THE MODERN RESEARCHS ON GROUNDWATER RESOURCES
OF MOIST SUBTROPICAL SOILS OF AZERBAIJAN

Abstract. One of the leading areas of modern soil science is the study of groundwater for use in agriculture. The importance of this direction is determined by the development of methods for studying soil processes. In uncultivated soils formed under natural vegetation, the approach of the groundwater level to the surface leads to soil salinization and waterlogging. Long-term and systematic irrigation in the Lerik region creates a completely new water and soil process. The reserves of humus, carbon, nitrogen and the C:N ratio were determined in pseudo-podzolized clayey mountain-forest yellow earth soils (Aric, Stagnic Cleptic Acrisols - Loamic) common in the zone of humid subtropics in the Lerik region located in the southern part of Azerbaijan. In order to turn uncultivated soils into arable land, it is necessary to create a mathematical model of groundwater level fluctuations, to determine the functional relationship between the amount of nutrients and the final product. The application of the results of mathematical calculations ensures the involvement of lands in agriculture and obtaining high productivity from these lands. The results of analyzes of the river waters chosen as the object of study show that there were no serious mineralization processes in the rivers. The mineralization of river waters in the Lerik region varied within 0.439-0.678 g/l. The content of magnesium in water taken from the Lerik region ranges from 0.021-0.037 g/l. The content of sodium and potassium ions in the salinity of water ranges from 0.061-0.083 g/l. According to the results of analyzes, it can be seen that the mineral composition of the Lerik River is useful for drinking and suitable for agriculture, as irrigation water.

Keywords: underground waters, humus reserves, carbon dioxide, zone of humid subtropics, composition of acidity, matter migration, modeling

The author chose some river waters of the Lerik region as an object of study. The article is devoted to the study of ground soils and the ionic and salt composition...
of the rivers of the Lerik region of the southern part of Azerbaijan. [5]

The average frequency of floods on this river is 9-10 days. Near rivers, reservoirs, reservoirs, groundwater is largely desalinated and can approach the drinking water standard in terms of quality. [1,3]

Maintaining the required level of ground, underground and juvenile waters, choosing options for draining excess water from fields, creating a mathematical model for changing the groundwater level to control the fertility of arable land through optimal agro technical and reclamation regimes are important. [5]

These studies can become invaluable literature for a new generation of soil scientists.

In the course of the research, river waters were taken from different regions of the Lerik region, their dry residue and ionic indicators were determined. The comparative geographical method was used. The Lerik River floods in summer and autumn seasons. The river is fed by 66% rainwater, up to 6% snow water and 28% groundwater and juvenile water. Samples were taken from various river waters of the Lerik region and their dry residue, HCO$_3^-$, chlorine, sulfate, calcium, magnesium, sodium + potassium ions, pH and other indicators were determined in the laboratory by the following methods. The aqueous medium (pH) was determined with a potentiometer, calcium and magnesium - with a trilometer, sulfate ion (SO$_4^{2-}$) - by mass, relative to Na$^{++}$ K$^+$, dry residue - by mass.

The Lerik River originates in the Talish Mountains and flows into the Caspian Sea. Average monthly water consumption ranges from 1.22 m$^3$/s in August to 37.8 m$^3$/s in October. The composition of river water is bicarbonate-calcium. River water is used for irrigation of agrocenosis. According to the results of the analysis, the water of this river is suitable for irrigation of agricultural crops and has a positive effect on agrosenosis.

To determine the functional relationship between the amount of nutrients and the final product

$$F(y, q_1, \ldots, q_N) = 0$$ (1)

It is very important to clarify the geological structure of the fertile soil layer, to identify and study the nature of the flows between fractal clusters, to choose a
method for processing the fertile zone, and to quickly identify and control migration
(1) and leads to other relationships

\[ \delta p_k = \sum_i c_{ki} q_i \quad q_k = \sum_i a_{ki} \delta p_i \]  

(2)

There are non-linear exchange relations between the “migration zones” of fertile soil layers even in the case of the linear filtration law. Maintaining the required level of groundwater is one of the main means of ensuring the availability of ameliorative conditions. The level can be controlled through the drainage system. The equation for changing the groundwater level is written as follows. (3)

\[ \delta \frac{\partial h}{\partial t} = \frac{k}{2} \left( \frac{\partial^2 h^2}{\partial x^2} + \frac{\partial^2 h^2}{\partial y^2} \right) - \frac{k_0}{M_0} (h - H) + W \]

There, \( \delta, k, k_0, M_0, H \approx const \)

The reaction of the soil solution is slightly acidic (pH 5.9-7.3). In the upper humus horizon, the acidity of the medium is relatively low.

The research results show that humus reserves in thick clayey pseudo-podzolized clayey mountain-forest zheltozems vary sharply depending on soil and ecological conditions. Comparative characteristics of soil crops show that most of the accumulative humus layer is washed away by water erosion processes, the structure is disturbed, and the process of podsolization is weakened. The amount of physical clay (<0.01mm) in pseudo-podzolized mountain-forest zheltozems ranges from 65.10-62.90 %, silt particles (<0.001) 21.80-23.60 %. The abundance of silty particles indicates the presence of an illuvial layer inherent in these soils. Humus reserves in these soils are 0.93-3.20 % at a depth of 0-100 cm, the amount of nitrogen varies between 0.08-0.12 %. The humus reserves in the upper layers are greater than in the lower ones. In pseudo-podzolized clay-mountain-forest zheltozems of the humid subtropical zone, due to aerobic-anaerobic moistening and decomposition of plant mass under favorable temperature conditions, the soil profile has a thickness of 48-52 cm. That is why 70-80 % of humus reserves are stored in the upper half-meter layer. Along the length of the profile, the C:N ratio fluctuates at a depth of 0-106 cm 6.22-7.63; 0-117 cm deep 3.97-8.35 and 0-85 cm deep 6.57-8.31. Studies have shown that the process of humus regeneration in the soils of the humid subtropics and the potential fertility of the soil are closely related to the conservation
and restoration of nitrogen reserves in the form of humus.

One of the main biological indicators of the soil is the amount of carbon dioxide. Systematic irrigation and annual treatment with various agro technical methods (plowing, loosening, fertilizing, ameliorative methods, etc.) radically change the processes occurring in virgin soils, which affects its moisture content, temperature, and CO₂ content in the soil layer. When analyzing soil sections laid in pseudo-podzolized clayey mountain-forest yellow earth soils, 8.1 mg CO₂ was released from 1 kg of soil at a depth of 0-25 cm, at a depth of 6.3 mg CO₂. 25-55 cm in 1 hour. As depth increases, the amount of carbon dioxide decreases.

References: