



Administrations, herders, and experts. Crossing sources and scales to write a social history of overgrazing in Soviet Kazakhstan (1960–1980)

Isabelle Ohayon

► To cite this version:

Isabelle Ohayon. Administrations, herders, and experts. Crossing sources and scales to write a social history of overgrazing in Soviet Kazakhstan (1960–1980). *Environmental Humanities in Central Asia. Relations Between Extraction and Interdependence* Edited By Jeanne Féaux de la Croix, Beatrice Penati, 1, Routledge, pp.55-82, 2023, <10.4324/9781003362364-4>. <halshs-04215840>

HAL Id: halshs-04215840

<https://shs.hal.science/halshs-04215840v1>

Submitted on 23 Jan 2024

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



HAL Authorization

Administrations, herders, and experts: crossing sources and scales to write a social history of overgrazing in Soviet Kazakhstan (1960–1980)ⁱ

In *Environmental Humanities in Central Asia*, par Jeanne Féaux De La Croix et Beatrice Penati, 55-82, 1re éd. London: Routledge, 2023. <https://doi.org/10.4324/9781003362364-4>.

Isabelle Ohayon [0000-0002-6790-1247](#)

Abstract

This chapter utilises various sources on pasture degradation from Kazakhstan's archives, interviews, and contemporary publications, to write a history of pasture degradation that foregrounds the reactions and competing interests of various political, economic, and scholarly actors. Pasture degradation in Kazakhstan in the 1960s–1980s was one of the main environmental issues in Soviet Central Asia. As in Kyrgyzstan, starting from the mid-1960s, the effects of overgrazing became evident in sheep-breeding areas. Pasture usage intensified in Kazakhstan to maximise the productivity of livestock breeding. Despite the sedentarisation of the nomadic and semi-nomadic population during the collectivisation period, season-dependent pasture usage remained the main method of herding. Forage provisioning by sovhozes and kolkhozes accompanied this traditional method of livestock breeding. The overall number of livestock reached pre-collectivisation level by the late 1950s, but there remained a lack of pastures and forage resources. Most agricultural lands were used for wheat and technical cultures (cotton, tobacco, sugar beet). This situation led a return to the use of pastures in Central Kazakhstan abandoned since the 1930s, and to the intensified usage of summer and winter pastures located nearby. x

Throughout the second part of the twentieth century, the world's major pastoral areas underwent a promethean exploitation, which was promoted by Socialist states (USSR, Mongolia, and the People's Republic of China) and post-colonial development policies (*e.g.* in the Sahel Belt) alike. Everywhere, but with varying intensity, these endeavours brought on forms of settlement, the development of mixed farming, urbanisation, and the deterioration of ecosystems.ⁱⁱ In Central Asia, overgrazing or desertification affected a significant part of the steppe and semi-arid and arid lands.

Over the years, this region had been shaped by interactions typical of pastoral nomadism between humans, animals, and their milieus, but also by cautious and conservative water management, partly inspired by the technical culture of neighbouring oasis societies. The Soviet industrial and technological shift led to a more intensive and invasive form of exploitation. A history of Soviet high-productivity development cannot be confined to its “technical” dimension: it must rely on a variety of sources and the comparison of multifarious documents and actors. Because the Soviet State was the driving force behind transformations, one cannot do without sources emanating from it; these, however, tend to steer the reflection towards political and economic objects. The prolific nature of Soviet bureaucracies at all levels can narrow the field of investigation of the historian, whom the profusion of data might seduce or overwhelm. This chapter means to compare this plethora of documents with the voice of the parties involved in animal husbandry, thus addressing the perspective and experience of all social groups involved in pastoralism, from herders, animal-husbandry officers to scientific experts. Different genres of sources are thus used: written documents (archives and press articles) are cross-referenced with testimonies, photographic documents, audio-visual sources, and more. Besides offering counterpoints to administrative sources, this method presents a view of the history of overgrazing through different angles and at various levels – herders, communities of experts or ministries. Importantly, it allows us to grasp the role of each actor in the “objectivation” (in a Durkheimian sense) of overgrazing as a social, economic, and environmental issue, and the leeway these actors enjoyed in the face of the Soviet central planning steamroller.

Indeed, these distinct outlooks enable us to examine the emergence of a potential environmental awareness among those directly dealing with the consequences of pastureland deterioration. The intent

is thus to discern the development of a consciousness that goes beyond the acknowledgement of contingent problems, puts the perceived phenomena into perspective, and seeks to interrogate and decipher their causes, while formulating a reflection on future possible transformations. This potential “ecologisation” might have emerged in two ways, which will be discussed in the following: the advent – or the absence – of an “environmentalism of the poor,”ⁱⁱⁱ understood as a form of grassroots activism initiated by the direct victims of ecological catastrophe, or the mobilisation of an “epistemic community” able to promote decisions towards environmental protection. In this sense, did areas affected by pastoralism and its evolution also experience the shift towards environmental concerns that marked the USSR from the 1960s to the 1970s, as first noted by Douglas Weiner?^{iv} How did different actors react to pasture depletion and degradation?

