

результатам исследования видно, что наиболее активный период процесса нитрификации приходится на июнь месяц. А максимальное содержание подвижного фосфора (32,56-37,89 мг/кг) по всем срокам посева было в период колошения зерновых культур в варианте, в котором сульфат аммония вносили с аммофосом. Влага, выпавшая в период колошения, положительно повлияла на содержание подвижного фосфора в почве. По результатам исследований установлено, что урожайность зерновых культур зависит от климатических условий региона, количества питательных элементов, агротехнических мероприятий, сорта и биологической особенности культуры.

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CONVEYOR PRODUCTION OF FODDER ON SALINE LANDS

ANNOTATION

In arid ecosystems, soil salinity is the main factor determining the growth and development of crops under irrigation. After the development of saline lands for a long time (more than 50 years), the inefficiency of their improvement by washing salts against the background of collector-drainage systems was established, and in this regard, the main direction of struggle in modern conditions remains to be the selection of salt-resistant crops on dispersed developed small plots (40-100 hectares) among lands not used for irrigation, with a utilization factor (CI) of no more than 0.4. Non-irrigated areas in this case serve as a zone of aeration and accumulation of mineralized waters flowing from neighboring irrigated areas. This is how the positive balance of the salt regime of soils in the upper (0-70 cm) soil horizons is maintained to an average degree. And through the selection of crops that combine high salt resistance with high productivity, it is possible to develop medium-saline soils for irrigated cultural pastures. Conducted long-term experiments with a large set of crops under irrigation, differing in the degree of salinity, confirmed the high efficiency of the development of saline lands for irrigated cultural pasture. Of the selected crops, donnikas and alfalfa distinguished themselves by high salt resistance and climatically determined productivity, which provide stable high productivity, respectively, from 460.6 to 420.4 c/ha of pasture mass.

Key words: irrigated pastures, saline lands, arid crops, grass mixtures. conveyor production

Introduction. The productivity of natural pastures and meadows of the desert and desert region of Western Kazakhstan is very low (1-3 t/ha), on the basis of which it is impossible to develop intensive and more productive animal husbandry. In this regard, the creation of a meadow-pasture conveyor belt in irrigation is promising, although there are also certain difficulties and problems here.

A limiting factor for the development of irrigated livestock fodder production is widespread soil salinization in the irrigated region, and the total area of salinized lands in the region is 92% of

agricultural land. In addition, in saline soils at a depth of 50-80 cm, there is a horizon called "maximum salt accumulation", containing up to 2% and more toxic ions, which are the roots of agricultural plants, except for alfalfa (*Melilotus*) and sudan grass (*Sorghum sudanense*). cannot penetrate [19, 20, 21].

The extremely complex soil-ameliorative conditions of the Caspian basin do not allow for the development of irrigated livestock feed production at an adequate level, its areas have decreased to 200-350 hectares compared to 5.0 thousand hectares during the period of the highest development of irrigation since the 80-90s of the last century [1, 17, 18].

However, providing the population of this region with a new dietary, indispensable food product - natural milk, especially for children and the young generation, creates the need to develop unsuitable saline lands for the creation of irrigated meadows and pastures.

From almost a century of irrigation experience (since 1928), it is known that all tested methods of salt washing in the framework of collector-drainage systems due to ecological and economic inefficiency are not used in irrigated agriculture of the region [1]. It can be said differently - since science and practice have not developed effective measures to combat soil salinization, farmers are forced to cultivate saline lands without drainage, with a very narrow set of fodder crops, at their own risk.

Only alfalfa (*Medicago*) and sudan grass are grown for hay production on a small 300 ha plot. In the green conveyor system, daily continuous supply of animal feed is impossible with a narrow set of fodder crops, and in connection with this, the problem of testing a large set of plants in saline areas arises.

The review of the literature showed that fodder crops were not tested in saline areas to create a grass-pasture conveyor not only in the Caspian Basin, but throughout Kazakhstan and the post-Soviet space [2, p. 21; 3, p. 17, p. 28; 6, 7, 16].

