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Rice Irrigation Regimes under the Condition of Kyzylorda Oblast

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Key words: Rice irrigation system, drainage network, soil, groundwater level, soil salinization, water salinity, rice map, eco-reclamation conditions, rice water balance draught, the thermal regime of water, salt regime of soils, irrigation regime, irrigation rate and filtration coefficient

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Abstract: Keeping up 12-15 cm layer of water in a rice draught in the post-tilling to waxen ripeness does not provide a favorable thermal and saline soil and water regimes. Temperature regime of water in a rice draught is determined by climatic conditions of the region and the depth of water on crops. In conditions of extreme continental climate of Syr-Darya water layer at a depth of 12-15 cm in the water warms up the draught 31,0 - 32,5°C which negatively affects the growth and development of rice plants and its yield. Favorable thermal regime of water is observed at a depth of 17-22 cm and here we have the necessary salt regime of irrigated soils. Therefore, maintaining the draught in paddy water layer depth of 17-22 cm provides favorable salt and thermal regimes of water and soil.

INTRODUCTION

Kyzylorda region is the main rice-growing region of Kazakhstan. Here are cultivated around 80-85% of crops of this culture of its total area. Intensive cultivation of rice in the region began in 1960-1965 years. In 1960-1985 was carried out widespread reclamation construction. At the end of this period, the area of rice irrigation systems engineering grew up here 225000 ha.

There were disbursed, mainly, old staled and new earth, characterized by the low, rarely moderate salinity. At the beginning of this period, water salinity in the Syr Darya was 0.3-0.4 h L^{-1}. Therefore, reclamation conditions of irrigated lands in 1965-1975 were quite satisfactory.

However, later mineralization of river water has increased, reaching in years of 1980-1985 to 1.4-1.7 h L^{-1}, for the worse and changed the chemical composition of water. All this greatly worsened ecological and reclamation situation of irrigation systems.

At the present time, the region has experienced complex hydro-geological conditions, decreased the water-bearing capacity of soils. Now the state of drainage system does not allow timely and accurately allocate excess surface water and soil and to ensure that the required groundwater lowering. Rice Irrigation System (RIS) are in a state where they can't receive without perceptible harm to increased reclamation. In this regard, the task of creating irrigation systems to favorable environmental conditions involves a reduction to a minimum loading of reclamation.

Currently applied in rice irrigation regimes were developed 40-45 years ago. Therefore, they almost did not take into account the fundamental changes of soil-reclamation and hydrogeological conditions that are rampant lately. Irrigation rate of rice now grown to 27000-30000 m^3/ha. Under these conditions with irrigation water per hectare of irrigated field comes 45-50 t salts. This contributes to the deterioration of ecological and ameliorative condition of irrigated lands, not only but also the surrounding areas and the landscape in general. All this explains the need for research in rice irrigation regime prevailing heavy soil-reclamation conditions. The task consists of to place the regime of flood of rice draught, ensuring a minimum loss of filtration and irrigation rate reduction of rice.

The novelty of the research work is to determine the optimum depth of flooded rice checks to ensure normal physiological growth and development of rice plants while maintaining favorable salt and thermal regime of the soil and water.

MATERIALS AND METHODS

Research methodology: Research works of field were conducted in 2012-2014 the rice crop rotation area of Karaultube experimental farm of the Kazakh Scientific Research Institute of Rice. The dynamics of the salt, the thermal regime in paddy fields, depending on the varying water depth and intensity of their discharge from the draughts.

For measurements of water balance elements on each draught trapezoidal weirs were installed at the water supply of the map sprinkler in draught and to the point of discharge of water from the draught in the map discharge channel. Seepage losses, evaporation from water surface and total water consumption of rice were studied by means of vessels, evaporators of Zaitsev[1].

Regime and the chemistry of the groundwater was studied using point piezometers installed at a depth of 100cm. These observations were made every 3 days, water samples were taken from them once in a decade. At each draught 3 points are fixed to study the dynamics of soil salt regime. At the beginning and end of the growing season soil sampled to a depth of 100 cm every 20 cm.

At each draught by 9 points were fixed phenological observations-note the date of occurrence and transmission phase full shoots, tilling, booting, flowering, dairy, wax and full ripening rice. During ripening rice harvest was conducted by accounting meters. The depth of the water gauge for each pin is measured by water temperature. Measurements of water temperature held at 9, 15, 19 h.

The climatic characteristics of the region: Observation materials on the weather station of Kyzylorda were used for the climatic characteristics The average annual temperature of the region is 9.9°C. The coldest month-January with an average temperature of 8.2°C. With the invasion of cold air masses air temperature falls sharply. The absolute minimum is lowered to 44°C. In winter the territory weather changes sharply.

Daily temperature amplitudes in winter are significant in some years may reach 20-28. The warmest month-July. The absolute maximum in July is 40-42°C. Daily temperature amplitudes in summer reach to 21-26°C.

Stable transition through daily average temperatures 5°C observed in late February-mid-March, at 0°C in the second half of March. In the fall transition through 5°C occurs in the first decade of October and the offensive of negative temperatures for the first decade of November. Annual humidity is about 56-60%. Maximum values of humidity of December-80-81% and the minimum in July-35-40%. By the nature of the region is characterized by moistening aridity. Annual rainfall is only 156 mm. The vegetation period of 2012 characterized by elevated temperature conditions (Table 1).

Here, the monthly average temperature in May and June were at 2.6-2.7°C above normal. Temperature testing in July, August and exceeded the norm by 1.7-2.0°C. We can assume that the temperature conditions of 2013 were within normal limits, except for a marked increase in air temperature in May. Start of the growing season of 2014 characterized by high temperature characteristics. July was cool in comparison to the norm. August distinguished repetitive days with hot weather. Therefore, we can assume that the period of study covered during typical weather conditions for the region.

Soil-reclamation conditions of the object of research: The lot of soil is meadow-swamp on mechanical composition predominantly medium and heavy loams. Soil salinity mostly average, at least-is weak. The type of salinity-chloride-sulfate and sulfate. Sands and sandy loams in meter layer are found in separate layers.

Availability of soil with nutrient is poor. The content of humus in the plow horizon is between 0.47-0.90%. Total phosphorus content 56.2-133.7 mg kg^{-1}.

Table 1: Climatic characteristics of the study area (according to the weather station of Kyzylorda)

	2012		2013		2014		The norm of the average temperature (°C)
Months	Average air temperature (°C)	Deviation from the norm (°C)	Average air temperature (°C)	Deviation from the norm (°C)	Average air temperature (°C)	Deviation from the norm (°C)	
April	19.6	6.3	15.2	1.9	10.6	-2.7	13.3
May	23.0	2.7	21.9	1.6	24.1	3.8	20.3
June	28.7	2.6	26.7	0.6	28.7	2.6	26.1
July	29.5	1.7	28.6	0.8	26.3	-1.5	27.8
August	27.7	2.0	25.6	-0.1	28.0	2.3	25.7
September	19.2	0.6	20.7	2.1	18.5	-0.1	18.6

Table 2: Water balance of rice draught, Karaultube experimental farm

Elements of water balance	2012 m^3/ha	2012 Percentage	2013 m^3/ha	2013 Percentage	2014 m^3/ha	2014 Percentage
Incoming part						
Water supply	22410	98.7	22940	99.2	22230	99.6
Precipitation	310	1.3	180	0.8	110	0.4
Total	22720	100.0	23120	100.0	22340	100.0
Expenditure part						
The total water consumption	9460	43.8	9180	41.8	9720	41.0
Initial saturation of the soil	3180	14.7	3420	15.6	4050	17.1
filtering	5520	25.6	7680	35.0	8180	34.5
Discharge of water from the draught	3480	15.9	1670	7.6	1730	7.4
Total	21640	100.0	21950	100.0	23680	100.0
Discrepancy	1080	4.8	1170	5.3	-1340	5.6

RESULTS AND DISCUSSION

Water balance of the rice draught: The total water consumption of rice is determined by varietal characteristics and climatic characteristics of the study area. The share of this parameter in this case is slightly less than half of the irrigation rate. Previously, similar studies were conducted by Kutybaev[2], Petrunin *et al*.[3], Rau and Kkalybekova[4] and Dlimbetov and Koshkarov[5].

