UDC 626.86 (255): 631.674.4

M. Yatsyk,
G. Voropay,
T. Topolnik,
Ph.D. Institute of Water Problems and Land Reclamation Academy of Agricultural Sciences

Resources saving technique of water regulation of soils on reclamative systems of polder type

Purpose. To develop a resource-saving technology for regulating the water regime of soils in polder type land reclamation systems. Methods. Analytical and theoretical with application of mathematical modeling, experimental methods of researches on production sites of reclamation systems. Results For realizatsiyiresursooschadnoyi technology water regime on production sites polder system "Ikva" volohozabezpechenist perennial grasses increased by 15- 20%. In modules plot of 245 hectares of saving water - 48.7 thousand. M3 per year of electricity consumed - 45.7 kW / h per 1 ha drainage, which is 5.7% per year, without reducing the average yield of perennial grasses. Conclusions Saving water and electricity expenses achieved through the introduction of resource-saving technological parameters of water regime and purposeful creation akumulyuvalnyh capacities in the root layer of soil.

Key words: polder system drained soils, drying rate, the level of groundwater, technology water regime, underground moisture, total water consumption, the root layer of soil.

Formulation of the problem. The use of reclamation systems of polder type is an important means of efficient use of flood lands in the humane zone of Ukraine. However, existing technological schemes water regime of soils in these systems are not always rational, often lead to inefficient power consumption, excessive wear of pump and power equipment. Due to the excess volumes of pumping water from the drained area during the growing season, the water regime for growing crops is often unfavorable. In addition, in dry periods, the need for water supply for humidification leads to an increase in operating costs and cost of agricultural products. Analysis of recent research and publications. To improve the water regime Technology drained soils accepted working hypothesis, according to which you can achieve more accurate determination of the dynamics of the water regime of soil aeration zone selection method considering the peculiarities of moisture root system grown crops during the growing season. The purpose of research - to develop technology sooschadnu resource of water regime in soil reclamation systems polder type, which takes into account the consumption of water the crops crops enables a reasonably expect reclamation regimes and simultaneously accumulate more moisture reserves in the zone of aeration.

The object and method of research. The resource-saving technology developed at the Institute of Water Problems and Nautical Melioration of the Republic of Armenia is based on an algorithm for determining resource-saving technological parameters of water regime regulation and the calculation of optimal groundwater level ranges (RGV) for each calculation period that provides the required moisture reserves in the root layer of soil during vegetation Period [2, 9, 1o]. To calculate the technological parameters of the water control algorithm information support has been developed, which, by function, is divided into 6 units. The first 3 blocks (meteorological, soil, biological) form normative background information. The filtration and hydrophysical characteristics, in particular the full and minimum volumetricity, formed in the soil block, are determined by available reference data and, if necessary, supplemented by field definitions. The necessary data for calculations related to the peculiarities of growth of specific agricultural crops and their water consumption are contained in the biological unit. In particular, this block generates averaged data from the leaf index, the capacity of the root system of different types of crops along the phases of their development and the functions of distribution of absorption of moisture. Operational information (the next 3 blocks) on the actual parameters of the water regime (actual RHV for the previous decade and the soil moisture), plant growth parameters and current meteorological parameters are formed based on the results of the control of the production process in the reclaimed field. Complex researches in order to provide the necessary calculations

of technological parameters and testing the developed resource-saving technology was conducted on the experimental site of the polder system "Ikva" in Rivne region. (1989 - 2o13 years). The reasons for the redevelopment of the territory of the polder system are atmospheric precipitation, groundwater, flooding and flooding of the flood waters of the Ikva River. Taking into account the geological, hydrogeological, and soil conditions, the following engineering engineering methods of drainage are provided on the system: protection of the territory from flooding with the waters of the Ikva River, interception of groundwater inflow (GW), and reduction of the RGV. These methods are implemented as follows: for damping and flood protection, a dam was built; The interception of the GW is carried out through the existing open channel along the dam; Reduction of RGV is achieved through the network of pottery drainage. The receiver for the drained array is the river Iqua. Since it does not provide for the passage of necessary water costs in the calculation period, ensuring the effective effect of drainage measures in this period is being met due to the drainage of water through a stationary pumping station. The volume of water discharged from the drainage massif into the water receiver (year of 1o% of supply) is 8o4.4 thousand m3, in particular the surface runoff is 489, drainage - 316.4 thousand m3. Taking into account the agricultural use of the research area, as well as the relief of the array, the summer polder is foreseen (Table 1). The dynamics of crop growth and the need to ensure their moisture during the growing season is determined by biometric characteristics: leaf index (and | |) and root system capacity (tg). Grown crops - perennial grasses. To determine the puffiness index, leaves without stems (in wet or damp-dry state) were weighed out of 25 *, 25-meters in 5-fold repeatability [1]. The growth of the land mass of perennial grasses was more intense in the years of many years. The value of the leaf index in many years of the year was 1o, 8-13,4, and in arid - 5,4 - 9. Accordingly, the average yield of perennial grasses in the rich days was 46,4, in arid ones - 31,3 centners / hectare. The bulk of the roots of perennial grasses were contained in a layer o - o, 2 m, the maximum depth of penetration of the roots - oh, 6 m.