Increasing the feed intake is part of the overall problem. Equally important is the improvement of the technology of preserving nutrients and increasing the digestibility of feed, which mainly depends on the speed of drying and the phases of herb development. As a result of large losses, the energy nutritional value of hay is low – 0.56-0.57 feed units (8.2-8.3 MJOE) per 1 kg of dry matter. For comparison: in the herbs themselves – 0.83-0.85 feed units ((10.1-10.2 MJ OE).

The main drawback of existing technologies is their unsuitability for drying herbs at the optimal time, when the energy and protein nutrition are maximum. In relation to legumes, this is the beginning (late-ripening varieties) and full budding, for cereals - exit into the tube. However, there are very few varieties and species of plants in the farmer's arsenal that provide high productivity in the early phases of development, especially for haymaking in practical conditions.

In the Atyrau branch of the South-Western Scientific and Production Center of Agriculture together with the Atyrau University named after H.Dosmukhamedov created 3 varieties of sweet clover, Arkas, Saraychik, characterized by high productivity of hay and haylage mass in the early phases of development – branching and budding. They provide such high productivity in the conveyor system.

Research materials and methods. The main method is field research. The relevance and novelty of scientific research work For the first time in Kazakhstan, in particular, in the saline lands of Atyrau region, a large range of fodder crops is being tested and their productivity is being studied.

The purpose of the research is to select crops on medium salinity soils to create a pasture-meadow conveyor belt, and the task of the research is to study their growth and development, productivity.

Location of the experiments :

- field - experimental site in the village of Saraychik, Makhambet district, Atyrau region;
- laboratory and vegetative - Kh.Dosmukhamedov Atyrau University, Atyrau.

The experience was laid down on 15.08.2020 by dump plowing to a depth of 20-22 cm, processed according to the black steam system. During the fallow period from 15.05 to August 15, two-time harrowing, cultivation of the soil as weeds appear, and pre-sowing rolling were carried out. The last operation was repeated after sowing perennial grasses. Watering by a surface method – by an assumption. The cutting of checks, the planning of the soil was carried out in a timely manner. The irrigation rate is 5-6 thousand m³/ha, the irrigation rate is 800 m³/ha.

During the research, field and laboratory experiments were used, the laying of which is carried out according to the accepted methodological guidelines. Field experiments are conducted according to the methodology of B.A. Dospekhov. Accounting and observations according to the VNIIC methodology.

Research results. Experiments are based on alluvial-meadow saline soils of medium mechanical composition, because in the irrigated agriculture of Atyrau region mainly alluvial-meadow and floodplain-meadow soils are used, which have been transformed into alluvial and meadow lands in the current conditions of aridization. Bitter saline underground water lies at a depth of less than 6 meters.

The amount of mobile forms of nitrogen is 30.8 mg/kg, phosphorus - 20 mg/kg, potassium - 440 mg/kg soil, that is, the soil is moderately supplied with nitrogen and phosphorus, and potassium is high.

The warm Atlantic air masses do not affect the humidification of the territory of the region, since the surface of the plain does not contribute to the retention of precipitation. Since air masses from Central Asia and Iran predominate in this territory, a sharply continental type of climate has formed here.

The average annual precipitation, according to the Makhambet metostation, located 30 km north of the experimental site, is 194.0 mm. The sum of temperatures above 400C is 3400-35000. The duration of days above 0-231-252 days, above 10 degrees - 171-181 days.

The thermal coefficient is 0.2-0.3, the calendar dates for the onset of days above 0 degrees are March 25.03-03 to November 14-22. The sum of positive temperatures is 3650-3959, above +10 - from 15-18.IX. to 14,X.

The duration of the frost-free period is 171-181 days. The last spring frosts in the air stop in the region in the period from April 13 to 27. In the average annual for a period with a temperature above 100C, 70-115 mm of precipitation falls, which does not provide the necessary need for plants for moisture, therefore, rain-fed agriculture with traditional crops has not been developed here. The formation of snow cover is observed in the second and third decade of December, with an average height of 10-20 cm. Water reserves in the snow are 30-50 mm. The duration of the period with a stable snow cover is 65-95 days. Strong winds (15 m/s) are observed 5-6 days in April, 6-7 days in May, 4-5 in June, 4-8 in July, 3 in August, 2-5 in September.

The object of the study is alluvial meadow saline soils. Alluvial-meadow saline soils are formed on the modern deltas of the Ural and Kigach rivers. The characteristic features of these soils are pronounced layering, buried humus horizons.