The total water consumption includes transpiration of moisture rice plants and natural evaporation from water surface. In other words, it is the most productive part of the water balance of rice draught. In our studies, total water consumption amounted to 9180-9720 m^3/ha. The share of this figure falls 41.0-43.8% irrigation rate (Table 2).

The volume of the initial saturation of the soil aeration zone depends on the Ground Water Level (GWL) at the onset of flooding draught after sowing rice and mechanical composition of soils. In the period of initial flooding groundwater depth ranged from 1.7-2.1 m. The volume of the initial saturation is set Observations vessels, evaporators without a bottom in the period of initial flooding. This volume is made up by years of research 3180-4050 m^3/ha, this is equal to 14.7-17.1% of the water supply. Note that this cost is subject to little regulation.

Filtering water in paddy fields is ecologic regulation component. The higher the score, the better the dynamics of soil salt regime. The value of this parameter is determined by the natural drainage conditions and semi-irrigated land. On the considered crop rotation plot depth map drains are 1.5-1.7 m depth enclosing field drains-collectors-1.8-2.3 m. The upper layers of soil (120-180 cm) are relatively low permeability. Here, the filtration coefficient of about 0.09-0.23 m for day.

The averaged value of the filtration coefficient of the aeration zone is 0,2 m for day. Soils are heterogeneous, containing a total thickness of clay loam and sandy sediment layers with high water permeability. The main groundwater reservoirs are cretaceous and quaternary sediments. Impermeable horizon is represented tertiary-cretaceous sediments which lies at a depth of 45-50 m.

Filtering water in paddy fields, on the one hand, causes an increase in losses of irrigation water for paddy field. On the other hand, filtration plays a positive role in the formation of a favorable mode saline soils and soils. However, the increase in seepage losses leads to an overload of drainage collection network, the rise of ground water in the surrounding areas which generally has a negative impact on the ecological status of the region. Therefore, the higher the score, the better the dynamics of soil salt regime. The value of this parameter is determined by the intensity of drainage of irrigated area. As noted above, on the considered crop rotation Cartesian plot depth of drains 1.5-1.7 m depth enclosing field drains, sewers-1.8-2.3 m. Therefore, irrigated array can be attributed to areal drainage territories. The upper layers of soil (120-180 cm) have relatively low permeability. In the study period the value of seepage losses amounted to 5520-8180 m^3/ha.

Thermal regime of water in a rice draught: The layer of water in a rice draught serves as a stabilizer or a regulator of temperature conditions. This is particularly important when a sharp change of weather conditions which is often observed in the region. The climatic conditions of the region are characterized by sharply continental. Summer months are characterized by high temperatures, practically almost complete lack of precipitation and severe aridity. However, against the background of all this are frequent days with cool weather. In this connection it is important to study the detailed temperature rice draught depending on the mode of irrigation and weather conditions.

A.G. Esipov, B.A. Neunylov found that for normal growth of rice plants are more important water and soil temperature than the air temperature. A.A. Ovchinnikov believes that the water temperature in a rice tilling after the check should be within 25-30°C. A.P. Dzhulay, K.S. Kirichenko, V.P. Dotsenko consider that the cultivation of early maturing varieties of rice water temperature equal to 18-20°C. If the water temperature is above 30°C, it is particularly harmful for the young seedlings of rice. This disturbed breathing process plants, they begin to secrete a large volume.

Table 3: The dynamics of water temperature draughts and an irrigation canal on the experimental site (26.07.2013, Air temperature-41.4°C)

Option irrigation regime	The water depth in the draught (cm)	Water temperature (°C) and Observation time (h)						
		8-10	10-12	12-14	14-16	16-17	17-19	17-19
1	12-15	23.2	25.0	26.5	29.2	31.0	32.3	29.5
4	17-22	23.1	24.0	25.6	27.1	28.5	28.4	27.8
7	27-32	22.5	23.2	26.8	26.9	27.5	27.4	26.7
Irrigation canal		21.5	24.3	24.3	24.3	26.3	26.0	24.2

carbon dioxide, water has less oxygen. According to Krasnodar rice experimental station maintenance in rice draught the water temperature in the range of 28-30°C for 3-4 days duration allowed to destroy the corn bunting. However, further extension of the maintenance of the high temperature caused a deterioration of rice. K.S. Kirichenko considers the optimal temperature of irrigation water at the beginning of the growing season of 17°C in the middle of the growing season-24-26°C, at maturity-20°C.

In the context of Japan, Mowjood *et al*.[6] found that flooding of rice fields in the lowlands provides good conditions of growth and development of rice plants. They found that the thermal energy is adopted surface field transmitted to the upper layer of the water by convection, then in the lower layers of the soil by conduction.

In the context of the Philippines, Bouman *et al*.[7] studied the thermal regimes in flooding rice fields and the absence of a layer of water. They note that in flooded rice fields takes place considerably more than the unflooded and the influx of thermal energy storage.

With the growth of rice plants their effect on the thermal regime is enhanced. There is no thick grass yet, upper soil layer strongly warmed and further the temperature of the soil in the rice fields during the day is much lower than in a natural area. A not able feature is the water temperature instability on the checks. Because of mixing and the small depth it responds quickly to changes in weather conditions the air temperature, cloudiness, wind speed and others. In the initial phases of development of rice water temperature in check during the day higher by 7-8° than in the irrigation channels and has a well pronounced diurnal character. In daily irrigation channel amplitude does not exceed 5° whereas in a rice field, it reaches 14°.

Thus, the thermal regime of water in a rice draught depends on the weather characteristics of the region, the period of plant development, irrigation regime and culture, etc. The most important period of development of the rice is the flowering and ripening cultures. The temperature condition so fair difficult at this time. During this period (end of July-mid August), the region is characterized by maximum air temperature (35-40°C) and minimum relative humidity. All this presents special demands on the temperature regime of water in a rice check. Therefore, many researchers in this crucial period of development of culture offer to maintain the temperature of ponded water at 24-26°C.

In this region, agro-climatic conditions of rice cultivation is investigated by Zhapbasbaev[8]. They found that the daily variation in water temperature follows the course of the temperature and varies depending on the nature of the active surface of the field and the temperature of the surface and its depth distribution determined by the thermal properties of the soil and water as well as the nature of the growth and development of plants. Due to the large heat capacity of water is almost entirely absorbs heat penetrating through the surface and because of the low thermal conductivity of the day prevents the soil from heat and at night-from cooling. Furthermore, due to running water is a constant heat exchange with the environment, so, in all parts of the field the temperature of the water is practically the same.

26 July air temperature in the experimental section risen to 41.4°C (Table 3). On this day, the dynamics of the water temperature in the check was next. When the water depth 12-15 cm, maximum temperature was between 17-19 h. It should be noted that the water was heated strongly in draught in between 14-19 h. During this period, the water temperature in the draught 12-15 cm depth is 32.3°C at a water depth 17-22 cm-28.5°C at a depth of 27-32 cm-26.3°C. Thus, if the minimum water depth there is a strong heating of the water to a level considerably in excess of the norm which is typically 28-30°C.

Consideration of the thermal regime of water at moderate ambient temperatures (Table 4) shows a slightly different trend. In this case, the observation day was chosen with respect to cooler weather when the maximum air temperature was 27.2°C. Given the average thermal activity on the specified day of weather, warming water in draughts was also moderate. So, for the active phase of the day on this day the water in checks warmed by about 1.5-1.8°C. As a result of the important role played by the stored water temperature for the night which was recorded at 8-10 am. In the interval of 16-17 h, the water temperature was at minimum draught depth 22.0°C at a depth of 17-22 cm-24.4°C and under a layer of water of 27-32 cm-26.2°C. In other words, set up for the night temperature difference is maintained throughout the day. On this day, a more favorable thermal regime has been

