Appendices to the Model Pasture Management Plan for Atyrau, Turkestan, Ulytau and Almaty regions

Atyrau region

5. Recommended pasture rotation schemes for Atyrau region*

Years	Plot numbers			
	I	II	III	IV
1	Summer May 27 to September 15	Autumn September 16 to November 25	Restoration field or winter pasture	Spring April 4 to May 26
2	Autumn September 16 to November 25	Restoration field or winter pasture	Spring April 4 to May 26	Summer May 27 to September 15
3	Restoration field or winter pasture	Spring April 4 to May 26	Summer May 27 to September 15	Autumn September 16 to November 25
4	Spring April 4 to May 26	Summer May 27 to September 15	Autumn September 16 to November 25	Restoration field or winter pasture

*Note: the field is grazed once per season in spring (from 5° to 15°C), summer (15°C), autumn (15° - 0°C), winter (-1° +4°C); in winter, the number of non-grazing days is 10-30 days. In spring, grazing begins when the grass height reaches 5 cm.

*Pasture rotations must be designed taking into account the natural and climatic conditions, type, species composition, and productivity of vegetation in pasture lands, i.e., pasture rotations will differ in the conditions of each region.

Recommendations for improving the technical condition of pasture lands in Atyrau region

Sandy and sandy loam soils are suitable for radical improvement of pastures with the sowing of prostrate summer cypress and camphorosma montpellier. Other loamy soils are not suitable for radical improvement. They are subjected to accelerated grassing without sowing annual pre-crops, after the destruction of shrubs (tamarisk, tamarix, and calligonum) by chemical or mechanical treatment.

The main soil cultivation method is autumn plowing to a depth of 20-22 cm, carried out in August; the field is rolled after sowing.

Sowing is carried out from the second half of November until the end of February of the following year, at a rate of 2.0-2.5 million plants/ha (for camphorosma – 1.5-2.0 million plants/ha), using a continuous method using an SST-3 saxaul-grass seeder. The seeding depth is 0.5 cm.

During the first year of plant life, grazing of animals on the crops is strictly prohibited. In the second year, moderate grazing is permitted during the autumn and winter seasons. From the third year onward, the seeded pastures are allocated to moderate grazing, and then to full grazing for the remainder of the grazing season, from the fourth to the twelfth year of their life, in a pasture rotation system, as outlined above.

Calendar schedule for the use of pastures, establishing seasonal grazing routes and the movement of farm animals in Atyrau region*

No.	Agroclimatic zones	Time for driving farm animals to distant pastures	Time for the return drive from distant pastures
1	I	April 25	October 24

*These dates may vary depending on the specific climatic conditions of the year.

Turkestan region

5. Recommended pasture rotation schemes for Turkestan region*

Four-year four-field pasture rotation for sandy desert pastures with alternating spring and winter seasons of use, summer and autumn

Year of use	Pasture area			
	1st	2nd	3rd	4th
1st	Spring	Winter	Summer	Autumn
2nd	”	”	”	”
3rd	Winter	Spring	Autumn	Summer
4th	”	”	”	”

Scheme of four-year, four-section pasture rotation for desert pastures of Turkestan region

Year of use	Pasture rotation area			
	I	II	III	IV
1st	Autumn	Summer	Spring	Rest
2nd	Summer	Spring	Rest	Autumn
3rd	Spring	Rest	Autumn	Summer
4th	Rest	Autumn	Summer	Spring

Three-year three-section pasture rotation scheme for desert pastures in Turkestan region

Year of use	Pasture rotation area		
	I	II	III
1st	Summer	Autumn	Spring
2nd	Autumn	Spring	Summer
3rd	Spring	Summer	Autumn

Pasture rotation scheme for the foothill zone of Turkestan region, used by seasons of the year

Natural forage areas		
Foothill pastures	Mountain pastures	Pre-sand pastures of clay desert
Seasons of use		
Spring, half summer	Summer	Autumn, winter
Main types of pastures		

Ephemeral-ephemeral-mixed herbs	Sedge-bluegrass-mixed herbs	Shrub-herbaceous and meadow-saltwort-saltwort-mixed herbs

*Pasture rotations must be designed taking into account the natural and climatic conditions, type, species composition, and productivity of vegetation in pasture lands, i.e., pasture rotations will differ in the conditions of each region.