To answer these questions, this chapter reconstructs the process that led to pastureland degradation, and examines the way political apparatuses, economic decision-makers, and herders found themselves trapped in production models that dramatically shaped their perceptions of environmental problems themselves. Finally, we turn to the role played by scientists and their capacity to alert and push forward change in opinions within the community. To address these points, as hinted above, this study uses “classic” archival documents from the agricultural administrations, the Communist Party of the Soviet Socialist Republic (SSR) of Kazakhstan, and the whole executive chain of command. These are complemented by scientific documentation, as a reflection of the position of a professional group, and scientific literature and material for the media made to popularise science. Finally, sources include a corpus of testimonies built from semi-structured interviews with 31 people in various regions of Kazakhstan, resulting from oral history field research conducted between July 2016 and August 2017. The interviewees were chosen because of their direct or indirect proximity to herding or rural life in the 1960s–1980s. These interviews touched upon the conditions of animal husbandry, personal farming, and social and political relationships in the kolkhozes.^v

<COMP: Place Table 2.1 Here>

The increase of pastoral pressure on a shrunken territory

A famine triggered by the 1930s collectivisation caused a massive settlement of the Kazakh population and a deep crisis of pastoralism. One of the key measures in Stalin's first five-year plan was a spate of forced livestock requisitions from nomadic herders to supply cities and industrial construction sites, while harvests and grain reserves were seized from farmers. These measures resulted in a food and sanitary crisis that pushed famished and dispossessed Kazakhs to leave their homesteads and take the road.^{vi} In 1933, a third of the Kazakh population perished from epidemics and hunger, and almost 500,000 permanently fled the Republic's territory.^{vii} The remaining livestock (20% of the stock available in 1928) was barely sufficient to ensure self-sustainability in the new kolkhozes to which the survivors from the famine had been assigned.^{viii} Due to reduced numbers, it became harder to lead the livestock towards more distant grazing pastures.

However, the Soviet authorities did not forgo the idea of harnessing the strong economic potential of pastoralism as an optimal production and exploitation method for arid environments. Therefore, they subsequently championed a policy of livestock acquisition and promoted sedentary pastoralism, thus professionalising pastoral mobility: individuals tasked with herd-keeping on pastureland were authorised to move around, while the rest of society was assigned to activities within the confines of the collective farms.^{ix} This theoretical model, which abolished nomadism as a lifestyle involving society as a whole, was gradually implemented and came to its desired end. In the 1960s, as in other societies of herders in the USSR, there were only a few remaining households living a nomadic life,^x and mobile pastoralism had become an almost exclusively masculine activity.^{xi} In the majority of cases, relatives (*rodstvenniki*) of herdsmen only joined them on the summer pasture (*jailau*) during the school holidays. Two factors reduced the perimeter of transhumance towards summer pastures: first, until the end of the 1950s, before the livestock recovered pre-collectivisation levels, the need for pastureland was less pressing and pastoral mobility was therefore distributed over smaller territories, often close to the villages (*auyl*). Second, cattle feed included a greater share of cultivated forage, as part of a wider agricultural development strategy devised to transform pastoralism in Soviet Central Asia.^{xii} Furthermore, collectivisation promoted the development of cereal crops and emphasised the reclamation of arable lands, thus encroaching on grazing land. This phenomenon was accentuated by

Khrushchëv's 1954 gigantic Virgin Lands campaign, which harnesses lands in the steppe areas with greatest rainfall (Aktyubinsk *oblast'*, Akmola, north Kazakhstan, and Karaganda).^{xiii}

Despite its original surface of 1.79 million km², not only did grazing land shrink, but its quality declined, too, because land earmarked for cereal farming was the richest in water resources. Water is a decisive factor for animal grazing and for the geography of pastoral movements. The availability of pastoral territory in Kazakhstan was thus quantitatively and qualitatively reduced, in line with a long-term process that had begun under the Tsars.^{xiv} Moreover, right after the war, farms experienced organisational problems regarding pastoral mobility and the definition and distribution of pastureland.^{xv} Pastoral pressure started to increase due to the steadily growing size of herds, while the kolkhoz land acreage failed to adapt rapidly to these changes. The plots assigned were overgrazed and herders strove to expand transhumance territories by negotiating with neighbouring farms or by using known pastures and confront the authorities with the *fait accompli*.

<COMP: Place Table 2.2 Here>

In 1961, this situation led Kazakhstani authorities to revise pastureland allotment in order to redistribute grazing resources. In 1964, before Khrushchev's departure, the creation of 155 sovkhoses (State farms) specialised in sheep-breeding, boasting 50,000–60,000 head of cattle each, and responsible for producing wool and meat, represented a momentous turn and a prelude to things to come.^{xvi} As part of an all-Union reform that embodied Khrushchëv's ambitious agricultural policy, existing kolkhozes (collective farms) were merged to generate *ex nihilo* bigger farms; meanwhile, the status of salaried sovkhos workers was boosted over that of kolkhoz members, whose pay depended on production results. In Kazakhstan, this process gave precedence to sheep-rearing, which had already become the preferred form of animal husbandry after sedentarisation and was viewed as the most "rational" choice, considering the country's agro-climatic conditions. Sheep were thought to have the highest output compared to the other species traditionally bred by nomads (goats, horses, and camels). The new sheep-rearing sovkhoses were built in semi-arid and arid regions on "unexploited and unallocated" lands from the State's public real estate, for a total surface of 133 million hectares.^{xvii}

The goal was to increase the size of the Republic's livestock by 42%, reaching 50 million sheep. Two decrees in 1964 and 1979 bolstered this policy through investments in wages and infrastructure (new villages, irrigation, road building, rural electrification, *etc.*).^{xviii} While they did not attain the desired outcome – the size of sheep livestock never reached the expected 50 million and its growth plateaued in the mid-1970s^{xix} – all these measures markedly affected the culture of pastoral husbandry and pastureland ecology.

