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BALANCES OF SOIL WATERS OF COTTON ROOTABLE LAYER IN EXPERIMENTAL PRODUCTION SECTIONS

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ABSTRACT

Regulation of the soil water balance item is the basis for creating optimal parameters for the reclamation regime ensuring a high crop yield. The values of the water balance item are determined using various formulas recommended by various researchers. Each formula, before applying, must be clarified for specific climatic conditions. With close occurrence of groundwater to the surface of the earth, euotranspiration increases.The main reason for the increase in euotranspiration is an increase in the recharge of the active soil layer by groundwater.

Keywords: soil water balance, water balance items, active soil layer, groundwater, groundwater recharge, evopotranspiration.

As you know, the water-salt balances of irrigated lands are the basis of any irrigation and drainage measures, since we regulating balance sheet items with the help of hydraulic structures, we improve the reclamation state of irrigated lands.Our studies have shown that when fresh and weakly mineralized groundwater occurs close to the surface of irrigated lands located on the right-bank floodplain terrace of the Syr Darya river, a small amount of salts accumulate in the soil, which is washed back from the soil into groundwater or underlying layers by pre-arable or moisture-recharging irrigation and atmospheric precipitation in the autumn-winter period.Therefore, when substantiating the applicability of various irrigation and drainage measures at the research object aimed at creating ameliorative and favorable conditions, it is enough to establish the parameters of hydraulic structures based on the water balance creating a condition that allows rational and efficient use of water and land resources.

The main condition for the rational and efficient use of land resources is the creation of an optimal reclamation regime in the active soil layer.The optimality of a reclamation regime cannot be determined without determining the water balance in the active soil layer.

To conduct field research, six pilot production sites were organized on light and medium loamy soils. Each experimental production site has four replicates.

The quantitative values of the items of the water balance of the root layer of the soil were determined in all experimental production sections of soils with different mechanical composition.

The following water balance equation was used:

$$W_k = W_H + \Delta W + A_0 + O_p + q - E \qquad (1)$$

where, W_H, W_k is the moisture reserve in the calculated soil layer at the beginning and end of the calculation period, m^3/ha; ΔW- moisture supply in the layer of growth of the root system of plants, m^3/ha;

The moisture supply in the growth layer of the root system for the billing period was determined by the formula of S.F. Averyanov:

$$\Delta W = ПВ\sqrt{1 - \frac{h}{H_{кп}}\left[1 - \left(\frac{ППВ}{ПВ}\right)^2\right]} (2)$$

where h is the distance from the groundwater level to the middle of the growth of the root system for the billing period, m;$H_{кп}$; - the maximum height of the capillary rise, m [1].Its value is determined by the plot of soil moisture.It is 1.97 m for light loamy soils, and 2.63 m for medium loamy soils.

If$h \geq H_{кп}$, then the humidity in the layer of growth of the root system is taken equal to PPV. PPV, PV - ultimate field and full moisture capacity of soils, in% to volume;

A_0- Precipitation used, m^3 / ha. They are calculated according to

$$A_0 = 10\alpha O_c \qquad (3)$$

where O_c is the total amount of precipitation during the billing period, mm; α is the coefficient of use of precipitation.

The coefficient of use of precipitation was taken taking into account their expenditure on wetting the leaves, a partial runoff for infiltration into groundwater.Its value changes during the calculation period depending on the temperature of the air, soil, rain intensity, soil moisture,the depth of groundwater and the slope of the earth's surface.

In spring, when the soil is waterlogged and the rain intensity is high enough, part of the rainfall flows down the soil surface, and the other part, when the GV is close to the ground, seeps to their level and is diverted by the drainage network.In this case, the coefficient (α) decreases and has a value of 0.5.In summer, at pilot sites, the groundwater level, due to the infiltration of irrigation water, approaches the surface of the earth.Despite this, the upper layers of the soil are very dry.

Therefore, the utilization of precipitation increases to 0.7. By autumn, its value decreases to 0.6.

where O_p is the irrigation rate, $м^3$/ ha. It is determined by the following formula

$$O_p = \sum_{i=1}^{n} m_i \qquad (4)$$

where m_i is the irrigation norm, $м^3$/ ha; n is the number of irrigations during the billing period.

