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ECOLOGICAL ASSESSMENT OF THE CONDITION OF PASTURES IN THE AKTOBE REGION

Pastures are essential to agriculture, particularly in areas with harsh climates and limited nutrient availability. They serve as an effective and economically viable alternative to conventional ruminant feeding methods while enabling the simultaneous production of other agricultural goods. In Kazakh- stan's Aktobe region, conducting ecological assessments of pasture lands is a key priority for agricultural producers, as these lands form the primary feed source for cattle, sheep, and horses.

The main goal of this study was to scientifically evaluate the current state of pasture ecosystems and perform an ecological assessment to ensure their sustainable use. Analysis of the pasture load across the region's districts revealed clear signs of ecosystem recovery and measured the extent of anthropogenic impact on these lands. From 1991 to 2023, the decline in livestock numbers has led to a reduction in pasture load and the gradual re-establishment of ecological equilibrium.

Furthermore, the study identifies the critical factors that contribute to the restoration of degraded pastures and offers comparative indicators for each district. This approach allows for a comprehensive assessment of the recovery levels of degraded pastures in the Aktobe region and helps chart out strategies for their further rational and sustainable utilization.

Key words: ecosystems, pastures, grazing load, environmental assessment, degradation, desertification.

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Ақтөбе облысы жайылымдарының жағдайын экологиялық бағалау

Жайылымдар климаты қатал және қоректік заттарға қол жетімділігі шектеулі жағдайда ауыл шаруашылығында маңызды рөл атқарады. Оларды пайдалану ауылшаруашылық өнімдерін қатарлас өндіруге мүмкіндік бере отырып, күйіс қайыратын малдарды азықтандырудың дәстүрлі әдістеріне тиімді және үнемді балама болып келеді. Қазақстанның Ақтөбе облысында жайылымдық жерлерді экологиялық бағалау ауыл шаруашылығы тауарын өндірушілер үшін маңызды бағыт болып табылады, өйткені бұл жерлер ірі қара, қой және жылқы малдарын азықтандырудың негізгі көзі болып табылады.

Бұл зерттеудің негізгі мақсаты жайылымдық экожүйелердің қазіргі жағдайын ғылыми тұрғыда анықтау және оларды ұтымды пайдаланудың экологиялық сараптамасын жүргізу болды. Облыс аймақтарындағы жайылымдық жүктемені талдау нәтижесінде экожүйені қалпына келтіру белгілері анықталды және олардың жағдайына антропогендік факторлардың әсер ету дәрежесі анықталды. 1991-2023 жылдар аралығында жайылымдардағы мал басының азаюына байланысты жүктемені азайту және экологиялық тепе-теңдікті орнату процестері байқалады.

Сонымен қатар, жұмыста тозған жайылымдарды қалпына келтіруге ықпал ететін факторлар анықталып, әр аймақ бойынша негізгі салыстырмалы көрсеткіштер берілген. Бұл Ақтөбе облысындағы тозған жайылымдарды қалпына келтіру дәрежесін бағалауға және осы ресурстарды одан әрі ұтымды пайдалану бағыттарын анықтауға мүмкіндік береді.

Түйін сөздер: экожүйелер, жайылым, жайылымдық жүктеме, экологиялық бағалау, деградация, шөлейттену.

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Экологическая оценка состояния пастбищ в Актюбинской области

Пастбища играют важнейшую роль в сельском хозяйстве в условиях сурового климата и ограниченного доступа к питательным веществам. Их использование является эффективной и экономически оправданной альтернативой традиционным способам кормления жвачных животных, при этом позволяя параллельно производить сельскохозяйственную продукцию. В Актюбинской области Казахстана экологическая оценка пастбищных угодий является важным направлением для сельхозпроизводителей, так как эти земли служат основным источником кормов для крупно- го рогатого скота, овец и лошадей.

Основной целью данного исследования было научное определение современного состояния пастбищных экосистем и проведение экологической оценки для их рационального использования. В результате анализа нагрузки на пастбища по районам области были выявлены признаки восстановления экосистем и определена степень влияния антропогенных факторов на их состояние. С 1991 по 2023 год в связи с сокращением поголовья скота на пастбищах наблюдаются процессы снижения нагрузки и установления экологического равновесия.