Table 4: The dynamics of water temperature draughts and an irrigation canal on the experimental site (07.08.2013, Air temperature-27.2°C)

Option irrigation regime	The water depth in the draught (cm)	Water temperature (°C) and Observation time (h)				
		8-10	10-12	12-14	14-16	16-17
1	12-15	20.5	21.0	22.5	22.2	22.0
4	17-22	23.7	24.5	25.1	24.6	24.4
7	27-32	25.5	26.2	27.0	26.5	26.2
Irrigation canal			23.0	23.7	25.0	25.124.8

Table 5: Trends in water temperature draughts and an irrigation canal on the experimental site (June 28, 2014, The air temperature-39.0°C)

Draught number	The water depth in the draught (cm)	Water temperature (°C) and Observation time (h)							
		8^{20}-10^{20}	10^{20}-12^{20}	12^{20}-14^{20}	14^{20}-16^{20}	16^{20}-18^{20}	18^{20}-20^{20}	20^{20}-22^{20}	22^{20}-23^{20}
2	12-15	29.0	30.0	31.0	31.0	31.0	30.0	30.0	30.0
1	17-22	22.0	27.0	27.0	28.0	27.3	27.0	26.5	26.0
3	27-32	26.0	25.5	26.0	26.5	27.0	25.5	25.0	24.5
Irrigation canal		27.0	27.0	28.0	28.5	28.0	27.6	27.5	26.5
The air temperature		31.0	33.0	37.0	38.5	38.9	37.0	35.2	32.0

Table 6: The dynamics of water temperature checks and an irrigation canal on the experimental site (July 14, 2014, The air temperature-28.0°C)

Draught number	The water depth in the draught (cm)	Water temperature (°C) and Observation time (h)							
		8^{20}-10^{20}	10^{20}-12^{20}	12^{20}-14^{20}	14^{20}-16^{20}	16^{20}-18^{20}	18^{20}-20^{20}	20^{20}-22^{20}	22^{20}-23^{20}
2	12-15	21.2	21.4	22.0	23.0	23.0	23.0	23.0	23.3
1	17-22	18.0	18.5	20.0	20.2	20.0	20.5	21.0	22.0
3	27-32	22.0	22.7	26.0	26.3	26.0	24.5	24.0	24.5
Irrigation canal		21.5	22.0	24.0	24.5	25.0	25.0	24.2	24.5
The air temperature		24.0	24.0	24.5	27.0	28.0	25.5	20.0	19.5

provided with a water depth of 17-22 cm, 27-32 cm. With a minimum water depth of the maximum temperature was only 22.2°C which is less than the optimal range.

Thus, the temperature of ponded water is directly related to depth of water. Maximum temperature regime characterized by the minimum depth. So, at a depth of 12-15 cm layer of the thermally active phase of the day the water temperature warms up to 32.3°C. As the water layer thermal regime begins to flatten. Increasing the depth of water up to 17-22 cm reduces the temperature by 2.5-3.8°C. On days with cool weather favorable thermal regimes of water provided at a depth of 17-22 cm and 27-32 (Table 5 and 6).

Irrigation regime of rice: In the region of researching of rice irrigation were initiated by Petrunin *et al*.[9]. G.R. Serenko performed studies of irrigation regime for rice under saline soils of left side massive of Kyzylorda. Here, the most positive results obtained from the flow to the phase of the buttonhole.

The study of rice irrigation regime to save irrigation water for irrigation of rice were investigated by Goryunov[10]. Studies performed Volkonsky *et al*.[11], the codition of Kyzylkum array confirmed the advantage of constant flooding of rice fields in comparison with shortened on saline soils.

Water-saving technologies of cultivation of rice to meet the requirements of the environment developed by V.V. Morozov, In the context of Ukraine. He proposed a closed draught irrigation system with a reuse of drainage waters. The use of drainage waters for irrigation of rice RIS and related crops can reduce rice irrigation rate at which improves the ecological condition of adjacent areas. Average annual rice irrigation rate decreased from 24.600 $m^{3/}$ha to 15-18 thousand m^3/ha.

