32	47.97	0.06	116.97
3	2.12	-2.12	0.64	4.43	78.18	56.41	0.18	124.02
4	4.37	-1.06	1.92	5.2	82.01	30.78	0.13	135.46
5	1.39	-0.15	0.44	1.9	63.16	66.91	0.03	123.57
6	1.59	-2.66	0.56	2.87	55.46	58.06	0.08	118.1
7	1.28	-1.58	0.55	2.09	57.18	51.31	0.06	117.88
8	1.65	1.5	0.6	3.83	59.56	58.36	0.05	125.74
9	2.38	0.1	0.9	3.24	72.48	68.27	0.05	147.23
10	3.31	-0.01	1.1	4.7	75.36	62.58	0.04	146.98
11	4.59	-0.29	2.25	4.48	99.37	19.74	0.06	140.09
12	2.19	-2.01	0.78	4	63.08	53.44	0.07	161.85
13	0.62	-3.88	0.18	1.2	36.59	56.91	0.07	99.74
14	1.12	-2.13	0.35	1.92	50.48	66.78	0.06	108.6
15	1.63	-0.69	0.67	1.91	71.01	57.93	0.06	132.5
16	1.89	0	0.71	2.47	76.88	74.69	0.02	152.66
17	1.84	-0.32	0.78	2.06	76.49	63.25	0.05	149.12
18	0.95	-1.66	0.34	1.3	53.55	71.67	0.05	129.15
19	3.21	-2.6	0.68	8	55.51	45.59	0.18	110.63
20	2.42	-1.91	0.69	3.97	60.61	72.65	0.04	138.35
21	3.49	0.28	1.11	4.25	77.94	78.89	0.05	165.63
22	3.59	-1.86	1.1	5.63	69.09	70.43	0.15	148.05
23	2.12	-0.85	1	3.8	72.62	64.2	0.07	143.62
24	2.47	-3.48	0.78	3.79	57.28	47.97	0.11	108.86
25	1.32	-0.34	0.56	1.97	68.63	63.25	0.04	135.6
26	0.75	-3.6	0.08	0.57	32.1	66.71	0.07	96.23
27	1.74	-0.32	0.8	2.1	76.73	66.3	0.05	147.51
28	1.21	-1.42	0.36	1.59	55.55	46.86	0.04	104.07
29	1.28	-1.99	0.49	2.87	55.41	63.13	0.07	161.66
30	2.16	-2.09	0.59	3.59	57.77	72.4	0.08	134.38
31	2.59	-1.26	0.69	4.52	61.76	48.37	0.11	116.71
32	1.65	-3.05	0.52	2.63	52.59	40.23	0.15	94.68
33	3.5	-0.1	1.19	5.17	75.93	57.78	0.16	143.56
34	3.36	-5.1	0.59	9.57	50.08	50.57	0.29	109.31
35	3.81	-1.75	1.27	5.72	72.15	69.83	0.06	151.07
36	2.93	-2.02	0.65	6.61	56.45	52.71	0.15	117.46
37	1.55	-1.02	0.57	2.09	64.64	53.94	0.05	121.81
38	1.86	-2.96	0.59	2.91	55.03	36.71	0.07	94.21
39	2.13	-0.39	0.6	3.77	61.55	61.64	0.06	129.25
40	2.58	-0.79	1.05	3.16	75.79	62.77	0.05	144.69
41	1.60	-1.36	0.57	2.47	60.23	19.04	0.04	82.5
42	3.66	1.52	1.01	4.54	77.3	64.53	0.06	162
43	2.45	-5.6	0.56	4.57	48.37	67.91	0.2	118.25
44	0.71	-2.22	0.23	1.11	45.69	59.28	0.05	104.85
45	4.87	0.23	2.66	4.46	95.18	18.79	0.07	126.27
46	2.25	-3.84	0.61	4.13	53.7	67.88	0.18	124.86
47	2.64	-2	0.82	4.27	63.91	73.93	0.08	148.66
48	2.99	-2.03	0.64	6.52	56.02	52.3	0.17	156.46
49	1.57	-0.71	0.59	2.07	68.81	49.59	0.05	142.27
50	3.11	-1.93	1.11	5.18	69.54	30.68	0.18	108.11
51	2.21	-0.93	0.89	2.79	72.29	58.57	0.06	135.86
52	1.78	-6.63	0.35	4.24	40.38	36.7	0.28	71.99
MIN	0.35	-6.63	0.09	0.57	32.1	18.79	0.03	75.99
MAX	4.87	1.72	2.66	9.57	95.18	89.43	0.29	172.09
AVG	2.28	-1.5	0.79	3.62	63.18	56.86	0.08	135.2