Full-scale research conducted using the field tenziometrychnoyi installation

1. Basic specifications polder system "Ikva" Parameter Number drainage area, ha: gross 245 of them polder net 245 225 225 of them polder land use ratio 0.93 Drainage closed network hectares: 210 Including: pottery drainage 210 open network 15 Length of dam damping, km 3,7 Pumping station, pc. 1 Performance pumping stations m3 / s 0,77 Depth channels open network of 1.7 - 2.5 Depth laying drains, 1.1 m distance between drains, m 12 - 18 diameter drains, m agricultural 0,075-0,05 Use, ha: arable land 10 hayfields 173 pasture 42

(vocational school), developed in the department of drainage and melioration of the Institute of Water Problems and Nautical Melioration (Figure). By PTU includes: a set of non lizymetriv disturbed soil structure established with them in layers vertically sensors (tenziometramy) and ceramic probes power measuring unit manometers - C, power control and power control tenziometriv refueling and supply system - 4 water supply Lithimeters and determination of the volume of its expenditures were carried out using a measuring block that has the form of a floating cassette in the shaft connected through the control unit and refueling 4 with ceramic power probes. Position the tape meets RI'V the field, achieved through the filters at the bottom of a mine to mine 1 RI'V registers recording device 2. During the growing season at a lizymetriv not grown plants, vegetation only simulated to ensure adequate conditions for shading the soil. The indicators of this lysimeter were determined by the magnitude of evaporation. The movement of moisture from the burette of the cassette in the mine to the lysimeter (for moisture) or the flow of water to the burette (for drainage) is due to the gradient of groundwater potential. In the operation of vocational volumes measured daily water consumption for each probe power potential of soil water in 0.1-meter layer of soil in lizymetrah and in the field, the current fixed RI'V. The amount of precipitation, temperature, relative humidity of air was determined directly on the experimental site. Atmospheric precipitation was measured by the pliuiograph P-2, temperature and relative humidity of air - by M-16 thermogram and M-21 hygrographer respectively. Periodic control over the indicators of self-recording devices was carried out by a psychrometer with aspirational MB-4M. To quantify moisture treatment plants investigated potential groundwater, which is equivalent to the direct measurements (according to ISO 15709 ^ O: 2004) passed the hydraulic pressure value (i m).

It has been established that the regime of groundwater pressure in the aeration zone is characterized by high dynamism mainly in the upper layers of the soil, which is explained by the influence of weather conditions and the presence of intensive transpiration of perennial grasses in this horizon (0-0.3 m). For deeper layers of the aeration zone, the state of moisture is close to equilibrium.

Field strain gauge: 1 - mine shaft; 2 - recording device FG; 3 - measuring block; 4 - control unit for strain gauges and refueling of the power system

Significant impact of intensive moisture selecting roots of perennial grasses in the horizon 0 - 0.3 m (maximum moisture absorption zone) on the formation of the regime pressures in the aeration zone demonstrates the need for its consideration during the Verification of reclamation regimes. The design of the vocational school made it possible to experimentally determine the amount of evapotranspiration of perennial grasses at the depth of the aeration zone. As a result, it was established that evapotranspiration is the main cost item of the water balance of the root layer of the soil. The study its dynamics indicates considerable unevenness in this process in depth aeration zone and dependence on the strength of weather conditions. The use of vocational schools enabled the experimental data to be obtained and the transpiration value determined by the depth of the aeration zone. It is established that the maximum expense of moisture for transpiration falls on a layer of thickness 0.3 m from the soil surface, where the highest concentration of roots. The simulation of the distribution of absorption of moisture by roots is carried out for the period of the 1st and 2nd slope of perennial grasses by the formed root system. Research results. According to the method of calculation modes vodorehulyu- tion defined process parameters that characterize the process of subsoil moisture (drain) and indicators related to water regime. For 0t humidity in the area of maximum absorption Zo = zm-on and one week of the growing season limits defined position ґV the following dependencies [3, 4] where x t * - Power aeration zone of the upper layer, m; Tg - power of the root system, m; Z * - zone of maximum absorption of moisture t the root system, m; E - total evaporation, m / day; Ey - physical evaporation (evaporation), m / day. For the study of reclamation regimes enough to take the linear dependence of physical evaporation, which is reduced to the maximum water absorption 0 - 0 Ey = uEyt) where * = k, 0H - some hranych- 0h - 0k not mentioned humidity, depending on which physical changes so Evaporation Ey so if soil moisture at the surface greater 0 0 (0> 0), then Ey maintains its maximum value Eyt), defined energy resources of the atmosphere; For 0. (0G the intensity of evaporation decreases with the linear law mentioned above.