Кроме того, в работе выявлены факторы, способствующие восстановлению деградированных пастбищ, и приведены основные сравнительные показатели по каждому району. Это дает возможность оценить степень восстановления деградированных пастбищ в Актюбинской области и определить направления дальнейшего рационального использования этих ресурсов.

Ключевые слова: экосистемы, пастбища, пастбищная нагрузка, экологическая оценка, деградация, опустынивание.

Introduction

In modern world practice, in connection with global climate change and intensification of desertification processes, there is an acute problem of developing and implementing effective management of natural resource potential, which allows to abandon resource-intensive technologies and flexibly manipulate the level of anthropogenic load on ecosystems, preserving soil and plant resources of arid areas [1].

Pastures represent one of the most extensive terrestrial ecosystems, occupying approximately 20% of the Earth's surface [2]. Their primary role is to serve as grazing lands for livestock. However, factors such as overpopulation and climate change are markedly accelerating the degradation of these rangelands, particularly in arid and semi-arid regions of the world [3]. Such degradation can lead to reduced productivity, fragmentation of the grass cover, loss of soil fertility, compaction and an increase in the proportion of plant species unsuitable for fodder.

Excessive grazing is the primary cause of pasture degradation; however, factors such as transport activities, water and wind erosion, geological exploration, oil and gas operations, and others also contribute negatively. The state of pastures directly influences the development of livestock farming, the formation of vegetation, the efficient use of natural resources, agricultural practices, ecosystem sustainability, the preservation of farmland, soil fertility, and overall environmental quality [4]. It is estimated that degradation processes and poor management lead to a loss in productivity on approximately 20% of the world's rangelands [5]. In countries where livestock primarily grazes on grass, degradation is the main driver behind the decline in pasture quality [6]. Although the factors contributing to degradation are diverse, overgrazing remains the most important [7]. In addition, the reduction in forage production caused by global climate change – lack of rainfall and rising temperatures – is a major contributor to pasture degradation [8].

One of the reasons for the low sustainability of natural communities is also the loss of biodiversity, which manifests itself in the phylogenetic incompleteness of ecosystems under changing environmental conditions, where the optimal balance of bio-ecological groups is disturbed. The system of adaptive landscape environmental management is becoming increasingly popular in the world, especially in arid countries [9].

In the early stages, rangeland degradation is so slow and imperceptible that it often goes unnoticed in the short term [10]. However, when the process reaches a critical stage, restoration becomes extremely difficult or even impractical, as it requires significant investment to repair the damage, which is often beyond the economic capacity of most countries [11].

The impact of grazing on the soil, and therefore on the plant, is also diverse. Loosening and fractur-

ing of the soil are of great importance, leading to the development of deflation processes in a sandy desert. However, moderate loosening of the soil by animals is a positive factor, helping to break up the crust on the soil surface, improving aeration and seed placement [12].

Kazakhstan's latitude determines the diversity of its agricultural land. The country is ranked sixth globally for its grassland resources, with natural forage areas spanning 188 million hectares—accounting for 70% of its territory [13]. These lands are primarily utilized for grazing. Before the dissolution of the Soviet Union, Kazakhstan had numerous state farms (2,452) and collective farms (395), and approximately 120 million conventional sheep were registered. Due to the large number of animals, long-distance grazing was practised over considerable distances [14].

In the Aktobe region, nearly 77% of the land is used as pasture, which supports the practice of extensive, long-distance grazing. However, the constant exploitation of these pastures contributes significantly to the pressing environmental issue of desertification—a process that is especially rapid and noticeable in arid ecosystems [15]. Additionally, compared to more fertile areas, desert pastures offer lower productivity due to restricted plant biomass and a limited variety of forage, thereby reducing the availability of essential nutrients for animals. Unpredictable weather patterns, including drought and scant rainfall, further lead to uneven vegetation distribution in these regions [16].

Despite these challenges, desert rangelands continue to provide an important source of forage for livestock. The natural adaptation of their plant species to extreme conditions renders them highly resistant to climate change. For instance, species like saxaul and camel thorn can endure prolonged drought periods, while their leaves and stems still supply sufficient nutrients for animal consumption [17].