Regression Models

We have developed various linear regression models between various water quality parameters. Polynomial regression attempts to model the relationship between two variables by fitting a linear

equation to experimental data. One variable is considered as a descriptive variable and the other is considered as a dependent variable.
However, simple linear regression follows the equation: y = a + bx, where x is descriptive variable and y is a dependent variable. Slope of a line is b and intercept is a following are various developed regression models

SAR VERSE RSC

Table 3: Summary Output of regression model for SAR VERSE RSC

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.213272
R Square	0.045485
Adjusted R Square	0.026395
Standard Error	0.983245
Observations	52

Table 4: statistical analysis (ANOVA) for SAR VERSE RSC

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	2.303443	2.303443	2.382616	0.128998
Residual	50	48.33853	0.966771		
Total	51	50.64198			

Table 5: Standard Error, t Stat, P value for SAR VERSE RSC

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	2.486204	0.192024	12.94738	1.37E-17	2.100513	2.871896	2.100513	2.871896
RSC	0.130503	0.084546	1.543572	0.128998	-0.03931	0.300319	-0.03931	0.300319

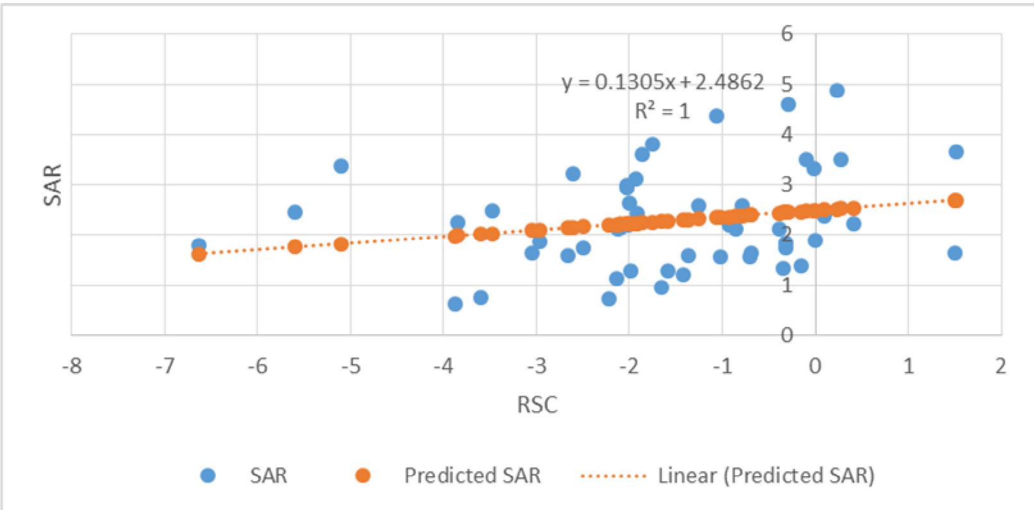

Figure 6: Regression model between SAR VERSE RSC

SAR VERSE KR

Table 6: Summary Output of regression model for SAR VERSE KR

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.855642
R Square	0.732123
Adjusted R Square	0.726766
Standard Error	0.52088
Observations	52

Table 7: Statistical Analysis (ANOVA) for SAR VERSE KR

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	37.07617	37.07617	136.6531	6.51E-16
Residual	50	13.5658	0.271316		
Total	51	50.64198			

Table 8: Standard Error, t Stat, P value for SAR VERSE KR

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0.849236	0.141935	5.983285	2.32E-07	0.564152	1.13432	0.564152	1.13432
KR	1.847046	0.158004	11.68987	6.51E-16	1.529686	2.164406	1.529686	2.164406