The technology of rice cultivation using periodic watering, providing reception harvest 4.5 and 6 t ha^{-1} was developed by K.A. Rodin. For each of the recommended for a different water regimes yield justified irrigation schedules agreed with the biological characteristics of rice and the dynamics of the daily total water use[12].

Rice irrigation system of Nizhny Kuban from 1955-2012, per capita consumption of irrigation water increased from 17.5-24000 m^3/ha. The capacity of irrigation canals as a result of overgrowth decreased in 1.3-5.0 times, there was a deterioration of the micro-relief draughts. In these conditions A.Y. Svistunov developed adaptation measures in rice production in the region to changes in temperature of the growing season. Proposed since phase sprouting period milky-wax ripeness of rice to maintain in draught the water layer depth of 10 cm in order to ensure maximum productivity and minimum water consumption culture.

A.A. Titkov, M.A. Bashirov, S.N. Turilo indicate the need to maintain a non-vegetation period of rice paddies groundwater level at a depth 1.5-1.8 m and below.

We have also carried out studies of rice irrigation regime under accumulative alluvial complicated lacustrine basins, plains (Right Bank Kyzylorda massive) with installed irrigation rate and its components, the optimal timing pre-harvest stopping delivery of irrigation water.

However, in these studies, in our opinion, there is insufficient justification for the depth of flooding checks with agro-climatic factors and conditions to ensure favorable environmental conditions landscapes. In addition the proposed irrigation regimes Culture little consideration of the technical and operational factors of the irrigation systems.

In our opinion at the time was not sufficiently justified the need to maintain in the rice tilling until after receipt of wax ripeness water depth of 10-15 cm. Apparently, there is an important role played by the fact that at one time was set by Japanese researchers optimality 12-15 cm depth of water in the rice fields, ensuring maximum yield culture. However, there is no dispute of the fact that both climatic and soil-reclamation conditions in Japan and our country and in particular, the lower reaches of the Syr Darya have little in common.

Researchers who has studied the issues of rice irrigation regime in Kazakhstan, in principle, the need to maintain in drauht after tilling until the end of the vegetation period of 12-15 cm water depth was considered inviolable. In connection with this question of changing the depth of the water after tilling was not raised initially. Therefore, many studies have been subjected to a detailed study of the elements of rice irrigation regime in the period prior to tilling.

However, after a period of tilling to ripening rice long enough at this time on the rice field are such important periods of organogenesis culture as booting, flowering and ripening. Of particular note is the flowering stage which is very important for rice. In this phase practically laid the foundations of the future harvest. Therefore, the requirements for agro-climatic factors in this period special. Many researchers are inclined to the fact that in said phase the water temperature should be at 23-25°C. At a water depth of 10-15 cm in the check it seems not always possible.

According to the International Rice Research Institute in the Philippines, conditions such elements of water flow in the rice fields as evaporation, runoff, filter and overflow are unproductive losses. Only transpiration is a productive element of water flow which is the maximum measure promotes the growth and development of culture. Here, the loss of water through seepage and overflow are about 20-50% on heavy soils with shallow ground water levels and 50-85% in the lungs with a deep soil groundwater level of 1.5 m or more.

Concept of ameliorating role of rice is known. Now when the irrigation system to the limit is overloaded due to maximum load of reclamation as in the whole agricultural landscapes, the concept to some extent lost its meaning and effect. Because today it is impossible to talk about desalination mode rice without a significant damage to the environment. As for Kyzylorda region, located in the lower reaches of the Syr Darya, characterized by practically not drained underground stream, this problem is even more acute.

Analysis of the data in Table 7 shows a direct dependence on the depth of the rice crop water layer in draught. With a minimum water depth to obtain sufficiently high (39.2 hundred weight ha^{-1}) for specific soil conditions, harvest rice. Saline soils pilot area average. A further increase in the depth of water up to 27-32 cm resulting in lower yield. This is due to the deterioration of the heat, salt, food and soil water regimes in a rice draught. Maintaining a 17-22 cm layer of water is beneficial even the least amount of irrigation water to 1 c products. Increasing the depth of water up to 17-22 cm led to an increase crop yield to 43.3 hundredweight/ha, while the increase was 4.1 hundredweight/ha.