Indeed, this shift was carried out according to a dual push towards extensive pastoralism, with the conquest of new grazing lands, and for intensification, with the development of forage and greater concentration of animals in State farms.

The conquest of new Virgin Lands?

The pastures that the authorities of the Kazakh SSR planned to conquer as new “Virgin Lands” could only be exploitable if they had enough water resources to cover the livestock's needs. As in the Sahel Belt in the 1950s, the Soviet State implemented a “pastoral hydraulic scheme.” Relying on water as a key factor for development, this policy aimed at multiplying water access points and modernising watering techniques in order to expand and intensify cattle-breeding.^{xx}

In Kazakhstan, pastoral irrigation was also promoted. The agricultural department of the central committee of the Kazakh Communist Party devised a specific plan of “water supply” (*obvodnenie*) to pastureland that aimed at both enabling cattle-watering and, to a smaller extent, land-spraying, supposedly to increase the plant-cover yield. Based on a hydrological assessment, the department set out to identify potentially exploitable areas. Twenty-three of them were identified across arid and semi-arid regions, for a total of 102 million hectares, *i.e.* 57% of the available grasslands, to feed a hypothetical 74 million head of livestock, all species combined.^{xxi} Each of these selected zones was studied for the productivity of its plant cover relative to its carrying capacity, *i.e.* the amount of animals that could be led to graze on it. The highest stake, however, was placed on the analysis of water resources and how they could be exploited. For instance, in the sand desert of Naryn-kum

(located east of the Volga and almost extending to the edge of the Ural River), with less than 200 mm of rain per year^{xxii} and few endorheic streams, the project aimed at developing 3.3 million hectares to breed 1.2 million head of livestock. It identified the average flow from three types of water resources: first, potable groundwaters accessible at a depth of 3–10 metres on coarse and medium sand areas of the northern part of the desert; second, brackish subterranean waters of potable quality for animals at a depth of 5–18 metres; and third, artesian non-potable water at a depth of 500–800 metres. The project's conclusion encouraged the construction of ordinary wells in the western part of the area; elsewhere, it proposed canals supplied through water collectors and pipes, and the use of natural and artificial lakes. The development costs just for the Naryn-kum were estimated at several hundred million rubles in ten-year increments – a considerable amount at the time.^{xxiii} In terms of investment-planning and technical processes, this was a typical example of the 23 projects of water supply. At republican scale, various hydraulic techniques provided an array of options, ranging from artesian wells, pumping stations, the collection of river water, motorised boreholes – even water holes drawn by animals (camels), which the State did not advertise.^{xxiv} In the subsequent 25 years, these developments were projected to triple the volume of sheep and goats and substantially increase the size of herds of other species (cattle, camels).^{xxv}

The new aspiration to conquer grazing land in the arid territories to consolidate the “forage base” (*i.e.* the total forage reserves, including natural or tame hay and natural pastureland) was part of a larger Soviet process. Overall, Kazakhstan played an important role in large-scale flagship development projects spurred by Soviet gigantism.^{xxvi} The republic was directly concerned by the “project of the century” – ultimately never completed – which consisted in diverting water from Siberian rivers southwards to supply the dried-out Aral Sea.^{xxvii} The country welcomed three major hydraulic engineering projects, including the Irtysh-Karaganda Canal, which steered the Irtysh River upstream.^{xxviii} Unsurprisingly, this *Zeitgeist* extended to the pastoral world: Kazakhstan was already the third largest grain producer in the USSR and needed to keep its rank as second mutton and wool producer.^{xxix} The rhetoric of conquest spread to Kazakh technocratic discourse, all the way to progressive herders. The ambition to intensify farming and acquire mastery over new territories was

amplified by the 1964 sovkhos reform mentioned above. “Being a *chaban* is a honourable trade; while tractor drivers plough virgin lands, we, the herders, set off to conquer arid and semi-arid lands,” said one of the chief shepherds of a Karatal sheep-breeding sovkhos in 1964 on the occasion of a gathering of the Communist Party organisations in the Alma-Ata *oblast*.^{xxx} Or, as a young herder put it in 1966: “In fact, really, sheep rearing was like a second Virgin Lands campaign [*vtoraia tselina*].”^{xxx}

The map of developed pastureland shows that many of these works never came to fruition, though.^{xxxii} This is the case for the venture in the Naryn-Kum Desert evoked earlier. In 1980, only 10 million hectares of grazing lands (often arid and with sandy soil) were supplied with water in the whole of Kazakhstan, *i.e.* only one-tenth of initial plans. Still, the “water supply” scheme triggered massive investments, large-scale projects, and the strong commitment of the administrative bodies in charge of water management (the Ministry of Water and its subsidiaries) and all levels of government. The mechanisation of pasture water supplies required numerous technical interventions and the resolution of technical challenges. A notable share of the equipment was poorly maintained, so that farms had to bring water to the grazing lands by tanker trucks or tractors.^{xxxiii} For instance, according to a May 1967 report from the People’s Committee overseeing the Dzhambul region, an audit of the pastures used by the Merke district farms in the Moiynkum Desert revealed that only 108,000 hectares out of 274,000 were equipped with wells, with more than half of these at a standstill. Thus, each well was servicing on average 8,000–12,000 animals in extremely unsatisfactory conditions. Meanwhile, many tanker trucks stood idle, awaiting repairs.^{xxxiv} In the few cases where “water supply” worked, the largely intensive feeding of livestock led to an overexploitation of their fragile soil.^{xxxv}