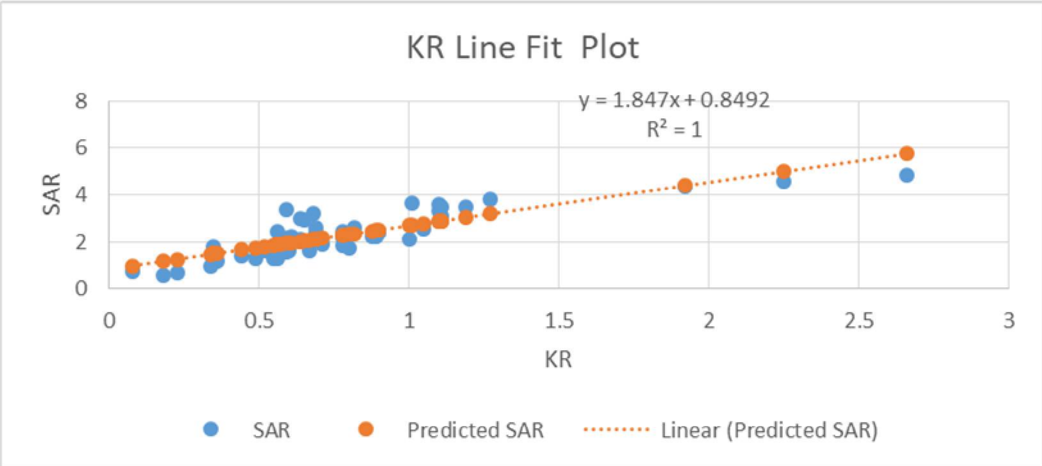

Figure 7: Regression model between SAR VERSE KR

SSP VERSE CRI

Table 9: Summary Output of regression model for SSP VERSE CRI

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.671691
R Square	0.451168
Adjusted R Square	0.440192
Standard Error	1.311862
Observations	52

Table 10: Statistical Analysis (ANOVA) for SSP VERSE CRI

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	70.73687	70.73687	41.10263	5.01E-08
Residual	50	86.04908	1.720982		
Total	51	156.7859			

Table 11: Standard Error, t Stat, P value for SSP VERSE CRI

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.919511	0.321856	5.963878	2.49E-07	1.2730	2.56597	1.27304	2.565978
CRI	18.95406	2.956428	6.411133	5.01E-08	13.015	24.8922	13.0159	24.89222

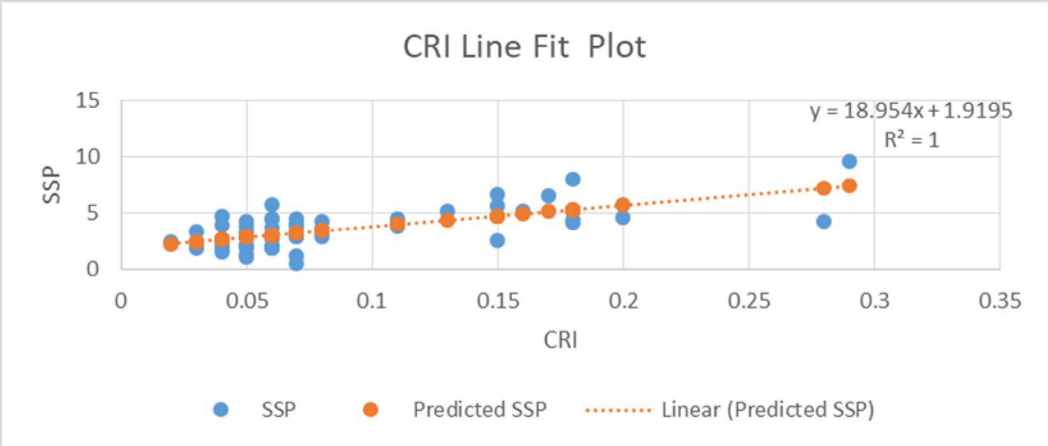

Figure 8: Regression model between SSP VERSE CRI

PI VERSE MAR

Table 12: Summary Output of regression model for PI VERSE MAR

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.105432
R Square	0.011116
Adjusted R Square	-0.00866
Standard Error	13.30168
Observations	52

Table 13: Statistical Analysis (ANOVA) for PI VERSE MAR

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	99.44465	99.44465	0.562042	0.456952
Residual	50	8846.729	176.9346		
Total	51	8946.173			

Table 14: Standard Error, t Stat, P value for PI VERSE MAR

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	69.066	7.218572	9.5678	6.96E-13	54.5671	83.5650	54.56716	83.56502
MAR	-0.0923	0.123159	-0.7496	0.456952	-0.3397	0.15504	-0.3397	0.155041