Humus horizon (A+B) they are quite powerful (60-80 cm), depending on the terrain, saline species are formed in elevated areas of short-term flooding, and not saline in depressions. The humus content in them ranges from 0.6 to 3.0%, gross nitrogen 0.04-0.2%, phosphorus 0.12-0.18%. Alluvial-meadow saline soils of medium mechanical composition were selected for laying field experiments, since alluvial-meadow and estuary-meadow soils are mainly used in irrigated agriculture of the Atyrau region. The experimental site is located on the bank of the river . The Urals is 2-3 km south of the village of Saraychik. The scheme of the object of study is given in Figure 1.

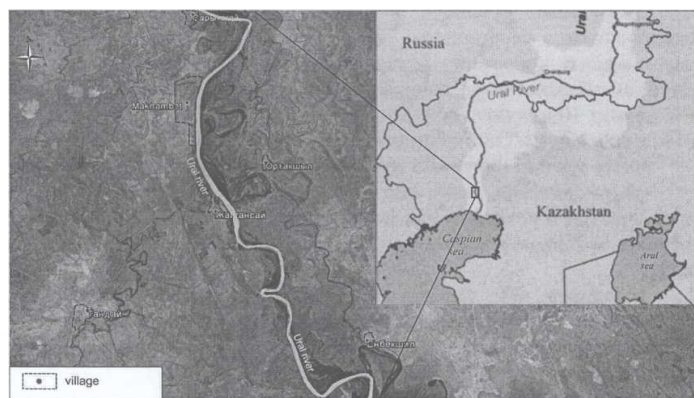


Figure 1 – Scheme of the object of study - Makhambet irrigation massif of Atyrau region in the lower reaches of the Ural river

Weather and climatic conditions in 2021-2022 were characterized by a cold spring-summer period, namely, from April to July, the air temperature rarely exceeds +25°C. The low temperature regime was preserved especially in May and July, that is, in the period when the active growth of cereals and sudan grass began. This immediately affected their growth and development and due to this they provided low productivity (Figure 1).

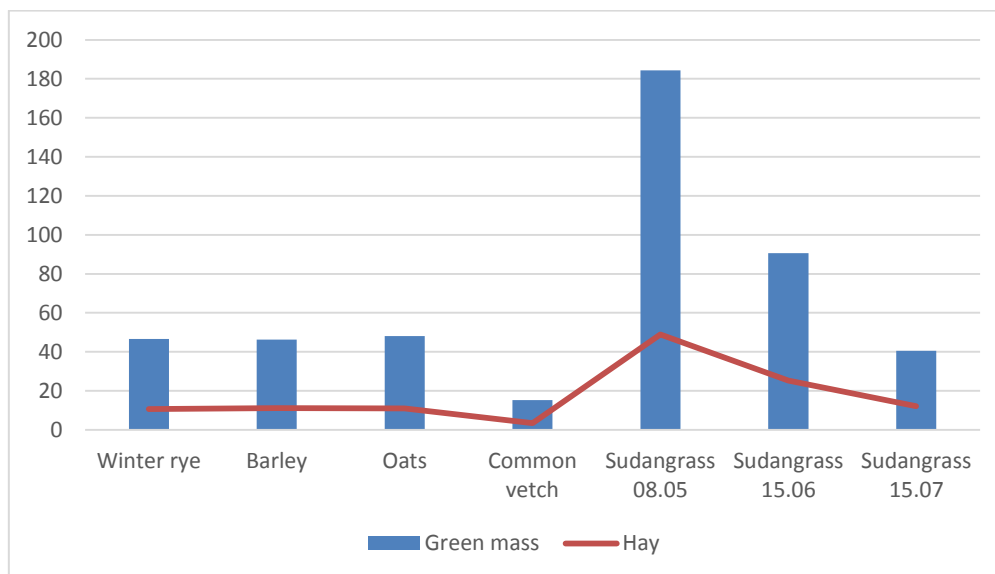


Figure 1 – Productivity of annual crops, c/ha

However, this distribution of heat did not affect the growth and development of legumes, and in this case they provided the highest yield of green mass (as well as grass) 384-234.6 t/ha, against 46.6-184.4 t/ha, compared to annual crops (Figure 2).