The main objective of this work was to provide a scientifically based identification of the current ecological situation of rangeland ecosystems and to conduct an environmental assessment with a view to their rational use.

In 1996, experts from the UNCCD noted that Kazakhstan had 179.9 million hectares of desertified land—about 60% of its total territory. By 2020, official figures predicted that almost 66% of the country's land would be affected by desertification. This environmental degradation is largely due to the overgrazing of natural forage areas, such as pastures and hayfields, which has significantly worsened the state of the ecosystems.

After the collapse of the Soviet Union, Kazakhstan's agricultural sector underwent a major restructuring beginning in 1991. Agricultural production plummeted, vast areas of arable land were abandoned, and many collective and state farms ceased to exist, leading to a notable decline in livestock numbers in rural areas. In 1994, the removal of livestock subsidies and the dissolution of state and collective farms forced many residents to leave their homes and move to district centers and towns. Then, starting in 1995, legislative changes stripped collective and state farms of their legal status, transforming them into production cooperatives or peasant farms.

All these factors emphasise the need to review the extent of degradation of pastureland, as they play a decisive role in shaping the current state of the land and require special attention for further ra- tional use of natural resources.

Study area

The Aktobe region is located in the northwestern part of Kazakhstan. It is a vast physical-geographical and economic region with an area of 30.062 million hectares, which is about 11% of the total area of the republic. The Aktobe region is the second largest region of Kazakhstan in terms of area.

The territory of the Aktobe Oblast (total area 30.062 million hectares) is located in several geomorphological regions: the Mugalzhar Mountains, the Podural Plateau, the Turgai Tableland, the Ustyurt Plateau and the Caspian Sea Lowland.

The great length from north to south (700 km) and from west to east (800 km), as well as the rather complex terrain, determine the diversity of the region's natural and economic conditions. According to the nature of the relief, the territory of the region is divided into five geomorphological regions: the Mugalzhar Mountains, the Poduralskoe (Ural-Emben) Plateau, the Turgai Plateau, the Ustyurt Plateau and the Caspian Lowland.

The region's climate is marked by abrupt temperature fluctuations, with harsh, cold winters giving way to hot summers. The shift from winter to summer happens quickly, resulting in a brief spring season. In addition, there is instability and scarcity of precipitation, high air dryness, intense evaporation and constant direct sunlight throughout the spring-summer season [18].

In summer, dry, heated tropical air masses from the deserts of Central Asia and Iran enter the region from the south, and arctic air masses from the Urals from the north. These cold, dry air masses undergo further dehydration due to the influence of the un-

derlying surface, transforming into continental-tropical air masses, which contribute to droughts and hot winds.

As of January 1, 2024, statistical data indicate that Aktobe Oblast comprises 323 settlements, including 12 administrative districts, one city of regional significance (Aktobe), seven cities of district significance (Alga, Kandyagash, Emba, Zhem, Temir, Khromtau, Shalkar), and 315 rural settlements organized into 134 rural districts.

The region's ecological situation is shaped by both natural and human-induced factors, such as moisture deficiency, temperature variations, harsh winters, and scorching summers. Additionally, degradation processes, overgrazing, vegetation burning for fuel, and mining activities contribute to environmental challenges. Special attention is given to the deterioration of soil and vegetation cover, as it reflects the overall state of the territory and serves as a key indicator of desertification.

Materials and research methods

This is study leveraged statistical data from of the Statistics Agency of the Republic of Kazakhstan alongside various cartographic resources to determine of the pasture load in the Aktobe region. The main goal was to the present pasture load assessment results for the period 1991–2023 years, identify of the most degraded pasture areas, and pinpoint zones with either low or high load variability as a result of overgrazing. Notably, there has been a shortage of detailed analyses on pasture load degradation in Aktobe; therefore, the methods and analyses used here can also be applied in other regions of Kazakhstan. The data gathered offer a deeper insight into the dynamics and variability of pasture load.