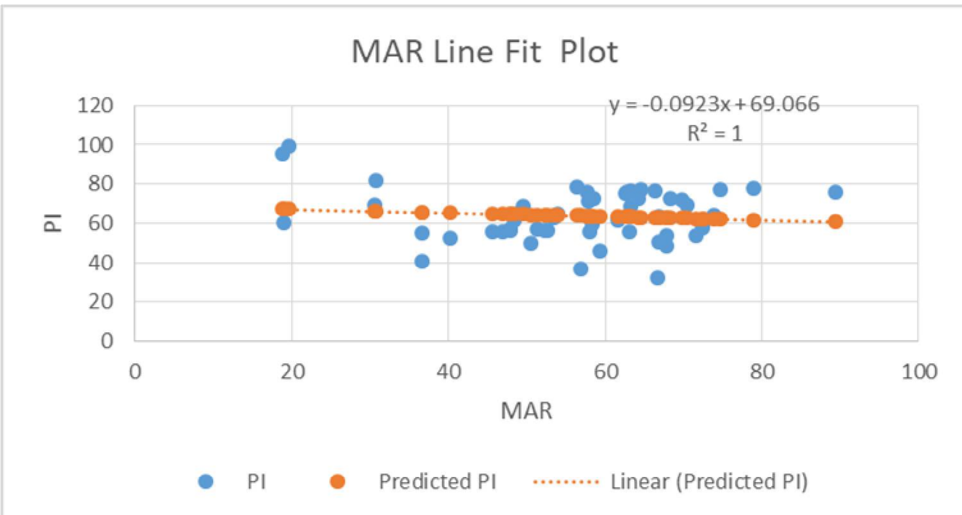

Figure 9: Regression model between PI VERSE MAR

KR VERSE PI

Table 15: Summary Output of regression model for KR VERSE PI

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.825724
R Square	0.68182
Adjusted R Square	0.675456
Standard Error	0.262979
Observations	52

Table 16: Statistical Analysis (ANOVA) for KR VERSE PI

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	7.409842	7.409842	107.1436	4.97E-14
Residual	50	3.457903	0.069158		
Total	51	10.86774			

Table 17: Standard Error, t Stat, P value for KR VERSE PI

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	-1.06385	0.18119	-5.87147	3.46E-07	-1.42778	-0.69992	-1.4277	-0.6999
PI	0.02878	0.00278	10.35102	4.97E-14	0.02319	0.034364	0.0231	0.03436

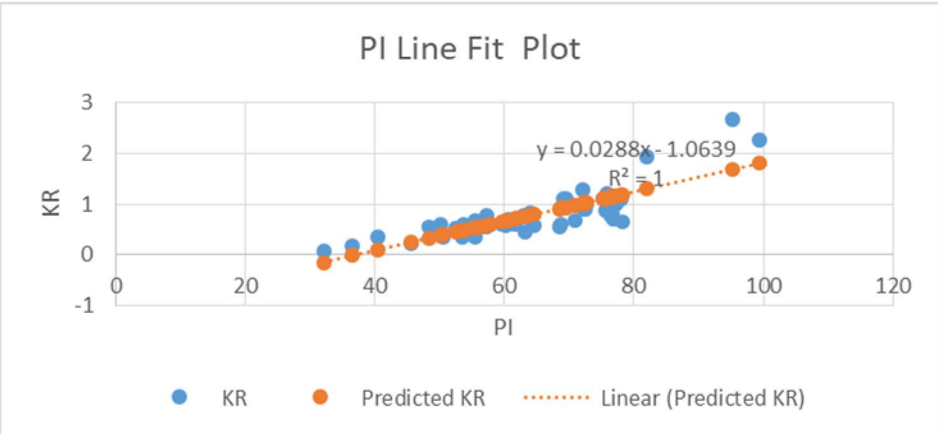

Figure 10: Regression model between KR VERSE PI

SAR VERSE CRI

Table 18: Summary Output of regression model for SAR VERSE CRI

SUMMARY OUTPUT	
Regression Statistics	
Multiple R	0.295203
R Square	0.087145
Adjusted R Square	0.068888
Standard Error	0.961549
Observations	52

Table 19: Statistical Analysis (ANOVA) for SAR VERSE CRI

ANOVA					
	df	SS	MS	F	Significance F
Regression	1	4.413198	4.413198	4.773215	0.03362
Residual	50	46.22878	0.924576		
Total	51	50.64198			

Table 20: Standard Error, t Stat, P value for KR VERSE PI

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1.852323	0.235909	7.851848	2.82E-10	1.37848	2.3261	1.37848	2.326161
CRI	4.734302	2.166958	2.184769	0.03362	0.38183	9.0867	0.38183	9.086765

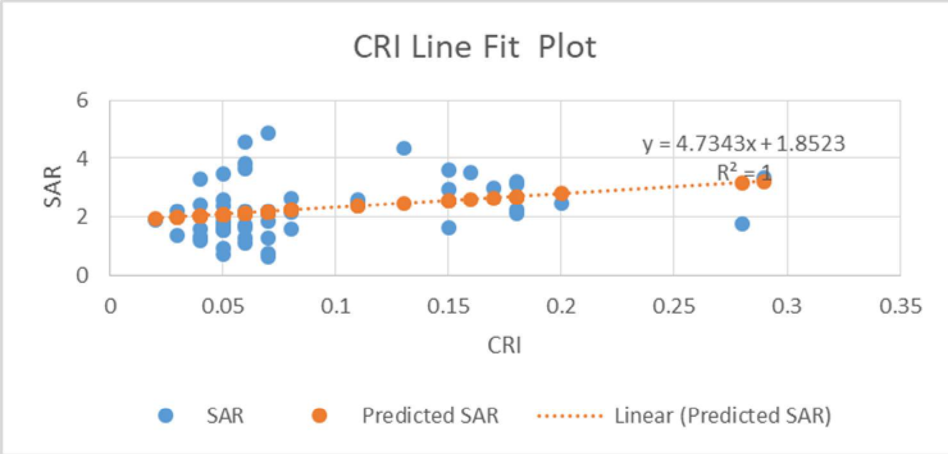

Figure 11: Regression model between SAR VERSE CRI

Electrical conductivity

The water salinity risk was the most significant water quality criterion for agricultural production, and it was an assessment of all suspended solids in samples. The main effect of high EC water on crop yield was the plant's inability to contend for water with ions in the soil solution. Even if the soil appears wet, the higher the EC, the less water available to plants since plants can only exhale "clean" water; useable plant water in the soil solution decreases significantly as EC rises. Irrigation water with a high EC reduces yield potential since the volume of water dissipated by a crop is directly related to production. The EC classification in the study sector is shown in Table 3. With the exception of one sample that had an excessive EC, the quality of water was mainly in the medium to high EC range.

Sodium adsorption ratio (SAR)

The salt or alkali danger in irrigation water is characterized in terms of sodium adsorption ratio (SAR) and classified as S1 (SAR<10), S2 (10-18), S3 (18-26), and S4 (>26). The sodium adsorption ratio criteria for each water sample were calculated using equation (Richards, 1954), and all samples fell into the excellent (S1) category, indicating that these water resources are appropriate for irrigation with no risk of dissolved substances.

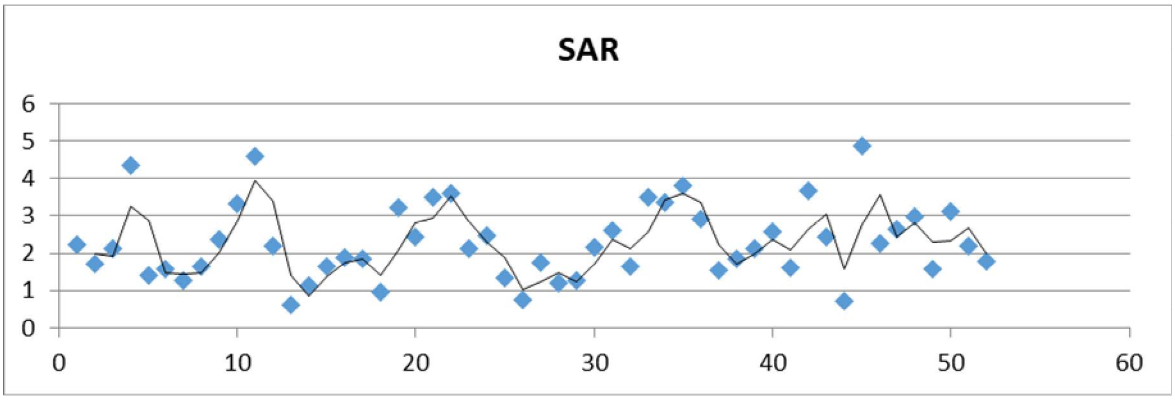

Figure 12: SAR value for all Samples

Soluble sodium percentage (SSP)

Wilcox (1955) presented a system for classifying irrigation water based on the soluble sodium percentage (SSP). The proportion of soluble sodium ranges from 0.57 to 9.57, with a mean value of 3.62 meq/L. SSP levels less than 50 indicate acceptable water quality, whereas SSP values greater than 50 indicate that the water is unfit for irrigation (USDA, 1954). Groundwater is safe for irrigation purposes if it meets these conditions.