The 1970s marked the advent of other localised measures to fence off and irrigate pasture lands. These developments targeted the sovkhoses in the driest areas, where cultivated pastures were sown under selected forage species to secure feeding for livestock kept close to the farms, as the animals were too young or too weak to be taken to further-removed grazing lands. The Kzyl-Orda or Taldy-Kurgan regions were the most active in devising fenced pastures because they were both irrigated by rivers (the Syr-Darya and Ili, respectively), which could provide the necessary water supplies.^{xxxvi}

Spurred by the central committee of the Kazakh Communist Party and council of ministers, and overseen by the regional agencies tasked with water and agriculture, these works were conducted in the same manner as for the new irrigation to grow cotton and rice in the Syr-Darya watershed. For instance, in the Kzyl-Orda region, the upstream linearisation of the Syr-Darya, achieved by rectifying its meanders, resulted in increased acreage for technical crops (cotton, corn, tobacco, sugar beet), but also in 75,000 hectares of irrigated pastures^{xxxvii}: both developments were instrumental in drying out the Aral Sea and damaging the local environment. Soil erosion and depletion resulting from the development of pastureland was denounced as early as the 1970s,^{xxxviii} very soon after the lands had been put under cultivation and used as pastures. Regional authorities complained about grass salinisation and the appearance of marshlands due to inadequate drainage. But rather than learning from this lesson, the same authorities requested that the spring flood discharge from the endorheic waters of the Sarysu River be diverted from the neighbouring Karaganda into the Chiili district, to allow irrigation and increase plant cover there.^{xxxix} Failure to grasp the situation was widespread: at the beginning of the 1980s, measures to expand pastureland productivity kept multiplying nationwide. Pesticides and herbicides were increasingly employed to destroy weeds and replace them with edible species.^{xl} In 1983, the Kazakhstan Institute for Land Planning (Kazgiprozem), in charge of registering land assets and managing land use, laid out a programme aimed at increasing the total irrigated surface by 48%, the surface of pastures enhanced by fertilisation and sowing by 69%, and the surface of irrigated grazing land by a whopping 180%!^{xli}

People and apparatuses facing tight forage resource management

These projects and measures to increase sheep meat and wool production and the tide of Soviet planning created a sense of urgency among those involved in the breeding industry, all the more so that bolstering pasture forage and grazing land surface represented an additional and pressing challenge to animal-feeding. Increasing forage productivity called for further irrigation investments, due to the difficulties experienced in exploiting the pastures available. Their natural yield ranged

between 0.5 and 3.5 quintal/ha: too low to meet the needs of mobile livestock.^{xlii} Moreover, on degraded pasturelands, the application of these yield-enhancement techniques turned out to be expensive, burdensome, and unsustainable, judging from the environmental damages they caused in some places (*e.g.* desertification, weed outgrowth).

The emphasis placed on producing forage had its roots in the hardships experienced every winter by farms and breeders, and thus by all the administrative branches of the executive and the Communist Party. A systematic shortage in hay affected animals in stables and sheepfolds, as well as grazing livestock. As early as the end of the 1950s, it had become customary to carry over additional forage to grazing lands, if the need arose (see Figure 2.1). In continental steppe ecosystems, storms and heavy snows followed by freezing temperatures contributed significantly to annual livestock losses and were therefore considered an intolerable hindrance to the rational model of Soviet pastoralism. They imperilled planned developments and raised the spectre of *dzhut*, which the authorities had been fending off since the late 1920s. Executive bodies had been obsessing over *dzhut*,^{xliii} and so had all ranks of the agricultural administrations. According to surveys from the nineteenth and early twentieth centuries, *dzhut* spells typically struck every 3–4 years in the Kazakh steppes; the most severe ones, which led to high livestock mortality rates, occurred every 10–12 years. It would then take a decade for the herd to return to its previous size, so that *dzhut* was one of the main factors underpinning extreme variations in animal population.^{xliv} This remained a genuine concern for the Soviet authorities in the second half of the twentieth century, in spite of the pastoral “modernisation.” Since the word “*dzhut*” had been banned from the agronomic and administrative vocabulary, this phenomenon was then called “massive losses of livestock.” There remained that, between November and March, sovkhoses and kolkhozes worked to counteract weather vagaries and their consequences. This resulted in long- and short-term strategies of stockpiling and supplying forage.

Farms and their hierarchies had to deal with such phenomena, experienced as emergencies every winter. For instance, during the winter of 1963–1964, in the Kzyl-Orda area, hurricanes, snow storms, gusts of wind, and sudden temperature drops produced ice sheets 40–90 cm deep, which drove many farms to bring their sheep and horses back from remote pastures and into stables and sheepfolds.^{xlv}

The available forage, though, could only cover ten days of feeding, which led the authorities to take 1,500 tonnes from the neighbouring region of Dzhambul and request forage from state reserves for an additional 1,000 tonnes.^{xlvi} As for the 60% of sheep, horse, and camel herds that remained on the winter pastures with their herders, the local authorities requested forage and warm clothing.^{xlvii} When the same winter came to an end, the three southern regions of Kzyl-Orda, Shymkent, and Dzhambul had lost 54,000 head of small stock, double the previous year.^{xlviii} Edige, a herder in Kyzylkum, gave a similar account of the 1961–1962 winter, when *kokhozes* resorted to emergency forage to counter the bad weather conditions. The death tally then was between 200 and 300 animals per farm (5–10% of the herd).^{xlix} Masaty, daughter and daughter-in-law of a *sovkhoz* director, also reported:

Shepherds and horse herders were responsible for fulfilling their socialist obligations in terms of livestock growth and meat output. When there was a *dzhut*, they could go to prison if their herd suffered heavy losses. As a horse herder friend of mine once told me there was a year when it kept alternating between cold and mild. The snow would melt and then it would snow again, which made water turn to ice. The horses couldn't break the ice to get to the grass and graze. They died because of it. One morning, he found 500 horses kneeling on the ice. Afterwards, they were all dead.

