4. RESULTS AND DISCUSSION

To discuss the monitoring of well water quality the area involved in this study was divided into different regions according to the local division .

The discussion would be focused on (I) monitoring of well water quality in different regions and studying factors that affect this quality, (II) comparing results of well water quality in the studied regions with the critical evaluation of water salinity in an attempt to draw cropping map in south of Sinai for the possible best utilization of the studied wells.

4.1. Monitoring of well water quality in the studied area:

4.1.1. El- Wady region:

This region has a number of wells, covering a large area, some of these wells having high salinity hazard and the others were of relatively low as mentioned below :

4.1.1.1. Salinity hazard:

Data presented in Tables (4-11) and illustrated by Fig. (3) show the monitoring of water analysis in different wells through year months. The obtained data indicated that the wells No. 1,2,3,4 and 6 had relatively low EC values in all year months, ranging between 1.06 and 2.91 dSm^{-1} Well No. 2 showed the lowest values of EC among these wells where they ranged between 1.61 and 2.48 dSm^{-1}.

Salinity in the abovementioned wells appeared to be stable during the year months, as a result of the stability of water discharge.

From the inspection of the tables and graph, it could be stated that the low values of salinity in these wells could be considerably attributed to the distance from the Suez Gulf and consequently the compensation of well water by the intrusion of the sea water was not taken place. Therefore, the climatic factors had the major effect on the changes occurred in salinity working on similar areas (Eriksson, 1959; Loewengart, 1961; Ephraums and Jenkins, 1990 and Wood and Sanford, 1995). In other words the well water deficit was not compensated by the seepage from the sea water.

In this respect the soil topography appeared to be the main factor responsible for low salinity. That is to say that the above wells occupy the top areas of this region having higher levels above that of sea water.

On the other hand, wells No. 5,7 and 8 had relatively the highest EC values during the year months, ranged between 3.81 and 7.60 dSm^{-1}. In well No. 7 summer months in particular June month recorded the highest EC values. So, the water discharge, as well as the compensation from the sea may play an important role in raising salinity, especially this well is the nearest one to the sea (3 Km) as compared with other wells in this region.

Generally, increasing temperature in the summer season increased the crop water requirements which increased water discharge and water salinity according to the findings obtained by

Boekelman, (1979) Yang (1989) Wang (1992), and Rogers and Dreiss (1995).

Considering the magnitude of salinity hazard according to the international guides, the data indicated that wells No. 1, 2, 3, 4 and 6 having C_3-C_4 according to USSL classification, Richard's (1954), C_2 according to both RUSSL and the Indian classification Gupta, (1979), and moderate salinity problem expected according to FAO classification Ayers and Westcot, (1985).

On the other side, the wells No 5,7 and 8 having C_5 according to USSL classification' Richard's (1954), C_3 according to RUSSL classification C_4 according to Indian classification Gupta (1979) and severe salinity problems are expected according to FAO classification, Ayers and Westcot, (1985).

Accordingly, the cropping pattern of this region must include two groups of plants, the first group represents the crops with relatively good salt tolerance that must be exploited in areas irrigated by the wells No. 1, 2, 3, 4 and 6, the second group represents the very salt tolerant crops which must be exploited in the areas irrigated by the wells No. 5,7 and 8 (Ayers and Westcot 1976 and Mass and Hoffman 1977).

4.1.1.2. Sodicity hazard:

Data presented in Tables (4-11) which are illustrated by Fig. (4) showed that the values of the adj-SAR were relatively low in the wells No. 1,2,3,4 and 6 ranging between 4.35 to 13.40. Generally the adj-SAR trend corresponded with that of the EC in

most wells, indicating that Na^+ represents the major soluble constituents. Thus, the contribution of seepage from the Suez Gulf especially at the highest water discharge may be confirmed by the EC and adj-SAR correspondence. In addition, the climatic changes as well as, the well water depths should be considered in the interpretation of the changes of well water sodicity.

Concerning the sodicity hazard in the abovementioned wells, it could be concluded that the changes in the adj. SAR were relatively limited during most year months especially in wells No. 2,3 and 6. This may be attributed to the plant cover stability in the areas irrigated with these wells.

On the other hand, wells No 1 and 4 showed some changes in their adj. SAR during the year months, well No., 1 recorded the relatively high adj SAR values during the months of February, March, April and August, but in the other months, the adj.-SAR were relatively low.

Well No. 4 had the relatively higher values of the adj SAR through months of January, February, March, April, May, June, July and August. Other months recorded the relatively low values. This may be due to the rainfall. Similar results were obtained under similar conditions by (Person and Fisher, 1971; Wiman and Agren, 1985; Brown and Sharp 1992 and Wood and Sanford, 1995).

Considering the values of the adj-SAR in wells No. 5, 7 and 8, this group of wells had the highest values of adj SAR ranged

between 14.84 and 37.61, 23.10 to 28.60 and 18.65 to 27.0 in wells No. 5, 7 and 8, respectively. Summer months recorded the relatively high values of adj-SAR. This trend is attributed to the climatic effect with increasing temperature followed by increasing crop water requirements and consequently increased water discharge. Thus, the climatic factors had an important role affecting the changes in sodicity monitoring.

Concerning the magnitude of sodicity hazard in the studied wells according to the international guides of water quality, it could be stated that the well No. 1, 2, 3, 4 and 6 had S1 according to USSL classification, Richard's (1954) and A1-A2 class according to the Indian classification, Gupta (1979). Thus, the sodicity problem is not expected in soil irrigated with this group of wells (Ayers and Westcot, 1985).

On the other hand wells No. 5, 7 and 8 had sodicity grades described as S2 according to USSL classification, Richard's (1954) and A3 according to the Indian classification, Gupta (1979). Therefore, the utilization of these wells water for irrigation should cause sodicity problems in the soils irrigated from these wells. So, the proper soil management practices should be consider to avoid the hazardous effect of sodium.

4.1.1.3. Water trace elements and boron (Tables 4-11):

Data of trace elements concentration (Table 4-11) showed that, all the studied wells in this region recorded undetectable concentration for Fe, Mn and Zn during months of January and February. In July and August small concentration from these elements was recorded. All wells contain small concentration of both boron and copper.

Generally, Cu showed the relatively high values followed by boron.

To evaluate the quality of wells water against its boron content, the data indicated that, all wells contain safe concentration of this element and consequently not plant injury is expected.

Table (4): Water analysis and quality classification of well no. (1) in El-Wady region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gupta)	FAO				
																					EC	INF.*	Toxicity Na^{+}	Toxicity Cl	Toxicity B
Jan.	7.20	2.30	9.23	3.20	10.10	0.42	-	2.05	10.20	10.70	0.22	-	-	-	0.062	4.05	8.50	$C4S_1$	C_2	$C_2A_1B_1$	Mod	Non.	Sev.	Sev.	Non.
Feb.	7.10	2.82	10.34	4.00	13.50	0.31	-	2.10	14.80	11.25	0.33	-	-	-	0.098	5.05	11.10	$C4S_1$	C_2	$C_2A_2B_1$	Mod	Non.	Sev.	Sev.	Non.
Mar.	7.20	2.86	11.16	3.55	13.85	0.45	-	2.35	14.70	11.96	-	-	-	-	-	5.18	11.42	$C4S_1$	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
Apr.	7.40	2.90	11.00	3.10	14.20	.60	-	2.60	14.60	11.70	-	-	-	-	-	5.34	11.74	$C4S_1$	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
May	7.20	2.32	9.25	2.65	11.20	.42	-	2.10	12.0	9.24	-	-	-	-	-	4.53	9.50	$C4S_1$	C_2	C_2A_1	Mod	Non.	Sev.	Sev.	
June	6.95	1.74	7.50	2.20	8.20	0.25	-	1.60	9.40	7.15	-	-	-	-	-	3.72	7.25	C_3S_1	C_2	$C2A_1$	Mod	Non.	Mod	Mod	
July	7.60	1.06	2.5	1.40	6.30	0.15	-	2.09	5.20	3.06	0.37	0.003	-	0.054	0.071	2.56	4.35	C_3S_1	C_2	C_1A_{1B1}	Mod	Non.	Mod	Mod	Non.
Aug.	7.20	2.77	10.50	4.10	13.20	0.15	-	2.10	14.60	11.25	0.33	0.066	0.030	0.048	0.108	4.90	10.80	C_4S_1	C_2	C_2A_{2B1}	Mod	Non.	Sev.	Sev.	Non
Sep.	6.90	2.65	9.22	4.30	12.40	0.45	-	1.85	16.10	8.42	-	-	-	-	-	4.76	9.99	C_4S_1	C_2	C_2A_1	Mod	Non.	Sev.	Sev.	
Oct.	7.0	2.60	9.29	4.10	12.20	0.33	-	1.75	14.42	9.75	-	-	-	-	-	4.70	9.90	C_3S_1	C_2	$C2A_1$	Mod	Non.	Sev.	Sev.	
Nov.	7.10	1.95	8.12	3.20	7.85	0.26	-	1.91	8.75	8.77	-	-	-	-	-	3.34	6.80	C_3S_1	C_2	C_2A_1	Mod	Non.	Mod	Mod	
Dec.	7.18	1.83	7.73	2.10	8.10	0.33	-	2.03	8.80	7.43	-	-	-	-	-	3.77	7.58	C_3S_1	C_2	C_2A_1	Mod	Non.	Mod	Mod	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

* INF. : Infiltration rate
These values represent the average of two years of the study.

Table (5): Water analysis and quality classification of well no. (2) in El-Wady region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	CT	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gupta)	FAO				
																					EC	INF.*	Toxicity Na^{+}	Toxicity CT	Toxicity B
Jan.	7.20	1.61	5.64	2.40	7.70	0.28	-	1.82	6.60	7.60	0.32	-	-	-	0.046	3.85	7.50	C_3S_1	C_2	$C_2A_1B_1$	Mod	Non.	Mod	Mod	Non.
Feb.	7.10	1.75	6.30	2.90	7.90	0.35	-	1.25	10.90	5.30	0.27	-	-	-	0.062	3.70	6.47	C_3S_1	C_2	$C_2A_1B_1$	Mod	Non.	Mod	Sev.	Non.
Mar.	7.20	1.75	7.15	2.30	7.75	0.30	-	1.22	10.0	6.28	-	-	-	-	-	3.57	6.68	C_3S_1	C_2	C_2A_1	Mod	Non.	Mod	Mod	
Apr.	7.30	1.76	8.0	1.70	7.60	0.25	-	1.20	9.10	7.25	-	-	-	-	-	3.45	6.90	C_3S_1	C_2	$C2A_1$	Mod	Non.	Mod	Mod	
May	7.25	1.73	7.30	1.90	7.80	0.27	-	1.25	8.85	7.17	-	-	-	-	-	3.64	6.90	C_3S_1	C_2	C_2A_1	Mod	Non.	Mod	Mod	
June	7.20	1.70	6.60	2.10	8.00	0.30	-	1.30	8.60	7.10	-	-	-	-	-	3.84	6.91	C_3S_1	C_2	C_2A_1	Mod	Non.	Mod	Mod	
July	7.40	1.62	6.0	2.20	7.50	0.22	-	2.32	8.30	5.30	1.824	0.043	0.014	0.028	0.096	3.71	7.60	C_3S_1	C_2	C_2A_{1B1}	Mod	Non.	Mod	Mod	Non
Aug.	7.20	1.62	6.0	2.70	7.15	0.20	-	1.86	9.50	4.69	0.24	-	0.024	0.04	0.068	3.40	6.60	C_3S_1	C_2	C_2A_{1B1}	Mod	Non.	Mod	Mod	Non
Sep.	7.10	1.75	6.47	2.60	8.0	0.36	-	1.33	10.50	5.60	-	-	-	-	-	3.75	6.93	C_3S_1	C_2	C_2A_1	Mod	Non.	Mod	Sev	
Oct.	7.20	1.69	7.19	2.50	6.90	0.23	-	1.82	7.60	7.40	-	-	-	-	-	3.60	7.38	C_3S_1	C_2	C_2A_1	Mod	Non.	Mod	Mod	
Nov.	7.15	1.82	6.85	2.50	8.62	0.23	-	1.81	8.90	7.49	-	-	-	-	-	3.98	7.76	C_3S_1	C_2	C_2A_1	Mod	Non.	Mod	Mod	
Dec.	7.25	2.48	9.65	3.10	11.75	0.33	-	1.83	15.95	7.05	-	-	-	-	-	4.66	9.08	C_4S_1	C_2	C_2A_1	Mod	Non.	Sev	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

* INF. : Infiltration rate
These values represent the average of two years of the study.

Table (6): Water analysis and quality classification of well no. (3) in El-Wady region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality						
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gupta)	FAO				
																					EC	INF.*	Toxicity Na^{+}	Toxicity Cl	Toxicity B
Jan.	7.10	2.25	8.94	2.60	10.50	0.36	-	1.32	14.35	6.73	1.078	-	0.004	-	0.011	4.37	8.30	C_3S_1	C_2	$C_2A1\ B_1$	Mod	Non.	Sev.	Sev.	
Feb.	7.20	2.60	10.40	3.20	12.10	0.22	-	2.10	16.60	7.22	0.43	-	-	-	0.006	4.65	9.76	C_4S_1	C_2	$C_2A_1\ B_1$	Mod	Non.	Sev.	Sev.	
Mar.	7.15	2.56	10.65	3.05	11.75	0.18	-	1.75	15.30	8.58	-	-	-	-	-	4.50	9.22	C_4S1	C_2	C_2A_1	Mod	Non.	Sev.	Sev.	
Apr.	7.10	2.52	10.90	2.90	11.40	0.15	-	1.40	14.00	9.95	-	-	-	-	-	4.34	8.68	C_4S_1	C_2	C_2A_1	Mod	Non.	Sev.	Sev.	
May	7.05	2.45	10.70	2.80	11.20	0.17	-	1.75	12.20	10.92	-	-	-	-	-	4.31	8.83	C_4S_1	C_2	C_2A_1	Mod	Non.	Sev.	Sev.	
June	7.00	2.39	10.50	2.70	11.0	0.20	-	2.10	10.40	11.90	-	-	-	-	-	4.28	8.98	C_4S_1	C_2	C_2A_1	Mod	Non.	Sev.	Sev.	
July	7.00	2.39	10.0	3.10	10.60	0.22	-	2.32	13.50	8.10	1.66	0.135	0.054	0.632	0.222	4.15	8.80	C_4S_1	C_2	C_2A_{1B1}	Mod	Non.	Sev.	Sev.	Non.
Aug.	7.20	2.44	9.50	3.20	11.40	0.25	-	1.86	11.90	10.59	0.1	0.42	0.026	0.082	0.067	4.52	9.26	C_4S_1	C_2	C_2A_{1B1}	Mod	Non.	Sev.	Sev.	Non.
Sep.	7.00	2.50	9.68	2.90	12.00	0.32	-	1.35	16.10	7.45	-	-	-	-	-	4.80	9.36	C_4S_1	C_2	$C_2\ A_1$	Mod	Non.	Sev.	Sev.	
Oct.	7.10	2.48	9.06	3.55	11.90	0.23	-	1.70	15.68	7.36	-	-	-	-	-	4.74	9.71	C_4S_1	C_2	C_2A_1	Mod	Non.	Sev.	Sev.	
Nov.	7.15	2.01	7.49	2.85	9.45	0.28	-	1.52	12.70	5.85	-	-	-	-	-	4.15	7.88	$C3S_1$	C_2	C_2A_1	Mod	Non.	Mod	Sev.	
Dec.	7.06	1.88	6.53	2.95	8.80	0.51	-	1.57	10.97	6.25	-	-	-	-	-	4.04	7.87	$C_3\ S_1$	C_2	C_2A_1	Mod	Non.	Mod	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

* INF. : Infiltration rate
These values represent the average of two years of the study.

Table (7): Water analysis and quality classification of well no. (4) in El-Wady region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gupta)	FAO				
																					EC	INF.	Toxicity Na^{+}	Toxicity Cl	Toxicity B
Jan.	7.50	2.65	10.4	2.40	13.40	0.29	-	2.20	13.60	10.69	1.078	-	0.004	-	0.011	5..36	11.50	C_4S_1	C_2	C_2A2B_1	Mod	Non.	Sev.	Sev.	Non.
Feb.	7.20	2.71	10.30	2.20	13.70	0.83	-	1.20	11.0	14.83	0.430	-	-	-	0.006	5.48	10.41	C_4S_1	C_2	$C_2A_2B_1$	Mod	Non.	Sev.	Sev.	Non.
Mar.	7.30	2.81	10.40	2.35	14.85	0.56	-	1.55	12.35	14.26	-	-	-	-	-	5.87	11.80	C_4S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
Apr.	7.50	2.91	10.50	2.50	16.0	0.30	-	2.10	13.70	13.50	-	-	-	-	-	6.27	13.20	C_4S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
May	7.50	2.86	10.50	2.80	15.15	0.30	-	2.10	14.65	12.0	-	-	-	-	-	5.88	12.37	C_4S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
June	7.50	2.82	10.50	3.10	14.30	0.30	-	2.10	15.60	10.50	-	-	-	-	-	5.50	11.55	C_4S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
July	7.20	2.60	9.50	3.10	13.50	0.25	-	2.55	14.0	9.80	1.66	0.135	0.054	0.632	0.222	5.40	11.90	C_4S_1	C_2	$C_2A_2B_1$	Mod	Non.	Sev.	Sev.	Non
Aug.	7.30	2.60	10.0	2.10	13.60	0.27	-	2.10	13.0	10.87	0.100	0.042	0.026	0.082	0.067	5.55	11.70	C_4S_1	C_2	C_2A_{2B1}	Mod	Non.	Sev.	Sev.	Non
Sep.	7.40	2.40	9.10	2.95	11.20	0.35	-	1.60	11.40	10.60	-	-	-	-	-	4.57	9.14	C_4S_1	C_2	C_2A_1	Mod	Non.	Sev.	Sev.	
Oct.	7.30	2.30	8.40	3.50	10.60	0.40	-	1.48	10.40	11.02	-	-	-	-	-	4.36	8.72	C_4S_1	C_2	C_2A_1	Mod	Non.	Sev.	Sev.	
Nov.	7.15	2.16	8.15	3.60	9.30	0.32	-	1.91	11.45	8.01	-	-	-	-	-	3.89	7.83	C_3S_1	C_2	C_2A_1	Mod	Non.	Sev.	Sev.	
Dec.	7.31	2.44	9.70	2.95	11.25	0.32	-	1.33	11.62	11.24	-	-	-	-	-	4.49	8.73	C_4S_1	C_2	C_2A_1	Mod	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

• INF. : Infiltration rate
These values represent the average of two years of the study.

Table (8): Water analysis and quality classification of well no. (5) in El-Wady region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl^{-}	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gupta)	FAO				
																					EC	INF. •	Toxicity Na^{+}	Toxicity Cl	Toxicity B
Jan.	7.50	5.60	13.70	8.30	33.30	0.58	-	2.10	30.20	23.58	0.32	-	-	-	0.022	10.10	22.70	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Feb.	7.40	5.80	12.50	10.05	34.50	0.55	-	2.30	27.30	28.00	0.28	-	-	-	0.012	10.30	23.70	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Mar.	7.40	5.75	12.35	10.15	34.90	0.67	-	2.20	27.10	28.77	-	-	-	-	-	10.42	23.70	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
Apr.	7.40	5.70	12.20	10.25	35.30	0.80	-	2.10	26.90	29.55	-	-	-	-	-	10.53	23.69	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
May	7.45	6.68	13.25	9.22	47.70	0.87	-	1.75	42.10	27.19	-	-	-	-	-	14.22	30.65	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
June	7.50	7.66	14.30	8.20	60.10	0.95	-	1.40	57.30	24.85	-	-	-	-	-	17.91	37.61	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
July	7.20	5.43	13.00	10.30	34.00	0.56	-	2.32	32.20	23.34	0.21	0.023	-	-	0.032	9.97	22.93	C_5S_1	C_3	C_4A_{3B1}	Sev.	Non.	Sev.	Sev.	Non.
Aug.	7.20	5.97	13.50	11.80	38.70	0.77	-	2.10	36.90	25.77	0.063	0.059	0.030	0.033	0.068	10.90	24.52	C_5S_2	C_3	C_4A_{3B1}	Sev.	Non.	Sev.	Sev.	Non
Sep.	7.30	5.70	13.80	8.75	35.20	0.65	-	2.00	33.00	25.35	-	-	-	-	-	10.40	22.88	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
Oct.	7.40	5.60	15.50	7.90	31.80	0.57	-	1.80	29.20	24.77	-	-	-	-	-	9.30	20.0	C_5S_1	C_3	C_4A_2	Sev.	Non.	Sev.	Sev.	
Nov.	7.10	4.46	12.72	5.90	25.15	0.70	-	2.11	25.70	16.66	-	-	-	-	-	8.27	18.44	C_5S_1	C_3	C_3A_2	Sev.	Non.	Sev.	Sev.	
Dec.	7.11	3.81	11.77	4.65	21.30	0.46	-	1.57	21.50	15.11	-	-	-	-	-	7.09	14.84	C_5S_1	C_3	C_3A_2	Sev.	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

• INF. : Infiltration rate
These values represent the average of two years of the study.