Recommendations for improving the technical condition of pasture lands in the sandy and clayey deserts of the Kyzylkum and sandy deserts of the Transkaratau-Moyinkum zone of Turkestan region

Radical improvement:

– grassing using seeds of such arid plants as *Kochia prostrata (L.), Ceratoides papposa Botsch, et lkonn, Haloxylon persicum Bunge ex Boiss, Haloxylon aphullum, Calligonum aphyllum* where the designed grass cover is less than 40% and valuable forage grasses such as *Climacoptera crassa, Climacoptera lanata, Poa bullosa, Agropýron* and many others growing in the desert zone are preserved in the grass stand when creating sown pastures.

Superficial improvement:

- Sowing seeds of arid crops *Ceratoides papposa Botsch, et lkonn, Haloxylon persicum Bunge ex Boiss, Haloxylon aphullum, Calligonum aphyllum*, and *Halothamnus subaphyllus (C.A. Mey)* harvested mechanically in virgin steppe areas of the desert zone.
- Planting shrubs, subshrubs, and grasses without tillage.

Improving the use (operation):

– application of fertilizers and rotted manure;

– introduction of recommended pasture rotation systems for pastures in the sandy and clayey deserts of South Kazakhstan

– study harmful and poisonous plants growing on natural forage lands, their species composition, and occurrence;

– control of poisonous and harmful plants in hayfields and pastures using agronomic and chemical methods;

– application of rotational pasture management technology developed for this zone of the sandy and clayey desert of South Kazakhstan

– determination and establishment of the optimal livestock load on the pasture depending on the type and qualitative and quantitative characteristics of the grass stand;

– introduction of hay rotation systems, i.e., a specific system of mowing grasses by year.

Recommendations for improving the technical condition of pasture crops in the Arys-Turkestan zone of Turkestan region

Radical improvement:

- Grassland is used on heavily compacted and low-value grass stands on gently sloping lands, solonetz soils, and solonetz complexes, where solonetz patches account for 10-30% of the structure.

It is advisable to use accelerated grassland cultivation methods using arid plant seeds.

Superficial improvement:

– They are carried out on hayfields and pastures containing at least 30-40% valuable grass species, provided the areas are not subject to erosion, have a sufficiently high overall projective cover (at least 40%), and relatively good moisture (floodplains, valleys, estuaries).

The main agricultural practices include:

– additional sowing of grasses into the turf;

– applying fertilizers, such as phosphorus and potassium fertilizers when additional sowing legumes, and nitrogen and nitrogen-potassium fertilizers when underseeding cereals.

– combining these practices increases their effectiveness.

Improving the use (operation):

– application of fertilizers and rotted manure;

– use of different grass stands at different times;

– allocation of several paddocks with early-maturing (winter and perennial rye) and late-growing plants (annual forage crops and summer-sown grasses);

– implementation of pasture rotations

– establishing optimal pasture loads;

– preparation of winter forage in the first half of summer by using surplus grass;

– supplementary feeding of livestock by sowing annual forage crops, concentrates, or silage in the second half of summer;

– thorough cleaning of wastewater and irrigation water from poisonous, harmful, and weed seeds when irrigating hayfields and pastures;

– systematic mowing of weeds on the boundaries of fields, hayfields and pastures, in ravines, on roadside strips, wastelands, roadsides and ditch edges and other lands not used for agricultural purposes.

– irrigation;

Recommendations for improving the technical condition of pasture lands in the foothill zone of Turkestan region

Radical improvement:

– accelerated grassing, creation of a new grass stand (sowing perennial grasses) with the participation of *Sameraria boissierana, Onobrychischora sanicica Bge* in the grass stand; according to life forms, they are characterized by very high resistance on the plain and in foothill growing conditions.

Superficial improvement:

In the foothill zone, it is advisable to carry out this procedure in the following cases:

– valuable or easily palatable grasses make up at least 25% of the meadow grass stand;

– hummocks, shrubs, and stones cover no more than 20-40% of the meadow surface (for slope and floodplain meadows, shrub cover is allowed up to 40%);

– the gross meadow yield exceeds 10-15 c/ha (hay). If at least one of the first three meadow condition indicators does not meet the requirements for surface improvement, the meadow should undergo radical improvement.

Improving the use (operation):

– inventory (complete and accurate) of forage lands (hayfields and pastures);

– application of fertilizers and rotted manure;

– introduction of recommended pasture rotation systems for pastures in the foothill zone of South Kazakhstan

– application of rotational pasture management technology developed for this ecological zone of South Kazakhstan

– determining and establishing the optimal load of agricultural animals on pastures, taking into account their productivity, actual condition (restored or degraded), season of use, and livestock species and breeds.

Calendar schedule for the use of pastures, establishing seasonal grazing routes and movement of farm animals in Turkestan region*

No.	Agroclimatic zones	Time for driving farm animals to distant pastures	Time for the return drive from distant pastures
1	I	3rd decade of April	1st decade of October
2	II	3rd decade of April	1st decade of October

3	III	1st decade of May	2nd decade of September
4	IV	2nd decade of April	1st decade of September

*These dates may vary depending on the specific climatic conditions of the year.

Ulytau region

5. Recommended pasture rotation schemes for Ulytau region

Years	Field numbers			
	I	II	III	IV
1	One-time pasturing from 20.04 to 24.06	One-time pasturing from 25.06 to 24.08	One-time pasturing from 25.08 to 20.10	Resting field
2	Resting field	One-time pasturing from 20.04 to 24.06	One-time pasturing from 25.06 to 24.08	One-time pasturing from 25.08 to 20.10
3	One-time pasturing from 25.08 to 20.10	Resting field	One-time pasturing from 20.04 to 24.06	One-time pasturing from 25.06 to 24.08
4	One-time pasturing from 25.06 to 24.08	One-time pasturing from 25.08 to 20.10	Resting field	One-time pasturing from 20.04 to 24.06

*Pasture rotations must be designed taking into account the natural and climatic conditions, type, species composition, and productivity of vegetation in pasture lands, i.e., pasture rotations will differ in the conditions of each region.

Recommendations for improving the technical condition of pasture crops in the dry steppe zone of Ulytau region

Radical improvement:

– accelerated grassing, creation of new grass stand (sowing perennial grasses).

Superficial improvement:

– removal of shrubs, weeds, and harmful vegetation;
– removal of hummocks and debris removal;
– snow retention;
– rejuvenation of natural grass stands, fertilization;
– sowing of perennial grasses;

Improving the use (operation):

– conducting paddock grazing and pasture rotations;
– maintaining seasonal grazing;
– watering;
– maintaining the pasture load approved by the authorized body, taking into account their productivity, actual condition (restored or degraded), season of use, and livestock species and breeds.

Recommendations for improving the technical condition of pasture crops in the semi-desert zone of Ulytau region

Radical improvement:

– carried out on heavily compacted and low-value grass stands on gently sloping lands, solonetz soils, and solonetz complexes, in which the proportion of solonetz patches in the structure is 10-30%.

It is advisable to carry out grassing using an accelerated method.

Superficial improvement:

– Conducted on hayfields and pastures containing at least 30-40% valuable grass species, provided the areas are not subject to erosion, have a sufficiently high total projective cover (at least 40%), and relatively good moisture (floodplains, valleys, estuaries).

Key agronomic measures include:

– additional sowing of grasses into the turf;

– fertilizer application: when additional sowing legumes, phosphorus and potassium fertilizers; when additional sowing cereals, nitrogen and nitrogen-potassium fertilizers.

– rejuvenation of grass stand;

– combining these techniques increases their effectiveness.

Improving the use (operation):

– fertilizer application;

– irrigation;

– using different grass stands at different times;

– separating paddocks with early-maturing (winter and perennial rye) and late-growing plants (annual forage crops and summer-sown grasses);

– establishing pasture load;

– preparing winter forage in the first half of summer by using surplus grass;

– supplemental feeding of livestock by sowing annual forage crops, concentrates, or silage in the second half of summer

Recommendations for improving the technical condition of pasture lands in the desert zone of Ulytau region

Radical improvement:

– accelerated grassing using arid plants growing in the desert zone when creating seeded pastures.

Superficial improvement:

– sowing arid crop seeds harvested mechanically in virgin steppe areas of the desert zone.

– sowing arid crop seeds supplemented with grass species of various economic importance.

– additional sowing with shrubs, subshrubs, and grasses without tillage.

Improving the use (operation):

– fertilizer application;

– effective water management;

– using different grass stands at different times;

– crop rotation;

– establishing pasture loads.

Calendar schedule for the use of pastures, establishing seasonal grazing routes and movement of farm animals in Ulytau region*

No.	Name of the rural district	Calendar dates for driving farm animals to distant pastures	Calendar dates for the return drive from a distant pasture to the camp
1		first half of April	the second decade of October

*These dates may vary depending on the specific climatic conditions of the year

Almaty region

5. Recommended pasture rotation schemes for Almaty region*

1. Desert zone of beef cattle and sheep farming

Years	Plot numbers			
	I	II	III	IV
1	Spring	Summer	Autumn	rest
2	Summer	Autumn	rest	Spring
3	Autumn	rest	Spring	Summer
4	rest	Spring	Summer	Autumn

Table 1 - Three-year three-season scheme with the use of intra-season pasture rotation

Years	Seasons and periods of pasture use											
	Spring pasture			Summer pasture			Autumn pasture			Winter pasture		
	*I	*II	*III	*I	*I	*II	*I	*II	*III	*I	*II	*III
1 year	beginning	middle	end	beginning	middle	end	beginning	middle	end	beginning	middle	end
2 years	middle	end	beginning	middle	end	beginning	middle	end	beginning	middle	end	beginning
3 years	end	beginning	middle	end	beginning	middle	end	beginning	middle	end	beginning	middle

*pasture areas

2. *Desert-steppe zone of irrigated, dryland agriculture and sheep farming*

Table 2 - Scheme of four-section three-season pasture rotation

3. Foothill zone of vegetable, industrial crops, horticulture and dairy farming

Table 3 - Scheme of three-year three-section pasture rotation

Years	Plot numbers		
	I	II	III
1	Spring	Summer	Autumn
2	Summer	Autumn	Winter
3	Autumn	Winter	Spring

4. *Mountainous zone of fruit growing, potato growing and meat and dairy cattle breeding*

Table 4 - Scheme of three-year three-section pasture rotation

Years	Plot numbers		
	I	II	III
1	Spring	Summer	Autumn
2	Summer	Autumn	Winter
3	Autumn	Winter	Spring

5. High mountain zone of alpine and subalpine meadows and pastures

Seasonal use (summer with a rotating plot). Grass utilization rate – no more than 80% of the pasture mass.

Table 5 - Scheme of three-year three-section pasture rotation

Years	Summer pasture		
	Section I	Section II	Section III
1	early summer	midsummer	late summer
2	late summer	early summer	midsummer
3	midsummer	late summer	early summer

*Pasture rotations must be designed taking into account the natural and climatic conditions, type, species composition, and productivity of vegetation in pasture lands, i.e., pasture rotations will differ in the conditions of each region.

Recommendations for improving the technical condition of pasture lands in Almaty region

1. *Desert zone of beef cattle and sheep farming*

Table 1 – Recommended measures for radical improvement.

Soil preparation	cultivating the soil with a disc harrow to a depth of 4-6 cm with an attack angle of 15%. On sandy soils – harrowing the soil. Seeding should be done with a disc seeder, ensuring seed placement into the soil.
Recommended crop improvers	narrow-spiked wheatgrass, prostrate summer cypress, Sálsola, camphorosma, eurotia, wormwood, saxaul, Calligonum, Calligonum paletzkianum Litv.
Sowing rates, kg/ha	wheatgrass – 12, prostrate summer cypress - 12, Sálsola - 8, camphorosma - 6, eurotia - 16, wormwood - 4, saxaul - 10, Calligonum - 10, Calligonum paletzkianum Litv. - 12, based on 100% economic suitability
Seeding depth, cm	all of the above plants are sown at a depth of 0.5-1.5 cm. Seeds are sown after sowing by rolling with ring rollers.
Sowing method	solid row sowing of saxaul, Calligonum and Calligonum paletzkianum Litv. with a row spacing of 45-60 cm. Sowing is carried out using a special seeder SST-3 and seeder SZT-3.6
Sowing dates	all of the listed plants are improvers and are sown in the pre-winter and winter periods, November-January

2. *Desert-steppe zone of irrigated, dryland agriculture and sheep farming*

Table 2 – Recommended measures for radical improvement of pastures.