The irrigation rate (m_i) is determined by the following formula: -

$$m_i \approx 0{,}9W_i^{max} - W_i^{фак} \qquad (5)$$

where W_i^{max} is the upper limit of the optimum moisture reserve in the calculated soil layer, m^3/ha ;$W_i^{фак}$- the actual moisture supply in the calculated soil layer before irrigation, which satisfies the following condition$W_i^{фак} = W_i^{min}$ .In this equality W_i^{min} $is$the lower limit of the optimal moisture supplies, m^3/ha.

Cotton was irrigated according to the pre-irrigation moisture scheme: 65-70-65 (according to the recommendations of UzNIIKh for cotton varieties S-6524), it was assumed that the soil moisture in the calculated layer after irrigation is 90% of the maximum moisture capacity.

The feeding of the root layer of the soil with groundwater is determined by the following improved dependence of S. F. Averyanov [2]:

$$q = q_0\left(1 - \frac{h_{гв} - h_0}{H_k - h_0}\right)^n \qquad (6)$$

Whereq_0- is the intensity of the total maximum evaporation with the greatest moisture in the soil, m^3/ha;$h_{гв}$ is average groundwater depth for the billing period, m;h_0 - the depth of groundwater,in which the feeding of the root layer of the soil with groundwater will be equal to the intensity of the total maximum evaporation with the greatest moisture in the soil. (see fig. 1)

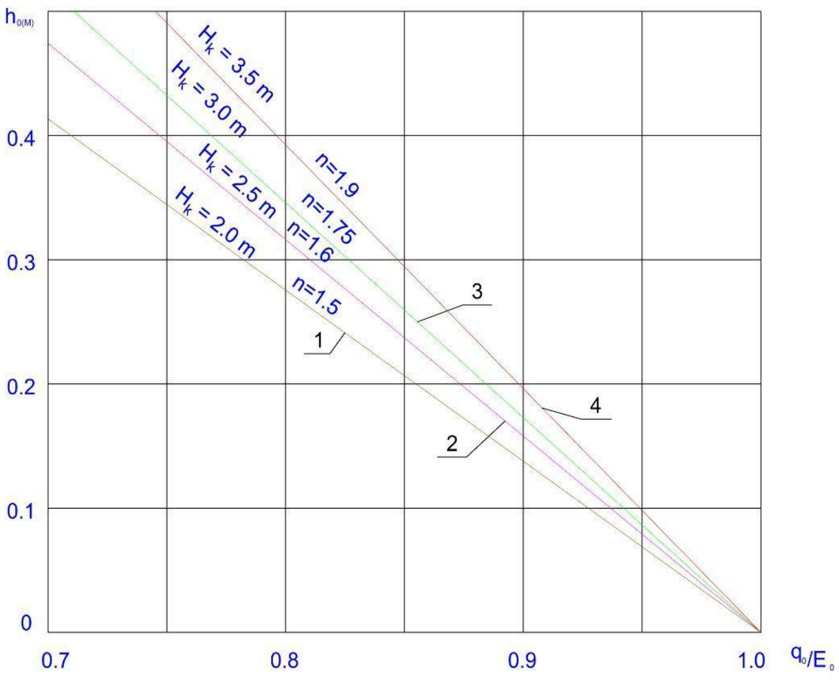


Fig. 1. Dependency Graphic $h_0 = f(H_K, q_0/\mathrm{E})$ for soils with different mechanical composition:

1-sandy loam; 2-light loam; 3-medium loam; 4-heavy loam.

H_k is the critical depth of groundwater with which their significant expenditure on evaporation begins, m. Its value for light loamy soils is 2.5 m, and for medium loamy soils 3.0 m.

