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About the issue of monitoring method of Ararat valley soils salinization

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ABSTRACT

The short description of the agro-ameliorative situation of the Republic of Armenia, particularly, that of Ararat valley shows that the unpredictable and unmanageable process of regime procedures at this area can cause serious consequences, pushing out the agricultural golden fund of the republic from the agricultural turnover, namely the land of Ararat valley. Numerous investigations on the soil reclaimed state in Ararat valley at the Republic of Armenia reveal that they are currently in an extremely threatening condition. The result analyses show that more than 35% of Ararat valley lands of agricultural importance are in insufficiently reclaimed state, moreover the 54% of them are weakly salinized, 11,8% are averagely and strongly salinized and 34.2% are strongly salinized. The analyses of the conducted theoretical and experimental research results show that the above mentioned negative processes are promoted by the depth of the ground water allocation, which in Ararat valley fluctuates within the depth of 1 m, 1-3 m and more than 3 m. According to the distribution area the ground waters on 6,6% land areas of Ararat valley irrigated soils are allocated at the depth of 1 m, in 27,8% land areas the ground waters are allocated at the depth of 1–3 m, and in the rest of 65,6% land area waters are allocated at the depth of more than 3 m. For the prevention of the soils salinization process at Ararat valley and for the development of measures for struggling against it, the impact of ground waters installation depth, their mineralization, calculated evapo-transpiration from the soil and plants, irrigation norm, watering regime and technique, pressure nutrition caused from underground water basin and the impact of evaporation raising from the ground water surfaces on the ground waters level change in the vegetation period is evaluated in the current work. For the evaluation of the above mentioned individual factors the integral equation of the ground water level changes has been formed in the result of the solution of which it becomes possible to forecast the elements of the water balance during the vegetation period and thereby to make the regime procedure of "ground water-soil-plant" system predictable and manageable.

Introduction

In the Republic of Armenia the area of well reclaimed irrigated soils makes 2576 km^2, 3470 km^2 of land area are in an insufficiently reclaimed condition, from which 189 km^2 are slightly salinized, 39 km^2 are averagely and strongly salinized and 119 km^2 are strongly and very strongly salinized. The area of Ararat valley makes 1385 km^{2}of which 827 km^2 is considered to be irrigated. In some part of the mentioned land areas the secondary salinization and alkalinization processes are actively taking place, and in the sectors where the ground and irrigated waters have weak mineralization, only excessive moistening occurs, and their area makes 183 km^2 [1–3]. On the up to the 6,6% irrigated soil areas of Ararat valley the ground waters are allocated at 1 m depth, in 27,8% land areas the ground waters are allocated at the depth of 1–3 *m*, in the rest of 65,6% land areas they are at 3 and more meter depth. Insufficient conditions of water-intake equipment works, insufficient water outlet capacity of guiding and regulating parts, inaccurate values of estimation parameters of drainage collection system, the existence of artificial backings, artificial clogging in the system and the non-regulated water pumping from the underground water basin have significant impact on the depth of the ground water allocation. The longitude of drainage collection system makes 1057,2 km, it supplies 384 km^2, including 350 km^2 open net, 34 km^2 closed net. The

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monitoring results show that depending on the depth of ground waters installation and on the conditions of underground water basin exploitation, the area of salinized land area of Ararat valley can go up to 40–45 thousand ha [4–7]. More than 228 km^2 area is under the threat of alkalinization. The area of ground water allocation makes 333 km^2 [3,8–10]. The underground natural water resources of Ararat valley make 73,87 m^3/s, including infiltration which makes 51,5 m^3/s, drainage stream- 8,08 m^3/s, spring streams - 14,29 m^3/s. According to the data of 2013 (USAID) the total number of deep wells in Ararat valley is 3318, unexploited wells are 1537, the number of the wells having water use permission makes 1571, actually exploited ones are 1781 and illegally exploited wells are 210. Water intake volume from the underground water basin makes 55,6 m^3/s, of which 42,38 m^3/s is taken in conditions of water use permission and 13,17 m^3/s is taken illegally. Water catchment upon the water use permission for fish-farming makes 43,15 m^3/s, factually it has made 35,5 m^3/s. In the last 20 years the catchment from the underground water basin of Ararat valley has increased in 1,6 times [3,8–11]. The agro-ameliorative state of the Republic of Armenia, particularly, that of Ararat valley shows that the unpredictable and unmanageable process of regime procedures at this area can cause serious consequences, pushing out the agricultural golden fund of the republic from the agricultural turnover, namely the land areas of Ararat valley. (see Figs. 1–9)