Table (9): Water analysis and quality classification of well no. (6) in El-Wady region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
																					FAO				
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gupta)	EC	INF.	Toxicity Na^{+}	Toxicity Cl	Toxicity B
Jan.	7.45	2.01	8.19	2.09	10.00	0.20	-	2.30	10.90	7.28	0.12	-	-	-	-	4.41	8.82	C_3S_1	C_2	$C_2A1\ B_1$	Mod	Non.	Sev.	Sev.	Non.
Feb.	7.30	2.33	8.30	2.70	11.60	0.37	-	1.60	11.10	10.27	0.16	-	-	-	0.007	4.94	11.21	$C4S_1$	C_2	$C_2A_2\ B_1$	Mod	Non.	Sev.	Sev.	Non.
Mar.	7.25	2.36	9.50	2.40	11.30	0.31	-	1.85	11.00	10.66	-	-	-	-	-	4.64	9.95	C_4S_1	C_2	$C_2\ A_1$	Mod	Non.	Sev.	Sev.	
Apr.	7.40	2.40	10.70	2.10	11.00	0.25	-	2.10	10.90	11.05	-	-	-	-	-	4.35	8.70	C_4S_1	C_2	C_2A_1	Mod	Non.	Sev.	Sev.	
May	7.20	2.36	9.70	2.35	11.20	0.37	-	2.21	11.70	9.71	-	-	-	-	-	4.60	9.43	C_4S_1	C_2	C_2A_1	Mod	Non.	Sev.	Sev.	
June	6.80	2.33	8.70	2.60	11.50	0.50	-	2.32	12.50	8.48	-	-	-	-	-	4.84	10.16	C_4S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
July	7.50	2.36	6.00	3.70	14.40	0.25	-	2.32	10.90	11.13	0.14	0.048	0.022	0.046	.106	6.54	13.40	C_4S_1	C_2	$C_2\ A_{2B1}$	Mod	Non.	Sev.	Sev.	Non
Aug.	7.40	2.39	9.50	3.10	11.70	0.25	-	2.10	13.50	8.95	0.124	0.023	0.030	0.076	0.081	4.68	9.83	C_4S_1	C_2	$C_2A_1\ B_1$	Mod	Non.	Sev.	Sev.	Non
Sep.	7.50	2.12	8.10	2.18	10.68	0.23	-	2.10	11.90	7.19	-	-	-	-	-	4.7	11.28	C_3S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
Oct.	7.40	2.0	8.20	2.04	9.55	0.21	-	2.30	10.80	6.90	-	-	-	-	-	4.22	8.02	C_3S_1	C_2	$C_2\ A_1$	Mod	Non.	Sev.	Sev.	
Nov.	7.30	2.03	8.45	2.00	9.37	0.46	-	2.26	11.15	6.87	-	-	-	-	–	4.10	8.40	C_3S_1	C_2	C_2A_1	Mod	Non.	Sev.	Sev.	
Dec.	7.15	2.02	8.20	1.75	9.81	0.37	-	2.15	12.13	5.68	-	-	-	-	-	4.39	8.67	C_3S_1	C_2	C_2A_1	Mod	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

• INF. : Infiltration rate
These values represent the average of two years of the study.

Table (10): Water analysis and quality classification of well no. (7) in El-Wady region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
																					FAO				
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gupta)	EC	INF.	Toxicity		
																							Na^{+}	Cl	B
Jan.	7.20	6.60	19.90	9.90	41.00	0.70	-	2.28	39.10	30.12	0.18	-	-	-	0.043	10.62	26.00	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Feb.	7.30	6.80	20.90	9.60	42.70	0.95	-	1.93	40.40	31.82	0.23	-	-	-	0.052	10.94	26.20	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Mar.	7.20	6.87	21.05	10.70	43.15	1.27	-	1.76	39.75	34.66	-	-	-	-	-	10.83	25.38	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
Apr.	7.10	6.94	21.20	11.80	43.60	1.60	-	1.60	39.10	37.60	-	-	-	-	-	10.73	24.57	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
May	7.05	7.27	21.10	11.15	45.40	1.20	-	1.85	40.85	36.15	-	-	-	-	-	11.32	26.58	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
June	6.95	7.60	21.00	10.50	47.20	0.80	-	2.10	42.60	34.80	-	-	-	-	-	11.91	28.60	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
July	7.00	7.27	17.00	16.50	44.30	0.95	-	2.09	41.00	35.66	0.23	-	0.018	0.043	0.056	10.83	25.90	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	Non.
Aug.	7.40	7.38	20.0	12.00	45.60	0.95	-	2.10	43.70	32.75	0.12	0.033	0.032	0.017	0.064	11.40	27.40	C_5S_2	C_3	C_4A_{3B1}	Sev.	Non.	Sev.	Sev.	Non
Sep.	6.95	6.92	20.7	11.00	41.90	0.95	-	2.05	40.20	32.3	-	-	-	-	-	10.52	25.25	C_5S_2	C_3	C_4A_{3B1}	Sev.	Non.	Sev.	Sev.	
Oct.	7.10	6.55	20.00	10.90	39.90	1.20	-	2.18	38.70	31.12	-	-	-	-	-	10.15	24.56	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
Nov.	7.00	6.16	18.35	11.00	37.10	1.20	-	2.27	39.50	25.88	-	-	-	-	-	9.69	23.72	C_5S_1	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
Dec.	7.10	6.42	21.40	9.65	38.30	0.98	-	1.83	40.60	27.90	-	-	-	-	-	9.72	23.10	C_5S_1	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

• INF. : Infiltration rate
These values represent the average of two years of the study.

Table (11): Water analysis and quality classification of well no. (8) in El-Wady region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
																					FAO				
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl^{-}	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gupta)	EC	INF.*	Toxicity Na^{+}	Toxicity Cl^{-}	Toxicity B
Jan.	7.10	4.79	12.55	6.62	28.00	0.60		1.90	28.0	17.87	0.14	-	-	-	-	9.03	20.80	C_5S_1	C_3	$C_3A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Feb.	7.00	5.60	16.50	6.50	39.00	1.10		2.80	40.0	20.30	1.67	-	-	-	0.023	11.50	27.00	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Mar.	7.00	5.43	15.75	7.45	36.75	0.95		2.45	34.65	23.80	-	-	-	-	-	10.80	24.85	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
Apr.	6.80	5.27	15.0	8.4	34.50	0.80		2.10	29.30	27.30	-	-	-	-	-	10.10	22.70	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
May	7.00	5.24	14.75	8.20	34.00	1.00		2.21	29.70	26.04	-	-	-	-	-	10.0	22.75	C_5S_1	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
June	6.91	5.21	14.50	8.0	33.50	1.20		2.32	30.10	24.78	-	-	-	-	-	9.92	22.81	C_5S_1	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
July	7.20	5.43	12.50	10.30	35.20	0.70		1.62	35.00	22.08	0.27	0.01	0.026	0.056	0.122	10.40	21.80	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non
Aug.	7.10	5.43	14.70	9.10	35.20	0.70		2.10	31.20	26.40	0.12	-	0.024	0.027	0.051	10.20	22.40	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non
Sep.	6.90	5.30	16.00	9.20	32.00	0.90		2.10	30.0	26.00	-	-	-	-	-	9.01	20.72	C_5S_1	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
Oct.	7.10	4.90	16.50	9.80	26.00	0.70		1.78	28.00	23.22	-	-	-	-	-	9.88	22.23	C_5S_1	C_3	C_3A_3	Sev.	Non.	Sev.	Sev.	
Nov.	7.10	4.50	12.90	5.50	26.25	0.82		1.97	26.10	17.40	-	-	-	-	-	8.66	19.05	C_5S_1	C_3	C_3A_2	Sev.	Non.	Sev.	Sev.	
Dec.	6.89	4.35	11.55	6.10	25.20	0.88		1.70	28.55	13.48	-	-	-	-	-	8.48	18.65	C_5S_1	C_3	C_3A_2	Sev.	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

* INF. : Infiltration rate
These values represent the average of two years of the study.

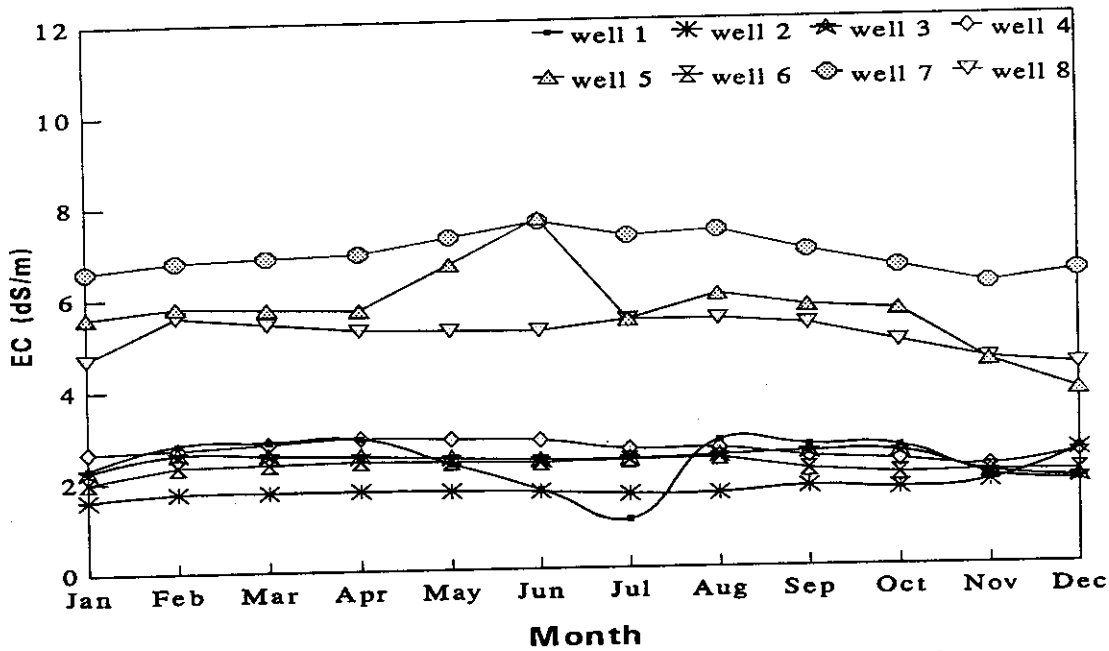


Fig. (3): Water wells salinity of EL-Wady region.

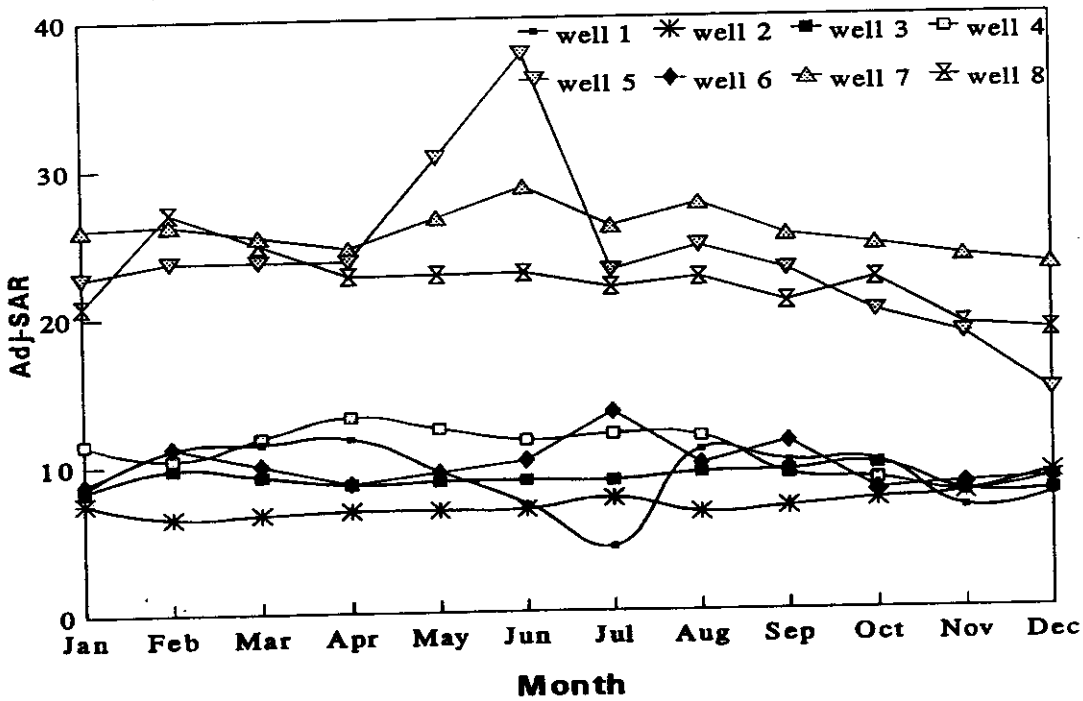


Fig. (4): Adj-SAR of Water wells of EL-Wady region.

4.1.2. Mesaad Region:

4.1.2.1. Salinity hazard:

Data in Tables (12,13 and 14) which are illustrated by Fig. (5) showed that the values of EC ranged between 4.47 and 13.25 dSm^{-1} in different three wells represente this region.

Well No. (10) had the highest salinity levels in all year months as compared with the others, the average was 6.49 dSm^{-1} during December and 13.25 dSm^{-1} in April. It was noticed that the agriculture practices had an important effect on the well water quality through the period of this study. The discharge of well water was high during April which consequently increased the EC for the highest value (13.25 dSm^{-1}), but during the months of January, July and August, the discharge appeared to be low due to the less water requirements for the crops that are prevailing in this region, which consequently recorded the relatively low EC values of well water. Thus the discharge of well water had an important role for the well water salinity monitoring as the smilar results by (Boekelman, 1979; Teller et al., 1982; Yang 1989; Mingchuan 1991; Wang 1992 and Rogers and Dreiss, 1995). Well No. (11) had relatively the lower values of EC during the year, ranging between 4.47 dSm^{-1} during December and 5.80 dSm^{-1} during February with an average of 5.13 dSm^{-1}. Considering the data of EC values of this well, it could be stated that the well water discharge appeared to be constant through the all year months. This well water had the lowest EC values which may be attributed to the long distance from the Suez Gulf. However, the well No. (9) had an intermediate values between the two above wells, its EC values ranged between

6.48 dSm^{-1} during December and 8.333 dSm^{-1} during February months with a average of 7.4 dSm^{-1}. Also, it is important to note that the well water discharge was almost constant during the year months, since the irrigated area around the will is cultivated with vegetables.

Therefore, the well water in Mesaad region could be classified into three grades; the first is relatively high in salinity level in all year months, this grade was represented by the well No. (10), the second grade was represented by the well No. (9), which had relatively an intermediate salinity level in this area and the third grade is represented by the well No (11) which had the relatively lowest EC values.

Changes in salinity levels in the three wells of this region could be attributed to their distance from the Suez Gulf.

Accordingly, the agriculture management of Mesaad region should be arranged into three complementary patterns of agriculture depending on the grade of salinity, i.e., the cropping pattern should be selected for the possible utilization of a particular salinity (Ayers and Westcot, 1976 and Mass and Hoffman, 1977).

Considering the magnitude of salinity hazard of well water in Mesaad region, the data stated that the months of February, March, April, June, September and October had relatively the higher EC values, but the months of January, July, August, November and December, showed the relatively lower EC values. This could be attributed to the factors of water discharge and climatic effect; i.e., high temperature and consequently high evaporation during the

summer months should contribute to increase the salinity level, but during the winter season, the low temperature, as well as, rainfall should be taken into consideration for lower salinity (Eriksson, 1959; Loewengart, 1961; Davis and Wiest, 1966; Poatil 1989 and Wood and Sanford 1995).

In addition, the water requirements for the agriculture practices increased during the summer months, which increased the discharge of well water and consequently increased water salinity, but through the winter season, the discharge of well water was relatively low.

It has to be noticed that, the ions of Na^{+} and Cl^{-} are the most prevailing ions in the water constituents followed by the SO_4^{--}, Ca^{++} and Mg^{++}. This may be attributed to the water seepage from the Suez Gulf. Similar results were reported by (Revelle, 1941; Eriksson, 1959; Lowengart, 1961; Person and Fisher 1971; Wiman et al., 1990; Dam 1992; Essink Oude, 1993 and Wood and Sanford 1995).

Generally, well water in Mesaad region has the highest salinity hazard since its salinity (EC) was classified as C5 in USSL (Richard's 1954) and Indian classification (Gupta, 1979); C3 in RUSSL and a severe salinity problem is expected with using it as reported by FAO (Ayers and Westcot, 1985).

4.1.2.2. Sodicity hazard:

Considering the data of well water sodicity hazard; Tables (12, 13 and 14) and Fig. (6), it could be stated that the values of the adj-SAR showed a patterns of general change through the different

year months. From inspection of the data and Fig., it could be noticed that, well No (10) had the highest values of the adj SAR during February, March, April, May, June, September and October. It had; 42.54, 47.24, 52.0, 46.82 and 40.29, respectively. The highest values were recorded through March, April and May, but the relatively lowest ones were recorded during January, July, August, November and December. This increase of sodicity hazard was associated with the increase in salinity due to the high water requirement and increased the water discharge.

On the other hand, decreasing of the sodicity hazard in July and August months is due to the agricultural practices, which do not require water, since these two months are very high temperature and no agricultural activities were done. These findings agreed with the findings of Boekelman (1979), Yang (1989), Wang (1992) and Rogers and Dreiss (1995).

In months of November and December, low temperature, as well as, rainfall reduced the values of the sodicity hazard. Similar results were reported by, Eriksson (1959), Loewengart (1961), Ephroums and Jenkins (1990) and Wood and Sanford (1995).

Well No. (11), had relatively the lowest values of the adj-SAR among the wells in this region, the adj-SAR increased to be almost 23 during January, June and July months but in months of October, November, and December, it had adj-SAR values; 19.70, 15.57 and 14.06 respectively. These changes of the sodicity hazard associated with the salinity changes could be refereed to the climatic conditions, which increased sodicity through summer months and decreased during winter months (Person and Fisher,

1971; Wiman and Agren, 1985; Brown and Sharp, 1992 and Wood and Sanford, 1995).

Well No. (9), had an approximately the intermediate values of adj-SAR between the above two wells. This may be due to its location from the Suez Gulf.

Generally, well water in Mesaad region had hazard sodicity effect according to the international guides of water quality. It was classified as very high sodium (S2) according to Richard's (1954), high sodium (A3) as guides of Gupta (1979) and severe problem toxicity of Na is expected (Ayers and Westcot 1985).

4.1.2.3. Water - boron and some trace elements:

As shown in Tables (12, 13 and 14) the analysis of well water boron generally showed safe concentration of this element in most year months, which had concentration ranged between 0.13 to 0.59 mg/L.

Also, the analysis of the trace elements; Fe, Mn, Zn and Cu showed undetectable concentration in most year months indicating that, water in this region was not polluted.