To calculate the potential (or standard) load on the pastures, the study employed the formula K = a/b, where 'a' is the actual yield of the pasture and 'b' represents the amount of feed consumed by one sheep during the grazing period (with a daily requirement of 2.5 kg of pasture feed per sheep) [21]. The impact of animals on the pasture ecosystem was assessed using the FAO/UNEP methodology, which involves calculating the ratio of the actual load (expressed in conventional sheep heads per hectare) to the potential load. The conventional population was determined using conversion factors: sheep and goats count as 1 sheep, cattle as 5 sheep, horses as 6 sheep, and camels as 7 sheep. This approach differs from calculations based on live weight. Additionally, the pasture load was computed based on the grazing period, which in this the region averages 270 days.

Results and discussion

In the Aktobe region, the number of main livestock species decreased from 1991 to 2023, with sheep and goats accounting for more than half of the total number of animals compared to 1991 (Fig- ure 1).

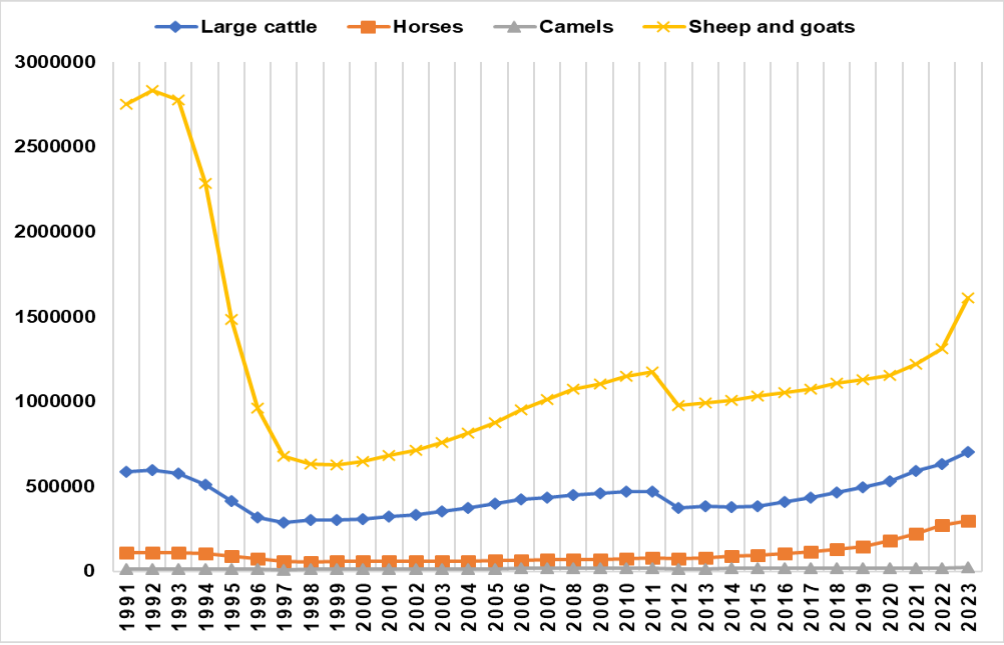

Figure 1 – Dynamics of the main types of livestock in the Aktobe region, thousands of head

According to Figure 1, we see a significant decrease in the number of livestock from 1992 to 1998. by 72% due to restructuring, while there were significant changes in the total number of livestock associated with an increase from 1999 to 2023, but the main increase in livestock did not even reach the level of 1991-1992 [22-23].

Under the conditions of year-round grazing in the Aktobe region, the amount of fodder consumed by one sheep during the grazing period is 9.1 centners per year. Therefore, in order to assess the degradation of pastures, we converted all livestock into conditional sheep (Table 1).

As can be seen from the table, before the collapse of the state collective farm system the main livestock was sheep (more than 2.83 million head or 74%), currently the number of sheep is 1.60 million or 30% of the total conditional sheep head (Figure 2).