2. Technical and economic indicators of implementation of resource saving technology for water regime regulation (polder system "Iqua", Rivne region) Indicator Amount Area of drainage, ha: gross 245 in particular polder 245 humidification 140 Total moisture deficit in dry year (75% availability of precipitation), Thousand m3 366,32 Defecitis of the moisture covered by the lying (source of humidification - р.ИКВа), thousand m3 242,5 Power of the pump station, m3 / s 0,77 Volume of pumped water per year, thousand m3 861,3 Electricity consumption per year, ths. KW / yr 198 Water saving from y rovadzhennya resource saving mode vodorehulyuvannya (per year), thous. m3 48.7 Saving electricity consumption per year, ths. kW / h 11.2

As a result of the GVV regulation in various modes (passive reduction and humidification), taking into account the natural conditions, in particular rainfall, the required parameters that characterize the water regime in the aeration zone are obtained. The analysis of the obtained results shows that the humidity regimes calculated according to the developed method have allowed to provide sufficient moisture of the root layer. The accumulated precipitation in the active layer of soil (0-0.6 m) in the passive reduction of the RGV to 1.26 m, when the accumulation capacity for moisture was formed in the upper layers of soil, was used as efficiently as possible. In order to assess the effectiveness of water regime regulation in terms of minimizing the washing regime for years of research on the introduction of developed regimes and traditional cyclic humidification, calculations have been made that confirm the significant reduction in the infiltration rate on the RHV. On average, it is 4 times smaller than that of cyclic locking. The results of water exchange studies in the aeration zone indicate a decrease in the evaporation rate from the RGV on average from 932 to 328 m / ha, which is 2.8 times less than the evaporation rate for cyclic skeletal schemes. Techno-economic indicators of implementation of resource-saving technology of water regime regulation on the experimental part of the polar system "Iqua" (Table 2) are determined.

Conclusions

A resource-saving technology of water regime in soil reclamation systems polder type, which focused on the implementation aku- mulyuvalnyh create containers in the upper levels of aeration zone means lowering RґV improves moisture grasses at 15- 20%. At the same time, water consumption is significantly reduced due to infiltration beyond the root of the soil layer. The average value of infiltration was 4 times lower compared to the traditional scheme of regulation (cyclic locking). Saving water and electricity expenses achieved through

the introduction of resource-saving technological parameters of water regime drained soil and purposeful creation akumulyuvalnyh capacities in the root layer of soil. On the module of the experimental area with the area of 245 hectares water saving - 48,7 thousand. m3na year and electricity consumption - 45.7 kW / h per 1 ha drainage, which is 5.7% per year, without reducing the average yield of perennial grasses.

Bibliography

1. Alekseenko L.N. Weighing method for determining the leaf area of meadow plants and meadow communities / L.N. Alekseenko // Botanical journal. -1965. - T. 50, No. 2. - P. 205 - 208.

2. Inland substitution of moisture, water consumption and moisture supply of perennial cultural herbs: monograph / N. A. Muromtsev, P. I. Kovalenko, N. A. Semenov and others - Ryazan: FGBOUVPRO RGATU, 2013. - 300 p.

3. Voropay G.V. Management of the regime of moisture of drained soils, taking into account the features of moisture selection by the roots of cultivated crops / G.V. Rip / / Reclamation and water management. - 2010 - Voip. 98. - P. 91 - 105.

4. Kovalenko P.I. Management of humidity of agricultural crops on reclaimed lands taking into account the dynamics of environmental factors / P.I. Kovalenko, MV Jacyk, VL Polyakov // Ibid. - 1996. - Vip. 82. - P. 3 - 12.

5. Moshinsky K.P. Estimated elements of underground humidification of peat soils / KP. Moshinsky // Byul. Sci-tech Information of UkrNIIiGiM. - K., 1957. - No. 3. - P. 20 - 24.

6. Oleynik A.Ya. Drainage of wetlands / A.Ya. Oleinik, VP Polyakov - K .: Science. Opinion, 1987. - 280 p.

7. Skrypnyk O.V. Technology of regulation of water regime of drained lands / O.V. Skrypnyk, I.S. Soroka, VP Kubyshkin - K.: Harvest, 1992. - 160 p.

8. Yangol A. M. Two-way humidity control during drainage / AM. Angel - M., 1970. - 136 p.

9. Jacyk M.V. The algorithm of combined water regulation on drainage-humidifying systems of the humic zone of Ukraine / M.V. Jacyk, GV Rip / / Reclamation and water management. - 2008. - Vip. 96. - P. 73 - 80.

10. Jacyk M.V. Resource-efficient technology for controlling the moisture supply of agricultural crops on drained lands / M.V. Jacyk, GV Ride / / Materials II International Sci. Pract. Conference dedicated to the World Water Day (water and energy), March 21, 2014 - K. - P. 107 - 108.