WAYS TO IMPROVE THE EFFICIENCY OF WATER RESOURCES USE ON IRRIGATED LANDS.

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ANNOTATION

Analyzing the water balance equations at close (h = 1.0 – 1.5m) and at (h = 3.0m) relatively deep occurrences of the groundwater level and using the data of a number of authors, it has been established that the maximum value of total evaporation is typical at close occurrences (h = 1.0–1.5 m) groundwater level. A decrease in the groundwater level leads to a decrease in the amount of total evaporation. This circumstance will make it possible to reduce the irretrievable losses of groundwater for evaporation.

Key words: *water resources, total evaporation, salt balance, groundwater, irrigation rate, root layer.*

The formation of various soils is associated with a different ratio of the main components of the water and salt balances, and different costs of water resources. This circumstance was reflected in the works of N.M. Reshetkina, I.P. Aidarov, E. Karimov, and others, who believe that the greatest consumption of water resources is typical for irrigated lands with a close (1 ... 1.5 m) groundwater occurrence (1 ,2).

To assess the difference in the consumption of water resources on irrigated lands, under different reclamation regimes, we analyze the changes in the total water balances at a close occurrence of the level (1 ... 1.5 m) of groundwater and its decrease to 3 m. m) equation (at h = 1… 1.5m) we get:

$$\Delta\ W_0 = (O_r''-O'_r) + (F_k'' - F'_k) - (E''- E') + [\,(\underline{P} - \underline{O})'' - (\underline{P} - \underline{O})'\,] + (R'' - R') - (D'' - D') - (\bar{S}''- \bar{S}') \text{ .... } (1)$$

Here: O_r – net irrigation norm; eepage losses from the canals of the irrigation network; E - total evaporation (per year); P - O - underground inflow and outflow; P - pressure feed; D - drainage runoff;
$\bar{C}$ - surface discharge. Indices Or″ and O′p refer respectively to balance sheets at h ≥ 3 m and h = 1...... 1.5 m.

Consider the changes in the components of the blanc. Irrigation norms net. The results of summarizing numerous data on the values of net irrigation norms, at different levels of fresh groundwater, are shown in Table 1 (3,4,5,6,7, etc.).

Table 1

Changes in net irrigation norms for cotton-alfalfa crop rotations depending on the level of groundwater.

UGV	1,0	1,5	2,0	2,5	3,0	4,0
$\bar{O}_r = O_{r\,I} / O_{r\,1}$	1,0	1,22	1,44	1,55	1,64	1,70

The given data show that Or″ > O′r .

When the groundwater level drops from 1 ... .. 1.5 to 3 m, the net irrigation norm for the cotton-alfalfa crop rotation increases by ~ 50%, which will require additional costs for the construction of the irrigation network.

In accordance with what has been said

$$F''_k = \frac{1-η}{η} O_p'' > F'_k = \frac{1-η}{η} O_p' \; ..... \qquad (2)$$

Much more difficult is the estimation of total evaporation, depending on the level of groundwater. This is due to the fact that total evaporation significantly depends not only on the regime of groundwater, but also on the moisture content of the root layer of the soil, the degree of shading by plants, salinity, and other factors. In this regard, we will evaluate the dependence E = f (h) for the main agricultural crops (cotton and alfalfa) with a known approximation, using the available lysimetric data at soil moisture (0.6 ... .. 0.9) HB (2.3, 4,5,6,7,8,9 etc.). As part of the collected data, there are evapotranspiration values that differ markedly from the general level (Table 2). To exclude the outstanding observations from processing, the critical values E” were used, selected from the condition so that their probability was not lower than the significance level α = 0.05, that is

$$R\,(x_p > \bar{x} + tσ) = α \quad i \quad R\,(x_1 < \bar{x} - tσ) = α \; ..... \qquad (3)$$

where xp and x1 are the maximum and minimum values of total evaporation;

σ is the standard deviation; t is the normalized deviation depending on the significance level and sample size (10).Tablitsa 2

Total evaporation at different groundwater levels, m3/ha

Cotton					plant Alfalfa				
1,0m	1,5m	2,0 m	2,5 m	3,0 m	1,0m	1,5 m	2,0 m	2,5 m	3,0 m
14670	11886	8370	10900	7470	16450	13900	16700	13000	13630
9670	12619	8195	7030	13780	9320		17242		9570
6320	11552	7525	13210	12360	14871		9800		15060
7394	9880	9505	9713	14500	9200		17325		17730
16764	12280	8721	9037	15200	12568		15080		10800
13440	11460	7023	8731	8077	11737		9300		7300
7993		7512		7092	14218		8700		10400
9624		9068		7424	15738		10800		10800
9603		9845		6926	13641		10200		16631
5933		7816		6888	14934		7700		15181
13099		11098		12370	10460		15809		13610
12045		9803		8653	16163		10981		10864
11598		9540		6281	15240		12191		13562
8985		10201		10037			14059		15029
9110		8985		8776			12117		10723
6604		8806		11960			15223		15164
7537		9670		11221			15088		12001
8006		11880		11045			10727		14720
4751		1280		9386			9405		14832

4897		10867		9340			11997		13406
5623		12267		10450			11862		10420
7100		9346		10454			15352		
14760		9014		8532			15694		
10711		10400		12672			12910		
14260		9270		13932			14760		
13150		9584		7684					
10945		9587		9300					
12167				9020					
12427				6570					
10549				8191					
12546									
10934									
12677									
13333									
11000									
16060									
12410									
12450									
14200									
13380									

The results of generalizations of data on the value of total evaporation are shown in Table 3.

