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ELECTROSAVING SYSTEM OF STABLE MANAGEMENT OF CROP CULTIVATION IN HIGHLANDS AND LOWLANDS

Agriculture is one of the strategic spheres of the economy in highland and lowland regions, the main impact of its development by farmers is the management of stable regimes of cultivating crops. Nowadays in Armenia and Artsakh, agriculture develops mainly due to enlarging mostly agricultural crop lands. As a means of solving the main task, one method of calculating the parameters of irrigation regimes is suggested in the case of drip and sprinkle irrigation.

Keywords: crop, highland, lowland, irrigation, surface, river

INTRODUCTION

The surfaces of dry lands are mainly increasing, therefore their fertility cannot be stable and depends on the climatic conditions of the given year. A guaranteed crop can be harvested only in the case of irrigation. During plant growth, inner river flow is small and it cannot satisfy the water needs of all crop fields. Land wastes are huge due to surface irrigation. They are conditioned by also the absence of calculation methods of irrigation regime parameters for the local environment. In the primary phase of the development of the field, the implementation of modern modelling practice is important in the management of the processes of effective usage of irrigation water in farmhouses by means of encouraging the practice of progressive methods and educating farmers. As a means of solving the main issue, one method of calculating the parameters of irrigation regimes is suggested in the case of drip and rain irrigation. Implementing the research work results will allow farmers to conduct stable management of crop irrigation regimes.

RESEARCH RESULTS

The formation of the geological structure of the Small Caucasus area is a result of difficult mountainous processes. Artsakh and its nearby territories are characterized by numerous volcanic, sedimentary and abrasive mixes. They are mainly represented by tuffites, sandstone and porous and cracked rocks and lime stones. In the upper streams of the Tartar River, Neogene and anthropogenic volcanic rocks are widely spread. They are represented by basalts and basaltic andesite, which are essentially cracked. In the lower streams of the Tartar River, there are alluvial and pluvial accumulations, and in the Karkar river basin, lake sediments [1]. Atmospheric precipitation has been monitored since the end of the XIX century in the research area. Over time, the number of observation points has reached 21 in Artsakh. They are located at altitudes of 160 to 2470 meters. However, research data on the distribution of precipitation over time is little and has a long history [2].

Water supply data all over the world is very approximate, as it is very difficult to precisely estimate such water supplies as they are in ice, soil humidity and swamps. At the same time, now it is possible to estimate rather precisely the water supply storage in the world's oceans, lakes, ponds, polar ice caps, glaciers and underground springs. The total fresh water supplies in the world comprises 35 million km^3 or 2.5% of all the water supplies in the hydrosphere. The greatest part of the mentioned supplies (24 million km^3 or 68.7%) exist in the ice and constant snow in the Arctic and at the South Pole. Fresh water rivers and lakes which constituting the chief supplies of water consumption for humanity, comprise on average about 90 000 km^3 of water or 0.26% of the world's fresh water supplies. As we see from these results, very little water is available for drinking and irrigation. If we also add the very unequal distribution of those available water resources to individual countries, it is clear that implementing water conservation is unavoidable. The daily lack of drinking water supplies is becoming a very important issue for almost all countries of the world. The wasteful usage of water resources is an increasing danger for human health and prosperity, the development of industry etc. The possibility of water security in terms of discovering new resources is also limited as in this case it represents water as a means of biosecurity, its uniqueness for both humans and the environment.

The reconstruction of surface water supply in the Republic of Armenia comprise 7.2 billion m^3. About 2.3 billion m^3 is used from that (it was 4 billion m^3 previously). 2 billion m^3 (3 billion m^3 previously) for irrigation and for supporting other spheres of production, and 430.0 million m^3 (550 million m^3 previously) for drinking and home utilization. Among natural water objects it is necessary to mention Lake Sevan with the surface area of 1238.5 km^2 and 33.2 billion m^3, among major rivers we can mention the Araqs with a 272 million m^3 annual flow, the Debed with 1169 million m^3, the Vorotan with 679 million m^3, the Arpa with 279 million m^3, the Aghstev with 290 million m^3 etc. Artificial lakes comprise about 82 reservoirs in the Republic with a total volume of 1067 million m^3 (Akhuryan with 525 million m^3, Spandaryan with 277 million m^3, Arpy with 105 million m^3, Aparan with 91 million m^3, and other reservoirs), of which 72 have hydro ameliorative significance. To serve the irrigation system of the Republic, a total of 4500 km of high canals and waterways were built and exploited.