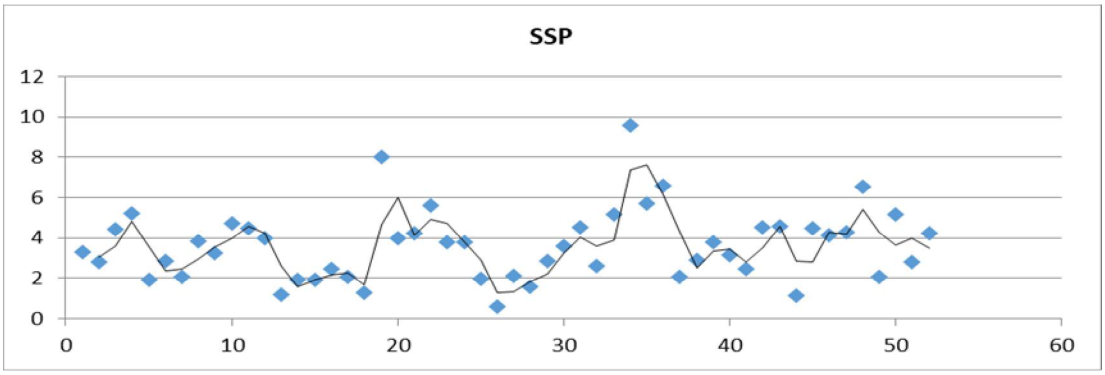

Figure 13: SSP value for all Samples

Residual sodium carbonate (RSC)

A high salt content in water causes salty soil to develop, and alkaline earth metal cations, expressed as residual sodium carbonate (RSC), have an impact on irrigation water quality (Karanth,1987). The HCO3– and CO3– in irrigation water precipitate calcium and magnesium ions in the soil, increasing the percentage of sodium ions in the soil. As a result, RSC was regarded as a predictor of the water's sodicity risk. A high RSC value in water causes an increase in salt adsorption on soil. RSC levels suggest that groundwater is generally acceptable for irrigation.

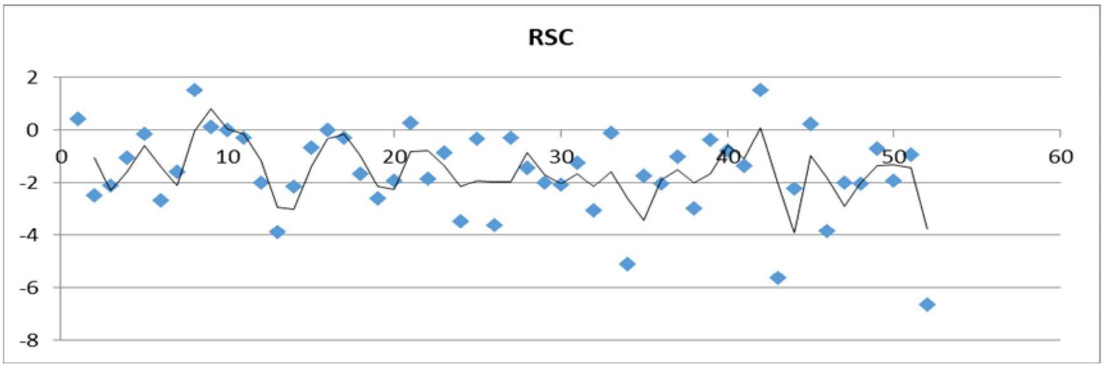

Figure 14: RSC value for all Samples

Permeability index (PI)

The permeability index is used to classify water suitability for irrigation purposes (PI). The formula for calculating the permeability index is (PI = Na + HCO3/Ca + Mg + Na*100), where all variables are in meq-1. The groundwater's PI values vary from 32.10 to 95.18, with a mean of 63.18. The PI values of >75 suggest that the irrigation water is of good quality. If the PI readings are between 25 and 75, the water quality for irrigation is satisfactory. If the PI readings are less than 25, however, the water is unsuitable for irrigation. The groundwater in the research region is generally acceptable for irrigation purposes, according to the US salinity diagram and Doneen's chart.

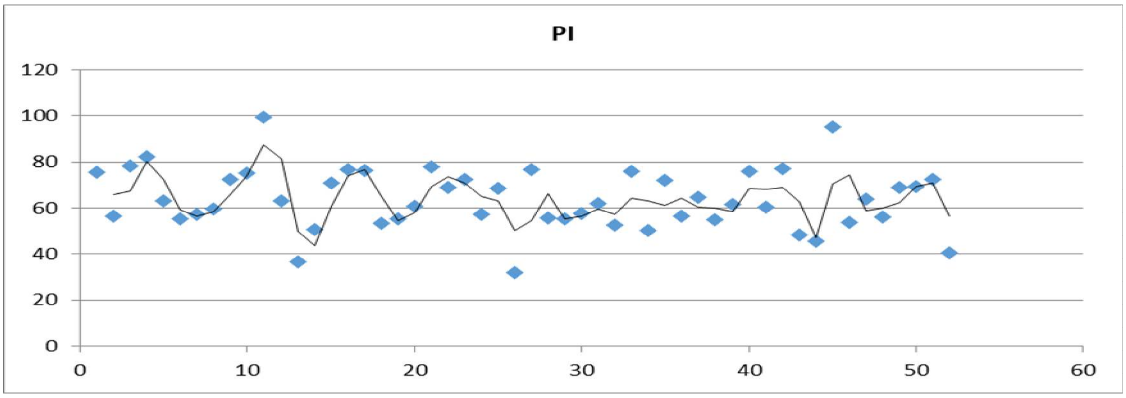

Figure 15: PI value for all Samples

Kelly's ratio (KR)

