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THE PRODUCTIVITY OF NATURAL GRASS

Astract

The results of the study of the impact of flooding, fertilizers and sowing of grass on the productivity of the natural grass estuaries

Keywords: *estuary, productivity, natural grass, mineral fertilizers, sowing*

The West Kazakhstan region ranks first in the republic in terms of the area of the land of estuary irrigation. More than 82% of the reclaimed lands of the West Kazakhstan Oblast are for irrigation. In spite of certain shortcomings, irrigation irrigation has been and remains the most affordable, cheap and highly effective irrigation method, allowing to create a fodder base for livestock in periodically arid regions, as well as in the zone of unstable hydration [1, 2]. In recent years, work has been intensified to restore the design capacity of irrigation and watering systems. So, in the plans for the development of land reclamation until 2020 in the West Kazakhstan region, it is envisaged to bring annually exploited areas of liman irrigation to 166,000 hectares.

The Ural-Kushum irrigation and watering system is the largest active irrigation system designed to provide periodic spring flooding of estuaries on an area of more than 90 thousand hectares. However, under current conditions, less than 25% of all lands of irrigation are periodically flooded every year.Preliminary studies have shown that in modern conditions, more than 75% of all lands of estuary irrigation are not properly maintained. Significant interruptions in flooding practically lead to degeneration of the vegetation cover, degradation of irrigated areas.Violations of the technological regime and breaks in flooding led to the degeneration of valuable plant species on them, and a decrease in the productivity of the natural grass stand.

Scientists suggest that restoring the water supply of estuaries should lead to the appearance on them of a large number of valuable plants [3, 4]. Issues of restoration of estuaries have economic and socio-economic significance for the population of these regions.

For the first time the studies were aimed at justifying the restoration of the natural grass stand of estuaries with degenerate vegetation, caused by prolonged interruptions in flooding. The work performed under the grant funding program of the Committee on Science of RK on the project “Restoration of productivity of natural grass stand of estuaries with degradiated vegetation, due to long-range breaks in flooding” (state registration RK 0115RK01760).

As ways to revive the natural grass stand on artificial permanent estuaries with an average depth of flooding, hydro-reclamation (creation of a flood regime) and agromeliorative (application of fertilizers and grass seeding) techniques on cells 31 and 32 are examined.

The results of the study are of great scientific interest, since the study of ways to restore productivity on engineering estuaries, with a significant break in flooding and degenerate natural vegetation, were conducted for the first time.

The productivity of natural grass in the flooded and non-flooded areas of the estuary. A feature of the natural grassland estuaries is the presence in one plant community of many biological groups that use water and food resources of the habitat unequally. The main grasslands in estuaries are plots with dominance quack grass, Beckmann vulgare, foxtail, puccinellia, ostrets. In estuaries, where the rational regime of their use is systematically violated, the average yield of hay from the grass communities is in the range of 11.7...24.8 centner/ha, decreasing in many farms to 6...8 centner/ha. The long absence of bays leads to the replacement of high-yielding grass stand with low-yielding xerophytic motley grass.

To determine the efficiency of restoration of natural grass stand on estuaries with degraded vegetation, an analysis was made of the productivity of sites with different flooding regimes. Along

with the flooded cells 31 and 32 we investigated the indicators of the grass stand of the cells with interruptions in flooding (7, 11, 14 and 17) and cells 22 and 23, where there is no flooding for more than 13 years (table 1).

The composition of vegetation on the investigated trasectic is different, which is a consequence of different flooding regimes. For example, on cells 22 and 23, there is a low-value weed in the fodder, in particular, mar. This can be explained by the long absence of bays on this cell.

Table 1 – The average height and density of the plantation of plants of the natural grass stand on the estuary

Periodicityof cellflooding	Cells	Height, sm		Number of stems, pcs/m^2		Share of grasses in total grass stand,%	
		Cerealgrasses	Motleygrass	Cerealgrasses	Motleygrass	Cerealgrasses	Motleygrass
Break for more than 13 years	22	29/35	49/24	234/97	126/9	65,0/85,8	35,0/7,9
	23	15/45	45/-	236/51	160/-	57,9/80,9	42,1/-
Break of 10 years	7	75/40	45/36	452/74	52/2	89,6/97,3	10,4/2,7
	11	70/65	46/55	452/123	516/1	46,2/99,1	53,8/0,9
	32	73/72	50/57	418/68	167/16	71,4/80,9	28,6/19,1
Break of 8 years and 2015	14	91/65	41/43	355/58	74/8	82,3/87,9	17,7/12,1
Break of 6 years	31	75/51	50/32	697/70	62/5	90,8/93,3	9,0/6,7

Note: The first indicator is the data for 2016, the second for 2017.

