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ASSESSMENT OF UNDERGROUND AND SURFACE WATER BY IRRIGATION WATER QUALITY STANDARDS

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Shirak plateau is not only the most important area in the region, but also important for agricultural production in RA, where the reclamation of irrigated land is mainly conditioned by soil-hydrogeological factors.

In this contest the quality of ground and surface water used for irrigation purposes is essential.

According to Irrigation water quality standards, irrigation water in the Shirak plateau area is considered to be of good quality. In case of using the above standards for irrigation purposes, secondary salinization will not occur.

Ground and artesian water in smaller spaces of the plateau is of no exception.

Key words: plateau, ground, artesian, underground, surface, mineralization.

Introduction

The relief of Shirak region is of various types. It includes types of highlands, hills, mountain slopes and valleys. Humidity of soil with low depth mark is insufficient, due to which irrigation is performed. Humidity coefficient is 0.53, while the total mean annual precipitation is 400 ... 500 mm. Common (carbonate), typical and lime-free soils are the subtypes of the most widespread types of mountainous black soils [1]. Winter and spring cereals, grasses, vegetables and horticultural (carrot, beet, cabbage, potatoes) plants are cultivated.

Water intake in 2008 was 18,13 and in 2009 - 12,62 million.m³.

However, because of the unsatisfactory irrigation system and especially the inter-farm network conditions water loss amounts to 40 to 45 percent.

Therefore, during the irrigation period house basements of some communities are filled with ground water. The secondary soil salinization can also be unavoidable, resulting to the reduction of crop harvest because of the deterioration of irrigation water due to mineralization. The above mentioned necessitates to assess the quality of underground and surface water according to irrigation water quality standards.

The excessive rise of ground water level has a negative impact on the normal development of crops, resulting to crop yield fall from 20 to 15 ... 50 ... 55 percent [2] and in some cases from 80 to 85 % percent [3]. Water mineralization can also have a negative impact on crop yields, if it exceeds the irrigation water permissible values, which are from 0.5 to 0.8 g /l.

Underground and surface water is used for irrigation purposes in the plateau area, due to which both ground water location depths and mineralization are undergoing changes.

The above mentioned circumstances condition implementation of assessments of groundwater location depths and underground and surface water qualities (pH, electrical conductivity, mineralization, anions, cations, SAR) according to irrigation water quality standards, which is the main goal of the this paper.

Problem statement

To reveal the chemical, mechanical (0 -1m layer), and hydrophysical characteristics of irrigated soils, in the pat (in 1986) thorough researches were carried out in Ani, Artik, Akhuryan, Amasia and Ashotsk districts, the results of which were collected according to the occupied areas and listed in Table 1 [4].

Table 1

Mineralization (C) and pH for ground and natural water sources in the Shirak plateau

N	Location of ground water	C	pH	Location of natural water source	C	pH
1.	Gyumri (city)	0,28	6,8	Gyumri (city)	0,34	6,7
2.	Akhurik (village)	0,85	7,2	Kamo (city)	0,12	6,8
3.	Gharibjanyan(village)	0,73	7,2	Hovit (village)	0,44	6,8
4.	Bagravan (village)	1,01	7,0	Basen (village)	0,10	7,2
5.	Ceti (village)	0,23	7,2	Jrarat (village)	0,17	7,2
6.	Shirak (village)	0,33	7,0	Voskehat (village)	0,36	7,2
7.	Isahakyan (village)	0,57	6,8	Sarnaghbyur(village)	0,08	7,0
8.	Aghin (village)	0,27	6,8	Vahramaberd(village)	0,34	6,8
9.	Arevik (village)	0,10	6,4	Poqrashen(village)	0,20	7,4
10.	Beniamin (village)	0,37	7,0	Ceti (village)	0,14	6,8

Researches have also been carried out in from 2007 to 2009 period, mostly on about the groundwater location depths and their mineralization (including irrigation water).

Mineralization data of Akhuryan district and the Shirak plateau ground water carried out in 2008, ranges mainly from 0,10g/l to 0,73 g/l, which is quite permissible.

Exceptions are ground water of Akhurik (0.85 g / l) and Bagravan villages (1.01 g / l) (Table 1).

In other words, the risk of mineralization of the above mentioned two villages is high.

The pH ranges from 6.8 to 7.2, with the exception of Arevik village, pH of which is 6.4, and mineralization is 0.10 g / l (Table 1).

The mineralization data of water sources in Kamo and Gyumri cities and 23 villages, which are located in the same region, ranges from 0.06 to 0.44g / l, while pH ranges from 6.4 to 7.2 (exception for Pokrashen village, where pH is 7.4).

The samplings, analysis, pH and electrical conductivity (mS) measurements of the ground, natural fountains, artesian and irrigation water of Shirak plateau were carried out in 2016, during June-October period (Table 2).

Table 2

Chemical test results of irrigation, ground, artesian and natural water sources in Shirak plateau (26.06-29.09.2016)

Sampling		pH	Electrical conductivity ms	Mineralization C, mg/l	Adsorbed part of sodium, SAR
Time, 2016	Place				
June 26	Artesian water, village Akhurik	7.2	240	1210	6-9
	Well 1, h=25, app.8 Village Azatan, str. 30,	7.5	61	310	3-6
	Well 2, h=3.5m, Village Azatan, str. 30	7.4	98	508	3-6
	River Akhuruk, irrigation water	7.2	47	240	3-6
August 5	Well 1, h=2m, village Azatan, village forepart	7.3	45	291	3-6
	Well 2, h=3.5m,	7.1	105	680	6-9
	Irrigation water, Azatan village forepart	7.4	51	330	3-6
	Artesian water, upper part of village Beniamin	7.3	14	89	3 \geq
	Ground water, h=1.3m, village Azatan	7.1	75	490	3-6
September 29	Ground water, h=0.4m, village Gharibjanyan	7.4	160	1040	6-9

The results were compared with irrigation water quality standards (Table 3).

Table 3**Irrigation water quality standards**

Standards	Category	Electric conductivity, $\mu\text{S}/\text{cm}^2$	Total dissolved salts, mg/l	Sodium risk, Na %	Adsorbed sodium quantity, (SAR)	Chlorides, mg-ekv/l	Sulfates, mg-ekv/l
International	1-st, excellent	<250	<175	<20	<3	<4	<4
	2-nd, good	250-750	175-525	20-40	3-6	4-7	4-7
	3-rd, permissible	750-2000	525-1400	40-60	6-9	7-12	7-12
	4-th, limited use	2000-3000	1400-2100	60-80	9-12	12-20	12-20
	5-th, harmful	>3000	>2100	>80	>12	>20	>20
Plateau water	excellent, good, permissible	14-240	240-508, 680-1210	4-5-10, 70-75	3-9	7-28	25-200

The quality of the Shirak plateau ground and surface water according to standards is excellent, good and satisfactory. During the usage of this water for irrigation purposes, secondary salinization of soil will not occur. Ground water depths range from 1.3 to 1.8m, while mineralization ranges from 0.29 to 0.68g / l.

For improvement of plateau soil-hydrogeological conditions, we suggest a functional connection of water mineralization (1), which includes underground (C_{ug}) water, humidity of soil root layer, (C_{hl}), irrigation water (C_{ir}) and mineralization of precipitations (C_{atm}).

$$C_{gw}=f(C_{gr},C_{hl},C_{iw},C_{atm}): \quad (1)$$

The crop yield in the Shirak plateau irrigated lands, which is conditioned by some soil-hydrogeological factors, has an important role for both ground water mineralization and their location depths [5,6,7].

This circumstance is due to the crop root system length, which are divided into three groups: short - 0.6-0.7m, medium - 0.7-0.9m and long 0.9-1.2m.