Table (12): Water analysis and quality classification of well no. (9) in Mesaad region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gopta)	FAO				
																					EC	INF.*	Toxicity Na^{+}	Toxicity Cl	Toxicity B
Jan.	7.20	7.50	25.10	5.90	49.5	0.95	-	1.25	44.8	36.40	0.34	-	-	-	-	12.57	27.65	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Feb.	7.00	8.33	25.70	12.30	55.8	0.80	-	1.70	51.0	41.90	0.32	-	-	0.017	-	12.80	31.36	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non.
Mar.	7.15	8.26	26.25	11.95	53.1	1.00	-	1.45	51.9	38.95	-	-	-	-	-	12.15	28.93	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
Apr.	7.30	8.20	26.80	11.60	50.4	1.20	-	1.20	52.8	36.00	-	-	-	-	-	11.50	26.50	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
May	7.25	7.90	25.90	8.55	50.4	1.00	-	1.18	48.75	35.92	-	-	-	-	-	12.20	27.10	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
June	7.20	7.60	25.00	5.50	50.4	0.80	-	1.16	44.7	35.84	-	-	-	-	-	12.90	27.70	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
July	7.40	7.06	19.00	11.50	45.5	0.81	-	1.16	42.1	33.55	1.08	0.015	0.029	0.08	0.082	11.66	26.20	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	Mod.
Aug.	7.00	7.27	21.50	10.00	48.3	0.81	-	1.16	44.2	35.25	0.59	-	0.026	0.059	0.033	12.20	27.50	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	Non.
Sep.	7.00	8.31	20.92	12.30	57.1	1.10	-	1.12	56.9	33.40	-	-	-	-	-	14.00	30.80	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
Oct.	7.10	8.12	22.01	11.70	53.2	0.90	-	1.21	51.2	35.40	-	-	-	-	-	12.97	28.53	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
Nov.	7.10	6.75	24.86	8.30	39.55	1.11	-	1.59	44.4	27.82	-	-	-	-	-	9.70	22.32	C_5S_1	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
Dec.	7.10	6.48	24.80	7.95	36.75	1.03	-	1.60	42.0	26.93	-	-	-	-	-	9.16	21.29	C_5S_1	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

* INF. : Infiltration rate
These values represent the average of two years of the study.

Table (13): Water analysis and quality classification of well no. (10) in Mesaad region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gopta)	FAO				
																					EC	INF.*	Toxicity Na^{+}	Toxicity Cl	Toxicity B
Jan.	7.40	7.60	17.5	12.1	52.80	1.20	-	3.10	48.4	32.1	0.22	-	-	-	0.016	13.70	35.60	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non..
Feb.	7.20	8.83	24.7	13.3	60.80	0.80	-	3.70	55.0	40.9	0.13	-	-	-	0.007	13.95	42.54	C_5S_2	C_3	$C_4A_5B_1$	Sev.	Non.	Sev.	Sev.	Non..
Mar.	7.20	11.04	31.1	16.1	81.95	1.05	-	3.70	74.35	52.15	-	-	-	-	-	16.67	47.27	C_5S_2	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
Apr.	7.20	13.25	37.5	18.9	103.10	1.30	-	3.70	93.7	63.4	-	-	-	-	-	19.40	52.00	C_5S_2	C_3	C_5A_6	Sev.	Non.	Sev.	Sev.	
May	7.25	10.86	28.0	15.0	81.75	1.05	-	3.60	72.8	49.4	-	-	-	-	-	17.65	46.82	C_5S_2	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
June	7.30	8.47	18.5	11.1	60.40	0.80	-	3.50	51.9	35.4	-	-	-	-	-	15.72	41.65	C_5S_2	C_3	C_4A_5	Sev.	Non.	Sev.	Sev.	
July	7.50	7.27	19.0	10.1	49.70	0.68	-	3.48	46.8	29.2	0.24	0.006	0.017	0.059	0.082	13.00	34.50	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non..
Aug.	7.00	7.28	20.0	7.6	51.50	0.72	-	3.48	47.8	28.54	0.54	-	0.030	0.026	0.130	13.90	36.10	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non..
Sep.	7.30	8.60	19.9	11.3	62.80	0.90	-	3.90	57.7	33.30	-	-	-	-	-	15.90	42.90	C_5S_2	C_3	C_4A_5	Sev.	Non.	Sev.	Sev.	
Oct.	7.20	8.20	18.9	9.95	60.20	1.10	-	3.75	58.8	27.60		-	-	-	-	15.80	40.29	C_5S_2	C_3	C_4A_5	Sev.	Non.	Sev.	Sev.	
Nov.	7.15	6.94	17.06	9.75	48.10	1.21	-	3.54	50.0	22.56						13.15	34.01	C_5S_2	C_3	C_4A_5	Sev.	Non.	Sev.	Sev.	
Dec.	6.96	6.49	18.0	8.30	49.85	0.90	-	2.32	45.2	22.53						11.91	28.92	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

* INF. : Infiltration rate
These values represent the average of two years of the study.

Table (14): Water analysis and quality classification of well no. (11) in Mesaad region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl^{-}	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gopta)	FAO				
																					EC	INF.*	Toxicity Na^{+}	Toxicity Cl^{-}	Toxicity B
Jan.	7.3	5.11	15.65	6.91	32.42	0.82	-	2.10	26.90	26.80	0.37	-	-	-	0.017	9.60	23.00	C_5S_1	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Feb.	7.2	5.80	19.67	7.40	33.60	0.54	-	2.20	29.00	30.01	0.32	-	-	-	0.020	9.15	20.58	C_5S_1	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Mar.	7.2	5.75	18.88	8.45	32.50	0.54	-	2.25	28.15	29.67	-	-	-	-		8.85	20.34	C_5S_1	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
Apr.	7.2	5.70	17.50	9.50	31.40	0.55	-	2.30	27.30	29.35	-	-	-	-		8.55	20.10	C_5S_1	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
May	7.3	5.56	18.00	7.35	31.60	0.67	-	2.54	28.20	26.88	-	-	-	-	-	8.87	21.55	C_5S_1	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
June	7.4	5.43	18.50	5.20	31.80	0.80	-	2.79	29.10	31.88	-	-	-	-	-	9.20	23.00	C_5S_1	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
July	7.4	5.43	18.00	6.30	33.80	0.65	-	2.55	30.10	26.10	0.51	0.032	0.021	0.027	0.100	9.70	23.30	C_5S_1	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Aug.	7.1	5.10	16.00	9.20	32.00	0.68	-	2.79	30.70	24.39	0.38	-	0.021	0.078	0.061	9.00	22.10	C_5S_1	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Sep.	7.2	5.77	18.68	8.70	33.10	0.92	-	2.25	29.5	29.65	-	-	-	-	-	8.94	21.00	C_5S_1	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
Oct.	7.2	5.60	19.00	8.55	31.20	0.78	-	2.30	28.7	28.53	-	-	-	-	-	8.40	19.70	C_5S_1	C_3	C_4A_2	Sev.	Non.	Sev.	Sev.	
Nov.	7.15	4.85	18.94	6.60	24.20	0.75	-	2.06	29.1	19.33	-	-	-	-	-	6.77	15.57	C_5S_1	C_3	C_4A_2	Sev.	Non.	Sev.	Sev.	
Dec.	7.12	4.47	17.83	5.95	21.15	0.86	-	2.45	25.1	18.24	-	-	-	-	-	5.82	14.06	C_5S_1	C_3	C_4A_2	Sev.	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

* INF. : Infiltration rate
These values represent the average of two years of the study.

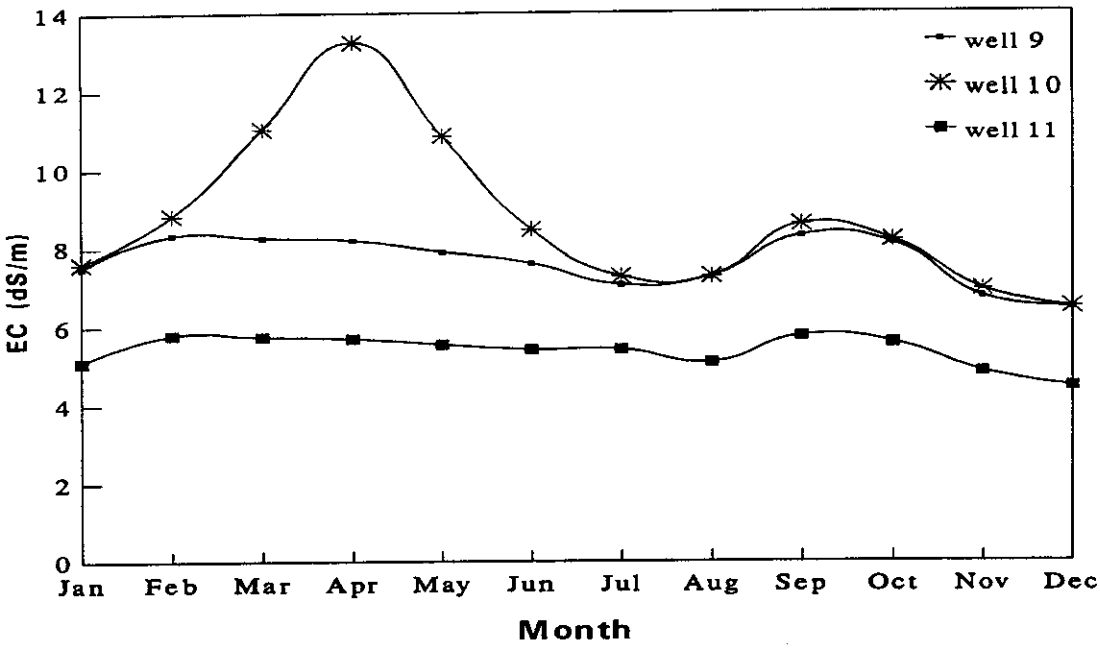


Fig. (5): Water wells salinity of Mesaad region.

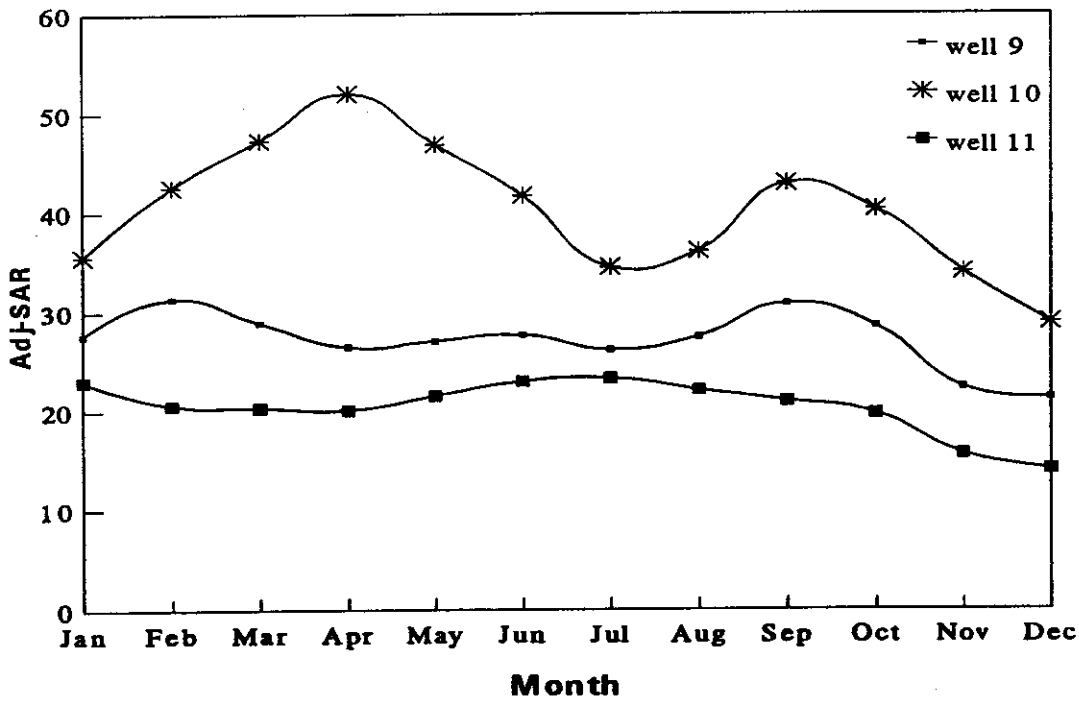


Fig. (6): Adj-SAR of Water wells of Mesaad region.

4-1-3 El-Tor region:

4.1.3.1. Salinity hazard:

As shown in Tables (15, 16 and 17) and Fig. (7), values of EC for the studied wells ranged between 2.04 and 5.43 dSm^{-1} with an average of 3.73 dSm^{-1}.

Well No. (12), which represents the source of irrigation water of the extension field farm had the highest level of salinity in this region in the most year months. Values of EC ranged between 4.33 and 5.43 dSm^{-1} with an average of 4.88 dSm^{-1}. Concerning this well, the irrigation of cultivated plants was the effective cause that affects water quality, since water discharge was high during April, May, June, July and August months as the demand on water was increased for growing olive and figs trees. Values of EC in these months were high and recorded 5.04, 5.83, 5.43 5.43 and 5.43 dSm^{-1} , respectively. However, during the winter months the well water discharge appeared to be low due to low temperature beside the occurrence of rainfall. These findings are in agreement with those of, Boekelman, (1979), Wang, (1992) and Rogers and Dreiss, (1995). In addition, the climatic variations had an effective part to monitoring the well water quality.

Well No. (14), showed the relatively lowest EC values in this region during the year months as compared with well No. 12, where the EC values ranged between 2.04 and 3.53 dSm^{-1} with an average of 2.78 dSm^{-1}. Also, the relatively high values of EC were recorded during March and April due to the highest discharge of water required for irrigation of the prevailing vegetables. Thus, the well

water discharge is considered the main factor controlling the water quality in the above two wells.

Well No. (13) showed the intermediate EC values between the above two wells, where EC ranged between 2.14 and 3.14 dSm^{-1} with an average of 2.64 dSm^{-1}. The highest EC values during months of April, May and June are mainly due to the highest water discharge. However, during summer months; July, August and September, the irrigation was approximately limited and consequently, the well water discharge was very low, then the EC values were relatively low, which represents the irrigation source for greenhouse.

Therefore, the well water in this region could be classified into three grades; the first is relatively high in salinity level in all year months, where the water discharge is approximately constant. This grade was represented by the well No. (12), the second grade was represented by the well No. (14), which showed relatively an intermediate salinity level, and the third one which represented by the well No. (13), had the relatively lowest EC values.

Accordingly, the agriculture management in this region should be classified into two complementary patterns of agriculture depending on the grades of salinity, i.e., the crops must be selected for the possible best utilization of a particular well water quality (Ayers and Westcot , 1976 and Mass and Hoffman, 1977).

Considering the magnitude of salinity hazard, it is worthy to note that the months of March, April, May, June and July recorded the higher EC values, but the months of Jan., Nov. and December

showed the, lower EC values. These changes in well water salinity could be mainly attributed to the water discharge and the climatic effect, i.e. high temperature and consequently high evaporation during the summer months should increase the salinity level. On the other hand, during winter season low temperature as well as, rainfall should be decreased the water salinity level (Teller et al, 1982; Wang, 1992 and Rogers and Dreiss, 1995). In addition, it has to be noticed that the water requirements for the agriculture practices increased during the summer months, which consequently increased the well water discharge, but through the winter months the discharge of well water was relatively low.

Ions of Na^+ and Cl^- are the most prevailing in the water constituents followed by the SO_4^{--} and Ca^{++}. This may be attributed to the distance from Suez Gulf which considerably affects the redistribution of ions in different wells (Revelle, 1941; Eriksson, 1959; Dam 1992; Essink, 1993 and Wood and Sanford, 1995).

Generally, according to the international guides of water quality ,well water salinity were situated in the grade of C4 (high salinity) according to USSL classification (Richard's, 1954), C3 (moderate salinity) where RUSSL classification was considered and C3 (high salinity) according to Indian classification (Gupta, 1979) and severe salinity problem is expected according to FAO (Ayers and Westcot, 1985).

4.1.3.2. Sodicity hazard:

Considering the data of well water sodicity hazard, Tables (15,16 and 17) and Fig. (8), it could be stated that the values of the

adj-SAR showed a pattern of general change through the different year months.

Well No. (12) showed the highest values of the adj. SAR during March, April, May, June, July and August, where values of adj-SAR were 22.23, 23.56, 23.53, 23.50, 24.92 and 25.10, respectively. The highest values were recorded through July and August. However, the relatively lowest values were recorded during October, November, and December. Decreasing values of the adj-SAR through October, November and December could be attributed to low temperature which decreased evapotranspiration and consequently the low demand on water, beside increasing the rainfall should be considered in reducing the values of the adj-SAR (Teller et al., 1982; Yang, 1989; Wang, 1992 and Rogers and Dreiss, 1995).

Well No. (14), showed relatively low values of the adj-SAR among the wells in this region the ranges were 7.31 to 14.6. Months of March, April, and May recorded the relatively high values; 12.25, 14.6, and 10.95, respectively. However the months of January, June, November, and December showed the relatively low values of the adj-SAR.

These changes in the adj-SAR values could be attributed to the climatic conditions, which increase the adj-SAR through summer months and decreased it through winter season.

On the other hand, well No. (13), showed an approximately the intermediate value of the adj-SAR among the two above wells.

toxicity is expected (Ayers and Westcot, 1985).

4.1.3.3. Well water boron and some trace elements:

As, shown in Tables (15, 16,17) the analysis of well water boron generally showed safe concentrations of this element in different year months, ranged between 0.2 to 0.33 ppm. Also, the concentration of trace elements; Fe, Mn, Zn and Cu appeared to be undetectable in the most year months indicating the well water in this region were not polluted.

Table (15): Water analysis and quality classification of well No. (12) in El-Tor region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
																				Indian	FAO				
																							Toxicity		
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	CT	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	(Gopta)	EC	INF.*	Na^{+}	CT	B
Jan.	7.20	4.41	14.56	1.98	27.60	0.40	-	1.60	29.80	13.14	0.28	-	0.12	-	0.007	9.61	20.20	C_5S1	C_3	$C_3A_3B_1$	Sev.	Mod	Sev.	Sev.	Non.
Feb.	7.10	4.90	15.50	2.56	29.96	0.55	-	1.60	25.50	21.35	0.52	-	-	-	0.019	9.96	20.90	C_5S_1	C_3	$C_3A_3B_1$	Sev.	Mod	Sev.	Sev.	Non.
Mar.	7.10	4.97	16.60	2.60	32.45	0.41	-	1.60	28.80	21.66	-	-	-	-	-	10.46	22.23	C_5S_2	C_3	C_3A_3	Sev.	Mod	Sev.	Sev.	
Apr.	7.10	5.04	17.70	2.70	35.00	0.27	-	1.60	32.10	21.97	-	-	-	-	-	10.96	23.56	C_5S_2	C_3	C_4A_3	Sev.	Sev	Sev.	Sev.	
May	7.05	5.23	17.85	2.05	35.30	0.43	-	1.50	36.85	17.28	-	-	-	-	-	11.22	23.53	C_5S_2	C_3	C_4A_3	Sev.	Sev	Sev.	Sev.	
June	7.0	5.43	18.0	1.40	35.70	0.60	-	1.40	41.60	12.70	-	-	-	-	-	11.48	23.50	C_5S_2	C_3	C_4A_3	Sev.	Sev	Sev.	Sev.	
July	7.20	5.43	16.0	2.90	36.50	0.30	-	1.86	37.40	16.44	-	0.021	0.026	0.231	0.047	11.87	24.92	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Sev	Sev.	Sev.	Non.
Aug.	7.30	5.43	16.50	2.90	36.30	0.30	-	1.62	36.40	17.98	-	0.035	0.083	0.037	0.094	11.67	25.10	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Sev	Sev.	Sev.	Non
Sep.	7.10	4.91	16.30	2.56	29.60	0.35	-	1.70	26.30	20.81	-	-	-	-	-	9.64	20.72	C_5S_1	C_3	C_3A_3	Sev.	Mod	Sev.	Sev.	
Oct.	7.10	4.82	16.90	2.55	28.20	0.45	-	1.80	23.40	22.90	-	-	-	-	-	9.04	19.49	C_5S_1	C_3	C_3A_2	Sev.	Mod	Sev.	Sev.	
Nov.	7.15	4.33	14.50	2.90	25.20	0.67	-	1.43	29.0	12.84	-	-	-	-	-	8.62	17.59	C_5S_1	C_3	$C3A_2$	Sev.	Mod	Sev.	Sev.	
Dec.	7.05	4.41	14.65	2.87	26.50	0.35	-	1.62	31.0	11.75	-	-	-	-	-	8.95	18.79	C_5S_1	C_3	C_3A_2	Sev.	Mod	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

* INF. : Infiltration rate
These values represent the average of two years of the study.