Table 1 – Conversion into conditional sheep heads, taking into account private livestock in Aktobe region

Years	Sheep	Large Cattle	Horses	Camels	Total in sheep heads
1991	2753200	585600 = 2892800 Sheep	108400 = 650400 Sheep	14300 = 100100 Sheep	6431700
1992	2831000	594500 = 2972500 Sheep	108300 = 649800 Sheep	14500 = 101500 Sheep	6554800
1998	629500	300200 = 1501000 Sheep	55900 = 335400 Sheep	10600 = 74200 Sheep	2540100
2011	1174000	471300 = 2356500 Sheep	76500 = 459000 Sheep	17100 = 119700 Sheep	4109200
2020	1153376	531432 = 2657160 Sheep	178051 = 1068306 Sheep	17613 = 123291 Sheep	5002133
2023	1608702	700995 = 3504975 Sheep	294803 = 1768818 Sheep	21335 = 149345 Sheep	7031840

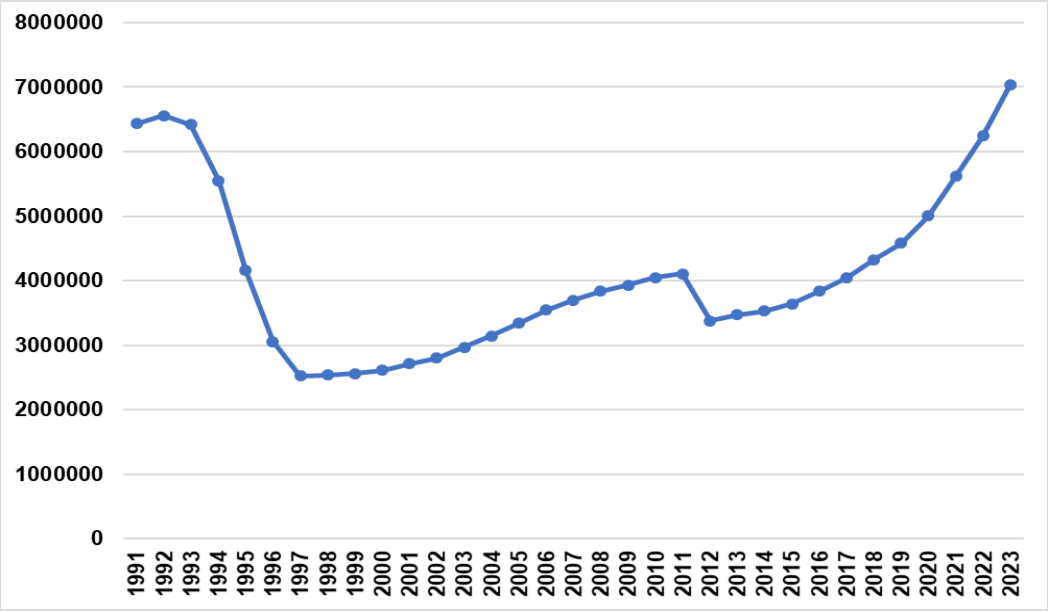

Figure 2 – Dynamics of changes in livestock numbers in Aktobe region, thousands of conventional sheep

By the end of 2023, the livestock popula- tion in the Aktobe region was recorded at 7,031.8 thousand conventional sheep heads. This included 1,608.7 thousand sheep and goats, 700.9 thousand cattle (equivalent to 3,504.9 thousand conventional sheep heads), 294.8 thousand horses (equivalent to 1,768.8 thousand conventional sheep heads), and 21.3 thousand camels (149.3 thousand conventional sheep heads).

According to the data in the table, the total number of livestock, measured in conventional sheep heads, has shown a steady increase since 2000. The

most significant growth has been observed in the population of cattle, horses, and camels, which has increased 1.5 times compared to 1991. However, the number of sheep and goats has not yet returned to the levels recorded in 1996.

Livestock distribution across the region remains uneven, with the highest concentration in the Mugalzhar district, which had 812.4 thousand conventional sheep heads in 2023. This is attributed to the district's favorable conditions for livestock farming. Most of the livestock is concentrated in the western-southern and northern areas, particularly in Baiganin (682.8 thousand), Kobda (758.0 thousand), and Shalkar (800.2 thousand conventional sheep heads).