According to the interviewee, this would often occur in the year of the monkey (according to the Asian calendar).¹ Even D. Kunaev, First Secretary of the Communist Party of the Kazakh republic, declared in December 1969 that district and *oblast*' organisations could not cope with recurring livestock losses and were covering them up by recording the shortfalls as local consumption figures.^{li} This did not necessarily mean that *kolkhoz* members were over-consuming meat: it is instead revealing of how administrative bodies, who found it impossible to question the principles of economic planning and to account for risk (especially weather-related), feared to admit that pastoral production was highly volatile.

Like a sword of Damocles hanging over their heads, the perspective of *dzhut* informed practices in a context of tight management of the resources available. Every year, nationwide, planned agriculture

imposed on farms to increase forage growing and harvesting, and provide detailed monthly inventories of their yields and of their stock. In 1965, in the Dzhambul *oblast'*, the preparations for winter were set to gather about 1.5 million tons of forage.^{lii} This required the exploitation of all sorts of lands and plants potentially usable. Indeed, on irrigated fields, rain-fed plots, natural meadows, lands located on the bed of the Chu or the Talas, in the mountains, and in the non-sandy zone of the Moynkum steppe, hay was mown not once, but twice or thrice. Marginal forage species (*e.g.* reeds) or residuals from technical cultures (corn, sugar beet), vegetable plants, and even straw were used to bolster forage reserves.^{liii} Finally, a Party committee in the Dzhambul *oblast'* had parks, public gardens, dacha gardens, and all of the region's road banks mowed; they even authorised cutting down vegetation from the Aksu Zhabagly protected natural park. This endeavour resulted in a total 9,000 tonnes of hay^{liv} – a modest amount if compared to the slated 1.5 million tons, but telling of the pressure farms experienced during the cold season. Every winter through the 1960s and 1970s, figures from kolkhozes and sovkhozes reflected an expected forage shortage of 15%.^{lv} This was partially compensated for by an equalisation mechanism across all the regions of the Soviet republic. Nasyr, a chief shepherd in the Kazalinsk region, remembered that hay supplies set aside for winter were frequently insufficient, which led to the death of many animals. Problems with forage deliveries, that he described as “fake promises” from the sovkhoz, were gradually resolved by the end of the 1970s.^{lvi} Nurpaiyz, a horse herder, reminisced about the *dzhut* of 1971–1972, when the Aktyubinsk and Kokchetav regions supplied the Kazalinsk district with hay to feed the animals.^{lvii} Zhenis, a veterinary doctor and party member, also evoked the hunger of the animals on the grazing lands:

In the 1970s, there were spells of drought, during the winter, we had to break the frozen crust [*korka ledianaia*] that had formed on pasturelands. Sometimes it snowed, sometimes it rained. As soon as the sheep heard the tractor, they would run to get grass and eat. This was in 1971 and 1973.^{lviii}

<COMP: Place Figure 2.1 Here>

New techniques and feedstuff quality standards also explain this rush to produce forage. The 1970s witnessed developments in fodder plants silage techniques and the use of additives or forage substitutes, especially in the larger sovkhozes where production was truly industrialised. The process of ensiling (*i.e.* the fermentation of forage to preserve it in silos as a wet product) marked a new phase of agricultural industrialisation in Europe, the USSR, and the United States. Buttressed by public policies, this practice became widespread among the largest farms, where it involved the addition of urea.^{lix} The mass production of vegetal meals made of hay and cereal residues, also kept in silos, was accompanied by the introduction of animal meals based on fish not suitable for human consumption.^{lx} Meals were combined with proteins, vitamins, and mineral supplements and were so popular that herders frequently requested phosphate additives to prevent diseases.^{lxi} Overall, this policy led to a steep increase in the share of cultivated fodder plants in the livestock feed. In 1970, about half the supplementary forage was produced from natural pastures. In 1980, 60% was coming from artificial pastures.^{lxii} However, the share of forage in the overall diet of Kazakhstani livestock and the evolution of the forage/pasture ratio remain difficult to quantify.

Herders ensnared between paternalism and productivity-based management

To understand the specific position of herders in the face of increasing pressure towards forage production and pasture overgrazing, one must examine their labour culture and the conditions in which they exercised their craft. First, their input was very seldom taken into account in economic, agronomic, and breeding decision-making. They were not consulted on plan delivery, the estimation and allocation of the “forage base,” or animal selection. Yet, at the end of the day, they were held accountable for the annual livestock yield,^{lxiii} be it at the kolkhoz, sovkhoz, or district level. There were two types of herders in the organigram of breeding farms: the chief shepherds (*starshii chaban*), who were largely accountable, and the assistant herders (*pomchaban*). Herdsmen were also hierarchised depending on the type of animals they handled: sheep, yearling calves, ewes, *etc.* These positions came attached to different migration timings and quality in pastures, varying levels of

comfort, and specific symbolic significance.^{lxiv} Each chief shepherd was responsible for a flock (*otar*) of about 700–800 animals (sometimes up to 1,200), and was assisted by one or two assistant herders. Together, they were responsible for grazing and herding, daily care, and lambing, and were held accountable for shearing outputs. These last two assignments were at the core of their production goals. The breeders' work was compensated primarily according to the birth rate, but also the quality of the wool produced each year and, to a lesser extent, the live weight of each animal.