Table (16): Water analysis and quality classification of well No. (13) in El-Tor region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl^{-}	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gopta)	FAO				
																					EC	INF.*	Toxicity		
																							Na^{+}	Cl^{-}	B
Jan.	7.20	2.62	7.09	2.37	16.00	0.25	-	1.90	14.60	9.21	0.17	-	0.048	0.119	0.0143	7.37	14.70	C_4S_1	C_2	$C_2A_2B_1$	Mod.	Mod.	Sev.	Sev.	Non.
Feb.	7.10	2.14	7.20	1.80	11.90	0.15	-	1.60	9.10	10.35	0.13	-	-	-	0.015	5.61	10.70	C_4S_1	C_2	$C_2A_2B_1$	Mod.	Mod.	Sev.	Mod.	Non.
Mar.	7.20	2.58	8.75	1.75	15.05	0.22	-	1.50	12.75	11.52	-	-	-	-	-	6.52	12.60	C_4S_1	C_2	C_2A_2	Mod.	Mod.	Sev.	Sev.	
Apr.	7.30	3.02	10.30	1.70	18.20	0.30	-	1.40	16.40	12.70	-	-	-	-	-	7.43	14.50	C_4S_1	C_3	C_2A_2	Mod.	Mod.	Sev.	Sev.	
May	7.35	3.08	9.90	1.45	19.40	0.32	-	1.63	17.55	11.69	-	-	-	-	-	8.17	15.95	C_4S_2	C_3	C_3A_2	Mod.	Mod.	Sev.	Sev.	
June	7.40	3.15	9.50	1.20	20.60	0.35	-	1.86	18.70	11.09	-	-	-	-	-	8.91	17.40	C_4S_2	C_3	C_4A_2	Sev.	Mod.	Sev.	Sev.	
July	7.40	2.28	7.50	1.85	12.90	0.25	-	1.62	13.50	7.38	0.32	-	0.035	0.198	0.039	8.96	11.44	C_4S_1	C_2	$C_2A_2B_1$	Mod.	Mod.	Sev.	Sev.	Non.
Aug.	7.20	2.39	8.50	1.80	13.90	0.22	-	1.62	13.00	9.80	0.18	0.002	0.032	0.046	0.018	6.12	11.75	C_4S_1	C_2	$C_2A_2B_1$	Mod.	Mod.	Sev.	Sev.	Non.
Sep.	7.20	2.42	7.95	1.00	14.90	0.15	-	1.65	17.65	4.70	-	-	-	-	-	7.04	13.02	C_4S_1	C_2	C_2A_2	Mod.	Mod.	Sev.	Sev.	
Oct.	7.30	2.45	8.30	1.20	14.70	0.51	-	1.69	16.95	6.07	-	-	-	-	-	6.74	13.14	C_4S_1	C_2	C_2A_2	Mod.	Mod.	Sev.	Sev.	
Nov.	7.20	2.21	8.15	1.41	12.15	0.31	-	1.63	14.81	5.58	-	-	-	-	-	5.56	10.84	C_4S_1	C_2	C_3A_2	Mod.	Mod.	Sev.	Sev.	
Dec.	7.25	2.29	8.30	1.67	12.60	0.26	-	1.52	15.01	6.30	-	-	-	-	-	5.64	10.71	C_4S_1	C_2	C_4A_2	Mod.	Mod.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

* INF. : Infiltration rate
These values represent the average of two years of the study.

Table (17): Water analysis and quality classification of well No. (14) in El-Tor region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
																				Indian	FAO				
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	CT	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	(Gopta)	EC	INF.*	Toxicity Na^{+}	Toxicity CT	Toxicity B
Jan.	7.10	2.04	8.91	0.99	10.70	0.30	-	0.70	12.00	8.20	0.16	-	-	-	-	4.81	7.69	C_3S_1	C_2	$C_2A_1B_1$	Mod	Mod	Sev.	Sev.	Non.
Feb.	7.20	2.91	11.62	2.40	14.60	0.43	-	0.85	12.00	16.20	0.18	-	-	-	-	5.51	9.91	C_4S_1	C_2	$C_2A_1B_1$	Mod	Mod	Sev.	Sev.	Non.
Mar.	7.20	3.22	12.21	2.30	17.30	0.44	-	1.02	14.30	16.93	-	-	-	-	-	6.40	12.25	C_4S_1	C_3	C_3A_2	Sev	Mod	Sev.	Sev.	
Apr.	7.20	3.53	12.80	2.20	20.00	0.45	-	1.20	16.60	17.65	-	-	-	-	-	7.30	14.60	C_4S_1	C_3	C_3A_2	Sev.	Mod	Sev.	Sev.	
May	7.25	3.04	12.35	2.20	15.55	0.52	-	0.95	15.05	14.62	-	-	-	-	-	5.74	10.95	C_4S_1	C_3	C_4A_2	Sev.	Mod	Sev.	Sev.	
June	7.30	2.55	11.90	2.20	11.10	0.60	-	0.70	13.50	11.60	0.22	-	-	-	-	4.18	7.31	C_3S_1	C_2	C_3A_3	Mod	Mod	Sev.	Sev.	
July	7.30	2.61	11.85	2.50	10.90	0.75	-	0.90	11.70	13.40	0.24	-	-	-	-	4.20	7.80	C_4S_1	C_2	C_2A_1	Mod	Mod	Sev.	Sev.	Non.
Aug.	7.40	2.63	11.26	2.44	11.65	0.85	-	0.95	11.75	13.50	-	-	-	-	-	4.45	8.23	C_4S_1	C_2	$C_2A_1B_1$	Mod	Mod	Sev.	Sev.	Non
Sep.	7.10	2.50	10.87	1.90	11.70	0.45	-	1.72	12.30	10.90	-	-	-	-	-	4.60	9.40	C_3S_1	C_2	C_2A_1	Mod	Mod	Sev.	Sev.	
Oct.	7.10	2.45	11.14	1.93	10.90	0.38	-	1.30	11.75	11.30	-	-	-	-	-	4.30	8.20	C_4S_1	C_2	C_2A_1	Mod	Mod	Sev.	Sev.	
Nov.	7.20	2.06	8.92	1.58	9.55	0.46	-	1.02	10.00	9.49	-	-	-	-	-	4.14	7.37	C_3S_1	C_2	C_2A_1	Mod	Mod	Sev.	Mod	
Dec.	7.20	2.05	8.31	1.52	10.25	0.35	-	1.01	10.35	9.07	-	-	-	-	-	4.61	7.94	C_3S_1	C_2	C_2A_1	Mod	Mod	Sev.	Sev	

Sev. : Severe problem.
Mod.: Moderate problem.
Non.: None problem.

* INF. : Infiltration rate
These values represent the average of two years of the study.

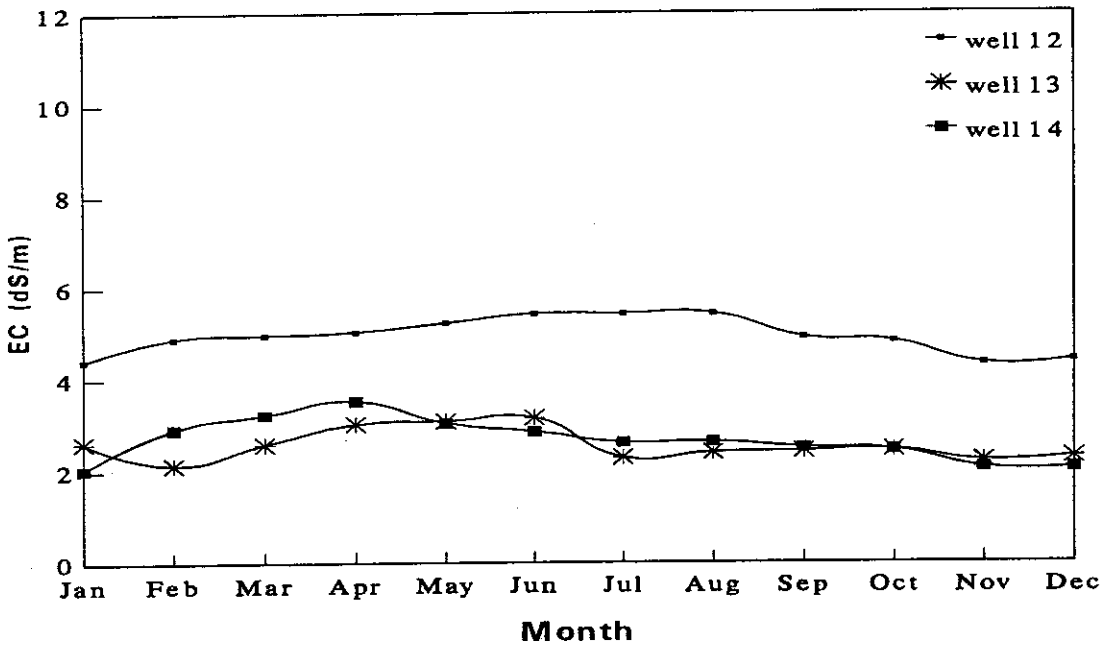


Fig. (7): Water wells salinity of EL-Tor region.

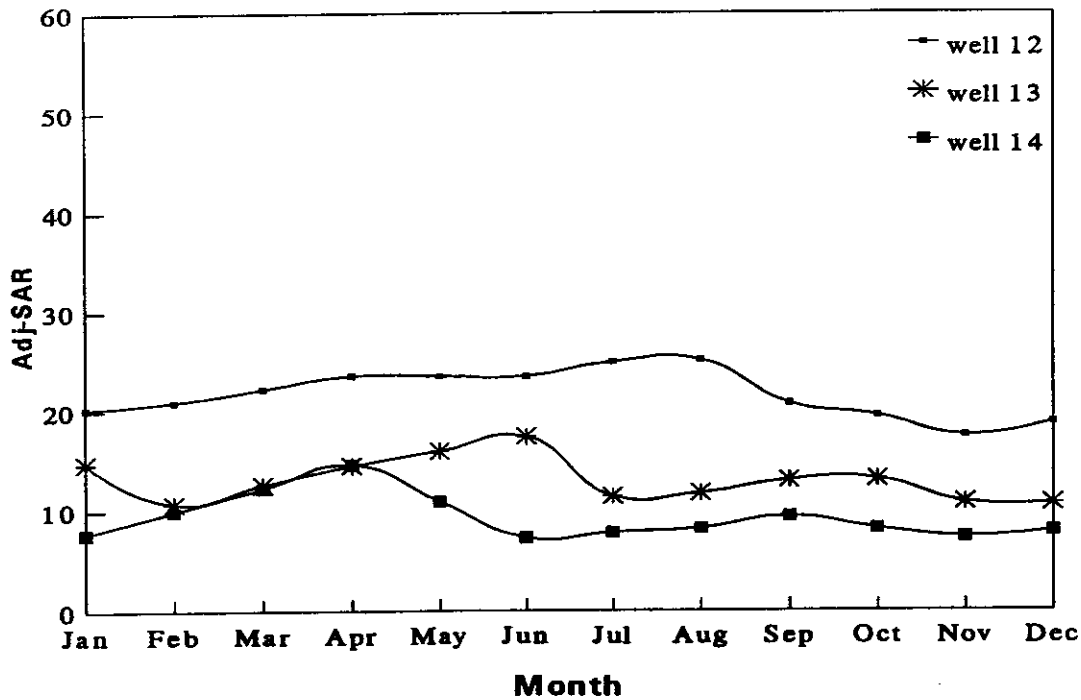


Fig. (8): Adj-SAR of Water wells of E-Tor region.

4.1.4. El-Korom Region:

4.1.4.1. Salinity hazard:

Chemical analyses of the wells represent this region are shown in Tables (18, 19, 20 and 21), and illustrated in Fig. (9). Values of EC ranged between 2.14 and 4.59 dSm^{-1} with an average of 3.36 dSm^{-1}.

Well No. (18) had relatively high salinity level in most year months, it had EC values ranged between 3.07 and 6.51 dSm^{-1} with an average of 4.79 dSm^{-1}. Data of water analysis indicated that the agricultural practices had an effective role for the well water quality, i.e., water discharge was high during, July month which consequently increased the EC to the highest value (6.51 dSm^{-1}), but during the month of August water discharge appeared to be little, and the lowest values of well water salinity were recorded.

Also, the data showed that the values of EC were relatively higher in months of February, Marsh, May, June and July than the other months. This mainly due to the water discharge as will as the climatic effect may be contributed for some extent.

Well No. (16), on the other hand it had relatively the low EC values during the most of year months. Its EC ranged between 1.89 and 4.88 dSm^{-1} with an average of 3.38 dSm^{-1}. Also, the water discharge was highest through the August month which recorded the high value of water salinity (4.88 dSm^{-1}).

Well No. (15), had EC values between the two above wells. The EC values were ranged between 5.75 and 0.88 dSm^{-1} with an average of 3.31 dSm^{-1}.

Well water salinity showed the highest values during June, July and August months. It wherethe EC values; 5.43, 5.75 and 4.88 dSm^{-1}, respectively, corresponding with; 0.88, 1.83, 2.94, 1.80 and 1.10 dSm^{-1} during the months of January, February., March, September and October, respectively. Thus, there is an evidence to indicate that the water discharge through the summer months was extremely higher than that in the winter months, where in winter months the low temperature, beside rainfall and low evapotranspiration should considerably effective. Then, the climatic factor had an additive role to decrease water salinity during winter months.

Well No. (17) showed an approximately constant state of salinity, during year months. The EC values were ranged between 2.44 and 3.85 dSm^{-1} with an average of 3.14 dSm^{-1}.

It will be sated that the well No. (17), represents the common state of well waters salinity in this region Fig. (9). Considering the magnitude of salinity hazard of well waters in El-Korom region, it will be noticed that the months of May, June, July, and August recorded the relatively high EC values, but the months of January, November and December showed the low EC values. This trend may be attributed to the contribution water discharge and climatic effect resulted from high temperature and high evapotranspiration during the summer months which increase water reqirements for crops, but during the winter months the low temperature beside rainfall should be decrease the well water salinity (Eriksson, 1959, Loewengart, 1961 and Wood and Sanford, 1995).

The analysis of well water in this region showed that the ions of Na and Cl are the most prevailing followed by the ions of SO_4

and Ca. Dominance of Na and Cl ions in the water may be attributed to the water seepage from the Suez Gulf, similar findings were found by (Eriksson, 1959; Loewenngart, 1961; Essink 1993 and Wood Sanford 1995).

Generally, according to the international guides of water quality, the wells of EL-Korom region had C4 according to USSL classification (Richard's, 1954), C3 in RUSSL classification, C3 in Indian classification (Gupta, 1979) and a severe problem will be occurred with using this water according to FAO (Ayers and Westcot, 1985).

4.1.4.2. Sodicity hazard:

Data of well water sodicity Tables (18, 19, 20 and 21) and Fig. (10), revealed that the values of the adj-SAR were generally varied through the different year months.

Well No. (18) had the highest sodicity hazard in this region during the most year months. Values of adj-SAR were 23.45, 21.82, 20.2, 21.24, 22.29 and 31.71 in the months of February, March, April, May, June and July respectively, but there were relatively low values during January, August, September, November, and December. Highest values of the adj-SAR were recorded through July which may be attributed to the highest water discharge. Decreasing the adj-SAR during the above mentioned months could be due to the climatic conditions and low water discharge as indicated by several researches; Boekelman, (1979); Wang (1992) and Rogers and Dreiss (1995).

Well No. (16) showed relatively lowest values of adj-SAR among the wells, in this region. The adj-SAR values were ranged between 20.0 in August and 8.80 in October.

Months of May, June, July and August recorded the relatively high sodicity hazard where the adj-SAR values were; 14.90, 18.10 15.30 and 20.00, respectively, but the other months recorded the relatively low values of adj-SAR. These changes of the adj-SAR values could be mainly due to the climatic conditions and water discharge. This finding goes along with the finding of Rogers and Dreiss (1995).

Concerning the data of well No. (15), values of the adj-SAR were changed drasticaly with the different months. The values were relatively high during the summer months but low during the winter months. These changes could be mainly due to the highest water requirements in summer months and climatic effect which contribute with some extent in these changes.

Well No. (17) had approximately intermediate values of the sodicity hazard expressed by adj-SAR in this region. Values of the adj-SAR were ranged between 25.19 during June month and 12.71 during December month. Summer months; May, June and July showed higher values than those in the other months. These changes were reffered to the high water discharge in this period due to the highest water requirements for growing crops, which may caused an interference of sea water that high in its Na.

Generally, well waters in El-Korom region had the sodicity hazard described as (S2) according to the USSL classification (Richrgd's, 1954), A2 according to the Indian classification (Gupta,

1979) and moderate problems are expected in toxicity by sodium and infiltration according the FAO guides (Ayers ad Westcot, 1985).

4.1.4.3. Well water Boron and some trace elements:

As shown in Tables, (18, 19, 20 and 21) the well water boron generally showed safe concentration in different a months, ranged between 0.11 to 0.35 mg/L.

Also, trace elements content of Fe, Mn, Zn and Cu showed undetectable concentration of these elements in most year months indicating that well water in this region was not polluted.

Table (18): Water analysis and quality classification of well no. (15) in El-Korom region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality						
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gopta)	FAO				
																					EC	INF.*	Toxicity Na^{+}	Toxicity Cl	Toxicity B
Jan.	7.50	0.88	3.64	0.46	4.50	0.25	-	1.40	5.10	2.35	0.09	-	-	-	0.01	3.10	4.80	C_3S_1	C_1	$C_1A_1B_1$	Mod	Mod.	Mod.	Mod	Non.
Feb.	7.20	1.83	7.20	0.80	10.00	0.30	-	1.40	12.80	4.10	0.23	-	-	-	-	5.00	9.00	C_3S_1	C_2	$C_2A_1B_1$	Mod	Non.	Sev.	Sev.	Non.
Mar.	7.30	2.94	10.20	1.50	17.10	0.45	-	1.16	18.25	9.84	-	-	-	-	-	6.85	12.55	C_4S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
Apr.	7.50	4.06	13.20	2.20	24.20	0.60	-	0.93	23.70	15.57	-	-	-	-	-	8.70	16.10	C_5S_1	C_3	C_3A_2	Sev.	Non.	Sev.	Sev.	
May	7..30	4.74	13.45	3.25	31.10	0.70	-	1.16	29.0	18.34	-	-	-	-	-	10.68	20.71	C_5S_2	C_3	C_3A_3	Sev.	Non.	Sev.	Sev.	
June	7.10	5.43	13.70	4.30	38.00	0.80	-	1.40	34.30	21.10	-	-	-	-	-	12.66	25.32	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
July	7.20	5.75	12.50	5.00	41.80	0.45	-	1.86	40.50	17.39	0.66	0.011	0.027	0.056	0.055	14.10	29.60	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non
Aug.	7.20	4.88	13.50	3.00	35.20	0.50	-	1.60	39.40	11.64	0.03	-	0.01	0.030	0.076	12.20	24.40	C_5S_2	C_3	$C_3A_3B_1$	Sev.	Non.	Sev.	Sev.	Non
Sep.	7.30	1.80	6.45	0.80	9.70	0.65	-	1.30	12.00	4.30	-	-	-	-	-	5.00	8.50	C_3S_1	C_3	C_2A_1	Mod	Non.	Mod	Mod	
Oct.	7.20	1.10	4.05	0.65	5.90	0.30	-	1.50	6.30	3.10	-	-	-	-	-	3.80	6.30	C_3S_1	C_2	C_1A_1	Mod	Non.	Sev.	Sev.	
Nov.	7.20	2.70	7.20	3.12	16.15	0.47	-	1.27	20.80	4.87	-	-	-	-	-	6.75	12.47	C_3S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
Dec.	7.22	2.81	9.87	0.92	16.90	0.45	-	1.19	22.30	4.65	-	-	-	-	-	7.08	12.76	C_3S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

* INF. : Infiltration rate
These values represent the average of two years of the study.