Table 2 – Main indicators of livestock production by districts of Aktobe region for 2023 [24]

Districts of the Aktobe region	Number of livestock, thousand conventional sheep	Density of livestock, head/1 sq. km	Number of livestock per capita, head
Alga	525,4	70,0	12,0
Aitekebi	572,5	15,5	27,7
Baiganin	682,8	12,5	29,7
Kargaly	240,5	48,1	15,6
Irgiz	459,2	11,6	33,0
Martuk	350,4	53,1	11,8
Mugalzhar	812,4	67,2	12,3
Temir	535,6	46,9	14,9
Wil	485,1	46,8	30,1
Kobda	758,0	54,0	47,4
Khromtau	442,8	34,2	9,5
Shalkar	800,2	13,5	18,9
Suburb of Aktobe	159,2	62,9	0,28
Total for the region	6023,9	41,2	20,3

Over the last twenty years, the number of livestock in the suburbs of Aktobe has decreased by 77%, in the Temir district by 18%, in the Uil- sky district by 11% (of the total number of live- stock in 1991), in the Kargaly region the number of livestock has not changed, in other areas it has increased by 1.5 times (Figure 3). Among the districts, a slight increase occurred in Shalkar- sky – 121,6%, Mugalzharsky – 125,1%, Khrom- tausky – 128,6%, Kobdinsky – 149,8%, i.e. the increase on occurred is mainly in the northern and west-southern regions of the region, where the conditions for animal husbandry are most favourable. The are decrease in the livestock occurred mainly in the western and eastern regions, at the such as Irgiz – 3,8% and Uil – 10,6%. In the studied sareas of the Aktobe region there is a dynamic increase in the number of livestock in the condition sheep, but for the main types of the livestock, horses, cattle and camels have increaseds. The number of the sheep and goats in all the districts of Aktobe region has not reached of the level in 1991 year.

With the growth of the livestock population, pressure on pastures has also increased. Currently, efforts are underway to restore the degraded steppe. Over the past 33 years, pasture restoration processes have contributed to a reduction in the baseline level of desertification, which is now considered weak.

The primary factors driving vegetation recovery have been a significant decline in grazing livestock numbers and a shift from an arid climate cycle to a more humid one. Pastures cover 77% of the region, with an average yield per hectare ranging from 2.2 to 10.5 c/ha, depending on the district. However, over the last 30 years, the total area of natural pastures in the Aktobe region has decreased by 9%, largely due to industrial and manufacturing development.

At the same time, livestock density has increased. In 2018, the number of livestock per hectare was recorded at 0.07, rising to 0.11 by 2023 as livestock numbers continued to grow (Table 3).