Productivity was stimulated through a complex blend of measures that combined allowances and management techniques. Several incentives made the position of *chabany* attractive: they benefitted from financial and in-kind premiums, accompanied by an array of symbolic rewards (medals, decorations). The latter were heavily advertised in the regional and national press, where production records were posted, honouring the best farms and workers. Herders who reached the top of the honours hierarchy could, as other USSR model workers, be celebrated as heroes of Socialist labour. Brezhnev's regime was particularly keen on this incentive and generously dispensed medals and other decorations, rewarding hard agricultural work. For instance, in the USSR, breeders were specifically targeted in 1973: one out of 50 employees in the agricultural sector workers received an award, but awardees were concentrated in Siberia and Kazakhstan – two large livestock-breeding regions.^{lxv} On the local level, advertising success had considerable impact on the life of the kolkhoz or the sovkhov and, for the individual, the highest awards could lead to getting elected Party or *oblast'* representative.^{lxvi} To this day, reminiscing on these events evokes feelings of pride. In Karkaralinsk, a 66-year-old woman said enthusiastically about the sovkhov's best herder that

[h]e was spearheading production [*on peredovik proizvodstva*]. He was decorated. He was sent to the VDNKh in Moscow, he was elected representative, and then decorated with the Order of Lenin, of the Red Labour Banner. He also received honours from the trade union [*po linii profsoiuza*].^{lxvii}

In the village of Furmanovka (now Moiynkum in the Dzhambul *oblast'*), a museum, still active nowadays, was created to honour Zhazylbek Kuanyshbaev, a herder who was hailed a hero of Socialist

labour on two occasions. There, one can also see the shearing or milking records and achievements of other herders.^{lxviii} Each year, the “festival of herders” (*chaban toy* in Kazakh), corresponding to the “day of agricultural workers” (*den' rabotnikov sel'skogo khoziaistva*) in the all-Union Soviet ritual calendar, was the occasion to gather all the workers from the sovkhoses of the area and confer honours and potential gifts. In the words of one such winner:

Oh - *chaban toi*, that was a big party! There were thirteen sovkhoses, all gathered together. The top *chaban* were given a bonus [*premiia*]. They got money, new yurts. One year, I got a yurt made of 6 *kanat* [a component of the yurt's truss]. A white yurt with a wooden floor. And a gold watch. And also a rug: there was a shortage of those [*defitsit byl*]. Everybody came, there was music. [And] a banner: ‘Top Shepherd, champion! [*Peredovoi, champion*],’^{lxix}

Access to rare consumer goods was a key contributing factor to the comfortable way of life of herders, but also to their respectability. The *avtolavka* – a truck that came to the pastures with supplies of various items and services – is remembered as embodying privilege and a certain affluence:

Artists would also go visit the herders where they were stationed [*na chabanskii točki*]. We used to call it the “agit-prop train” [*agit-poezd*]. In the propaganda team, they had a doctor, a tailor, household services, a hairdresser, a librarian with newspapers and magazines and a convenience store. An entire crowd came to the dwellings, where, for instance, there would only be two families. These people gladly came to where herders were staying since, if they [the herders] didn't want of the hard-to-find goods, these could be purchased. A group would come, in the little 2-bedroom lodging, and it would be a whole pandemonium [*tselyi kontsert*]: some had their hair cut, other their measurements taken in the tailor workshop, some were selling goods. The travelling shop brought imported shoes from the Czech Republic, Poland or Germany [*germanskii*], vodka, gherkins, fruit spread [*povidlo*], and jams from Moscow, Azerbaijan or Ukraine. The herder

would slaughter a sheep and, after dusk, there would be a concert. On the following day, we would go to another herder. All this was done for two-three *chabany* in the area.^{lxx}

This service replaced *de facto* an institution invented in the 1920s, the “red yurt,” supposedly to provide ideological support (through the press and literature on political education) and medical assistance to breeders in transhumance.^{lxxi} Primarily devised for the *zimovki* [winter pastures], the *avtolavka* did reach the farther transhumance spots (*otgonnye točki*), but it took some time for this initiative to be effectively implemented throughout the country. In 1965, dysfunctions, especially in the access to health services and culture, were publicly criticised in a *Pravda* article signed by “Kazakhstan’s finest herders” (*peredovye zhivotnovody Kazakhstana*).^{lxxii} However, for the 1970s and 1980s, our interviews reflect the unanimous appreciation of *avtolavka* services and the impatience that preceded their arrival:

The *chabany* could not miss it. They saw the *Avtolavka* coming from afar from the hill and said: “oh, the *Avtolavka* is coming!” (*Oi, avtolavka keledi!*; in Kazakh in the original). It came once a week at the request of the RaiPO [district supplier] to each herder dwelling [*chabanskije točki*]. It was the *avtolavka*’s task to do the rounds among all herdsmen and provide them with hard-to-find goods [*razvesti defitsit*]. It did not come from the sovkhov, but from the RaiPO and God forbid a *chaban* should complain that it hadn’t come for a while. The Raikom [district’s executive committee] would get wind of it! The *chabany* knew their rights.^{lxxiii}

All the respondents stressed the *avtolavka* services that strove to answer to the herders’ needs:

Sometimes, people would call the *raikom* if a *chaban* had something to complain about. There was a case when a *chaban* who was 200–300 km away said that the “Krona” batteries from his portable radio were wearing out. It was an emergency [*ChP, chrezvychajnoe proisshestvie*]. They chartered an *avtolavka*. He just said his batteries would run out soon. If a shepherd’s hair had grown, the domestic service provider [*bytkombinat*] was called. If the *bytkombinat* hairdresser did not go, he could get fired. [...] Then herders got their own

bytkombinat: they got from the *chabany* [their] children's measurements it was them who sew their clothes. [...] Herders placed orders through animal-husbandry technician [*zootekhnik*]. The sector technician had to do rounds and check if anything was missing, food, forage. Then the *avtolavka* came to each dwelling every month.^{lxxiv}

<COMP: Place Figure 2.2 Here>

True or not, these representations highlight, if not the specific nature of the status of herder, the performative impact of the “cult of the herder.” The advent of this genuine “cult,” described by Svetlana Jacquesson for neighbouring Kyrgyzstan,^{lxxv} can also be found in Kazakhstan and in most of the pastoral areas of the USSR (*e.g.* Buryatia, Tuva. The respondents – Roza, Sandybai, and Masaty – internalised the values promoted by the State's narratives. The *chaban*'s remunerations, whether monetary or in kind, were perceived as high-ranking in the rural income-based hierarchy. Private flocks, obtained especially as standard annual payments and ranging approximately between 50 and 150 heads, held a special place in the family budget. Not only were they considered a form of wealth that could be directly commandeered for private consumption: they did also constitute a fundamental variable to adjust the kolkhoz or the sovkhoz statistics. Herders used these animals to make up for shortages or inflate their results,^{lxxvi} and thus get rewards or earn rights to scarce goods (cars, refrigerators, *etc.*):

There was money – it was the goods that weren't there. That's why it was so complicated to incentivise [*zainteresovat*] only with money. Those who delivered high volumes were even given cars, a *Moskvich*, a *Zhiguli*, or an *Ural* motorcycle. Combine-harvester drivers, herders, machinists and mechanical engineers, each got gifts in turn.^{lxxvii}

Herders were thus at the top of the hierarchy of agricultural labourers and were rewarded in the same way as their technical counterparts. The Party committee on the kolkhoz or sovkhoz levels had agency in these incentives and used these tools to stimulate the work of livestock breeders and meet the plan's objectives.

The other side of a herder's existence was made of rough living conditions and work pressure. By dint of the latter, herders were affected by changes in feeding conditions, and therefore by the nature and quality of pastures. These conditions directly impacted the health of their livestock (private or collective) and their wages. A flock might produce at least 110 lambs and 100 ewes, but when the plan's lambing targets were not met, breeders, as we previously mentioned, had to compensate by using animals from their own private flocks.^{lxxviii} For instance, a 90-year-old former herder explained that in 1979, due to hay shortages, they suffered heavy losses. He lost 12 head of livestock and replaced them with his own animals. He remembered how fiercely he argued with his wife about this decision. As he feared, the sovkhos might launch an enquiry and punish him.^{lxxix} If this strategy was often willingly adopted, the sovkhos could also sometimes forcefully seize private livestock and even impose deductions on salaries.^{lxxx} This is what a 1969 complaint recorded: several herders protested against their sovkhos managers, accusing them of abusing their position and seizing 24 animals without their owners' consent.^{lxxxi} Indeed, shepherds were regularly auditioned by local political leaders, especially the *partorg* (representative of the Party's local branch) and *oblast'* personnel.^{lxxxii} Similar procedures existed in all of Central Asia's pastoral areas, as can be seen in the picture below, from Kyrgyzstan (Figure 2.3).

<COMP: Place Figure 2.3 Here>

The combination of private and collective flocks was complicated by many factors, including the regulation of land use. In many cases, privately owned animals grazed with the collective flock, following mutual arrangements between herders. Putting these animals together left room for manipulations on both types of flocks. For instance, when an animal was sick, it could either be recorded as a loss for the kolkhoz or not, depending on whether the herder was more inclined to give preference to collective output or his personal gains. Sometimes, though, private small flocks were sent to graze with privately owned cows, on meadows close to the villages, and could visibly be distinguished from the kolkhoz's livestock. As for the choice of pastureland, as we previously mentioned, except for the afterwar period, the task of mapping the seasonal pastoral migrations fell to centralised bodies ranking above State farms and districts, particularly because it was contingent on

the engineering works that would provide grazing lands with water supplies and chemical treatments. As Masaty reported:

Chabany didn't get to decide themselves where to go with their flocks (*otar*). Because they had geneticists and breeders working in and for the sovkhoses. They could set aside a very good meadow for a difficult period of the year so that the grass could grow properly. Pastures were also sprayed by An-2 planes to fend off grasshoppers and weeds, there again the idea was to get better grass. That's why the decisions as to where the livestock would be taken to graze came from the top.^{lxxxiii}

Caught in these hierarchical constraints, herders were inevitably the first to face the deterioration of the plant cover. As very classically noted in the Sahel Belt, they observed the decay of pastures close to water points that were overgrazed and trampled on by cattle and sheep, and of the green lands along the transhumance routes towards large seasonal pasturelands. They did inform their kolkhoz or sovkhos managers and animal-husbandry officers of the state of the pastures,^{lxxxiv} but were not authorised to stray from their assigned area. They were therefore acutely aware that they were letting their animals feed on overgrazed lands, but they were predominantly passive towards this problem. This circumstance raises the question of the degree of latitude and agency at their disposal.