The yield for 2014 confirm the dependence of productivity on the depth of water in a rice draught. The maximum yield was obtained by flooding the draught layer 17-22 cm, the minimum-at 12-15 cm layer of water. Rice irrigation rate increases with the depth of flooding but the optimal utilization rates of moisture occur in 17-22 cm layer of flooding-497 m^{-3} hundredweight (Table 7).

Increasing rice irrigation rate with increasing depth of flooding due to increased seepage losses because of the increased hydraulic head and flow rate. However, despite this, the whole volume of water expended per unit of production is minimal at a depth of flooding equal to 17-22 cm. In this regard, in the period after tilling before the wax ripeness in paddy fields is proposed to maintain the water layer of 17-22 cm.

During the growing season thedynamics of salt regime of soils following (Table 8). While maintaining the depth of the water at the level of 12-15 cm (1-3 options) for the irrigation season in salt-washed m layer of soil on the dry residue is 0.234-0.369%. Moreover, the intensity of salt removal increases with the number of periodic discharges. At the same time there is a tendency of increasing washing out the salts with 2 water discharge from the draught. Review of performance of the first and fourth embodiments which are characterized by only one water discharge, shows enhancement of salt removal by flooding the draught layer depth of 17-22 cm. Here, the difference in washing out the salts is 0.122% and the difference is quite noticeable and this despite the fact that the initial soil salinity in the fourth embodiment (0.964%) is somewhat lower than in the first.

Discharges of water coming into the operational part of the irrigation rate, depend entirely on the technical and organizational conditions. Necessity flowage and discharges in the rice fields is explained regulation salt regime of soils and water in a rice draught at a high salt content. Along with this water discharges overload of drainage network, thus there is a rise of the ground water level rainfed array. Retraction of mineralized waste water

Table 7: Effect of depth of flooding water in the draught in the post-tilling before the waxen stage on rice yield (Karaultyube experimental farm)

The layer of water in the draught (cm)	Year of study	The average rice yield (hundred weight/ha)	Yield increase (Hundred weight/ha)	Irrigation rate (m^3/ha)	Water consumption per 1 quintal harvest (hundredweight/ha)
12-15	2013	39.2	-	20510	523
	2014	40.3	-	21020	521
17-22	2013	43.3	4.1	21660	501
	2014	44.6	4.3	22160	497
27-32	2013	40.9	1.7	22940	560
	2014	42.8	2.5	23480	548

Table 8: Dynamics of the content of water-soluble salts in the soil horizon meter (in the numerator-the salt content in the beginning of the growing season, in the denominator-the end of the growing season of 2013 (Karaultyube experimental farm)

	Salt content (%)			
Water depth (cm)	Solid residue	Chlorides	Sulfates	After washing the salts of dry residue (%)
12-15	1.078	0.064	0.404	0.234
	0.844	0.042	0.267	
17-22	0.964	0.113	0.663	0.356
	0.608	0.082	0.442	
27-32	1.159	0.124	0.528	0.378
	0.781	0.086	0.298	

Table 9: Dynamics of water-soluble salts in the soil horizon meter (in the numerator-the salt content in the beginning of the growing season, in the denominator-the end of the growing season (Karaultyube experimental farm, 2014)

		Salt content (%)				
Draught number	The depth of flooding (cm)	Solid residue	Chlorides	Sulfates	After washing the salts of dry residue (%)	After washing of salts in percentage of the initial content on dry residue
1	12-15	0.486	0.048	0.304	0.121	24.8
		0.365	0.037	0.171		
2	17-22	0.546	0.042	0.284	0.174	31.9
		0.372	0.036	0.152		
3	27-32	0.458	0.053	0.225	0.156	34.5
		0.302	0.033	0.092		

beyond crop rotation area, due to the specific soil-reclamation and hydrogeological conditions of the ancient delta of the Syr Darya does not eliminate the problem of the negative impact on its eco-reclamation conditions. Therefore, the impact of this norm should be established on the basis of objective consideration of soil-reclamation and environmental conditions[13, 14].