The research area's Kellys Ratio values varied from 0.09 to 2.66. According to them, the majority of the KR for the groundwater samples (83 percent) fell under the permitted range of 1.0 and are therefore appropriate for irrigation.

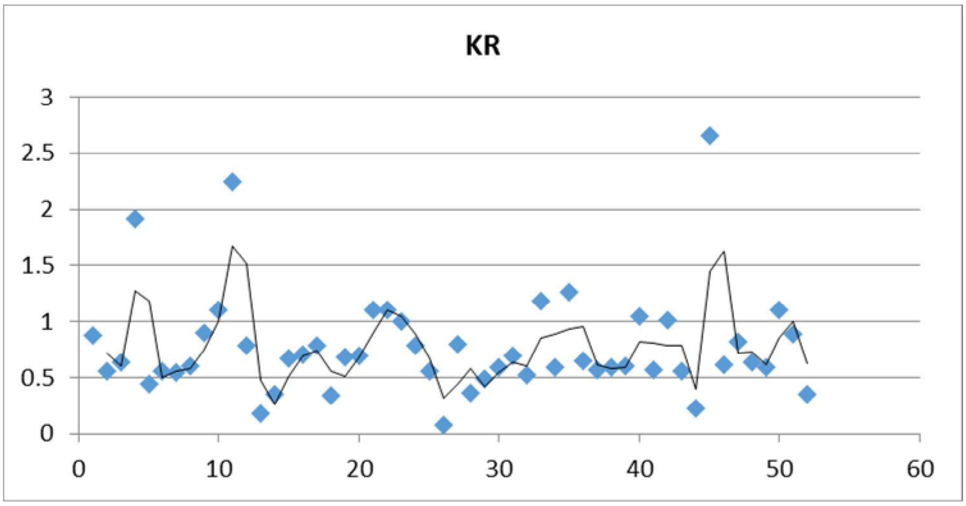

Figure 16: KR value for all Samples

Corrosively ratio index (CRI)

Water's corrosiveness may be measured by means of a measurement known as the corrositivity ratio Index (CRI, water with a corrositivity ratio less than one is considered safe and non-corrosive. A corrosivity ratio of more above two indicates corrosiveness. The corrosively ratio index (CRI) values varied from 0.03 to 0.25 meq L-1 suggesting that groundwater is safe and acceptable for home, industrial usage & is less corrosive.

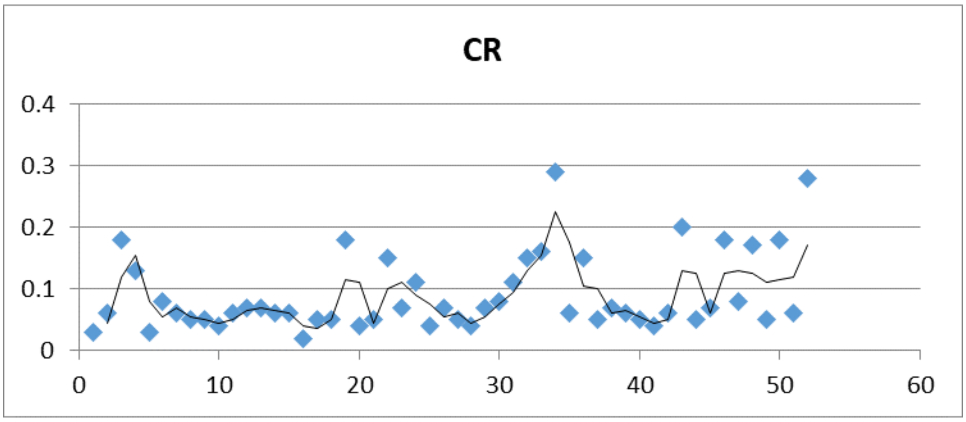

Figure 17: CR value for all Samples

Magnesium adsorption ratio (MAR)

The magnesium concentration of water is one of the most significant qualitative parameters for assessing irrigation water quality. In most bodies of water, calcium and magnesium are in a condition of balance. As soils grow more salty, more magnesium in water will have a negative impact on agricultural yields). In this study, the magnesium adsorption ratio of groundwater varies with 18.79 to 89.43. The permissible limit for MAR is 50. A high MAR has a negative impact on the soil and has a detrimental effect on soils when it surpasses 50. As a result, the waters are classified as acceptable (66 percent) and unsuitable (36 percent) (27 percent). A model for the Irrigation Water Quality Index has been attempted (IWQI). The ground water quality for irrigation was assessed using several irrigation water quality indices such as SAR, SSP, RSC, PI, and KR. The indices' values were added together, and the groundwater quality was categorized from good to unsuitable Only 88 percent of the water was determined to be marginally unsuitable for irrigation, although certain areas of the land (11 percent) had acceptable water quality.

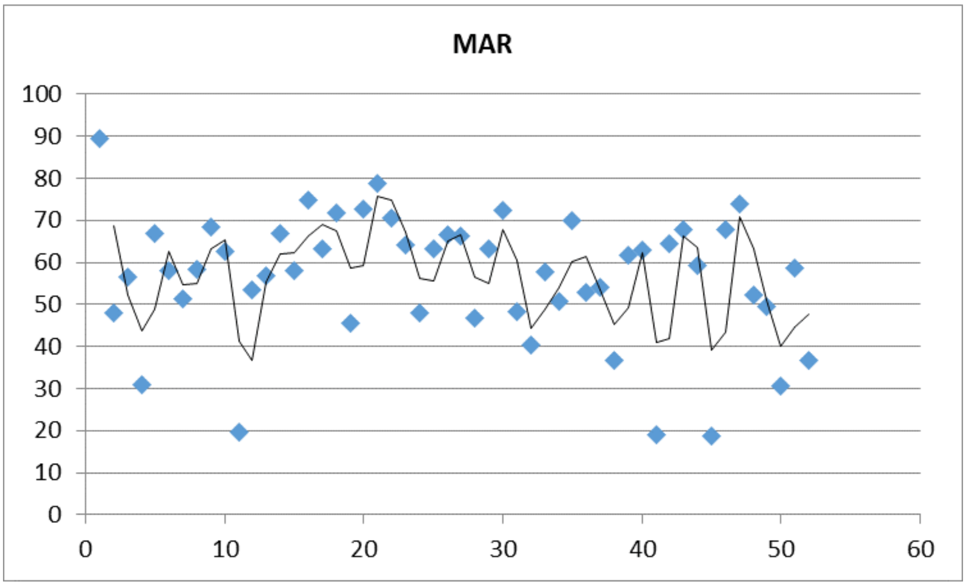

Figure 18: MAR value for all Samples

Table 21: Irrigation Groundwater Determined by EC Values

EC(µS/cm)	Class	Samples No	% Samples No
0-250	Low	Nil	Nil
251-750	Medium	14	26.84
751-2250	High	32	66.23
2251-6000	Very High	1	1.52

Table 22: Water Quality Classification Based on WQI Value

Water Assessment Series	Water Class	Samples No (Iwqi)	%	Sustainable Status
<50	Excellent	0	0	Sustainable
51-100	Good	7	11	Sustainable
101-200	Poor	44	83	Slightly Unsustainable
201-300	Very Poor	0	0	Unsustainable
>301	Very Bad	0	0	Highly Unsustainable

CONCLUSION

The current research might aid in groundwater resource assessment management, as well as provide social, economic, and environmental advantages to assist governance and policy. This research suggests that the use of more participation parameters will not essentially lead to improvements of predicted results, but type of input parameters is more important than its number. Good correlations established between physicochemical parameters using regression model which could be used to predict the level of contamination of PIPAR City region water by different parameters. Such analysis is also economic valuable and time saving because statistical equations is being used to measure the extent of pollution hence some anticipatory action can take before the detailed study and controlled the pollution to an assured extent. This statistical process would be very helpful in case of the obligation of large data set and predominantly in case of emergency when instantaneous mitigation channels required to sustain the water quality standard. The findings revealed that the ground water in the research region scored well on the IWQI, with the majority of samples (83 percent) falling into the somewhat untenable for irrigation category. This research can provide the necessary knowledge for the authority to undertake long-term groundwater management and pollution prevention strategies. Because of the low quality of irrigation groundwater, crop selection is limited, and only rebellious crops can thrive. As a result, improved watering techniques and the development of resistant crop types that can thrive without yield slaughter are both strongly desired.

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