Table 3

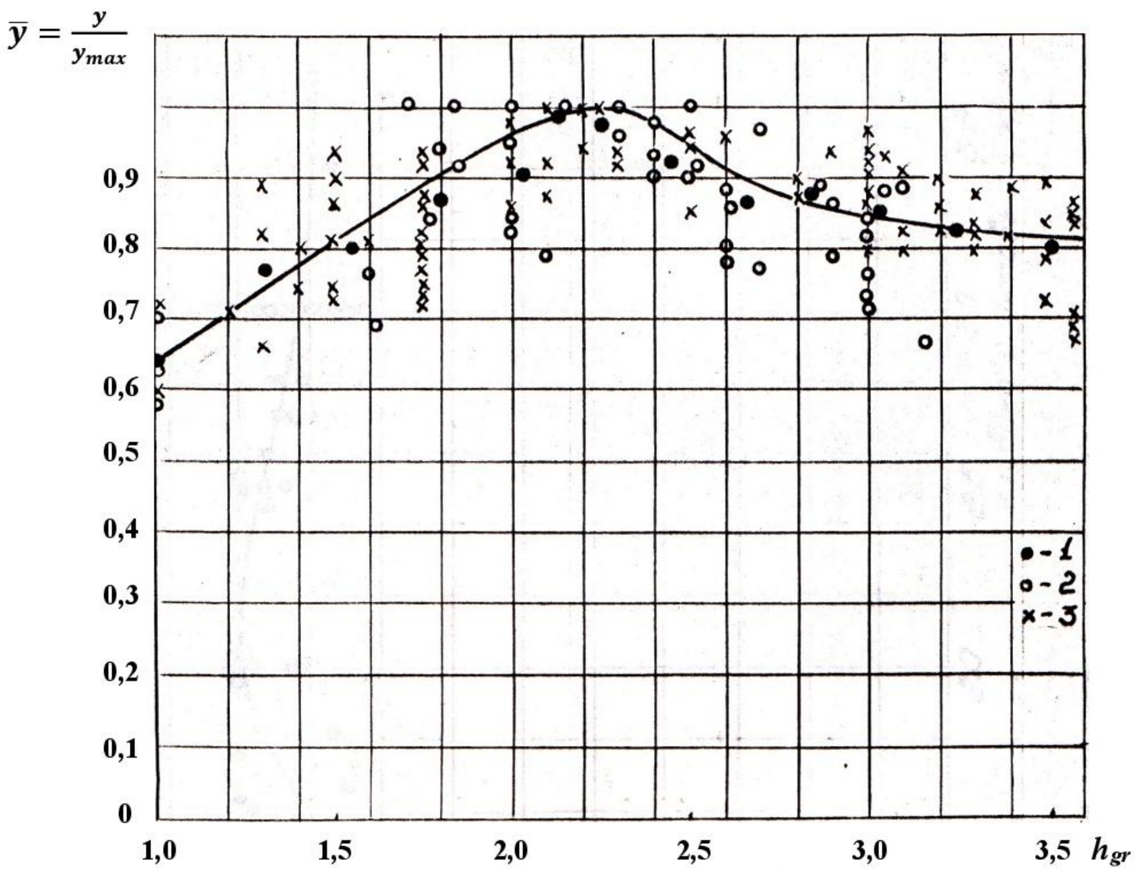
Values of "E" depending on the level of groundwater, thousand m3 / ha

culture	The value of "E" at the level of groundwater, m				
	1,0	1,5	2,0	2,5	3,0
Cotton	10,9	11,6	9,9	9,8	9,6
plant Alfalfa	13,7	13,9	12,7	12,5	12,4
Rotation Weighted Average	11,7	12,3	10,7	10,6	10,4