Soil preparation	Moldboard tillage to a depth of 20-22 cm, similar to fallow or stubble cultivation, and harrowing with simultaneous compaction. If the soil has a thin humus layer, non-moldboard tillage to a depth of 15-18 cm is recommended.
Recommended crop improvers	narrow-spiked wheatgrass, prostrate summer cypress, Sálsola, camphorosma, eurotia, wormwood, saxaul, Calligonum, Calligonum paletzkianum Litv.
Sowing rates (clean sowing), kg/ha	wheatgrass – 15, prostrate summer cypress - 15, Sálsola - 8, camphorosma - 6, eurotia - 20, wormwood - 4, saxaul - 10, Calligonum - 10, Calligonum paletzkianum Litv. - 12, based on 100% economic suitability
Sowing dates	all the listed improving plants are sown in the period November-January.
Seeding depth, cm	all of the listed plants are sown with the seeds being planted into the soil at a depth of 0.5-1.5 cm. The seeds are planted after sowing by rolling them with ring rollers.
Sowing method	Solid row sowing of saxaul, Calligonum and Calligonum paletzkianum

	Litv. with a row spacing of 45-60 cm. Sowing is carried out using a special seeder SST-3 and a seeder SZT-3.6

3. Foothill zone of vegetable, industrial crops, horticulture and dairy farming

Table 3 – Recommended measures for radical improvement of pastures

Soil preparation	moldboard plowing to a depth of 18-20 cm, or cultivation with a disc harrow (or similar tool) to a depth of 15-18 cm. The soil is prepared as a fallow or early fallow.
Recommended crop improvers	Blue and yellow alfalfa, Hungarian sainfoin, Russian wild rye, broad- and narrow-spike wheatgrass, awnless brome grass.
Sowing rates (clean sowing), kg/ha	alfalfa - 8-10; sainfoin - 40-45; wheatgrass - 10-12; wild rye - 7-10; awnless brome grass - 12-14.
Seeding depth, cm	alfalfa, wild rye, brome grass, wheatgrass – 2-3 cm, sainfoin – 4-5 cm.
Sowing method	Solid row sowing with 15 cm row spacing after seed rolling. Wild rye can be sown with 30-45 cm row spacing.
Sowing dates	spring, with the first opportunity to begin field work.

4. Mountainous zone of fruit growing, potato growing and meat and dairy cattle breeding

Table 4 – Recommended activities for superficial improvement

Additional sowing seeds	Additional sowing should be done with a disc seeder, ensuring the seeds are embedded into the soil.
Recommended crop improvers	Alfalfa, sainfoin, awnless brome grass, clover, and mixtures thereof. For pastures, it's best to use two- or three-component mixtures.
Sowing rates (clean sowing), kg/ha	alfalfa - 8; sainfoin - 50; awnless brome grass - 17-21; clover - 10 pure seeding, kg/ha. When additional sowing grasses in mixtures, the seeding rate of each crop is reduced by half of the norm
Seeding depth, cm	alfalfa, brome grass, clover - 1.5-2.0, sainfoin - 4-5
Sowing method	continuous row sowing with a row spacing of 15 cm
Sowing dates	spring

5. High mountain zone of alpine and subalpine meadows and pastures

In this pasture, no surface or root improvements are being carried out, as the grass stand is in good condition. The only possible method is mowing weeds and poisonous plants.

Calendar schedule for the use of pastures, establishing seasonal grazing routes and movement of farm animals in Almaty region*

No.	Name of the rural district	Time for driving farm animals to distant pastures	Time for the return drive from distant pastures
		from the first decade of June	until the first decade of September

*These dates may vary depending on the specific climatic conditions of the year.