Cumulative evaporation is one of the most important and difficult determinants of the water balance. Its value is normally determined by various evaporative data. There is not enough data on the total evaporation in Artsakh and adjacent areas, hence empirical formulas are often used. The norm of water consumption is one of the main components of irrigated field water balance equality and is defined by [3]

$$\frac{dv}{dt} = r + q_n \pm q_s - E_e \pm q_{me} \quad (1)$$

where:
v - the soil humidity supply,
t - time,
r - the volume of atmospheric precipitation,
q_n - the amount of water given to the field,
q_s - the field surface flow,
E_e - the summative evaporation,
q_{me} - humidity circulation.

For the definition of E_e summative evaporation, the multifunctional connection of the air-soil-plan is assumed [3].

$$E_e = f(E_0, v, \omega) \quad (2)$$

where:
E_0 - climatic factor of evapotranspiration,
ω - the parameter to characterize the biological factor.

For areas where the ratio of atmospheric precipitation to summative evaporation is large, B.P. Mnatsakanyan proposes defining the annual value (E_0, m) of E_e summative evaporation components by simplified formula [1]

$$E_0 = 0.0127R \quad (3)$$

For areas where the ratio of atmospheric precipitation to summative evaporation is small, the annual value (E_0, m) of E_e evapotranspiration components is defined by [1]

$$E_0 = 0.0167R - B/100 \quad (4)$$

where B is the constant, the value of which fluctuates between Artsakh and its neighbouring territories within the amplitude of 33÷67.

The wide range of this parameter significantly decreases the degree of preciseness of the estimated values. S. Rustamov defines the evapotranspiration values through water balance of the territory while forming the water balance of Small Caucasus rivers by the relation of atmospheric precipitations and river flow [4]. The mentioned method can be used only in the case when the bottom of drainage is watertight and no filtration flows occur. Nevertheless, in the observed area porous and cracked rocks predominate, which occur as a result of newborn volcanoes and also limestone where intensive filtration occurs.

The biological factor of evaporation (ω) is used to determine the plant lighting by

$$N = e^{-\beta\omega} \tag{5}$$

where:

N - under plant lighting;

β - coefficient whose value is changeable from 0.25 to 0.4.

In the absence of surface flow and subsisting ground waters, the water balance of irrigated field Equation (1) can be presented in the following way

$$\frac{dv}{dt} = r + q_w - E_e \tag{6}$$

when q_w - the norm of the water given to the field.

We are developing a method for calculating the parameters of the irrigation regime of crops in Artsakhi conditions in the case of using drip and rain irrigation methods. For this purpose, it is necessary to solve the following issues:

- Research of infrastructures and water supplies that must be irrigated and zoning lands to be irrigated to form schemes to enlarge irrigated soil areas.
- Research of soil of agricultural importance including agrochemical and water-geological research of the active humus zones.
- Research of water demand methods, the formation of their double models in Artsakhi conditions and choosing the best simple model. Research of modern irrigation models and techniques in Artsakhi conditions.
- Forming a methodological literature for crop irrigation for Artsakhi conditions and printing it.

Organizing training courses to improve farmers' knowledge. Implementation of the research work results will allow farmers to realize stable management of a stable crop irrigation regime under which we understand the complex solution of the following issues:

- Eliminating water wastes in the external and internal irrigation system in limited conditions of irrigation water supplies.
- Applying water saving watering techniques.
- Applying a method to predict and calculate sustainable watering norms. Prioritizing valuable crop watering.
- Continuous improvement of knowledge in the field of hydro-amelioration and application of best practices.

CONCLUSIONS

In this article, we presented some methods for calculating the parameters of the irrigation regime of crops in Artsakhi conditions in the case of drip and rain irrigation. Implementation of the research work results will allow farmers to realize management of a stable crop irrigation regime.

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SYSTEM ELEKTROOSZCZĘDNEGO STABILNEGO ZARZĄDZANIA NAWADNIANIEM UPRAW NA TERENACH GÓRZYSTYCH I NIZINNYCH

Rolnictwo jest jedną ze strategicznych sfer gospodarki w regionach górskich i nizinnych, a głównym czynnikiem jego rozwoju jest zapewnienie warunków do stabilnego zarządzania uprawami. Obecnie na terenie Armenii i Artsahu rolnictwo rozwija się głównie dzięki powiększeniu gruntów rolnych. Jedną z metod zwiększenia wydajności upraw, bez ponoszenia ich kosztów, jest budowanie systemów pozwalających na stosowanie energooszczędnego kształtowania parametrów nawadniania przy wykorzystaniu wód z opadów deszczu i zastosowania nawadniania deszczowego.

Słowa kluczowe: **uprawy, wyżyny, niziny, energooszczędne nawadnianie, powierzchnia, rzeka**