In all cells flooded in 2016 and 2017, there is a tendency to increase the proportion of cereal grasses in the general herbage of cells. This is due to the improvement of the conditions for the growth of valuable grasses. In 2017, the number of stems per m^2 of area is significantly lower in all cells compared to 2016. The influence of prolonged cold weather up to the 20th of June and the lower irrigation rates in comparison with 2016 on the growth and development of plants. Also, the plant altitude indicators for 2017 are also inferior to those of 2016. In cell 22 and 23, the proportion of cereal grasses in 2017 is high, but it is mostly low shrunken shriveled plants that do not have haymaking significance, but are used as pasture plants. In all cells flooded in 2016 and 2017, there is a tendency to increase the share of cereal grasses in the general herbage of cells from 46.2-90.8% in 2016 to 80.9-99.1% in 2017. This is due to the improved conditions for the growth of valuable grasses in flooding.

In 2016, the lowest yield of green mass and hay was obtained on cells with prolonged interruptions in flooding (table 2). Thus, the yields of non-flooded cells 22 and 23 were 34.5 and 42 centner / ha, of which weights were 10.2 and 15.2 centner / ha, respectively. Such a rapid growth of weed vegetation on non-flooded cells is due to a large amount of precipitation in this area in April-May 2016. The comparison shows that the precipitation in the amount of two months for the long-term data is 33 mm, and in 2016 - 87.1 mm, the excess of 2.63 times.

Table 2 – Yield of natural grass in the estuary

Parameters	Cells of estuary 49						
	7	11	14	22	23	31	32
Yield of green mass, centner/ha	107 42,2	102 55	85,3 40,2	72 9,8	72 9,5	94,1 41,5	78,2 55,6
Yield of hay, centner/ha	49 21,5	53 35	44,5 21,3	34,5 5,2	42 6,3	47,2 21,7	44,5 35,2

Note: The numerator is the productivity of 2016, the denominator is the yield of 2017.

In 2017, the lowest yield of green mass and hay was obtained on cells with prolonged interruptions in flooding. So the yield of green mass of non-flooded cells 22 and 23 was 9.8 and 9.5 centner / ha, respectively, hay - 5.2 and 6.3 centner/ha.

In the non-flooded part of many cells, the share of wormwood, pasture plants is high. In the flooded part of the cell 17, the share of the less valuable forage ratio of the tuber. In all cells, the yields for 2017 are significantly lower than in 2016. An important role in the accumulation of the vegetative mass of plants was played by the small value of the sum of the positive air temperatures necessary for the favorable growth and development of the natural grassland of the estuaries. At the same time, the yields of many cells remain at a good level for our conditions.

In 2016, the yield of green mass in flooded cells (78.2-107 centner/ha) exceeded the yield from non-flooded cells (72 centner/ha) by 6.2-35 centner/ha. The yield of hay in the flooded cells (44.5-53 centner/ha) exceeded the yield from non-flooded cells (34.5-42 centner/ha) by 2.2-11 centner/ha. In 2017, the lowest yield of green mass was recorded in non-flooded 22 and 23 cells 9.8 and 9.5 centner/ha, which is 30.4-45.8 centner/ha less compared to the productivity of flooded cells. The lowest yield of hay was also obtained in non-flooded 22 and 23 cells, 5.2 and 6.3 centner/ha, which is 15-28.9 centner/ha less compared to the yield of flooded cells.

The influence of mineral fertilizers on the growth and development of natural grass. An important factor in the intensification of meadow feed production is the systematic use of fertilizers, complete satisfaction of plants with elements of mineral nutrition.

Experiments to study the effect of mineral fertilizers on the productivity of the natural grass stand of estuaries have shown that the best fertilizers for grain fertilizers were grass groups and, couch-grass.

In 2015-2017, the highest height of cereal grasses (99-110 cm) was provided by a dose of mineral fertilizers $N_{50}P_{50}K_{50}$. This variant of the experiment exceeded the control over the years by an average of 6-24 cm or by 6.4-27.9%. The dose of $N_{40}R_{40}K_{40}$ gave the height by years on average by 3-20 cm more in comparison with the control.

Steble of cereals in comparison with the control on the variant of the experiment $N_{30}R_{30}K_{30}$ increased from year to year by an average of 86-88 pieces on $N_{40}R_{40}K_{40}$ version - up to 94 plants and $N_{50}P_{50}K_{50}$ version - to 118-160 plants. Steble of cereals for all variants of the experience an increase in the number of stems per m^2 compared to 2015.