Table (19): Water analysis and quality classification of well no. (16) in El-Korom region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality						
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gopta)	FAO				
																					EC	INF.*	Toxicity Na^{+}	Toxicity Cl	Toxicity B
Jan.	7.40	1.89	5.27	0.63	12.5	0.40	-	1.40	12.30	5.10	0.12	-	-	-	0.007	7.30	12.40	C_3S_1	C_2	$C_2A_2B_1$	Mod	Non.	Sev.	Sev.	Non.
Feb.	7..30	2.14	5.10	1.90	13.90	0.45	-	1.20	10.90	9.25	0.17	-	-	-	0.009	7.40	12.20	C_3S_1	C_2	$C_2A_2B_1$	Mod	Non.	Sev.	Sev.	Non.
Mar.	7.35	2.04	5.85	1.10	13.13	0.40	-	1.45	11.35	7.68	-	-	-	-	-	7.05	11.95	C_3S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
Apr.	7.40	1.95	6.60	0.20	12.37	0.35	-	1.70	11.80	6.02	-	-	-	-	-	6.70	11.70	C_3S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
May	7.30	2.55	7.55	0.70	16.95	0.48	-	1.55	15.80	8.33	-	-	-	-	-	8.25	14.90	C_4S_1	C2	C_2A_2	Mod	Non.	Sev.	Sev.	
June	7.40	3.15	8.50	1.20	21.60	0.60	-	1.40	19.80	10.70	-	-	-	-	-	9.80	18.10	C_4S_1	C_3	C_3A_2	Sev	Non.	Sev.	Sev.	
July	7.40	2.74	7.0	2.70	17.70	0.25	-	1.62	18.20	7.83	0.18	0.027	0.031	0.034	0.068	8.04	15.30	C_4S_1	C_2	$C_2A_2B_1$	Mod	Non.	Sev.	Sev.	Non.
Aug.	7.20	4.88	21.50	1.30	30.80	0.50	-	1.62	27.60	24.88	0.31	.01	0.040	0.09	-0.085	9.10	20.0	C_5S_1	C_3	$C_3A_3B_1$	Sev	Non.	Sev.	Sev.	Non
Sep.	7.30	2.10	8.58	0.97	11.10	0.35	-	1.20	10.90	8.90	-	-	-	-	-	5.10	9.20	C_3S_1	C_2	C_2A_1	Mod	Non.	Sev.	Sev.	
Oct.	7.40	1.95	7.75	0.95	10.30	0.45	-	1.40	9.35	8.70	-	-	-	-	-	4.90	8.80	C_3S_1	C_2	C_2A_1	Mod	Non.	Sev.	Mod	
Nov.	7.15	1.95	7.05	1.55	10.25	0.50	-	1.47	12.35	5.63	-	-	-	-	-	4.95	9.13	C_3S_1	C_2	C_2A_1	Mod	Non.	Sev.	Sev.	
Dec.	7.22	2.01	7.60	1.65	10.40	0.35	-	1.62	12.70	5.68	-	-	-	-	-	5.02	9.28	C_3S_1	C_2	C_2A_1	Mod	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

* INF. : Infiltration rate
These values represent the average of two years of the study.

Table (20): Water analysis and quality classification of well no. (17) in El-Korom region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality								
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	CT	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gopta)	FAO				
																					EC	INF.*	Toxicity Na^{+}	Toxicity CT	Toxicity B
Jan.	7.20	2.52	8.00	1.20	16.00	0.25	-	1.30	17.10	7.05	0.15	-	-	-	0.017	7.50	13.80	C_4S_1	C_2	$C_2A_2B_1$	Mod	Non.	Sev.	Sev.	Non.
Feb.	7.30	2.77	8.20	1.80	18.00	0..30	-	1.90	18.20	8.20	0.25	-	-	-	0.009	8.10	16.20	C_4S_1	C_2	$C_2A_2B_1$	Mod	Non.	Sev.	Sev.	Non.
Mar.	7.30	3.03	7.12	1.75	21.30	0.42	-	1.50	20.95	8.14	-	-	-	-	-	9.90	18.50	C_4S_1	C_3	C_3A_2	Sev.	Non.	Sev.	Sev.	
Apr.	7.40	3.30	6.05	1.70	24.60	0.55	-	1.10	23.70	8.10	-	-	-	-	-	11.70	19.90	C_4S_2	C_3	C_3A_2	Sev.	Non.	Sev.	Sev.	
May	7.30	3.57	6.50	1.45	27.30	0.50	-	1.25	24.35	10.15	-	-	-	-	-	13.26	22.54	C_4S_2	C_3	C_3A_3	Sev.	Non.	Sev.	Sev.	
June	7.40	3.85	7.00	1.20	30.00	0.45	-	1.40	25.00	12.25	-	-	-	-	-	14.82	25.19	C_4S_2	C_3	C_3A_3	Sev.	Non.	Sev.	Sev.	
July	7.20	3.36	6.50	1.70	25.10	0.36	-	1.16	24.40	8.10	0.22	-	0.011	0.039	0.039	12.40	21.08	C_4S_2	C_3	$C_3A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Aug.	7.10	2.93	7.30	1.20	20.40	0.36	-	1.62	21.30	6.34	0.24	-	0.027	0.129	0.114	9.89	18.29	$C4S_1$	C_2	$C_2A_2B_1$	Mod	Non.	Sev.	Sev.	Non
Sep.	7.20	2.90	8.15	1.35	19.10	0.30	-	1.25	18.15	9.50	-	-	-	-	-	8.76	15.84	C_4S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
Oct.	7.30	2.80	8.17	1.15	18.30	0.40	-	1.17	17.45	9.40	-	-	-	-	-	8.48	14.41	C_4S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
Nov.	7.07	2.62	7.48	1.77	16.60	0.35	-	1.28	16.90	8.02	-	-	-	-	-	7.71	13.45	C_4S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
Dec.	7.30	2.44	7.17	1.85	14.80	0.45	-	1.41	15.55	7.31	-	-	-	-	-	7.16	12.71	C_4S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

• INF. : Infiltration rate
These values represent the average of two years of the study.

Table (21): Water analysis and quality classification of well no. (18) in El-Korom region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
																					FAO				
																							Toxicity		
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl^{-}	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gopta)	EC	INF.*	Na^{+}	Cl	B
Jan.	7.10	3.28	8.55	1.35	21.80	0.96	-	1.60	21.50	9.50	0.11	-	-	-	0.011	9.90	18.80	C_4S_1	C_3	$C_3A_2B_1$	Sev.	Non.	Sev.	Sev.	Non.
Feb.	7.20	4.85	9.30	3.90	34.40	0.60	-	0.93	27.30	19.97	0.21	-	-	-	0.006	13.40	23.45	C_5S_2	C_3	$C_3A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Mar.	7.25	4.09	9.30	2.70	28.40	0.70	-	1.76	23.20	16.14	-	-	-	-	-	11.50	21.82	C_5S_2	C3	C_3A_3	Sev.	Non.	Sev.	Sev.	
Apr.	7.30	3.34	9.30	1.50	22.40	0.80	-	2.60	19.10	12.30	-	-	-	-	-	9.60	20.20	C_4S_1	C_3	C_3A_3	Sev.	Non.	Sev.	Sev.	
May	7.30	3.87	9.10	2.32	26.90	0.81	-	1.76	23.60	13.77	-	-	-	-	-	11.17	21.24	C_4S_2	C_3	C_3A_3	Sev.	Non.	Sev.	Sev.	
June	7.40	4.40	9.00	3.15	31.40	0.82	-	0.93	28.10	15.34	-	-	-	-	-	12.74	22.29	$C5S_2$	C_3	C_3A_3	Sev.	Non.	Sev.	Sev.	
July	7.30	6.51	12.00	6.30	50.50	1.10	-	1.62	42.10	26.18	0.35	0.012	0.020	0.037	0.080	16.69	31.71	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non.
Aug.	7..0	3.07	8.00	2.20	19.50	0.53	-	1.40	21.80	7.03	0.19	0.021	0.026	0.101	0.088	8.60	16.30	C_4S_1	C3	$C_3A_2B_1$	Sev.	Non.	Sev.	Sev.	Non
Sep.	7.20	4.04	9.27	3.90	26.30	0.90	-	0.95	24.40	15.02	-	-	-	-	-	10.24	17.92	C_5S_2	C_3	C_3A_2	Sev.	Non.	Sev.	Sev.	
Oct.	7.10	3.90	8.50	4.10	24.80	1.10	-	1.40	23.40	13.70	-	-	-	-	-	9.90	19.80	C_4S_1	C_3	C_3A_2	Sev.	Non.	Sev.	Sev.	
Nov.	7.20	3.41	7.15	3.80	22.35	0.75	-	1.60	21.30	11.15	-	-	-	-	-	9.52	17.99	C_4S_1	C_3	C_3A_2	Sev.	Non.	Sev.	Sev.	
Dec.	7.23	3.31	9.52	1.85	20.70	0.83	-	1.48	20.20	11.22	-	-	-	-	-	8.74	16.81	C_4S_1	C_3	C_3A_2	Sev	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

* INF. : Infiltration rate
These values represent the average of two years of the study.

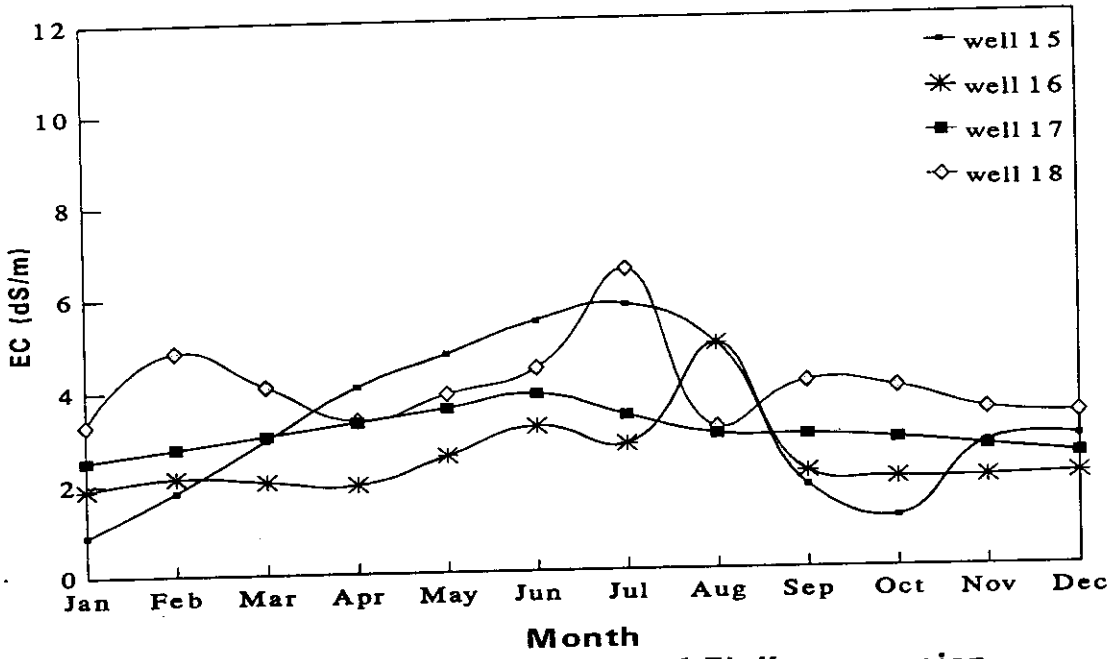


Fig. (9): Water wells salinity of EL-Korom region.

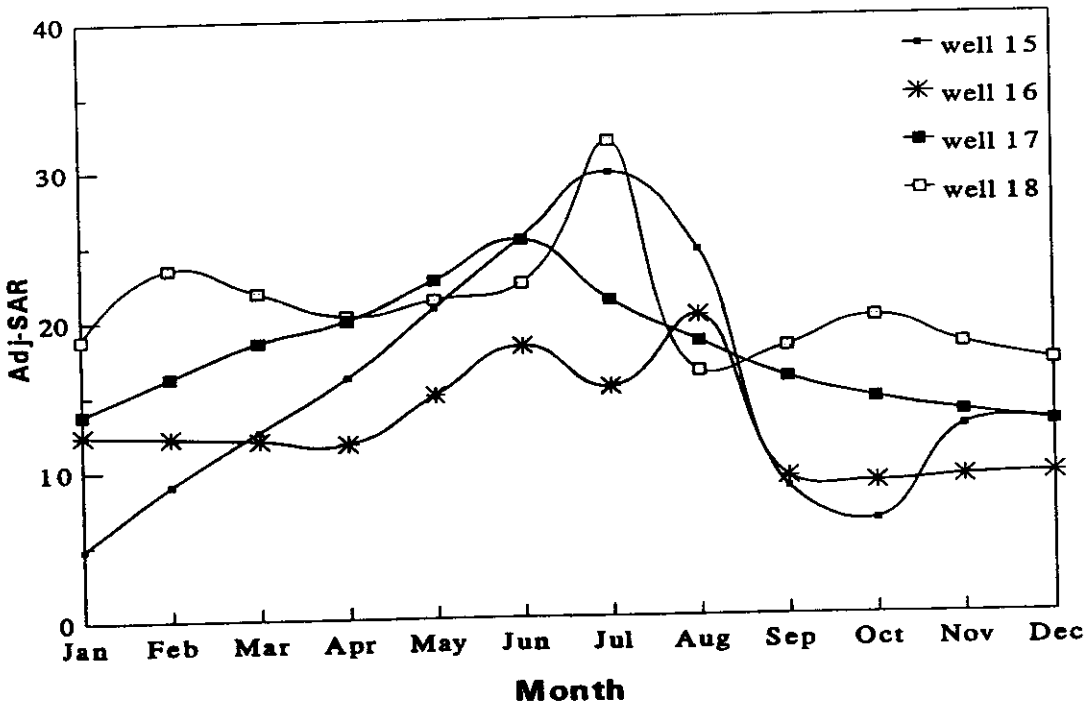


Fig. (10): Adj-SAR of Water wells of EL-Korom region.

4.1.5. El-Gebeel Region:

There are ten wells in this region, some of these are relatively low in there salt content (Wells No. 20 and 21). The remained wells coded as 19, 22, 23, 24, 25, 26, 27 and 28 are relatively high in their salinity hazard.

4-1-5-1: Salinity hazard:

As shown in Tables from 22 to 31, and Fig. (11), the wells No. 20 and 21 had salinity levels ranged between 2.06 and 3.55 dSm^{-1}. Months of May, June, July and August showed a slight increase in salinity level of the two wells. Data also revealed that the changes in salinity during the year months were small, as a result of the constant water discharge in the areas irrigated with these wells. Ions of Na, Ca Cl and SO_4 are the most prevailing in these wells.

To evaluate the salinity hazard of the above two wells in accordance with international guides of water quality the data showed that the salinity is classfied as C4 following the Richard's (1954) USSL, C2 according to both RUSSL and Indian classification Gupta (1979), and moderate salinity problem is expected according to FAO classification (Ayers and Westcot, 1985). Therefore, the injury effect appeared to be not predicted in soils that received this water where the proper management practices for soil water and plants were taken into consideration.

On the other hand, the other eight wells having relatively the highest salinity levels where the EC values ranged from 5.8 to 11.95 dSm^{-1}.

Concerning the magnitude of salinity hazard in this group of wells, the data revealed that the water salinity had C5, C3, C4 and Sever problems according to the international guides described by USSL, (Richard's 1954), RUSSL, Indian (Gupta, 1979) and FAO classification (Ayers and Westcot 1985), respectively. So, the use of these waters for irrigation for a long time should be needed the proper soil-water management practices to alleviate the hazardus effect of salinity on soil and plant. In this respect, it will be noticed that the well No. 25 had C5 in its salinity hazards according to the Indian guides of water quality, which is having a sever salinity effect, thus the highest salt tolerant crops should involved in the area subjected to irrigate with this well.

4.1.5.2. Sodicity hazard:

Refereeing to the data in Tables from 22 to 31 and Fig. (12), it will be stated that wells No. 20 and 21 having the relatively low values of adj-SAR, ranged between 8.82 and 15.8 as compared with the other wells in this region. In both wells, the values of adj-SAR showed a general increase during summer months especially in July and August. In the winter season it was decreased this may be due to the contribution of the climatic factors, which the increasing of hot temperature generally increased the plant water requirements and consequently increased the water discharge and water salinity. In the winter season, low temperature as well as rainfall should be considered as factors responsible for the decrease of the adj-SAR. These results are in agreement with the findings obtained by Person and Fisher, (1971); Brown and Sahrp, (1992) and wood and Sanford, (1995). Data also revealed that the agronomic practices in the areas adjacent to well No. 20 and 21 appeared to be stable,

which leads to constant values of adj-SAR. It could be concluded that the factor of crop water requirements had the major effect on the sodicity hazard in the studied wells.

Considering the magnitude of sodicity hazard in the two above wells, data revealed that the water having S1 grade according to the guide of USSL (Richard's 1954) and A1-A2 grade in accordance with the Indian guides (Gupta, 1979). Guides described by FAO revealed sever toxicity problems from Na^+ on the plants subjected to irrigation with this water for a long time. Thus, the user should consider some precautions to alleviate the sodicity hazard. Wells No. 19, 22, 23, 24, 25, 26, 27 and 28, on the other side having relatively high sodicity hazard as compared with that in wells No. 20 and 21 in this region.

These eight wells showed high contribution of Sea water seepage to compensate the deficit of well water. That is to say that, increasing of sodicity values were associated with increasing of water salinity. Values of adj-SAR ranged between 21.72 and 53.50.

Among these wells, well No. 25 had the relatively highest values of adj-SAR whereas the well No. 26 had approximately the relatively lowest values and this was corresponded with the salinity hazard, i.e. the water of high salinity had high values of the adj-SAR.

In this concern, the sodic hazard potential of a given water is often evaluated from the SAR and salinity, i.e. at the same SAR values, the dispersion potential of a low salinity water exceeds that of a more saline water. Thus, the water of high salinity not having sodicity hazard even at high values of adj-SAR . Thus, in all above

wells the toxicity of Na should be mainly consider to evaluate of such water for irrigation.

For the magnitude of the sodicity hazard of the studied eight wells, the data indicated that, with the exception of well No. 25, all wells had S2 grade according to USSL guides, Richard's (1954). Most of wells had A4 grade according to the Indian guide Gupta (1979), these grades of sodicity seemed to be the alarming problems that could be a voided with the proper management practices.

4.1.5.3. Water trace elements and boron:

Amounts of water trace elements and boron were recorded in tables from 22 to 31, and the data showed that the water concentration of trace elements, Fe, Mn, Zn and Cu were very low it having safe amounts for these elements in all detected months. Furthermore, the water discharge, as well as the climatic variations showed un appreciable effect on the amounts of these elements indicating that the water reservoir for all wells in this region are not polluted.

Also, the data of boron concentration showed safe amounts for the growing crops. Increasing water discharge slightly increase the water boron content.

Table (22): Water analysis and quality classification of well no. (19) in El-Gebeel region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	CT	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gupta)	FAO				
																					EC	INF.*	Toxicity		
																							Na^{+}	CT	B
Jan.	7.40	7.82	24.93	4.02	49.20	1.20	-	1.20	60.10	18.05	0.59		0.012		0.036	12.94	28.50	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Feb.	7.0	10.10	28.90	8.10	73.20	1.10	-	1.20	72.50	37.60	1.01		0.022		0.024	17.02	39.14	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non.
Mar.	7.30	9.15	27.20	6.30	64.80	0.95	-	1.30	63.55	34.40	-	-	-	-	-	15.79	36.32	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Apr.	7.50	8.20	25.50	4.50	56.40	0.80	-	1.40	54.60	31.20	-	-	-	-	-	14.57	33.50	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
May	7.60	8.44	26.00	5.05	59.30	0.95	-	1.40	60.0	29.90	-	-	-	-	-	15.06	34.86	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
June	7.70	8.69	26.50	5.60	62.20	1.05	-	1.40	65.50	29.45	-	-	-	-	-	15.55	36.23	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
July	7.20	8.14	22.50	6.60	56.80	0.68	-	1.39	59.80	25.39	0.77	0.006	0.031	0.103	0.046	14.90	32.80	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non.
Aug.	7.20	8.47	25.00	4.20	57.20	0.68	-	1.40	57.20	28.48	0.69	0.044	0.036	0.12	0.077	14.97	33.60	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non
Sep.	7.40	7.80	26.10	6.30	51.70	0.77	-	1.25	55.90	27.72	-	-	-	-	-	12.86	28.3	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
Oct.	7.50	8.40	26.70	4.30	59.30	0.88	-	1.39	56.90	32.89	-	-	-	-	-	15.01	33.80	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Nov.	7.10	8.10	27.07	5.65	56.40	1.27	-	0.96	62.53	26.90	-	-	-	-	-	14.16	30.58	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Dec.	7.06	7.85	28.25	4.10	52.98	0.87	-	1.34	59.60	25.18	-	-	-	-	-	13.18	29.64	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

* INF. : Infiltration rate
These values represent the average of two years of the study.