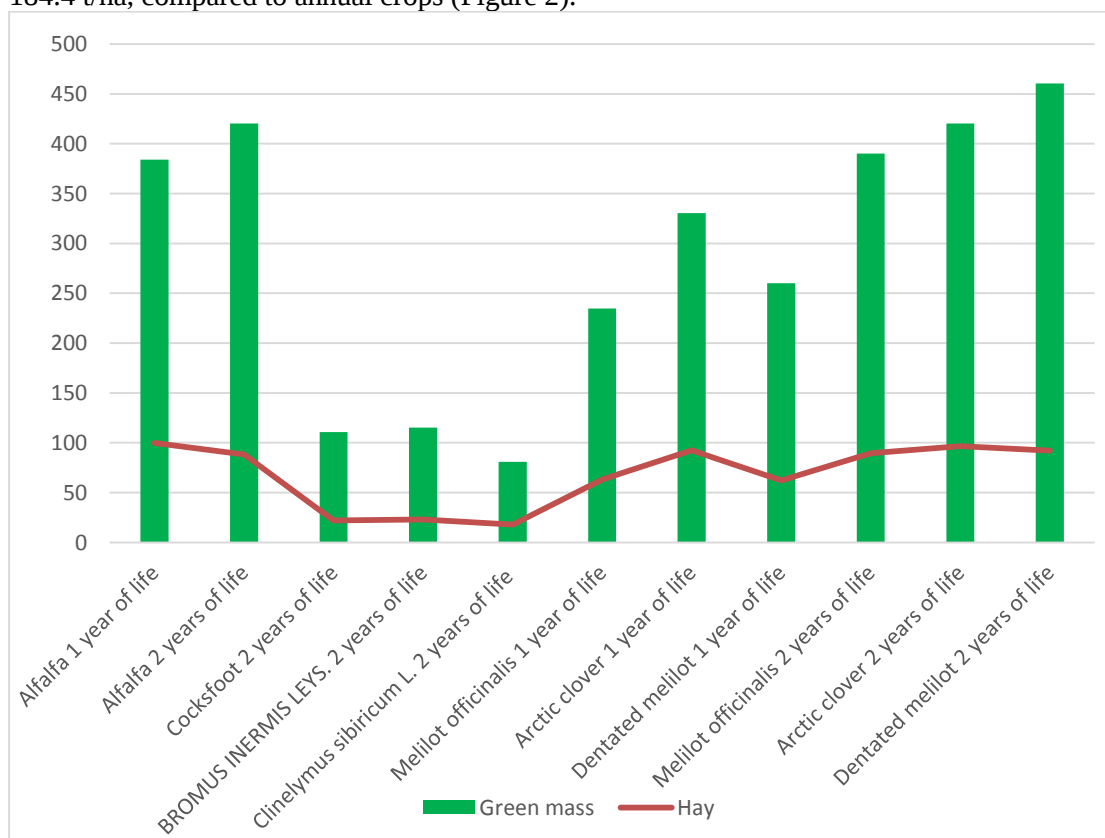


Figure 2 – Productivity of perennial crops, c/ha

Research data shows that in the 2021-2022 agricultural year, the continuous conveyor period for harvesting green mass and grass will be extended from May 10 to November 15, that is, the conveyor period for harvesting will be 189 days. In addition, cereals provide green mass and grass productivity from May 10 to June 26, and water grass mainly in the second period of summer - from June 27 to September 19.

A significant break in the preparation of Sudan grass is observed from July 8 to July 19 and from July 30 to August 18. This break is removed by the second and third mowing of alfalfa, as well as the medicinal camellia (*Melilotus officinalis*) (22.07-5.08) and the first mowing of perennial grasses [4, 5, 8, 9, 10, 11].

In general, legumes provide productivity from May 31 to November 15. The contribution of first-year alfalfa, which remains in the branching period from May 21 to November 15 at a height of 80-120 cm, is special.

Perennial grasses such as *Dactylis glomerata*, *bromopsis inermis* and narrow sedge (*Elymus junceus* Fisch.) complete their development cycle with no more than 5-8 cm height, so they do not satisfy agricultural productivity in the first year [12, 13, 14, 15].