Fertilizing with mineral fertilizers was influenced by the amount of generated harvest. With increasing doses of mineral fertilizers, the yield of hay increased. So already in a dose of $N_{30}R_{30}K_{30}$, the yield increase was 4,4-10,2 centner, $N_{40}P_{40}K_{40}$ – 6,4-9,4 centner, $N_{50}P_{50}K_{50}$ – 4,2-15,8 centner per hectare.

Mineral fertilizers significantly affect the content of nutrients in plants, which are necessary for the full-fledged feeding of farm animals. Evaluation of hay quality was carried out in the agrochemical laboratory – Testing center LLP «Oral-Zher», Uralsk. Analyzes showed that the content of crude protein was higher in all variants of the fertilizer experiment than in the control. The highest value of 7.44-11.44% was obtained in the variants $N_{40}P_{40}K_{40}$ and $N_{30}P_{30}K_{30}$. For feed units, all test doses were above control.

Thus, the use of root fertilization with various doses of mineral fertilizer in the form of azofosca with an active substance content of 16% NPK in conditions of optimal soil moistening regimes had a positive effect on the growth and development of meadow with natural vegetation.

Influence of grass overseeding on the state of natural grass. To restore degraded areas, along with regulating the flooding regime and applying fertilizers, it is necessary to carry out measures of aboriginal or superficial care aimed at increasing the yield of the most useful vegetation.

In the autumn 2015-2017 years, overseeding of grasses was carried out, with minimization of soil treatment in order to preserve the indigenous grass stand. The following herbs were used for overseeding: alfalfa (Medicago), brome (Bromopsisinermis L.), wheatgrass (Agropuron), bluegrass (Elytrigia) – 20 kg/ha. Seed kinds: wheatgrass – Stavropolsky kind - 1; brome – Akmolinskiy kind 91; wheatgrass –Krasnokutskiy narrow-haired kind 305.

Overseeding of autumn 2015 did not give the expected result in the vegetation period in 2016, but showed the greatest effectiveness in 2017. This is explained by the fact that in many perennial grasses the shoot remains in a shortened state during the whole vegetation period of the first year and only the next year (or even in 2-3 years) begins to stretch upwards. The productivity of natural herbs is shown in Table 3.

Table 3 – Productivity of improved grass stand

Variant	Collection from 1 hectare by years, centner				Contents in 1 feed digestible protein by year	
	Absolutelydrymass		Feed units			
	First year (2016)	Second year (2017)	First year (2016)	Second year (2017)	First year (2016)	Second year (2017)
Control (withoutsowing)	11,2	12,4	3,3	3,7	23	23
Sowingmedicago	29,0	65,5	16,2	36,6	268	293
SowingBromopsisinermis L.	21,2	22,8	12,7	13,7	79	81
Sowingagropuron	29,2	31,4	14,5	15,6	88	90
Sowingelytrigia	25,6	27,3	15,1	16,1	54	59
Sowingmedicago +Bromopsisinermis L.	24,3	37,3	15,5	23,8	134	136
Sowingclover	17,5	93,2	7,7	41,4	224	267

To increase the productivity of the estuaries by sowing grass, we recommend the use of the following technology, which allows minimizing the impact on the plow layer and, correspondingly, minimum reproductions on the reproduction of products.

For the sowing of valuable herbs, plants that grow on the sowing area by an intensive (child) disc drive with a disc-type lumber harvester LDG-10 to a depth of 5 to 7 cm. It is recommended to process disk implements in several tracks for areas that are flooded for a relatively short time at a distance of approximately 1/3 of the radius of flooding from the edge of the cells. The number of passes of the unit depends on the degree of compaction of the soil and its turfiness and can vary from 4 to 6. Most perennial grasses are small-seeded crops that do not withstand deep sealing, so they are closed to a depth of 2 to 3 cm. Immediately prior to sowing, a 4-fold harrowing of the field. On solonetzes it is better to use harrows with knife-like teeth - they better break lumps without drying the soil. Behind the harrows follow ringed skating rinks (to avoid deep seeding) and seeders - the gap in carrying out these works should not exceed several hours. Herbs are sown with special grains-sowing machines, such as СЗТ-3,6, СЗТ-47, СЗТН-19, СЗТН-32. For tightening the moisture to the seeds, reducing the blowing of the soil and sealing the seeds, it is necessary to roll up the ring-shaped skating rinks 3ККШ-6А after the sowing, to which the bundles of fagots are tied.

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ТҮЙІН

Мақалада жайылым шабындық шөбінің өнімділігіне шөптердің егуінің, минералды тыңайтқыштар мен су басудың әсерін зерттеудің нәтижелері келтірілген.

РЕЗЮМЕ

В статье приведены результаты исследований влияния затопления, минеральных удобрений и подсева трав на продуктивность естественного травостоя лиманов.