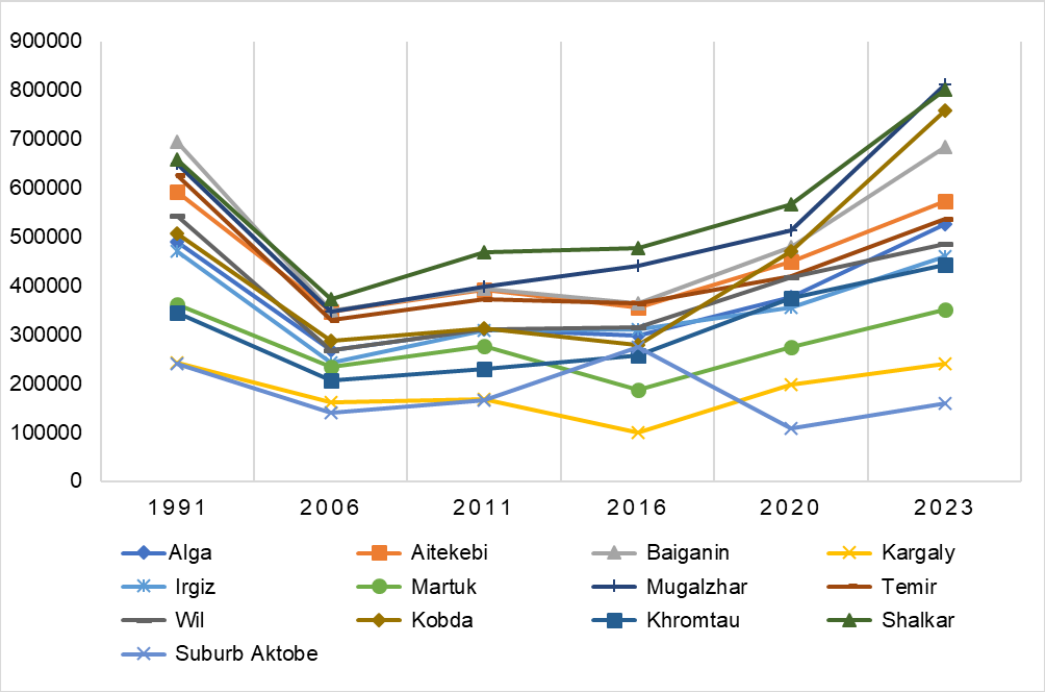

Figure 3 – Dynamics of changes in livestock numbers by districts of the Aktobe region, thousand conditional sheep

Table 3 – Dynamics of livestock and pastures in the Aktobe region, 1991-2023.

Years	Livestock, thousand heads..	Pastures thousand hectares	Livestock density per pasture, head/ha
1991	3461,5	25390,4	0,13
1995	1996,4	24999,1	0,08
2007	1528,5	24660,7	0,06
2012	1435,6	24437,2	0,05
2018	1719,9	23150,8	0,07
2023	2411,8	23037,3	0,11

Pasture digression is an exogenous succession of a recessive type. This phenomenon was first described by G.N. Vysotsky in Ergeni, where it is defined as a successive change in plant communities in a certain area, arising under the influence of overgrazing. The pasture load was determined based on the length of the grazing period, which in the region averages 270 days. Following this approach, the authors [25] developed a scale to assess the impact of livestock on pastures (Table 4).

Table 4 – Scale for determining the impact of livestock on pastures (GSP)

Actual livestock load in relation to potential, (%)	Degree of influence of animals on the pasture ecosystem
350 and more	Very high
250 – 350	Tall
150 – 250	Moderate
100 – 150	Low
10 – 100	Ecological balance

It is known that a sheep's daily forage requirement is 2.5 kg, amounting to 9.1 kg annually. The scientifically grounded potential pasture load is calculated using the formula K = a/b, where "a" represents the actual yield, and "b" denotes the amount of fodder consumed by a sheep during the grazing period. The actual yield for each district in the region was determined from the average yield of dry edible matter (Table 5).

Table 5 – Dynamics of the influence of livestock on pasture ecosystems in the Aktobe region (1991-2023)

Districts	Pasture area (thousand ha)	Livestock (thousand heads)			Average yield kg/ ha of dry consumed mass	Ratio of potential to actual load per 1 hectare		Ratio of actual overload to potential		The degree of influence of animals on pasture 1991-2014
		Sheep, goats	Cattle, horses, camels	Total conditional sheep heads		1991	2023	1991	2012	
1	2	3	4	5	6	7	8	9	10	11
Alga	518,1 393,0	213,9 105,4	276,0 420,0	489,9 525,4	3,8 3,6	0,42 0,94	0,39 1,33	2,24 3,41	222 341	moderate tall
Aitekebi	3170,6 2687,1	187,8 87,7	405,3 484,9	593,1 572,6	5,9 7,8	0,65 0,19	0,86 0,21	0,29 0,24	29 24	ecol. balance ecol. balance
Baiganin	5200,5 5649,4	415,0 166,6	280,4 516,2	695,4 682,8	7,2 8,7	0,79 0,13	0,96 0,12	0,16 0,12	16 12	ecol. balance ecol. balance
Kargaly	302,0 300,4	33,2 36,6	210,1 203,9	243,3 240,5	3,5 2,4	0,38 0,81	0,26 0,80	2,13 3,08	213 308	moderate tall
Irgiz	3367,8 3224,2	249,7 114,9	220,9 344,3	470,6 459,2	3,1 5,2	0,34 0,14	0,57 0,14	0,41 0,24	41 24	ecol. balance ecol. balance
Martuk	443,8 269,6	54,0 54,0	308,0 296,3	362,0 350,3	4,5 5,8	0,49 0,82	0,64 1,30	1,67 2,03	167 203	moderate moderate
Mugal-zhar	2482,7 1162,4	294,2 169,2	354,7 643,2	648,9 812,4	3,6 5,8	0,39 0,26	0,64 0,70	0,67 1,09	67 109	ecol. balance low
Temir	1124,0 764,2	305,5 123,3	320,8 412,3	626,3 535,6	4,2 3,5	0,46 0,56	0,38 0,70	1,22 1,84	122 184	low moderate
Wil	1022,9 1013,0	317,0 137,6	226,0 347,5	543,0 485,1	6,7 4,6	0,74 0,53	0,51 0,49	0,72 0,96	72 96	ecol. balance ecol. balance
Kobda	1199,8 1164,8	191,0 201,0	314,9 556,9	505,9 757,9	3,0 3,5	0,33 0,42	0,38 0,65	1,27 1,71	127 171	low moderate
Khromtau	1082,5 991,7	106,3 65,5	237,8 377,2	344,1 442,7	2,6 2,4	0,29 0,32	0,26 0,45	1,10 1,73	110 173	low moderate
Shalkar	5318,9 5385,0	297,7 108,4	360,3 691,7	658,0 800,1	6,9 7,4	0,76 0,12	0,81 0,15	0,16 0,20	16 20	ecol. balance ecol. balance
Suburb of Aktobe	156,8 145,8	81,2 29,3	158,7 129,8	239,9 159,1	2,2 2,1	0,24 1,53	0,23 1,09	6,37 4,74	637 474	very high very high