Mainly short-root crops are cultivated in the Shirak plateau (beets, carrots, cabbage, potatoes, etc.) and middle -root (cereal) plants, for which groundwater optimal depth according to (H_{op} , Formula 2) comprises 0.9-1.1 and 1.6-1.8m respectively, according to Ararat Valley and Gegharkunik region many years (1962 ... 2007) research data [2.7].

To conclude, it is very important to determine the current location depths in the Shirak plateau and other irrigated lands. It will help to determine the important parameters of drainage systems according to the following formula [7].

$$H_{op}=1.1h_1+Kh, \quad (2)$$

where, H_o - optimal depth of ground water for high and stable crop yield,

h_1 - full length of the root system,

h - capillary water layer height of aeration zone from ground water surface,

K - coefficient 1.2 and 3 of capillary water sidebar, for short, middle and long-root crops respectively.

Conclusion

According to survey results - ground water location depths in the Shirak plateau ranges from 1.3 to 1.8m, mineralization from 0.3 to 0.7 g/l and pH from 7.04 to 7.5.

During vegetation period there wasn't any water in house basements.

The survey results confirm:

- according to Irrigation water quality standards, underground and surface water is mostly good and partly excellent and permissible,
- mineralization of irrigation water doesn't threaten secondary soil salinization.
- pH data of ground, artesian and natural water sources are acidic.

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ՇԻՐԱԿԻ ՍԱՐԱՀԱՐԹԻ ԱՏՈՐԳԵՏՆՅԱ ԵՎ ՄԱԿԵՐԵՎՈՒՅԹԱՅԻՆ ԶՐԵՐԻ ԳՆԱՀԱՏՈՒՄ ԸՍՏ ՈՌՈԳՄԱՆ ՄԻՋԱԶԳԱՅԻՆ ՉԱՓՈՐՈՇԻՉՆԵՐԻ

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Ավադեմիկոս Ի.Վ.Եղիազարովի անվան ջրային հիմնահարցերի և հիդրոտեխնիկայի ինստիտուտ

Շիրակի սարահարթը ոչ միայն մարզի, այլև ՀՀ գյուղատնտեսության արտադրության կարևորագույն տարածքներից է, որտեղ ոռոգվող հողերի մեկտրատիվ վիճակը պայմանավորված է առավելապես դրանց հողաջրաերկրաբանական պայմաններով: Այդ հարցում կարևոր դերակատարում ունի ոռոգման նպատակով օգտագործվող ստորգետնյա և մակերևութային ջրերի որակը: Ըստ ջրի որակի գնահատման միջազգային չափորոշիչների սարահարթի տարածքի ոռոգման ջրերը համարվում են առավելապես լավ որակի. դրանց ոռոգման նպատակով օգտագործման դեպքում հողերի երկրորդային աղակալում տեղի չի ունենա: Բացառություն են կազմում սարահարթի անհամեմատ փոքր տարածքների գրունտային և արտեզյան ջրերը:

Բանալի բառեր. սարահարթ, գրունտային, արտեզյան, ստորգետնյա, մակերևութային, հանքայնացում:

ОЦЕНКА КАЧЕСТВА ОРОШАЕМЫХ И ПОДЗЕМНЫХ ВОД ШИРАКСКОГО ПЛАТО ПО МЕЖДУНАРОДНЫМ СТАНДАРТАМ

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Ширакское плато является не только наиболее важной областью в регионе, но также имеет важное значение для сельскохозяйственного производства в РА, где мелиорация орошаемых земель в основном обусловлено почвенно-гидрогеологическими факторами.

В этом аспекте качество подземных и поверхностных вод, используемых для орошения, приобретает важное значение.

По международным стандартам, качества вод применяемых для орошения Ширакского плато является хорошим. В случае использования вод соответствующих данному международному стандарту не приведет засолению Ширакского плато.

Подземные и артезианские воды Ширакского плато составляют исключение.

Ключевые слова. плато, подземные, артезианские, поверхностные, минерализация.