In the second year of the above-mentioned cereals, perennial crops give their mass from May 25 to September 25, that is, in 120 days.

Studies conducted in 2021 found that the studied types of grain crops and the Sudanese grass, with different terms of its sowing, ensure continuous grazing of animals from April 21 to October 10, in addition, the Sudanese grass of the first three sowing dates (08.05; 15.06; 15.07) after the last mowing, an ottawa is formed, serving as additional pasture feed for animals, however, have low productivity – 5-7 kg / ha. In addition to taking into account the pasture mass, we studied the hay productivity of the tested crops. At the same time, it amounted to 24.0 c/ha for winter rye, 19.0 c/ha for barley, 27.2 c/ha for oats and 18.0 c/ha for spring vetch. The noted crops provided haymaking products in the following terms: winter rye from 23.05 to 29.05; barley from 03.06 to 21.06; oats from 08.06 to 26.06; vetch in the phase of the beginning of bean formation – 28.07-14.08. The productivity of Sudanese grass hay was, respectively, according to the terms of sowing and mowing: In the first term (08.05) sowing – I mowing was carried out in the first decade of July, the yield was 28.5 c / ha; II mowing in the first decade of August - a yield of 17.2 c / ha; III mowing was carried out in the first decade of September – the yield is 12.6 c/ha. In the first sowing period, 58.5 c/ha was obtained for 3 mowing. At the second sowing period (15.06), two mowing of Sudanese grass was obtained, 23.8 c/ha and 10.5 c/ha, respectively, in the first decade and the last decade of August, totaling 24.3 c/ha. At the third sowing period (15.07), the number of mowing decreased to one – 20.4 c/ha was provided in the second decade of August. At the last sowing date (15.08), the Sudanese grass does not have time to form a hay mass. From the above data it can be seen that the Sudanese grass provides hay from August to the first decade of September, and cereals from June to July. The productivity of hay and pasture mass was ensured with the appropriate number of plants and stems in 1 plant and their height (Table 1).

Table 1 – Growth indicators of various cereals and Sudanese grass, 2021

№	Variants	Number of plants pcs/m ²	Number of stems pcs/m ²	Height of plants when harvesting for hay
1	Winter rye	144,8	566	92
2	Barley	90,4	390,6	71,2
3	Oats	81,4	407	88,6
4	Common vetch	161,6	808	72
5	Sudanese grass	68,4	410,4	110,6
6	Sudanese grass	63,2	396	105,4
7	Sudanese grass	60,8	366	96,0
8	Sudanese grass	58,4	340,2	69,6

It is well known that during conveyor production, labor productivity and output per unit of equipment sharply increase. For example, during the conveyor production of hay from dormice, the

need for hay harvesting equipment is reduced by 12 times than when cultivating alfalfa, due to this, huge financial resources are released, sufficient for the purchase of expensive technical lines for the production of high-quality feed, for example, grass flour, briquettes, protein-vitamin concentrates, haylage, etc. For example, in the production of alfalfa hay on an area of 2,250 per season, 30 MTZ tractors would be required for mowing, raking and pressing hay. At the same time, to carry out the same operations on the same area, the need for tractors is reduced to 3 units in the production of donnik hay.

It is the conveyor guaranteed supply of raw materials with a daily hay productivity of an average of 10.2 tons for 188 days that guarantees the production of high-quality feed, no matter how high the cost of equipment and the plant would be.

It is well known that only when the green mass arrives for 100-120 days a year, the operation of artificial feed drying plants is economically justified. At the same time, the productivity of herbs, as shown by the data of research institutions in Kazakhstan, where the production of grass flour has received the greatest development, should not be lower than 260-350 c/ha of green mass or 41-60 c/ha of grass flour.

Due to the low yield of herbs and the inability to provide daily raw materials for a long time, the production of high-quality feed – grass flour - has not been properly developed in the world. The energy intensity of its production is too high and reaches 300-470 kg of diesel fuel per 1 ton of flour. These disadvantages can be completely eliminated by involving donniks in the conveyor and organizing the drying of herbs.