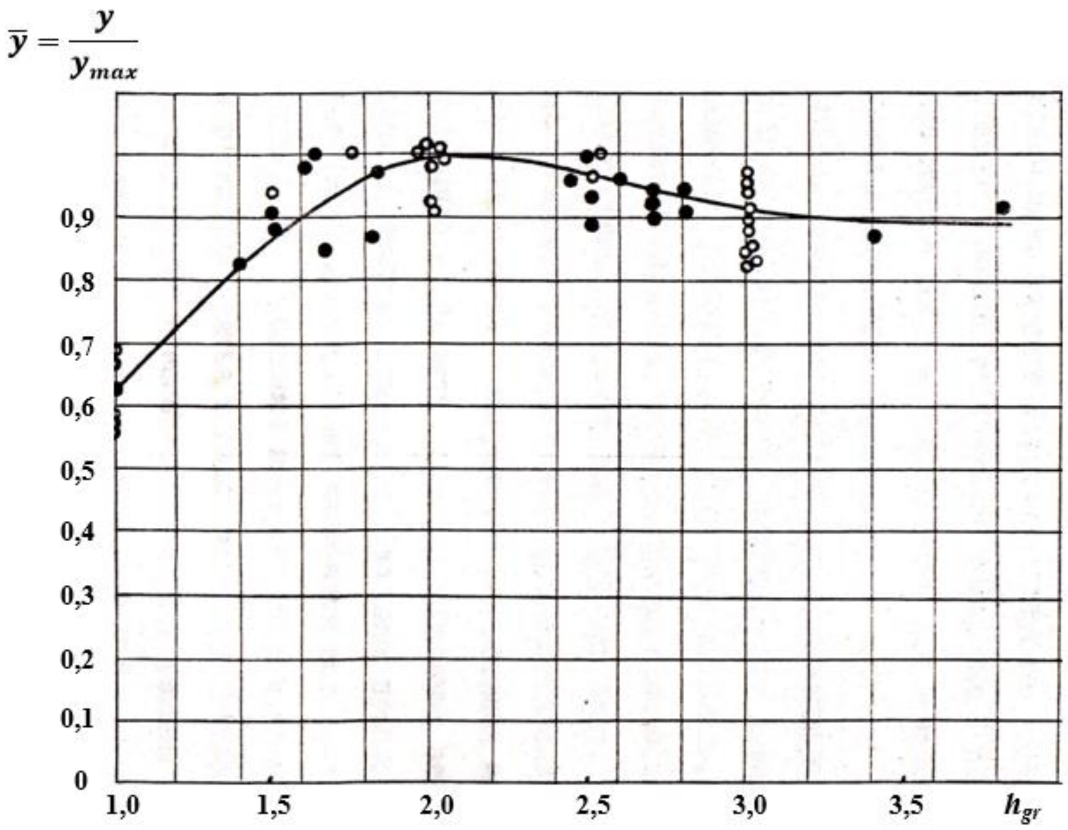
The data obtained show that the maximum values of total evaporation are typical for irrigated soils with a close occurrence of fresh groundwater (1 .... 1.5m). A decrease in the groundwater level leads to a decrease in the amount of total evaporation, mainly due to the non-vegetation period.

Thus E″ < E′. The decrease in E is small and amounts to 10....15%. The nature of the dependence E = f(h) is in good agreement with the dependence of the yield on the groundwater level (Figs. 1 and 2). [2,9,11].

The difference between the underground inflow and outflow (P - O)″ - (P - O)′ after lowering the groundwater level will increase due to an increase in inflow P″ > P′ and a decrease in outflow O″ < O′ . The pressure supply R″ > R′ will change similarly, since Δh″ ≥ Δh′. When improving the irrigation technique, ¯S = O or ¯S″-¯S′. To assess the change in drainage flow, consider the balance of groundwater:



Figs. 1.1 Dependence of cotton on hgr 1-according to Legostaev; 2-according to Kiseleva; 3- irrigation regimes and hydromodular zoning of the UzSSR



Figs. 2.1 Dependence of y^- alfalfa on h_{gr}

1-According to Amanov; 2- according to Efimov.

$$\Delta W'_g = q'' - R' + (\underline{P} - \underline{O})' - D' \qquad \ldots\ldots\ldots\ldots (4)$$

$$\Delta W''_g = q'' - R'' + (\underline{P} - \underline{O})'' - D'' \qquad \ldots\ldots\ldots\ldots (5)$$

insofar as $q'' > O$; $q' < O$; $R'' > R'$; $(\underline{P} - \underline{O})'' > (\underline{P} - \underline{O})'$

we get: $\Delta D = \Delta q + \Delta(\underline{P} - \underline{O}) + \Delta R > O$ that is $D'' > D'$

Thus, changing the reclamation regime of irrigated lands in the Saz zone by increasing the depth of groundwater makes it possible to reduce unproductive evaporation and obtain additional water resources necessary for the further development of irrigation in the Syrdarya basin.

This gives grounds to say that a change in the reclamation regimes of irrigated lands in the Saz zone is a necessary element in the reconstruction of existing reclamation systems in the Syrdarya basin, which should precede the transfer of part of the Siberian rivers to Central Asia.

However, changes in the reclamation regime, with a decrease in the level of groundwater, are associated with a violation of the ratio between the components of the water and salt balances of irrigated lands, which requires an assessment of possible changes in soil processes and soil fertility. The main possible changes are due, on the one hand, to the fact that an expense item appears in the balance of surface and soil waters, in the form of descending currents of irrigation water (q), and on the other hand, a change in the water regime of the root layer of soils and a decrease in yield (Fig. 1 and 2) .

These processes together lead to a certain decrease in the content of humus in soils, and an increase in the removal of mineral nutrients (NDK) to groundwater. A generalization of the literature data shows that there are no significant changes in soil fertility; the decrease in humus content does not exceed 20%, PPK - 5 ... 10% (13.14, etc.)

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