Table (23): Water analysis and quality classification of well no. (20) in El-Gebeel region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality						
																				Indian	FAO			
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	CT	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	(Gupta)	EC	INF.•	Toxicity Na^{+}	Toxicity CT	Toxicity B
Jan.	7.60	2.52	11.28	1.42	12.70	0.62	-	0.90	14.20	10.92	0.18		0.022		0.043	5.04	8.82	C_4S_1	C_2	$C_2A_1B_1$	Mod	Non.	Sev.	Sev.	Non.
Feb.	7.46	2.52	10.30	1.70	12.70	0.45	-	1.20	12.70	11.25	0.48		0.018	0.004	0.019	5.20	9.90	C_4S_1	C_2	C_2A1B_1	Mod	Non.	Sev.	Sev.	Non.
Mar.	7.56	2.49	9.69	1.15	13.80	0.41	-	1.30	13.50	10.21	-	-	-	-	-	6.0	11.25	C_4S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
Apr.	7.60	2.46	9.0	0.60	15.00	0.38	-	1.40	13.70	9.88	-	-	-	-	-	6.80	12.60	C_4S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
May	7.56	2.78	10.05	1.13	16.30	0.36	-	1.35	16.72	9.77	-	-	-	-	-	6.85	12.85	C_4S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
June	7.50	3.10	11.10	1.90	17.60	0.35	-	1.30	19.75	9.90	-	-	-	-	-	6.90	13.10	C_4S_1	C_2	C_3A_2	Sev.	Non.	Sev.	Sev.	
July	7.46	3.25	9.50	2.60	19.60	0.38	-	0.93	20.30	10.85	0.21	0.044	0.029	0.152	0.054	7.96	13.50	C_4S_1	C_2	$C3A_2B_1$	Sev.	Non.	Sev.	Sev.	Non
Aug.	7.40	2.88	10.00	1.60	17.40	0.36	-	1.40	17.20	10.76	0.18		.028	0.073	0.025	7.20	13.70	C_4S_1	C_2	$C_2A_2B_1$	Mod	Non.	Sev.	Sev.	Non
Sep.	7.30	2.52	10.51	1.49	12.70	0.43	-	1.42	13.0	10.71	-	-	-	-	-	5.20	10.40	C_4S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
Oct.	7.40	2.50	10.31	1.55	12.50	0.61	-	1.35	13.10	10.52	-	-	-	-	-	5.13	9.74	C_4S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
Nov.	7.25	2.38	10.00	1.48	11.91	0.34	-	1.26	15.22	7.25	-	-	-	-	-	4.97	9.19	C_4S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
Dec.	7.50	2.15	8.77	1.36	10.90	0.43	-	1.31	13.0	7.15	-	-	-	-	-	4.84	8.95	C_3S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non.: None problem.

• INF. : Infiltration rate
These values represent the average of two years of the study.

Table (24): Water analysis and quality classification of well no. (21) in El-Gebeel region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gupta)	FAO				
																					EC	INF.*	Toxicity		
																							Na^{+}	Cl	B
Jan.	7.50	3.09	11.64	1.46	17.50	0.45	-	1.20	20.0	9.85	0.15		0.022		0.038	6.80	12.96	C_4S_1	C_2	$C_2A_2B_1$	Sev.	Non.	Sev.	Sev.	Non.
Feb.	7.46	3.53	13.30	1.70	19.60	0.40	-	1.20	18.20	15.60	0.71	0.019	0.018	0.065	0.069	7.15	13.94	C_4S_1	C_2	$C_2A_2B_1$	Sev.	Non.	Sev.	Sev.	Non.
Mar.	7.40	3.56	13.25	1.80	20.05	0.44	-	1.25	20.85	13.44	-	-	-	-	-	7.30	14.40	C_4S_1	C_2	C_3A_2	Sev.	Non.	Sev.	Sev.	
Apr.	7.40	3.63	13.23	1.90	20.50	0.48	-	1.31	23.50	11.30	-	-	-	-	-	7.45	14.90	C_4S_1	C_2	$C2A_2$	Sev.	Non.	Sev.	Sev.	
May	7.40	3.66	13.53	2.0	20.50	0.50	-	1.35	22.65	12.53	-	-	-	-	-	7.37	14.70	C_4S_1	C_2	C_2A_2	Sev.	Non.	Sev.	Sev.	
June	7.50	3.69	13.90	2.10	20.60	0.52	-	1.40	21.80	13.92	-	-	-	-	-	7.30	14.60	C_4S_1	C_2	C_2A_2	Sev.	Non.	Sev.	Sev.	
July	7.50	3.85	13.0	4.0	21.80	0.36	-	1.39	26.00	11.77	0.22	0.029	0.034	0.092	0.039	7.50	15.80	C_4S_1	C_2	C_3A_{2B1}	Sev.	Non.	Sev.	Sev.	Non.
Aug.	7.20	3.31	11.50	3.50	18.0	0.32	-	0.93	21.30	11.09	0.15	-	0.032	.063	0.071	6.57	12.50	C_4S_1	C_2	C_3A_{2B1}	Sev.	Non.	Sev.	Sev.	Non
Sep.	7.20	3.52	12.35	3.10	19.40	0.35	-	1.35	22.40	11.45	-	-	-	-	-	7.0	14.40	C_4S_1	C_2	C_3A_2	Sev.	Non.	Sev.	Sev.	
Oct.	7.40	3.48	13.64	2.20	18.50	0.38	-	1.82	21.50	11.40	-	-	-	-	-	6.70	14.40	C_4S_1	C_2	C_3A_2	Sev.	Non.	Sev.	Sev.	
Nov.	7.07	2.37	9.65	1.27	12.45	0.32	-	1.51	15.20	6.98	-	-	-	-	-	5.33	10.39	C_4S_1	C_2	C_2A_2	Mod	Non.	Sev.	Sev.	
Dec.	7.20	2.06	7.70	1.55	11.00	0.31	-	1.63	12.90	6.03	-	-	-	-	-	5.11	9.71	C_3S_1	C_2	C_2A_1	Mod	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

* INF. : Infiltration rate
These values represent the average of two years of the study.

Table (25): Water analysis and quality classification of well no. (22) in El-Gebeel region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality						
																		USSL	RUSSL	Indian (Gupta)	FAO			
																							Toxicity	
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl	$SO_4^{=}$	B	Fe	Mn	Zn	Cu						EC	INF.	Na^{+}	Cl	B
Jan.	7.00	7.10	20.70	7.10	48.70	.60	-	1.40	42.00	33.70	0.54	-	-	0.002	0.034	13.06	28.07	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Feb.	7.20	7.44	21.60	8.40	51.20	0.80	-	1.20	53.30	27.50	0.49	-	-	0.001	0.044	13.22	29.08	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Mar.	7.25	7.07	21.70	7.40	48.50	0.80	-	1.75	50.75	25.90	-	-	-	-	-	12.70	29.47	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
Apr.	7.30	6.70	21.80	6.40	45.80	0.80	-	2.30	48.20	24.30	-	-	-	-	-	12.19	29.86	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
May	7.25	8.07	21.90	8.60	56.75	0.70	-	2.42	57.90	27.63	-	-	-	-	-	14.45	35.81	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
June	7.20	9.45	22.00	10.80	67.7	0.60	-	2.55	67.60	30.95	-	-	-	-	-	16.72	41.77	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
July	7.50	7.93	21.00	11.10	56.00	0.72	-	2.32	58.70	27.80	0.68	0.001	0.018	-	0.065	13.97	34.22	C_5S_2	C_3	C_4A_{4B1}	Sev.	Non.	Sev.	Sev.	Non.
Aug.	7.40	8.10	21.00	11.20	57.40	0.75	-	2.30	61.70	26.35	1.13	-	0.026	0.066	0.081	14.30	35.00	C_5S_2	C_3	C_4A_{4B1}	Sev.	Non.	Sev.	Sev.	Non
Sep.	7.00	8.20	21.30	11.10	58.00	1.00	-	2.30	52.10	37.00	-	-	-	-	-	14.46	35.33	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Oct.	6.95	7.60	19.70	10.40	53.10	0.85	-	1.85	49.30	32.90	-	-	-	-	-	13.69	32.17	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Nov.	7.10	7.03	22.45	6.20	46.40	0.70	-	1.92	44.60	29.23	-	-	-	-	-	12.26	29.42	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
Dec.	7.01	6.67	21.90	6.05	44.60	0.89	-	1.95	43.80	27.69	-	-	-	-	-	11.93	28.63	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

• INF. : Infiltration rate
These values represent the average of two years of the study.

Table (26): Water analysis and quality classification of well no. (23) in El-Gebeen region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
																				Indian	FAO				
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl^{-}	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	(Gupta)	EC	INF.*	Toxicity Na^{+}	Toxicity Cl	Toxicity B
Jan.	7.20	6.24	16.90	5.59	43.75	1.00	-	2.60	41.9	22.74	0.21		0.022	0.018	0.042	12.47	28.63	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Feb.	7.10	8.20	19.60	5.40	62.00	1.60	-	1.60	58.20	28.80	0.42		0.029	0.016	0.039	17.53	38.56	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non.
Mar.	7.15	8.00	19.35	6.55	59.20	1.40	-	1.95	51.85	32.70	-	-	-	-	-	16.46	37.35	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Apr.	7.20	7.80	19.10	7.70	56.40	1.20	-	2.30	45.50	36.60	-	-	-	-	-	15.40	36.20	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
May	7.30	7.59	18.00	6.25	54.60	1.40	-	2.54	48.25	29.46	-	-	-	-	-	14.91	35.05	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
June	7.50	7.38	17.00	4.80	52.80	1.60	-	2.79	51.00	22.41	-	-	-	-	-	14.43	33.91	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
July	7.50	7.06	14.50	8.30	47.30	1.00	-	2.55	48.40	20.15	0.33		0.032	0.025	0.051	14.03	33.00	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non
Aug.	7.20	7.27	17.50	8.20	50.60	1.10	-	1.86	52.50	23.04	0.32		0.032	0.048	0.044	14.13	31.80	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non
Sep.	7.10	7.80	17.50	7.50	54.60	1.40	-	2.10	59.30	19.60	-	-	-	-	-	15.44	35.51	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Oct.	7.20	7.20	18.50	7.80	51.30	1.10	-	2.40	58.30	18.00	-	-	-	-	-	14.14	33.93	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Nov.	7.36	6.68	17.50	7.60	47.30	0.87	-	2.61	53.85	16.81	-	-	-	-	-	13.35	32.04	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Dec.	7.40	6.44	17.25	7.05	44.35	1.20	-	2.32	48.35	19.18	-	-	-	-	-	12.72	29.89	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

* INF. : Infiltration rate
These values represent the average of two years of the study.

Table (27): Water analysis and quality classification of well no. (24) in El-Gebeel region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl^{-}	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gupta)	FAO				
																					EC	INF.*	Toxicity Na^{+}	Toxicity CT	Toxicity B
Jan.	7.20	7.57	18.37	9.55	51.40	1.20	-	0.80	59.00	20.72	0.13	0.101	0.033	0.066	0.033	13.74	28.16	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Feb.	7.20	7.19	19.60	9.40	47.00	1.60	-	1.40	51.00	25.20	0.096	0.028	0.028	0.018	0.021	12.34	26.53	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Mar.	7.20	7.69	20.40	9.80	52.75	1.60	-	1.16	55.10	28.29	-	-	-	-	-	13.55	28.76	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
Apr.	7.20	8.20	21.20	10.20	58.50	1.60	-	0.93	59.20	31.37	-	-	-	-	-	14.77	31.00	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
May	7.25	8.44	20.10	10.40	62.25	1.40	-	1.04	61.80	31.31	-	-	-	-	-	15.18	32.27	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
June	7.22	8.69	19.00	10.60	66.00	1.20	-	1.16	64.40	31.24	-	-	-	-	-	15.60	33.54	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
July	7.20	7.06	18.50	11.50	47.30	0.97	-	1.39	59.30	17.58	0.54	0.113	0.038	0.086	0.061	12.20	27.45	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non
Aug.	7.25	7.06	18.30	11.60	46.50	0.97	-	1.62	54.60	21.15	0.32	0.029	0.030	0.10	0.096	12.03	28.00	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non
Sep.	7.10	7.60	18.70	10.20	53.30	1.40	-	1.40	65.30	16.90	-	-	-	-	-	14.02	31.54	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Oct.	7.20	7.44	18.35	10.95	50.80	1.35	-	1.50	62.00	17.95	-	-	-	-	-	13.27	30.52	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Nov.	7.15	6.69	17.49	11.50	42.90	1.60	-	1.76	51.00	20.73	-	-	-	-	-	11.29	26.53	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
Dec.	7..30	8.28	20.19	10.85	58.60	1.46	-	1.40	62.00	27.70	-	-	-	-	-	14.90	33.52	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

* INF. : Infiltration rate

These values represent the average of two years of the study.

Table (28): Water analysis and quality classification of well no. (25) in El-Gebeel region.

Month	pH	EC	Cations (me/L)				Anions (mc/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
																				Indian	FAO				
																							Toxicity		
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	(Gupta)	EC	INF.*	Na^{+}	Cl	B
Jan.	7.30	6.31	12.92	5.03	45.10	0.82	-	1.00	49.90	12.97	1.19		0.023	0.032	0.039	15.03	32.31	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non.
Feb.	7.22	11.10	22.00	11.10	94.50	0.95	-	1.22	89.70	37.63	1.03	0.015	0.021	0.029	0.042	23.23	52.26	C_5S_3	C_3	C_5A_5B	Sev.	Non.	Sev.	Sev.	Non.
Mar.	7.30	11.30	21.75	12.15	96.80	1.10	-	1.23	92.80	37.77	-	-	-	-	-	23.50	52.88	C_5S_3	C_3	C_5A5	Sev.	Non.	Sev.	Sev.	
Apr.	7.40	11.50	21.50	13.20	99.10	1.10	-	1.25	95.90	37.75	-	-	-	-	-	23.78	53.50	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
May	7.35	11.72	22.25	11.35	102.00	1.35	-	1.00	99.45	36.50	-	-	-	-	-	24.91	53.40	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
June	7..30	11.95	23.00	9.50	105.00	1.62	-	0.70	103.00	35.42	-	-	-	-	-	26.05	53.40	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
July	7.20	10.86	19.00	11.50	90.30	1.10	-	1.16	92.60	28.14	1.33	.016	0.027	0.036	0.041	23.15	49.77	C_5S_3	C_3	$C_5A_5B_1$	Sev.	Non.	Sev.	Sev.	Non
Aug.	7.00	11.08	18.50	11.50	89.10	1.10	-	1.16	88.40	30.64	1.15		0.037	0.064	0.065	23.00	49.45	C_5S_3	C_3	$C_5A_5B_1$	Sev.	Non.	Sev.	Sev.	Non
Sep.	7.00	11.45	18.70	17.00	97.60	0.87	-	1.10	95.40	37.67	-	-	-	-	-	23.10	50.82	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
Oct.	7.10	11.40	19.90	17.00	96.40	0.95	-	0.97	96.00	37.28	-	-	-	-	-	22.44	49.36	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
Nov.	7.16	11.17	20.80	13.30	95.95	0.87	-	0.99	98.70	31.23	-	-	-	-	-	23.23	48.78	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
Dec.	7.21	10.92	20.05	11.95	90.85	1.31	-	0.90	101.10	22.16	-	-	-	-	-	22.71	47.69	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

* INF. : Infiltration rate
These values represent the average of two years of the study.

Table (30): Water analysis and quality classification of well no. (27) in El-Gebeel region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
																				Indian	FAO				
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	CT	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	(Gupta)	EC	INF.*	Toxicity Na^{+}	Toxicity CT	Toxicity B
Jan.	7.12	8.60	18.20	13.50	65.10	0.87	-	1.17	56.90	30.60	0.33	-	0.022	0.064	0.048	16.85	36.20	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non.
Feb.	7.10	8.90	20.20	12.70	69.00	0.95	-	0.95	71.30	30.60	0.36	-	0.026	0.049	0.042	17.01	36.06	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non.
Mar.	7.00	9.35	23.80	11.80	74.00	1.00	-	0.85	72.50	37.25	-	-	-	-	-	17.50	36.93	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Apr.	6.90	9.80	27.40	11.00	79.00	1.05	-	0.70	73.70	44.05	-	-	-	-	-	18.00	37.80	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
May	7.20	10.87	26.20	11.20	84.40	1.30	-	0.93	81.04	41.13	-	-	-	-	-	19.50	42.52	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
June	7.40	11.95	25.00	11.40	89.80	1.55	-	1.16	88.40	38.19	-	-	-	-	-	21.00	47.25	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
July	7.50	10.32	21.00	11.50	83.60	0.97	-	1.39	83.20	32.48	0.086	0.059	0.032	0.075	0.059	18.50	43.47	C_5S_3	C_3	$C_5A_4B_1$	Sev.	Non.	Sev.	Sev.	Non
Aug.	7.20	9.23	24.00	8.56	69.00	0.97	-	1.16	77.0	24.31	1.28	0.019	0.038	0.086	0.055	17.12	36.80	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non
Sep.	7.00	9.32	23.90	9.20	73.00	1.07	-	0.75	79.30	27.12	-	-	-	-	-	17.94	36.77	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Oct.	7.10	9.20	20.10	12.60	70.00	1.12	-	1.14	75.40	27.28	-	-	-	-	-	17.31	37.20	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Nov.	7.20	7.60	18.50	10.90	56.05	1.13	-	1.24	64.20	21.34	-	-	-	-	-	14.62	32.16	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Dec.	7.16	8.49	20.85	9.35	64.45	1.07	-	0.94	66.35	28.43	-	-	-	-	-	16.61	34.88	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

* INF. : Infiltration rate
These values represent the average of two years of the study.

Table (31): Water analysis and quality classification of well no. (28) in El-Gebeel region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)						adj. SAR	International Guide of water quality							
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	CT	$SO_4^{=}$	B	Fe	Mn	Zn	Cu	SAR		USSL	RUSSL	Indian (Gupta)	FAO				
																					EC	INF.•	Toxicity Na^{+}	Toxicity CT	Toxicity B
Jan.	7.30	5.80	14.19	4.79	38.75	0.75	-	2.60	40.80	15.08	0.15		0.011	0.019	0.046	12.60	29.00	C_5S_2	C_3	$C_4A_3B_1$	Sev.	Non.	Sev.	Sev.	Non.
Feb.	7.20	6.94	19.50	4.50	47.00	1.20	-	1.90	47.30	23.00	0.25		0.019	0.022	0.039	13.58	31.23	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non.
Mar.	7.15	7.87	20.85	5.80	57.90	1.50	-	1.55	55.0	29.50	-	-	-	-	-	15.79	35.41	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Apr.	7.10	8.80	22.20	7.10	68.80	1.80	-	1.20	63.70	35.00	-	-	-	-	-	18.00	39.60	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
May	7.30	7.82	20.60	5.95	57.40	1.40	-	1.41	58.30	25.64	-	-	-	-	-	15.66	34.59	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
June	7.50	6.84	19.00	4.80	46.00	1.00	-	1.62	53.00	16.18	-	-	-	-	-	13.33	29.59	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	
July	7.50	7.82	16.50	8.20	55.8	0.81	-	2.32	60.80	18.19	0.30	0.033	0.033	0.054	0.057	15.90	39.00	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non
Aug.	7.20	7.60	18.00	9.60	52.50	0.86	-	2.30	59.80	18.86	0.22	0.012	0.025	0.058	0.056	14.10	35.3	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non
Sep.	7.10	7.20	16.40	9.40	51.40	0.77	-	2.11	55.70	20.16	-	-	-	-	-	14.30	32.90	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Oct.	7.20	7.00	17.70	7.30	50.20	0.79	-	1.37	46.30	28.32	-	-	-	-	-	14.20	30.53	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Nov.	7.15	6.62	17.80	7.10	45.85	0.82	-	2.28	56.75	12.54	-	-	-	-	-	13.21	31.55	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Dec.	7.15	6.78	18.85	6.35	47.70	0.81	-	1.95	49.35	22.41	-	-	-	-	-	13.45	29.92	C_5S_2	C_3	C_4A_3	Sev.	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

• INF. : Infiltration rate
These values represent the average of two years of the study.