Conclusion. Saline lands suitable for agricultural development in Atyrau region (without complex land reclamation) are mainly represented by alluvial-meadow saline soils, their supply with mobile forms of nitrogen and phosphorus is moderate, and potassium is high.

Weather and climatic conditions of the reporting year were characterized by high rainfall and low temperature regime. In this case, annual crops from May 10 to September 10, and from September 20 to November 15 - alfalfa, i.e. grazing period of 189 days, provide continuous livestock grazing.

Among the annual crops, water grass provides the highest yield of pasture mass, the optimal sowing date is May 8, where the total yield of pasture mass is 266.4 t/ha, grass is 58.5 t/ha, and the lowest summer alfalfa is 15.4 t/ha of green mass, 3.4 c/ha of grass.

During the conveyor period, the first harvest of green mass and grass is provided by winter rye (*Secale*) and barley (*Hordeum*) until the third decade of May, from the third decade of May, alfalfa, camellia and perennial grasses in the second year. Among leguminous crops, until the third decade of June, alfalfa and alfalfa in the second year have high green mass and hay productivity, after this period, until November 15, it is observed only in white alfalfa (*Melilotus dentatus*).

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ТҮЙІН

Аридті экожүйелерде топырақтың тұздылығы суару егістігінің өсуі мен дамуын айқындайтын негізгі фактор болып табылады. Тұздалған жерлер ұзақ уақыт игерілгеннен кейін (50 жылдан астам) коллекторлық-дренаждық жүйелер аясында оларды тұздармен шаюмен жақсартудың тиімсіздігі анықталды және осыған байланысты қазіргі жағдайда күрестің негізгі

бағыты суландыру үшін пайдаланылмайтын жерлердің арасында жайылған дамыған шағын учаскелерде (40-100 га) тұзға төзімді дақылдарды іріктеу болып қалады пайдалану коэффициентімен (ПК) 0,4 аспайды. Бұл жағдайда суарылмайтын учаскелер көрші суармалы учаскелерден ағатын минералданған сулардың аэрация және жинақталу аймағы болып табылады. Топырақтың жоғарғы (0-70 см) топырақ горизонттарындағы тұздық режимінің оң теңгерімі дәл осылай сақталады. Ал жоғары тұзға төзімділікті жоғары өнімділікпен ұштастыратын дақылдарды іріктеу есебінен суармалы мәдени жайылымдарға арналған орташа сортанды топырақты игеруге болады. Суармалы дақылдар көп жиналған, тұздылық дәрежесімен ерекшеленетін көпжылдық тәжірибелер суармалы мәдени жайылым үшін сортанды жерлерді игерудің жоғары тиімділігін растады. Іріктелген дақылдардан түйежоңышқа және жоңышқа жоғары тұзға төзімділігімен және климаттық тұрғыдан белгілі бір өнімділігімен ерекшеленді, олар жайылым массасының 460,6-дан 420,4 ц/га дейін тұрақты жоғары өнімділікті қамтамасыз етеді.

РЕЗЮМЕ

В засушливых экосистемах солёность почвы является основным фактором, определяющим рост и развитие посевов под орошение. После освоения засоленных земель надолго (более 50 лет), была установлена неэффективность их улучшения промывкой солями на фоне коллекторно-дренажных систем, и в связи с этим основным направлением борьбы в современных условиях остается подбор солеустойчивых культур на рассредоточенных развитых небольших участках (40-100 га) среди земель, не используемых для орошения, с коэффициентом использования (КИ) не более 0,4. Неорошаемые участки в этом случае служат зоной аэрации и накопления минерализованных вод, стекающих с соседних орошаемых участков. Именно так в среднем поддерживается положительный баланс солевого режима почв в верхних (0-70 см) почвенных горизонтах. А за счет подбора культур, сочетающих высокую солеустойчивость с высокой продуктивностью, можно осваивать средне-засоленные почвы для орошаемых культурных пастбищ. Проведенные многолетние опыты с большим набором культур под орошением, отличающихся степенью солёности, подтвердили высокую эффективность освоения засоленных земель для орошаемого культурного пастбища. Из отобранных культур донники и люцерна отличались высокой солеустойчивостью и климатически определённой продуктивностью, которые обеспечивают стабильную высокую продуктивность соответственно от 460,6 до 420,4 ц/га пастбищной массы.

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