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FORAGE PRODUCTION IN THE NORTHERN PART OF KAZAKHSTAN

Abstract. The natural grassland in the northern part of Kazakhstan is in the degraded and heavy grazed state, particularly near the ails and villages.

Forage production as a grain branch takes a leading place in plant production of the Northern Kazakhstan.

The alkaline soils take about 30 million hectares in the Northern Kazakhstan, 80% of which are used as feed lands for silage production and pastures. The proper usage of these lands will promote to improve the soil fertility and forage crops yield. But only the proper melioration of these lands will give the efficient response.

One of the main forage crops in the Northern Kazakhstan is a corn for silage. By its nutritive and energetic values, the corn makes up to more than 40% in the structure of ruminant animals ration. The yield and prod

Activity of early-ripening hybrids of corn is affected by the agricultural practice of its cropping. Time of planting, seeding rates and time of harvesting corn hybrids are of special importance.

Keywords: maize, crop production, fodder production, Productivity, agricultural engineering.

Introduction. The steppe zone occupies about 40% of the territory of Northern Kazakhstan. The annual amount of precipitation ranges from 250 to 350 mm, and the sum of temperatures during the growing season reaches 2200-24000. This zone is one of the largest regions of the Republic. However, the further development of animal husbandry and increase of its productivity is constrained by insufficient provision of livestock feed and its low quality.

Currently, a lot of work is being done to restore the livestock and improve its quality, which requires not only the development of new technology for its maintenance, but also a new approach to the management and organization of the forage base. First of all, it refers to its stability over the years, with a high quality of feed [1-3].

In the North of Kazakhstan, the area under forage crops is being restored, which employs about 3.6 million hectares or about 14% of the total arable land. Huge spaces are occupied by natural forage lands. Only natural pastures more than 30 million hectares and about 1.5 million hectares of natural hayfields [4].

As a rule, these lands are marginal lands – saline soils, underdeveloped, poor in nutrients. Most of them are located in the area of steppes and semi-deserts. Hay harvest on these lands does not exceed an average of 3-5 C, pasture weight 15-20 C ha. In sharply dry years, the harvest is reduced by 1.5-2.0 times [5, 6].

Of great importance is the improvement of the quality of corn silage, which occupies a greater proportion in the structure of ruminant diets. Therefore, it is necessary to improve the quality of this valuable juicy food on the basis of widespread introduction of advanced technologies of their cultivation, harvesting and storage.

Achieving these priorities is possible only on the basis of progressive energy-resource-saving technologies of cultivation of forage crops, harvesting and storage of feed, improving the structure of diets and feed quality, which ultimately contributes to an increase in meat and milk production in the country by 25-30%.

Materials and methods. Studies on the development and reclamation of saline were carried out on meadow-steppe saline complexes in LLP "Novokubanka" Akmola region, located in the subzone of southern carbonate chernozems.

The tab of experiments was preceded by a detailed soil scheme of experimental plots on a scale of 1: 500.

All records and observations were carried out in accordance with the "Guidelines for soil-reclaimed research and development of projects of reclamation of saline lands in the Kazakh SSR" Alma-Ata, 1980.

During the laying of field and production experiments with corn conducted in SKYISH was guided by the "Methodological recommendations for the formulation of field experiments with corn". Dnepropetrovsk 1980 and "guidelines on the assessment of bioenergy, crop rotations and technology of cultivation of fodder crops", M., 1989.

Results and discussion. Given the wide variety of solonetzes in Kisnish (VNIIESH) was developed by reclamation in their group (3). All the soils of solonetz complexes of reclamation is divided into 9 groups. The basis for the division of Solonets into groups, in addition to their differences in soil-reclamation properties, is the uniformity of the reclamation techniques used. The productivity of the development of saline depends on the system and use in the reclamation period and the types of crops grown.

The results of a comparative study of salt resistance of crops using field (agronomic salt resistance) and vegetation (biological salt resistance) experiments have shown that the salt resistance of perennial grasses is generally higher than annual crops. Among the first the highest agronomic and biological tolerance different Wheatgrass beskorpusnye. Agronomic salt tolerance of sweet clover, especially the 2nd year of life, is also quite high, although its biological salt resistance is much lower than other crops. Wheatgrass, alfalfa, folonari significantly behind in terms of resistance to salinity in the wheat-grass and clover 2-year, differ little among themselves in agronomic salt tolerance. Markedly inferior to them in the rump.