Here, on the pastures of on Baiganin district to the 695,4 thousand conventional sheeps were grazed in 1991 year, with an average grass yield of 7,2 c/ ha of air-dry edible phytomass. In the Aitekebi, Baiganin, Irgiz, Mugalzhar, Uil and Shalkar districts, pasture of the overload was not exceeded and was in ecological balance. Only in Alginsky, Kargalinsky and Martuksky districts was there a moderate grazing pressure in 1991. In the Temir and Kobdinsky districts in 1991 there was a low level of pressure on pastures by farm animals. In this respect, the pastures were in the middle stage of desertifica- tion. In 2023, with a pasture yield of 2,4-3,6 c/ha in the Alginsky and Kargalinsky districts, the pasture

load was at a high level, increasing almost 1,5 times. However, in 2014, in the Aitekebisky, Baiganinsky, Irgizsky and Uilsky districts, the number of livestock grazing decreased, which contributes to the intensive restoration of the grass cover and the formation of an ecological balance. In addition, despite the increase in the number of conventional sheep from 658,0 to 800,1 in the Shalkar region, ecological equilibrium is observed in the pastures. Only in the suburbs of Aktobe has there been a very high degradation of pastures since 1991.

Unsystematic grazing and excessive livestock pressure on pastures can result in significant wind erosion and the formation of large-scale desertification zones. However, over the past 30 years, pasture ecosystems in most areas of the Aktobe region have experienced minimal degradation and have remained in a state of ecological balance.

As a result, on sandy-soil pastures that have undergone improvement, restoration and demutation processes occur at an accelerated rate, allowing pasture loads to be maintained at a sustainable ecological level.

Conclusion

The influence of livestock and human activity on the semiarid ecosystems of the Aktobe region is a significant concern, as it leads to the transformation of natural ecosystems into anthropogenic ones. A detailed analysis of changes that took place in the 20th and early 21st centu- ries due to livestock grazing revealed the follow- ing trend: during periods of high pasture loads (1991–1995), a regressive exogenous succession occurs, where the original climax community is replaced by short-term derivative groups. Grazing on brown soils has been found to contribute to the displacement of light soils, the formation of dune landscapes, a decline in floristic and phytocenotic diversity, and the erosion of boundaries between plant communities.

On the other hand, when grazing pressure decreases or is absent, particularly in combination with increasing climate humidity, the opposite process takes place–endogenous succession, which facilitates the restoration of the primary vegetation cover (demutation). This phenomenon has been observed in the region since 1991 and continues to the present day. Despite the fluctuations in the livestock population, which saw a decline from 3461.5 thousand conventional sheep heads in 1991 to 1995-1996, and a further decrease to 2411.8 thousand conventional sheep heads in 2023, the pastures have, in general, maintained ecological balance, with the exception of specific areas. Presently, ecological balance is maintained on all pastures within the districts; however, adherence to the established norms of pasture load is imperative.

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