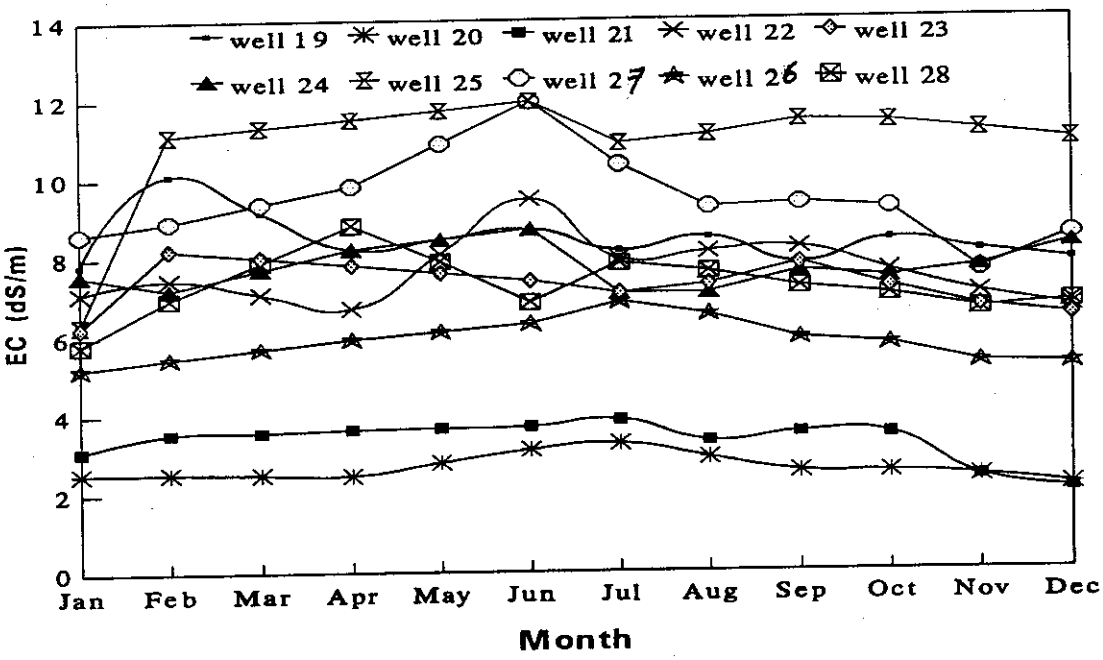


Fig. (11): Wells water salinity of EL-Gebeel region.

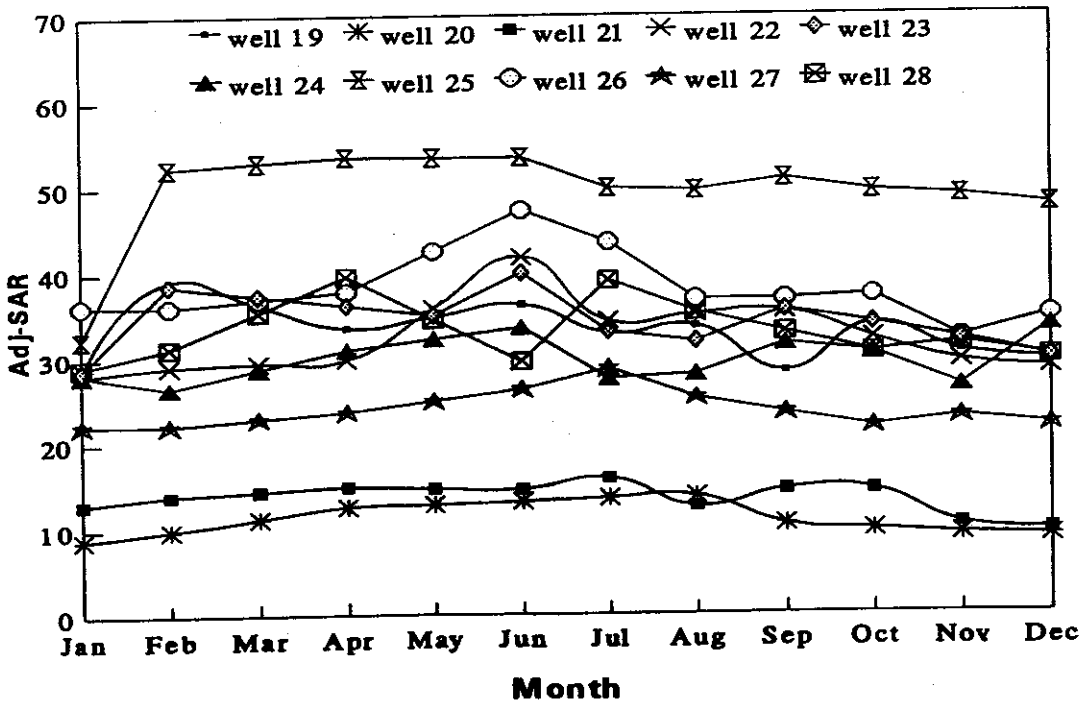


Fig. (12): Adj-SAR of Water wells of Gebeel region.

4.1.6. Rass Raie Region:

4.1.6.1. Salinity hazard:

As shown in Tables 32, 33 and 34 and Fig. (13) the values of EC ranged between 9.11 and 14.12 dSm^{-1} with an average of 11.61 dSm^{-1}. Well No. 31 had the relatively highest salinity level in the most year months having EC values ranged between 9.09 and 18.46 dSm^{-1} with an average of 13.73 dSm^{-1}. Well water salinity monitoring showed an increase of water salinity during July month, (18.46 dSm^{-1}). In months of June and August, salinity was decreased. In this concern, the agronomic practices had an important role for the salinity monitoring, namely the crop water requirements were relatively highest through July month which consequently increased the water discharge and water salinity. This mainly attributed to the compensation from the sea. But during June and august months, farmers not irrigate the soil. Then water discharge appeared to be little. Thus water discharge is a major factor affecting the salinity monitoring. These results are in a good agreement with those obtained by Boekelman (1979), Wnag (1992), and Rogers and Dreiss (1995).

Considering the data of well No. (30), the results revealed that the relatively lowest EC values during year months were recorded in this well among the wells represented this region It had EC values ranged between 7.67 and 10.20 dSm^{-1} with an average of 8.92 dSm^{-1}. This may be attributed to the relatively lowest water discharge, as well as, the far distance of this well from the Suez Gulf should be considered for lowering water salinity as the results of, Pewe (1981), Wiman (1985), and Brown and Sharp (1992).

Data of well No. (29) showed that the water salinity of this well had the intermediat values between the two above wells, it had EC values ranged between 9.11 and 14.12 dSm^{-1} with an average of 11.62 dSm^{-1}.

Therefore, the well water in Rass Raiea region could be classified into there salinity grades; the first grade is represented by the well No. (31) which have the relatively high salinity level in all year months, where the water discharge is approximately constant along the year months. The second grade is represented by the well No. (29), which had relatively an intermediate salinity level in this area and the third grade represented by well No. (30) which had the relatively lowest EC values of this area.

Accordingly the agriculture management of Rass Raiea region should be classified into three complementary patterns of agriculture depending on the grades of salinity, i.e., the cropping pattern should be selected for the possible best utilization of a particular salinity depending on its salt tolerance according to the findings obtained by Ayers and Westcot (1979), and Mass and Hoffman (1977).

Considering the magnitude of salinity hazard of well water in Rass Raiea region, it has to be noticed that the months of June, July and August recorded the highest EC values but months of October, November and December should the lowest EC values. This will be attributed to the contribution of factors, i.e., high temperature and consequently high evapotranspiration during the summer months led to increase crop water requirements and well water discharge, but in the winter season, low temperature as well as, the rainfall

should be considered for salinity decreasing due to the reducing of well water discharge according to Eriksson (1959); Loewengart (1961), Davis and Wiest (1966), Patil (1989) and Wood and San ford (1995).

The ions of Na and Cl are the most prevailing in the water constituents followed by the ions of SO_4, Ca and Mg. This will be due to the water seepage from the Suez Gulf similars results were obtained by (Revelle, 1941; Davis and Wiest, 1966; Pewe, 1981; Wiman et al, 1992; Dam, 1992; Brown and Sharp, 1992 and Essink, 1993).

Generally, Well water in Rass Raiea region has the highest salinity hazard since its salinity (EC) was classified as C5 in USSL (Richard's, 1954), and Indian classification (Gupta, 1979); C3 in RUSSL. Such salinity level is very harmful to the growing plants and a severe salinity problem is expected with using it as reported by FAO (Ayers and Westcot 1985). So, the proper agronomic practices should be introduced as mentioned in section (4.2).

4.1.6.2. Sodicity hazard:

Data of well water sodicity; Tables (32,33 and 34) which illustrated by fig. (14) showed that the values of the adj.SAR having a pattern of general change through the different year months

Well No. (31) had the highest values of the adj.SAR during January, February, March, April, May, July, September and October, it had 52.7, 47.52 46.31,45.1, 42.8, 77.8, 50.9 and 54.1, respectively. Highest values were recorded through July month, but it had the relatively lowest values during June, August, November,

and December. Decreasing the adj.SAR in June and Aug. months was due to the agricultural practices, which did not approximately discharge water through this period. This result indicates the role of water discharge in the monitoring adj.SAR (Teller et al, 1982 and Rogers and Dress. 1995).

In months of November and December, low temperature as will as, rainfall should be considered in reducing the values of the adj.SAR (Eriksson, 1959; Loewengart, 1961; Davis and Weist, 1966; Patil, 1989; Jenkins and Ephraums, 1990 and Wood and Sanford, 1995).

Well No. (30) had relatively lowest values of the adj.SAR among the well water in this region, it had the high values through June, July, August, September and October months; 44.4, 40.9, 40.3, 41.8, and 41.2, respectively. Months of January, February, March, April, May, November, and December relatively recorded the low values of the adj.SAR; 39.4, 40.2,38.55,36.9,40.67,31.05 and 30.63, respectively. These changes could be attributed to the contribution of climatic conditions which increased adj.SAR through summer months and decreased it through the winter months according to Davis and Wiest (1966); Patil (1989), Wiman et al (1990), Brown and Sharp (1992) and wood and Sanford (1995).

Well No. (29) had an approximately intermediate values of adj.SAR between the two above mentioned wells.

Generally, well water in Rass Raiea region had hazard sodicity effect in according to the international guides of water quality. It was S2 as Richard's (1954), guide, A4 according to the

Indian classification (Gupta 1979) and a severe toxicity problem is expected (Ayers and Westcot , 1985).

4.1.6.3. Well water boron and some trace elements:

As shown in Tables (32,33,34) the analysis of well water boron generally showed safe concentration in different year months ranged between 0.28 to 0.7 mgL^{-1}.

Also, the amounts of the trace elements Fe, Mn, Zn and Cu showed undetectable concentration in most year months indicating that, well waters in this region were not polluted.

Table (32): Water analysis and quality classification of well no. (29) in Ras Raiea region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	Cl^{-}	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gopta)	FAO				
																					EC	INF.*	Toxicity Na^{+}	Toxicity Cl	Toxicity B
Jan.	7.10	9.34	19.11	13.03	68.8	1.60	-	1.40	74.62	26.52	0.50	-	-	-	0.016	17.20	36.12	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non.
Feb.	7.20	10.10	20.60	14.40	75.8	2.10	-	1.86	80.00	31.04	0.57	-	-	-	0.056	18.12	43.66	C_5S_3	C_3	$C_5A_4B_1$	Sev.	Non.	Sev.	Sev.	Non.
Mar.	7.20	10.10	20.60	14.30	75.9	2.10	-	1.73	77.30	33.87	-	-	-	-	-	18.17	43.69	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
Apr.	7.20	10.10	20.60	14.20	76.0	2.10	-	1.60	74.60	36.70	-	-	-	-	-	18.12	43.70	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
May	7.25	11.84	24.80	16.35	95.9	2.05	-	1.50	98.65	38.95	-	-	-	-	-	20.99	43.70	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
June	7.30	13.58	29.00	18.50	115.8	2.00	-	1.40	122.70	41.20	-	-	-	-	-	23.76	57.02	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
July	7.50	12.49	23.00	15.10	96.8	1.20	-	1.62	101.20	33.28	0.50	0.013	0.015	0.078	0.101	22.18	54.34	C_5S_3	C_3	$C_5A_5B_1$	Sev.	Non.	Sev.	Sev.	Non
Aug.	7.00	14.12	26.50	19.50	119.8	1.35	-	1.86	118.40	46.89	0.45	0.015	0.032	0074	0.042	24.98	62.45	C_5S_3	C_3	$C_5A_5B_1$	Sev.	Non.	Sev.	Sev.	Non
Sep.	7.10	10.30	25.57	13.10	83.2	1.70	-	1.65	95.80	26.12	-	-	-	-	-	19.00	46.55	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
Oct.	7.20	10.20	23.25	13.90	83.6	1.63	-	1.45	95.20	25.73	-	-	-	-	-	19.40	46.56	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
Nov.	7.21	9.11	20.98	12.40	69.6	1.77	-	1.53	75.51	23.97	-	-	-	-	-	17.04	40.04	C_5S_2	C_3	C_4A_5	Sev.	Non.	Sev.	Sev.	
Dec.	7.21	9.48	21.95	13.80	71.8	1.45	-	1.74	82.00	25.26	-	-	-	-	-	16.98	40.75	C_5S_2	C_3	C_4A_5	Sev.	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

* INF. : Infiltration rate
These values represent the average of two years of the study.

Table (33): Water analysis and quality classification of well no. (30) in Ras Raiea region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
																					FAO				
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	CT	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gopta)	EC	INF.•	Toxicity Na^{+}	Toxicity CT	Toxicity B
Jan.	7.10	9.80	22.93	10.91	72.00	1.20	-	1.20	66.40	39.44	0.48	-	-	-	0.017	17.50	39.40	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non.
Feb.	7.20	9.59	22.80	10.20	69.60	1.40	-	1.86	71.40	30.74	0.28	-	-	-	0.004	17.10	40.20	C_5S_2	C_3	$C_4A_4B_1$	Sev.	Non.	Sev.	Sev.	Non.
Mar.	7.20	9.40	21.85	10.45	67.40	0.96	-	1.63	69.80	29.23	-	-	-	-	-	16.75	38.55	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Apr.	7.20	9.20	20.90	10.70	65.20	0.52	-	1.40	68.20	27.72	-	-	-	-	-	16.40	36.90	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
May	7.25	9.70	21.20	12.00	71.23	0.78	-	1.63	75.20	28.38	-	-	-	-	-	17.46	40.67	C_5S_2	C_3	C_4A_5	Sev.	Non.	Sev.	Sev.	
June	7.30	10.21	21.50	13.30	77.26	1.05	-	1.86	82.20	29.05	-	-	-	-	-	18.52	44.44	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
July	7.50	9.56	18.50	16.90	78.10	0.83	-	1.16	71.70	41.47	0.40	0.022	0.018	0.085	0.082	18.56	40.90	C_5S_3	C_3	$C_4A_5B_1$	Sev.	Non.	Sev.	Sev.	Non
Aug.	7.00	9.56	18.50	16.70	70.50	0.86	-	1.62	82.20	22.74	0.50	-	0.030	0.093	0.041	16.80	40.32	C_5S_2	C_3	$C_4A_5B_1$	Sev.	Non.	Sev.	Sev.	Non
Sep.	7.10	9.56	17.72	14.10	75.70	2.10	-	1.20	86.10	22.32	-	-	-	-	-	19.00	41.80	C_5S_3	C_3	C_4A_5	Sev.	Non.	Sev.	Sev.	
Oct.	7.20	9.30	19.65	13.90	73.20	1.80	-	1.35	78.10	29.10	-	-	-	-	-	17.90	41.20	C_5S_2	C_3	C_4A_5	Sev.	Non.	Sev.	Sev.	
Nov.	7.20	7.67	19.05	12.45	53.09	1.70	-	1.42	58.92	25.95	-	-	-	-	-	13.40	31.05	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	
Dec.	7.14	7.88	22.76	11.60	55.20	1.60	-	1.65	60.65	28.86	-	-	-	-	-	13.31	30.63	C_5S_2	C_3	C_4A_4	Sev.	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

• INF. : Infiltration rate
These values represent the average of two years of the study.

Table (34): Water analysis and quality classification of well no. (31) in Ras Raiea region.

Month	pH	EC	Cations (me/L)				Anions (me/L)				Boron and some trace elements (mg/L)					SAR	adj. SAR	International Guide of water quality							
			Ca^{++}	Mg^{++}	Na^{+}	K^{+}	$CO_3^{=}$	HCO_3^{-}	CT	$SO_4^{=}$	B	Fe	Mn	Zn	Cu			USSL	RUSSL	Indian (Gopta)	FAO				
																					EC	INF.*	Toxicity		
																							Na^{+}	CT	B
Jan.	7.10	11.91	16.19	11.01	92.90	2.10	-	1.40	95.40	35.40	0.56	-	-	-	0.015	21.50	52.70	C_5S_3	C_3	$C_5A_5B_1$	Sev.	Non.	Sev.	Sev.	Non.
Feb.	7.00	13.25	22.90	18.10	97.80	1.60	-	0.93	94.60	44.87	1.17	-	-	-	0.003	21.60	47.52	C_5S_3	C_3	$C_5A_5B_1$	Sev.	Non.	Sev.	Sev.	Non.
Mar.	7.05	12.93	26.10	16.40	96.90	1.06	-	0.93	91.45	48.08	-	-	-	-	-	21.05	46.31	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
Apr.	7.10	12.62	29.30	14.70	96.00	0.52	-	0.93	88.30	51.02	-	-	-	-	-	20.50	45.10	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
May	7.15	11.47	26.40	12.50	85.00	0.81	-	1.16	84.20	39.35	-	-	-	-	-	19.25	42.80	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
June	7.20	10.32	23.50	10.30	74.00	1.10	-	1.40	80.10	27.40	-	-	-	-	-	18.00	40.50	C_5S_2	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
July	7.50	18.46	31.50	19.90	154.80	1.62	-	1.62	171.60	34.60	0.70	0.017	0.026	0.117	0.183	30.50	77.80	C_5S_4	C_3	$C_5A_5B_1$	Sev.	Non.	Sev.	Sev.	Non
Aug.	7.20	13.10	21.74	19.50	100.86	2.10	-	1.47	104.95	37.78	0.360	0.046	0.023	0.08	0.039	17.00	38.30	C_5S_2	C_3	$C_5A_4B_1$	Sev.	Non.	Sev.	Sev.	Non
Sep.	7.10	13.30	22.28	18.40	101.82	2.30	-	1.35	105.70	37.75	-	-	-	-	-	22.60	50.90	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
Oct.	7.20	12.90	21.20	19.70	99.90	1.90	-	1.60	104.20	36.90	-	-	-	-	-	22.10	54.10	C_5S_3	C_3	C_5A_5	Sev.	Non.	Sev.	Sev.	
Nov.	7.15	10.10	21.47	15.95	72.98	1.89	-	1.46	86.15	24.69	-	-	-	-	-	16.98	39.56	C_5S_2	C_3	C_5A_4	Sev.	Non.	Sev.	Sev.	
Dec.	7.27	10.11	26.25	10.77	76.30	1.40	-	1.12	83.75	29.85	-	-	-	-	-	17.55	39.55	C_5S_2	C_3	C_5A_4	Sev.	Non.	Sev.	Sev.	

Sev. : Severe problem.
Mod.: Moderate problem.
Non. : None problem.

• INF. : Infiltration rate
These values represent the average of two years of the study.