Of annual crops is allocated to the biological and agronomic salt mustard crop which is reduced with increasing soil salinity very slowly. It is followed by barley. Millet, wheat, oats, mogar are characterized by a relatively average salt resistance. Sorghum and Sudanese grass greatly reduce the yield with increasing salinity and die at the lowest level of soil salinity compared to other crops, which is largely due to the unfavorable temperature regime for these crops in these conditions. Table 1 presents average years of data, shows the extent of yield reduction of crops by 25%, 50% and 75% compared to crop them into non-saline soil.

Table 1 – Scale of salt tolerance of agricultural crops under conditions of chloride-sulphate salinity

The content of toxic salts in % to the soil (layer 0-40 cm), corresponding to the degree of decrease in yield on							
Perennial crop	25%	50%	75%	Annual crop	25%	50%	75%
Wheatgrass	0,38	0,72	1,06	Mustard	0,35	0,74	0,91
				Barley	0,30	0,56	0,75
Melilot	0,35	0,64	0,93	Millet grain.	0,31	0,45	0,66
Elymus junceus	0,40	0,60	0,89	Wheat	0,27	0,44	0,67
				Mogar.	0,26	0,44	0,67
Elymus sibiricus	0,37	0,65	0,90	Sudanese	0,23	0,44	0,71
				Oat	0,25	0,39	0,60
Lucerne	0,34	0,60	0,92	Agro	0,20	0,36	0,57
Zhitnyak	0,32	0,55	0,92	Millet feed	0,20	0,34	0,47
Rump	0,32	0,37	0,66				

On the basis of the data obtained, the grouping of crops by salt tolerance was developed (table 2).

Comparison of this group with the one developed by Kiryushin V. I. and Moiseenko N. D. (5) the group of cultures on salt tolerance testifies to the different relation of cultures to salinity and salinity.

Sweet clover and mustard, the salt lick is extremely stable, but the resistance to severe salinization of the sweet clover below. Unselfish Wheatgrass on the contrary, showing high quality in both respects,

Table 2 – Grouping of crops by salt and salt tolerance for the conditions of the arid steppe of Northern Kazakhstan

Degree of stability	Salt tolerance	Salt Resistance (V. I. Kiryushin, N. D. Moiseenko, 1971)
Very strong	Wheatgrass unselfish	Sweet clover (yellow and white)
Strong	Sweet clover (yellow and white)	A. Siberian, Wheatgrass SIZ
Average	Wheatgrass PPE. Sitnikova, a. Siberian, alfalfa: Petrohemija, seneviratna, selegilina, zhytnyak, rump	Alfalfa: Petrohemija, seneviratna, selegilina, zhytnyak, rump
Weak	Sainfoin	Sainfoin
Annual crop		
Very strong	Mustard	Mustard
Strong	Barley	Barley
Average	Millet fodder, wheat, mogar, millet grain, oats	Oats, millet, mogar, Sudanese grass
Weak	Sorghum, Sudanese grass	Wheat, sorghum

more resistant to strong salinization. Even greater differences in relation to salt the salt lick sustainability exhibit a. and wheat. Siberian salt lick has a strong resistance to medium salt tolerance, and the wheat – average salt tolerance and weak solonetz resistance.

Equally strong resistance to salinity and salinity shows barley, and weak – sainfoin. Given that the prospect of using saline soils is mainly associated with the tinning of their perennial grasses, it is advisable to establish the degree of salinization of soils – weak, medium, strong and very strong - focusing on the nature of reducing the yield of medium-resistant perennial grasses (alfalfa, corn, hair), respectively, 25%, 50% and 75%. Based on these considerations, the classification of saline soils according to the degree of salinity can be presented in the following form:

Slightly salted 0.2-0.4%;
Average saline 0.4-0.6%;
Strongly saline 0.6-0.9%;
Very strongly saline >0.9%.

Economic analysis showed the feasibility of using the meadow solonetz complexes in grassland crop rotations with sowing of such crops as wheat grass beskorpusnye, clover, a. Sitnikova, Wheatgrass. Moreover, Wheatgrass and melon pay for the costs in the first two years. At the same time, the use of these lands as natural hayfields on the verge of profitability. On the complexes of these soils, already involved in the arable land, it is more expedient to place salt and salt-resistant field crops, of which barley, oats, mustard are the most preferred.