Objectives and methods

Hydro-physical properties of land area, salinization degree and type, the depth of the ground water installation, surface evapotranspiration, ground waters nutrition intensity from the underground water basin, the evaporation stream from the ground water surfaces, efficiency coefficient of the intra-economic network, relief, reclaimed and hydrological conditions [4,12–15] of the land area influence the land regime procedures. For the solution of the problem it is necessary to design the water balance of the area needing to be reclaimed/amelioration. In conditions of Ararat valley it is introduced in the following way:

$$P + M_1 + F_k + Q_1 - ET_0 - D = 0 \quad (1)$$

$$M_1 = \sum_{i=1}^{n} (M_i \cdot a_i)/\eta_i \quad (2)$$

$$F_k = M_1\left(1 - \frac{1}{\eta}\right) \quad (3)$$

Where P-is the atmospheric precipitation, which is absorbed into the soil, M_1-is the average weight of irrigation norm, F_k-is the filtration flow/stream from the irrigation system, Q_1-is the pressure stream from the underground basin towards the ground waters,

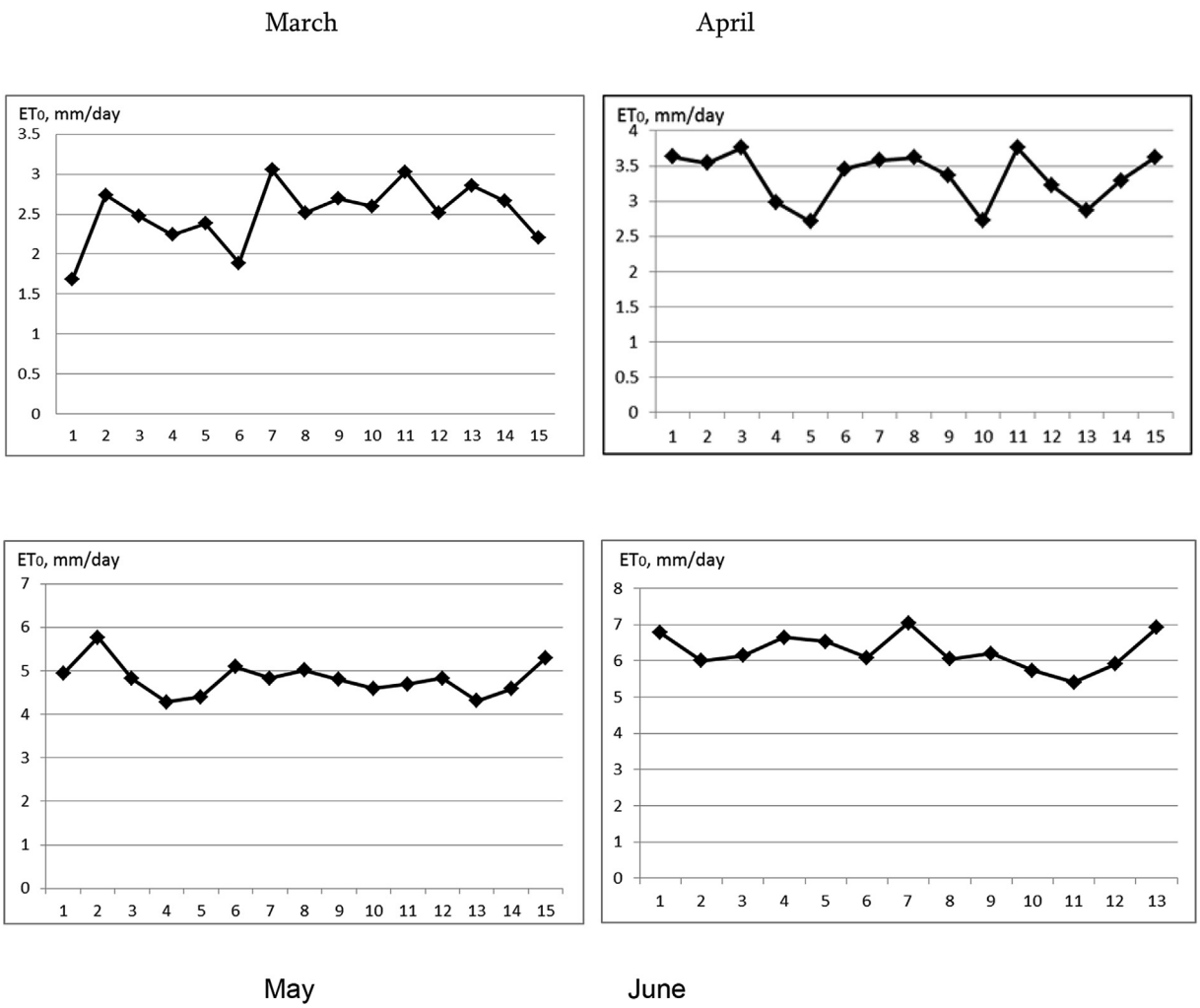

Fig. 1. Estimated evapotranspiration dynamics calculated through the average monthly indicators of Ararat and Armavir hydro meteorological stations in 1998–2012.

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