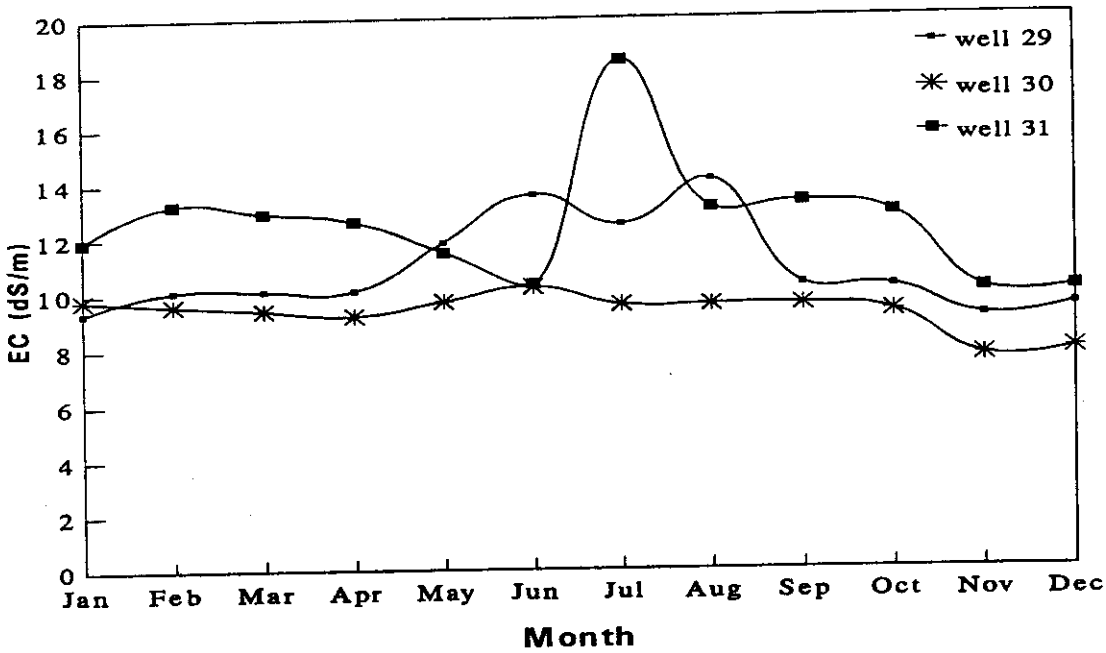


Fig. (13): Wells water salinity of Rass Raiea region.

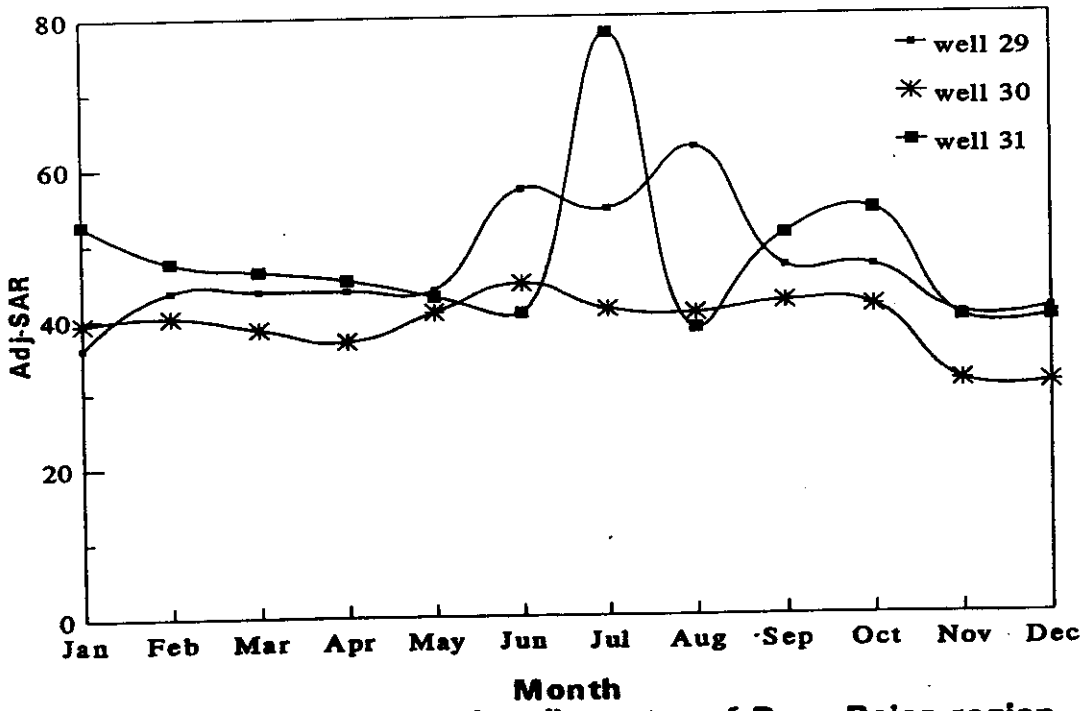


Fig. (14): Adj-SAR of wells water of Rass Raiea region.

4.2. Evaluation of wells water salinity for their possible best utilization:

Data in Table (35) which illustrated by Fig. (15), show that the wells No. 1, 2, 3, 4 and 6 in El-Wady region, No. 13 and 14 in El-Tor region, 16 and 17 in El-Korom region, and well No. 20 in El-Gebeel region having low salinity levels among the wells in the studied area having EC values ranged between 2 and 3.0 dSm^{-1} during months with the exception of the wells No. 16 and 17 which having little raises in their salinity during June and August.

Under the circumstances of agriculture pattern in Egypt, especially in South of Sinai, the relatively low salt tolerant crops, especially the vegetables, should be situated in the areas irrigated with these wells. That is to say, where drawing a cropping map in South of Sinai, the vegetables crops which are sensitive and /or moderately sensitive to salinity stress above the grade (I) should be subjected to irrigate with the wells mentioned above. In this concern the modern irrigation systems should be used with the proper soil management practices to alleviate the salinity problems.

Therefore, the regions of El-Wady, El-Tor and El-Koroom having major wells showing relatively low grade of salinity and consequently, these regions must be specified to growing the sensitive and moderately sensitive crops for the grades (II) and (III) of salinity according to the guides described by Mass and Hoffman (1977).

Table (35): Salinity evaluation of wells water in the studied area in south of Sinai.

Location	EL-Wady			Messad			EL-Tor			EL-Korom			EL-Gebeel			Rass Raiea		
Gr. of sal.	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
No. of wells	1,2,3,4,6	5.8	7	-	11	9,10	13,14	12	-	16,17	15,18	-	20	21,26	19,22, 23,24, 25,27, 28	-	-	29,30,31
Jan.	2.16	5.19	6.60	-	5.11	7.55	2.33	4.41	-	2.20	2.08	-	2.52	4.14	7.06	-	-	10.35
Feb.	2.44	5.70	6.80	-	5.80	8.58	2.52	4.90	-	2.45	3.34	-	2.52	4.49	8.55	-	-	10.98
Mar.	2.46	5.59	6.87	-	5.75	9.65	2.90	4.97	-	2.53	3.51	-	2.49	4.63	8.63	-	-	10.81
Apr.	2.50	5.50	6.94	-	5.70	10.72	3.27	5.04	-	2.62	3.70	-	2.46	4.78	8.71	-	-	10.64
May	2.34	5.96	7.27	-	5.56	9.38	3.06	5.23	-	3.06	4.30	-	2.78	4.87	8.99	-	-	11.00
June	2.15	6.43	7.60	-	5.43	8.03	2.85	5.43	-	3.50	4.91	-	3.10	4.97	9.27	-	-	11.37
July	2.00	5.43	7.27	-	5.43	7.16	2.44	5.43	-	3.05	6.13	-	3.25	5.35	8.49	-	-	13.50
Aug.	2.36	5.70	7.38	-	5.10	7.27	2.51	5.43	-	3.90	3.97	-	2.88	4.91	8.40	-	-	10.89
Sep.	2.28	5.50	6.92	-	5.77	8.45	2.46	5.91	-	2.50	2.92	-	2.52	4.71	8.48	-	-	11.05
Oct.	2.21	5.25	6.55	-	5.60	8.16	2.45	4.82	-	2.37	2.50	-	2.50	4.61	8.32	-	-	10.80
Nov.	1.99	4.58	6.16	-	4.85	6.84	2.13	4.33	--	2.28	3.05	-	2.38	3.81	7.69	-	-	8.96
Dec.	2.13	4.08	6.42	-	4.47	6.48	2.17	4.41	-	2.22	3.06	-	2.15	3.63	7.92	-	-	9.16

* 1 : Grade 1 (1-3 dSm^{-1})
  2 : Grade 2 (3-6 dSm^{-1})
  3 : Grade 3 (>6 dSm^{-1})

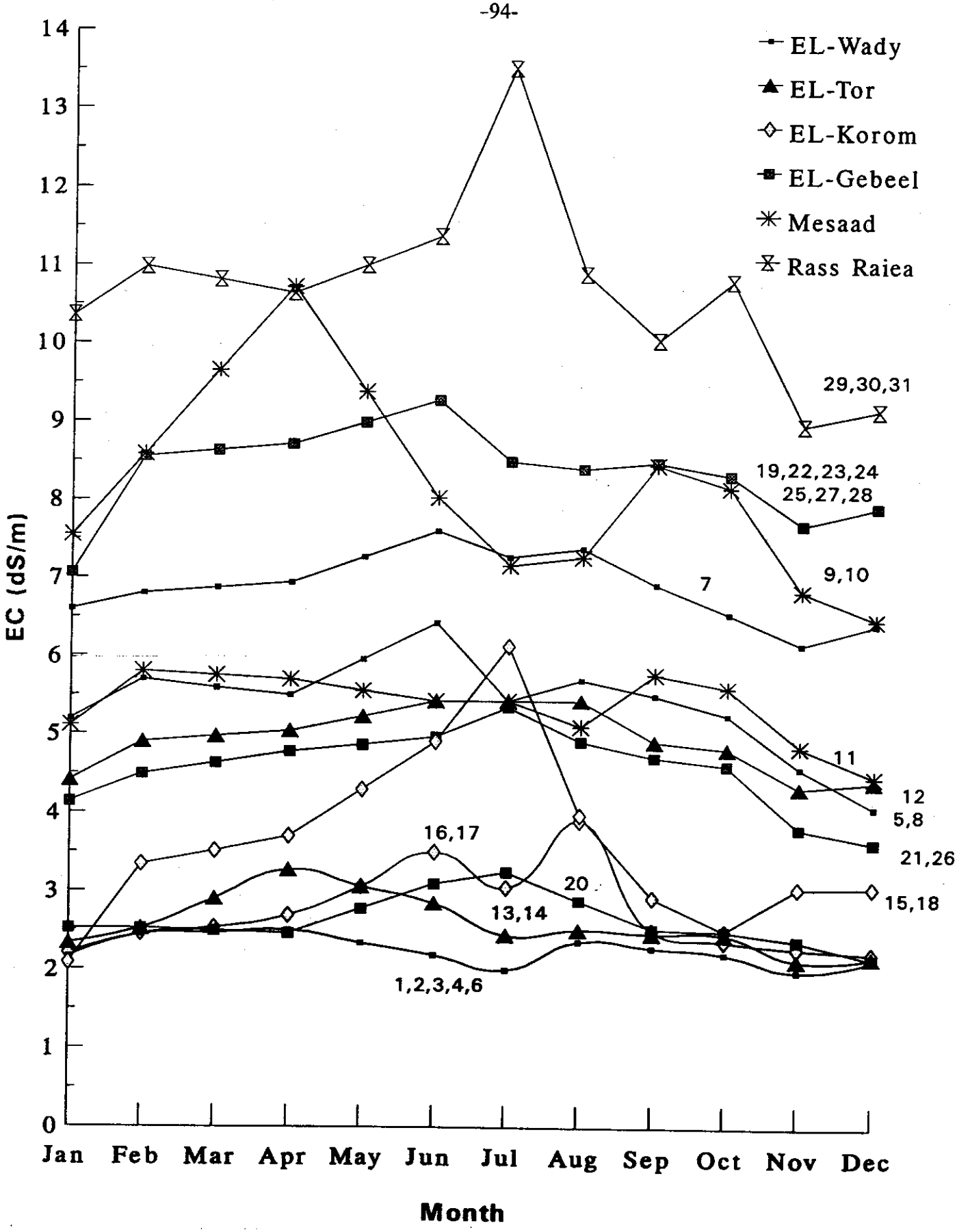


Fig. (15): Salinity evaluation of wells in the studied area in South Sinai.

For the second grade of salinity (Table 35 and Fig. 15), show that the wells No. 15 and 18 in El-Korom region, No. 21 and 26 in El-Gebeel region No. 5 and 8 in El-Wady region, No. 12 in El-Tor region and No. 11 in Mesaad region, all having salinity more than 3 dSm^{-1} and less than 6.0 dSm^{-1} during the all year months. So, the areas that subjected to irrigate with these wells must be exploreted with the relatively moderate salt tolerant crops for the above salinity grade. In these areas, some cereal and vegetable crops, such as some wheat, barley and tomatoes varities, as well as some forage crops, such as alfalfa, all were successfully growing under this grade of salinity.

In this respect, the proper management practices for soil and water to avoid the problems of salinity must be considered. So, the addition of chicken manure in soil at 30 cm depth, as on organic fertilizer in the recommended doses, should increase the ability of plants for better growing under salinity stress conditions (Amer,1989).

Wells representing the third grade of salinity (above 6 dSm^{-1}), as shown in Table (35) and Fig. (15), are the wells No. 7 in El-Wady region, No. 9 and 10 in Mesaad region, No. 19, 22, 23, 24, 25, 27 and 28 in El-Gebeel region, No. 29, 30 and 31 in Rass Raie region. Thus, El-Gebeel and Rass Raie region had the highest representation of the relatively serious salinity water among the regions of the studied area. Additionally, wells of Rass Raie region had the highest salinity hazard among these wells.

Therefore, the possible best exploitation of the above wells must be mainly depended on successful policy of soil-water management. Furthermore the selection of the highest salt tolerant plant must be considered.

That is to say that according to the data of crops salt tolerance (Mass and Horrman, 1977) the areas that are subjected to irrigate with these wells should be successfuly exploited with the relatively high salt tolerant crops. In this concern, data in Fig. (15) showed that the highest grade of salinity (above 6.0 dSm^{-1}) could be divided into sub-grades, i.e., wells No. 7 in El-Wady region No. 9 and 10 in Mesaad region and No. 19, 22, 23, 25, 27 and 28 in El-Gebeel region all having approximately EC values ranged between 6.5-8.5 dSm^{-1} approximately. Then this group of wells should be used to irrigate some crops such as oleaves and other fruitable crops that be able to tolerate these grades of salinity using the guides of Mass and Hoffman (1977) with considered the water-soil management to prevent the harmful salinity effect. On the other hand, wells of Rass Raie region had the highest salinity grads, all approximately above 10.0 dSm^{-1}. This region should be exploited with relatively highest salt tolerant plants under the critical program of soil management.

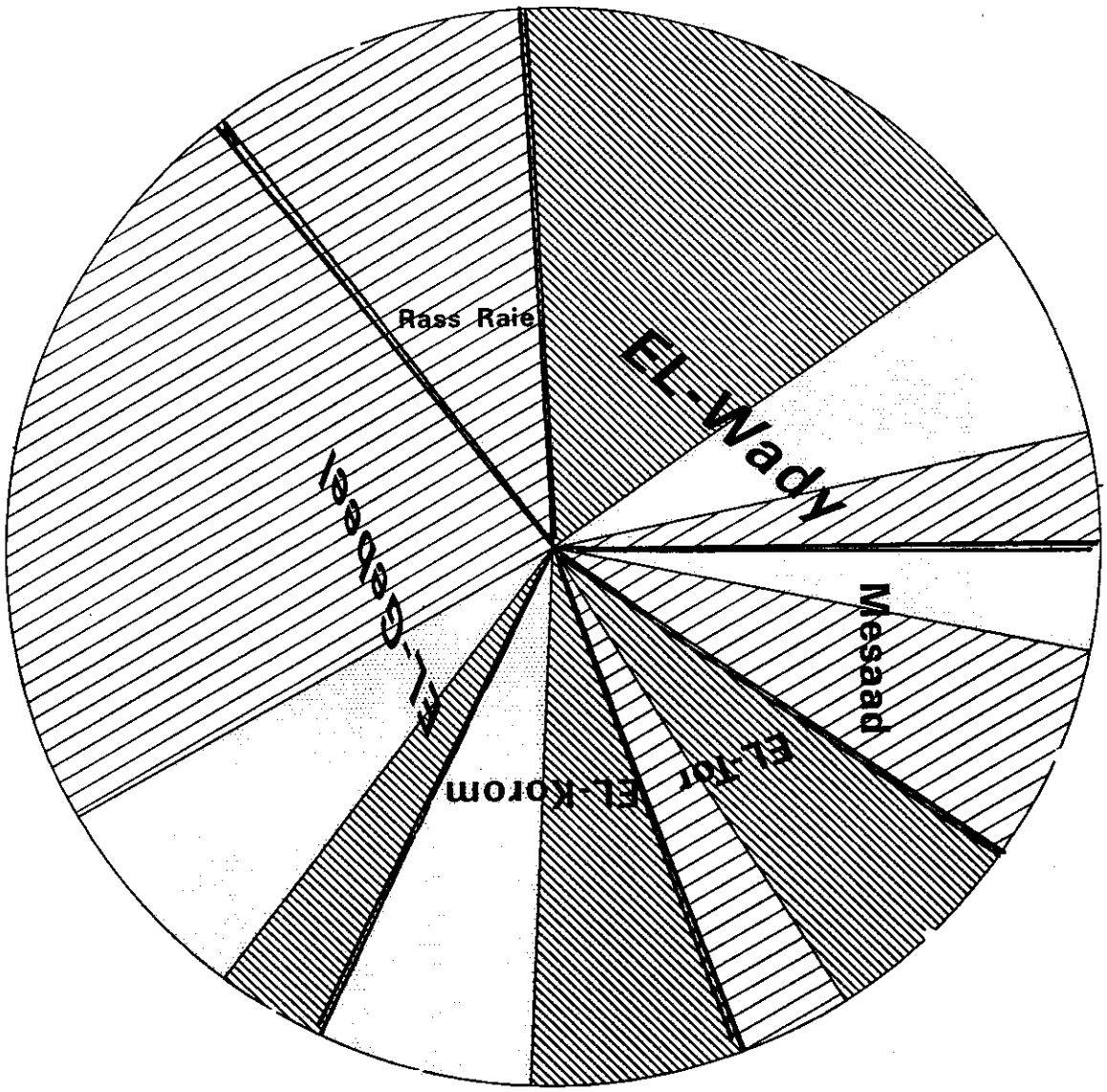
Finally, a cropping map could be drawn for the studied area in an endeavor to increase the agriculture production through the possible best exploitation of particular wells in each region according to their salinity grade and the guides of plant salt

tolerance as shown in Fig. (16). Studying the highlights data in this schematic graph, it could be reported that, about 62.5 % of El-wady region could be cultivated by the sensitive and/or moderately sensitive crops for the above salinity grades, but an about 25 % of this region should be exploited by the moderately tolerant crops for the above salinity grade. Tolerant crops should exploit an about 12.5 % of this region.

Considering the situation in Mesaad region, about 33 % of the area could be cultivated by the moderately salt tolerant crops for the above salinity grade but more than about 66 % of the area should be exploited by the relatively high salt tolerant crops. Sensitive and moderately sensitive crops not be recommended for their exploitation in this region.

For the situation in El-Tor region, about 66 % of the area could be exploited by relatively the sensitive and/or moderately sensitive crops for the above salinity grades, but an about 33 % of the area should be exploited by the moderately salt tolerant crops the above salinity grade. In El-Korom region 50 % of the area could be cultivated by the sensitive and /or moderately sensitive crops the above salinity grades. At least 50 % of the area should be cultivated by the moderately salt tolerant crops the above salinity grade.

Concerning the recommended agriculture pattern in El-Gebeel situation, it may be stated that the majority number of wells must be utilized to irrigate the relatively highest salt tolerant crops. Thus, about 70 % of this region should be exploited by the



Salt sensitive crops for the above salinity grades.

Moderately salt tolerant crops for the above salinity grade.

Salt tolerant crops for this grade of salinity.

Fig. (16): Schematic representation of the cropping map in the studied area.

relatively highest salt tolerant crops. Moderately salt tolerant and sensitive crops the above salinity grades, could be exploited in about 20 % and 10 % of this region, respectively.

Area of Rass Raie should be exploited by the relatively high salt tolerant crops. Sensitive and/or moderately salt tolerant crops are not recommended for their exploitation in this region.

Generally, successful agriculture policy in all regions of the studied area should mainly depends on the most suitable soil-water and plant mangement practices under saline agriculture conditions. In this concern, the utilization of organic manure such as chicken manure in the rizosphere area with a rate of about 1-2 % may enhance the plant salt tolerance. Also, the use of foliar application of certain amino acids shush as proline or proline + glatamic in a concentration of about 5 ppm at the sensitive growth period may enhance the plant salt tolerance (Amer 1989).