Place and role of corn in crop rotation. In the conditions of Northern Kazakhstan, where moisture is the main factor of plant productivity, the main action of its predecessors is determined by its influence on the water regime of the soil. According to the obtained data, the reserves of productive moisture in the root layer of the soil after harvesting corn are 1.5-2.5 times higher than after barley, wheat, sunflower, which dry the soil to a greater depth. Especially large differences in the content of moisture productivity were observed in the soil layer of 100-150 cm (35.1 against 16.8-17.1 mm).

The productivity of crop rotation links depends not only on the saturation of their corn, but also its saturation by its predecessors. The results of our studies show that the productivity is higher when placing corn after spring barley and legumes in a mixture with cereals. On average, for 10 years its productivity after barley amounted to 47.5 C/ha of fodder units after corn 39.7 C/ha, after spring wheat – 42.3, after corn for corn – 49.7 C/ha.

Thus, in the conditions of the steppe zone of Northern Kazakhstan, it is advisable to sow corn in the following links: 1) maize – maize – barley; 2) maize – oats; 3) maize – spring wheat – oats, barley, annual grasses.

The saturation of crop rotations with corn is determined by the specialization of farms taking into account soil and climatic conditions. The maximum productivity of grain crop rotations was observed at 33.3% saturation of their corn. So, at 66% of grain on average for 5 years it was received from 1 hectare of crop rotation area: grain – 28,7 C/ha, exchange energy – 31,8 GJ. Therefore, for farms in the region

specializing in the production of milk and beef, the most productive is the crop rotation, in which corn occupies 40%, spring wheat 20%, grain and annual herbs 20%. The productivity of corn in specialized crop rotations largely depends on its predecessors. The highest yield was obtained by placing it after spring wheat (53.5 C/ha DM) and peas (56.7 C/ha), and the lowest (40.6 C/ha) – in permanent crops. The greatest collection of exchange energy from 1 hectare is provided by crop rotations with a specific weight of corn in the structure of sowing 66.7%.

Corn crops for silage (grain-bearing mass) are placed in fields with different soil nutrient and moisture content. Therefore, it is very important to know the reaction of maize plants to mineral fertilizers in connection with their predecessors. We have found that when sowing after spring wheat and barley, corn reacts to phosphorus fertilizers better than after corn. Nitrogen-potash and phosphorus-potash fertilizers most contributed to the increase in its yield after the pea mixture (table 3).

Table 3 – Efficiency of application of mineral fertilizers for corn for different predecessors

Predecessor	Dry matter, C/ha		
	without fertilizers	$N_{60}P_{60}$	$N_{60}P_{60}K_{60}$
Spring wheat	32,3	43,6	45,0
Barley	38,1	46,9	47,3
Corn	32,8	36,8	43,8
Pea-oat mixture	40,5	49,8	56,7
HCP_{05}		2,7	3,0

Types, doses and methods of application of complex fertilizers. In order to provide plants with nutrients in the earliest period of their vegetation, a sharp reduction in nutrient losses from fertilizers, stimulation of the growth of the corn root system, the most effective is the row application of complex mineral fertilizers simultaneously with the sowing of corn.

However, one of the factors constraining the widespread introduction of row-by-row application of complex mineral fertilizers together with sowing is the opinion that the germination of corn is reduced when using increased doses of fertilizers that adversely affect seeds and seedlings.

In our research, undertaken in 2009-2011, a complex mineral fertilizer with seed introduction has had a depressing effect on seedlings and maize seedlings. On average, nitrophos at a dose (NP)20 had the least negative effect on seedlings and young plants in 3 years with rowed introduction of tuks. From the dose is double the number of plants decreased by 9%. The dose of nitrophoska (NPK)40 reduced thickness of 7-8% in comparison with the dose (NPK)20. The use of elevated norms of superphosphate and ammophos did not adversely affect the density of corn. Compared to the control (without fertilizers), row-by-row placement of the tuks reduced the density by a maximum of 8.4%(nitrofoska (NPK)240). Further processes of biomass accumulation proceeded more intensively in variants with row application of fertilizers. So, in phase 5-8 leaf weight per plant at scattered making fertilizers increased relative to control at 16-20% (ammophos and nitrophos), and the localization of similar doses from 0 to 34.5(P20) to 76.4-80.0% of (nitrophos and map). Thus, row placement of complex types of fertilizers is more effective than their application at random for cultivation.

The evaluation of the final result showed that the total yield of green mass in the experiment averaged 276.0-334.0 t/ha or 37.0-47.7 t/ha (table 4).

Row application of fertilizers sharply increased their efficiency. Thus, the increase in the yield of fodder units from the row application of the same doses of fertilizers compared with the introduction of randomly increased within the following limits: nitrophos – 3,4.

The best results in comparison with the control provided the use of nitrophos. The increase was 8,2-10,7 kg K. u/ha. a Smaller effect is obtained by applying nitrophoska (6,7-7,5 t/ha), ammonium phosphate (7,1-7,6 t/ha) and superphosphate (up to 5.4 t/ha). The same pattern was observed in the yield of dry matter.

Table 4 – Efficiency of various types and doses of complex mineral fertilizers when applied together with sowing

Option	Yield, t/ha					
	Average for 2009-2011		Feed unit			Average for 3 years
	Green mass	Dry matter	2009	2010	2011	
1.Control (without fertilizers)	276,0	40,8	32,4	32,4	46,3	–
Spread under cultivation						
2. $N_{60}P_{60}K_{60}$	310,1	43,2	37,0	38,5	48,2	41,4
3. P_{20}	283,0	41,7	35,5	31,6	48,8	38,0
4. $N_{20}P_{20}$	295,0	45,0	36,1	36,7	45,9	39,6
5. $N_{20}P_{20}K_{20}$	287,6	43,3	35,3	37,1	42,7	38,4
In the rows at sowing						
6. P_{20}	284,3	42,7	38,0	32,9	48,8	39,9
7. P_{40}	300,1	45,6	39,5	36,9	50,7	42,4
8. $N_{20}P_{20}$	315,0	48,0	41,9	45,3	48,4	45,2
9. $N_{40}P_{40}$	328,0	51,0	38,3	49,4	55,5	47,7
10. $N_{20}P_{20}K_{20}$	322,0	47,2	38,0	40,6	52,3	43,2
11. $N_{40}P_{40}$ K_{40}	334,0	47,9	35,8	44,7	53,0	44,5
12. $N_{12}P_{52}$	310,0	47,1	41,0	44,2	47,0	44,1
HCP_{05}	4,7	3,7	39	4,3	3,8	4,1
Note: P – double granular superphosphate; NP – nitrophos; NPK – nitrophoska; $N_{12}P_{52}$ – ammophos.						

Higher increases were obtained from the application of double DOX fertilizers-(NP)40 and (NPK)40. At the same time, the use of relatively high standards of ammophos N24P104 gave a positive result in all years of research. The influence of the superphosphate was the smallest of all the studied types of fertilizers. A significant increase in the yield of fodder units on average for all years was obtained only with an increase in the dose to 40 kg / ha. Thus, the productivity of maize crops with a row placement of complex fertilizers is in all cases higher than with scattered.

At the same time, nitrophos and nitrophosphate should in this case be applied in limited doses. And only in years with moderate moisture (2011) and uniform distribution of precipitation during the growing season, the dose of nitrophos can be increased to 40 kg / ha.

The decrease in the increments from the use of nitrogen-phosphorus-potassium fertilizers (nitrophosca) in comparison with nitrogen-phosphorus (nitrophos), especially in arid conditions, is explained by the fact that the placement of potassium fertilizers in rows, especially in dry years, causes oppression of growth and development processes. The use of high doses of fertilizers simultaneously with sowing creates foci of different concentrations in the soil, so with an increase in the concentration of salts of the soil solution in the zone of the focus, the growth of corn roots and their branching is suspended.

This disrupts the metabolism and reduces the ability of plants to withstand negative external factors.

Row-by-row use of complex maize tuks, which are in dire need of nutrients from an early period of life, resulted in better quality products than from their scattered application. So, if you broadcast the location of the fat content crude protein accounted for 11.21-of 11.94%. The introduction of a full dose (NPK)60 increased it to 12.02%. In the localization of fertilizers, the protein concentration was 11.04-13.19% depending on the type and dose of the tuks. At the same time, the highest content was provided by nitrofoska (NPK)20 -12,92%.

Row fertilizer application had a positive impact on the nutritional value of corn mass. At the same time, the yield of digestible protein with the introduction of nitrofosk was higher by 21.9, and nitrophos – by 9.1%. compared with similar doses, introduced at random – respectively 3.2 and 3.3 C/ha. From the increased norms, the protein content increased by 11.1% for nitrophos (NP)40, for superphosphate P40 – to 9.7%, for other types of fertilizers, these indicators were lower.

Row placement of fertilizers dramatically increases their energy efficiency, especially at a relatively low dose. At the same time, the lowest energy costs per feed unit were when applying a low dose of superphosphate (1,7-2,2 MJ). Of the other studied types of fertilizers, the most effective was the use of nitrophos at a dose of 20 kg / ha (3.5 MJ). There was also the highest energy coefficient. Effective is the entry in row nitrophoska (NPK)20 and ammophos $N_{12}P_{52}$.

Conclusion. An important component of biological melioration of solonetzes is the sole and salanauskaite cultivation of fodder and forage crops – barley, oats, panic, Sudan grass, sweet clover, a., Wheatgrass, Wheatgrass and contrary. Only by improving the structure of crops that do not require additional costs, it is possible to increase the production of feed, especially in economic entities saturated with saline soils. Corn for silage should be placed in the system of soil-protective crop rotations. The best precursors are leguminous and forage and annual grasses.

The introduction of complex mineral fertilizers in rows when sowing corn increases the payment of fertilizers for the harvest of feed. 3-5 times. Higher increases are provided by nitrophos (8,2-10,7 C/ha) and ammophos (7,1-7,6 C/ha), which gives the maximum conditionally net income and increases in the green mass of maize the content of crude protein, fat and reduces the proportion of fiber.

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СОЛТҮСТІК ҚАЗАҚСТАН МАЛ-АЗЫҚ ӨНДІРІСІ

Аннотация. Мақала Республиканың солтүстігіндегі жемшөп өндірісінің жағдайы мен болашағы жайлы мәселелерге арналған. Солтүстік Қазақстанның өсімдік шаруашылығында жемшөп өндірісі астық саласы ретінде алғашқы орында тұр.

Солтүстік Қазақстанда кебірлі кешендер 30 млн.га алаңды алып жатыр, оның 80% сүрлем және жайылым ретінде пайдаланылады. Осы жерлерді дұрыс пайдалану топырақ құнарлылығын және жемшөптік дақылдардың өнімділігін арттыруға мүмкіндік туғызады. Бұл жерлердің тиімділігіне түпкілікті өзгерту енгізу арқылы ғана қол жеткізуге болады.

Солтүстік Қазақстанда сүрлемге арналған жүгері негізгі жемшөптік дақыл болып саналады және энергетикалық көрсеткіштері бойынша күйіс қайыратын жануарлар рационының 40% құрайды. Жүгерінің ерте пісетін будандарының өнімділігі мен құнарлылығы агротехникаға байланысты. Әсіресе, себу мерзімі, себу мөлшері және ору мерзімі өте маңызды.

Түйін сөздер: жүгері, өсімдік шаруашылығы, жемшөп- өндірісі, өнімділік, ауылшаруашылық техникасы.

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ПРОИЗВОДСТВО КОРМОВ НА СЕВЕРЕ КАЗАХСТАНА

Аннотация. Статья посвящена состоянию и перспективам кормопроизводства на севере страны. В растениеводстве кормопроизводство, как зерновая отрасль Северного Казахстана занимает первое место.

В Северном Казахстане солончаковые комплексы занимают площадь 30 млн.га из которых 80% используются в качестве силоса и пастбища. Правильное использование этих земель повысит продуктивность почвенного плодородия и кормовых культур. Это может быть достигнуто только путем окончательного изменения эффективности этих земель.

В Северном Казахстане для силоса кукуруза считается основной кормовой культурой, а энергетический индекс составляет 40% рациона животных. Продуктивность и плодородие семян раннего созревания куку-*рузы зависят от агротехники. Особенно важно сроки сева, урожайность и сроки сбора урожая.

Ключевые слова: кукуруза, растениеводстве, кормопроизводство, gродуктивность, агротехники.

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