The intensity of the total maximum evaporation, with the greatest soil moisture, is determined by the formula of I.A.Sharov:

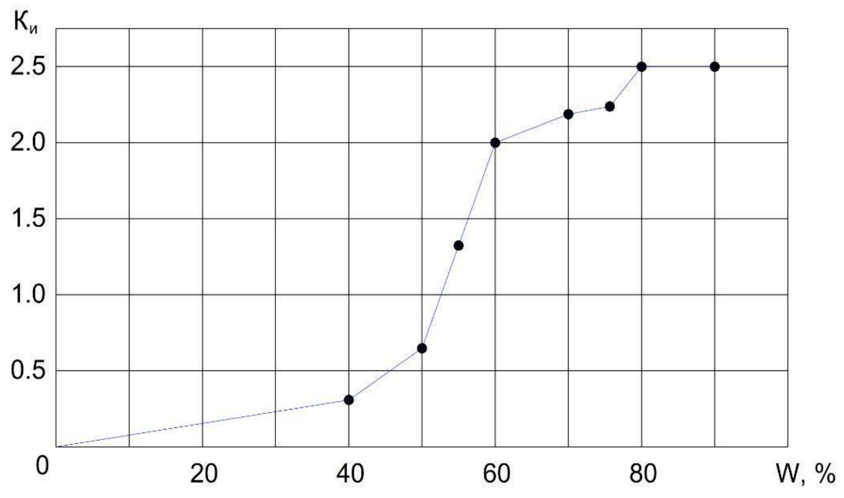
$$q_0 = \beta bt \qquad (7)$$

t- the average daily temperature for the billing period, °C; β - settlement period, days;b - coefficient depending on soil-reclamation and hydrogeological conditions, quality of agricultural measures, type and phase of development of crops.On average, its value is taken for vegetation 2,5[3].

Cotton water consumption is determined by the formula of P.A. Volkovsky with the introduction of a coefficient that takes into account the type and phase of development of cotton, as well as the depth of water[4]:

$$E = K_\phi^* K_u \sum t \qquad (8)$$

where $K_\phi^*$is the coefficient introduced by us in the formula of the above author;The value of the coefficient (K_ϕ^*) taking into account the type, phase of



Soil moisture in% of NV

Fig. 2. Dependence graph $K_u = f(W)$– (according to P.A. Volkovsky)

development of cotton and the depth of groundwater are determined by the equation of water balance of the root layer of the soil on the basis of field experiments in experimental production sites.

$K_u$is coefficient depending on soil moisture (see fig. 2); $\sum t$ is the sum of daily average temperatures for the billing period, ° C.

Studies of the dynamics of the moisture reserve in the root-inhabited soil layer at the experimental production sites showed that, as the level of the average weighted vegetation depth of the groundwater decreases, the quantitative values of the cotton consumption of feeding the root layer of the soil with groundwater decrease, and irrigation norms increase.The coefficient of groundwater recharge in pilot production sites organized on light loamy soils with a decrease in groundwater level from the surface of the earth from 0.65 to 1.6 m decreases from 0.96 to 0.58.While irrigation norms at a water depth of 0.65 m amounted to 10.1% of water consumption, then at a depth of 1.6 m it amounted to 36.2%.And in the pilot production sites organized on medium loamy soils, the values of the coefficient of recharge by groundwater with the GWD dynamics in the range of 0.48 ... 2.56 m range from 0.88 ... 0.30.Irrigation norms at the aforementioned depths of GB are of water consumption, respectively, 7 and 65%[5].

CONCLUSION

1. A more accurate determination of the values of the water balance item of the root layer of cotton is important for creating and assessing the optimal reclamation regime in the soil.Therefore, it is necessary to improve the formulas and methods for determining the values of their members used to determine the item of the water balance of the active soil layer for specific climatic conditions.

2. Formula S.F. Averyanova

$$q = q_0 \left(1 - \frac{h_{гв}}{H_k}\right)^n$$

it is not advisable to use in the form in which they are proposed. Since, according to this formula, q is the value fluctuates in pedals 0< $q < q_0$. Our experiments and other researchers have shown that the value for cotton in July and August is greaterq_0

3. The formula of P. A. Volkovsky for determining the cotton evopotranspiration gives large errors, because it does not take into account the type and phase of development of crops, the depth of groundwater. Therefore, it is necessary to introduce into its formula a coefficient taking into account the above $K_{ф}^{*}$factors.

4. Our studies have shown that approaching the groundwater level to the surface of irrigated lands increases unproductive losses of water from the surface of irrigated land. The artificial decrease in the groundwater level from the surface of the earth increases the costs of the construction and operation of irrigation and drainage systems and agricultural measures. Therefore, it is necessary to find such a depth of groundwater that ensures the optimal reclamation regime.

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