Mean washing out the salts in the variants with a layer of 12-15 cm is equal to 0.315%, in embodiments with a water depth of 17-22 cm-0.384% which indicates a significant improvement with increasing salt regime layer ponded water to 17-22 cm.

In embodiments with a maximum depth of water (embodiments 7-9) holds increase the removal of water-soluble salts, associated with increased depth filtration of soils. Here, the average value of washing out the salts is 0.417% which is 0.033% higher than in the embodiments where the water depth of 17-22 cm.

Salt content in the meter horizon soil at the experimental site in 2014 is 0.458-0.546%. This indicates an average degree of content of water-soluble salts. The type of salinity in the main-chloride-sulfate. During the irrigation season salt-washed solid residue was 0.121-0.174%. It should be noted that the intensity of the removal of water soluble salts generally negligible. However, the low intensity of washing out the salts takes place when the depth of the flooding pin equal to 12-15 cm. This volume washing out the salts of dry residue in comparison with the initial content was only 24.8% (Table 9).

The figure was 31.9% according to increasing layer flooding to 17-22 cm. Further increase in the depth of 27-32 cm before the flooding resulted in an increase of the relative index of salt removal to 34.5%. However, here the absolute value of the washing out of 0.156% by dry residue. Thus, the more favorable the salt regime of soils under rice takes place at layer flooding 17-22 and 27-32 cm.

Analyzing the dynamics of the salt regime of soils over years of research, it can be argued that in the post prior to tilling of rice wax ripeness most optimal in terms of favorable salt regime of soils is a layer of 17-22 cm depth of flooding.

CONCLUSION

At a depth of 12-15 cm of the thermally active phase of the day the water temperature warms in draught 32.3°C. With the growth of the layer of water temperature regime begins to flatten. Increasing the depth of water up to 17-22 cm reduces the temperature by 2.5-3.8°C. On days with cool weather favorable thermal regime of water is provided at a depth of 17-22 cm and 27-32. It should therefore be considered as the depth of water in a rice draught, equal to 17-22 cm, the optimal depth in the post before the start of tilling of rice wax ripeness.

Rice yield is influenced by prevailing in the rice fields of water, nutrient, salt and thermal regimes. More favorable salt and thermal regimes in the years of research developed at the 17-22 cm layer of water, resulting in a maximum yield. A further increase in the depth of water up to 27-32 cm resulting in lower yield. Obviously, this is due to the deterioration of the heat, salt, food and soil water regimes in a rice check. Maintaining a 17-22 cm layer of water is beneficial even the least amount of irrigation water to 1 c products. Mean washing out the salts in the variants with a layer of 12-15 cm is equal to 0.315%, in embodiments with a water depth of 17-22 cm -0.384% which indicates a significant improvement with increasing salt regime layer ponded water to 17-22 cm. In embodiments with a maximum depth of water is an increase in the removal of water-soluble salts, due to the increase in depth filtration of soils.

Salt content in the meter horizon soil at the experimental site in 2014 is 0.458-0.546%. This indicates an average degree of content of water-soluble salts. The type of salinity in the main-chloride-sulfate. During the irrigation season salt-washed solid residue was 0.121-0.174%. It should be noted that the intensity of the removal of water soluble salts generally negligible. This is to some extent due to the small initial salt content. However, the low intensity of washing out the salts takes place when the depth of the flooding pin equal to 12-15 cm. This volume washing out the salts of dry residue in comparison with the initial content was only 24.8%. With increasing layer flooding to 17-22 cm, the figure was 31.9%. A further increase in the depth of 27-32 cm before the flooding resulted in an increase of the relative index of salt removal to 34.5%. However, here the absolute value of the washing out of 0.156% by dry residue. Thus, the more favorable the salt regime of soils under rice takes place at layer flooding 17-22 and 27-32 cm. Analyzing the dynamics of the salt regime of soils over years of research, it can be argued that in the post prior to tilling of rice waxen ripeness most optimal from the point of ensuring favorable salt regime of soils layer is 17-22 cm depth of flooding.

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