Interviews with herders and other parties involved in rearing very strikingly show some casual awareness of the deterioration of grazing lands and, in a vast majority of cases, mere indifference to it. From the respondents' silence or their inability to understand what was at stake, it transpires that this issue was underconceptualised in the sovkhos and kolkhoz economy. It was neither recognised, nor thought out as a "generalized" problem, whether at farm or national level. Therefore, in the discourse on the state of the pasture lands, there is no sign of increasing awareness. Ecologist Sarah Robinson, though, made some interesting findings in her field research on farms located in the Moiynkum Desert of southern Kazakhstan. For instance, herders from the Zhenis sovkhos, created in 1960, showed no sign of opposition when pastures previously used sporadically as grazing land during the seasonal migrations were reclassified as principal pastures, where animals were to feed in spring, summer, and

autumn.^{lxxxv} This intensification of pastoral use, by cutting short the time required to allow the plant cover to grow back and thus stripping the pastures of their quality, was the result of an increase in livestock. A lack of expertise, due to the rupture in the transmission of pastoral knowledge that took place in the 1930s, could partly explain why herders did not protest, although this is not directly mentioned by respondents.^{lxxxvi} Another reason resides in the primacy of executive committees in the prospection of new grazing zones. This primacy was enforced very early on, after pastoralism was reinstated in the 1940s.^{lxxxvii} In the Moiynkum region studied by Robinson, when the plant cover was too damaged close to the water points, herders said that they would unilaterally decide to extend the grazing perimeter beyond the allowed 3 km.^{lxxxviii} This self-attributed modicum of freedom did not constitute a challenge to the general grazing organisation, which remained widely accepted due to their respect of the hierarchy. Some interviews show that herder discontent mostly focused on pressure to increase the livestock. Yet, such pressure was resented because it entailed breeding more animals with the same grass and water resources, not because it led to overgrazing. Eventually, herders only showed concern for environmental damage when they worried that the watering points assigned to each pasture would not cover their livestock's needs.^{lxxxix}

The fear of drought transpires from the practice of an ancient propitiatory rite that consisted in praying and slitting the throat of an animal over flowing water (a river, or spring water), so that blood would drip into the latter. This rain-propitiating rite (*Tasattyq* in Kazakh) has been performed in most of the country's regions (Kzyl-Orda, Chimkent, Dzhambul, Alma-Ata *oblast'*) from the 1960s to this day.^{xc} In the Soviet era, it was often recorded by the local services monitoring religious practices of the Plenipotentiary for the Council of Religious Affairs, for instance, in Turkestan,^{xcⁱ} Semipalatinsk,^{xcⁱⁱ} and the Virgin Lands.^{xcⁱⁱⁱ} It was also recorded in the oasis regions of Central Asia in the nineteenth and twentieth centuries, even if it bore a different name and form.^{xc^{iv}} For breeders as well as farmers, this pre-Islamic sacrifice, documented among various Turkic peoples,^{xc^v} was integrated into Muslim rites and accompanied by a prayer from the Qur'an in Arabic, sometimes recited by a mullah. In the 1960s and 1970s, the ceremony's officiants were neither accredited by the state services nor part of the few officially recognised mullahs. Depending on the social and religious contexts, performing the *Tassatyk*

was a social event where food and the animal itself were shared, either on the sacrificial grounds or at the home of the person who had commissioned the ceremony.^{xcvi} There were other propitiatory rites to fend off *dzhut*, but they are not attested in the second half of the twentieth century.^{xcvii} Therefore, this recourse to religious rites is revealing of the fear to face a dry season. More generally, such a symbolic and social investment into praying to avoid drought reflects some lack of confidence in technical and human devices; perhaps herders found solutions offered by farms and administrations in case low rains are inadequate. Even though they showed concern for their flock (in terms of productivity and animal welfare), herders had very little room to manoeuvre and resolve overgrazing problems. It is also likely that they were not fully aware of them.

Therefore, it seems that the model of “environmentalism of the poor,” reflecting activism from the lower levels and propelled by “poor” or “marginal” populations, is not applicable to the social configuration of pastoralism in Soviet Kazakhstan. Still, using it enables us to see the high level of integration of herders and breeders within Soviet society and the comfortable way of life they subsequently enjoyed. Embedded in social, political, ideological, material, and sanitary frameworks created by Soviet paternalism, breeders internalised the system’s ethos of intensive production because they had a vested interest in it. The large, sometimes gigantic, flocks from the sovkhozes, which at times reached 60,000 head of sheep, recalled images of the wealthy nomads and their abundant flocks of yore. This imaginary is reflected in many interviews, where prosperity was directly linked to abundant meat consumption; moreover, in an essentialist way, meat consumption was considered as a marker for herder societies since ancient times. Thus, actors involved in Soviet pastoralism benefitted indirectly from the wealth of State farms, the level of respectability pushed forward by the dominant discourse, and preferential access to goods. At the same time, the availability of good quantities of meat, allowed by this economic model, was satisfying the cultural and ritual needs of rural Kazakh society. Until the end of the Soviet era, families in rural areas enjoyed the luxury of being able to slaughter a lamb whenever they desired, while cities faced chronic meat shortages. Being a relative of an *auyl* resident allowed urban-dwellers to obtain meat from time to time.^{xcviii}

Experts: embedded actors or budding epistemic community?

While in the planned economy herders were at one end of the pastoralist chain of command, experts, in the broadest sense, intervened at different levels of the economic and political breeding process and held a decisive position. A nebulous aggregate of institutions, expert agencies, and research institutes devised the breeding policy framework. Spurred by the highest-level governing powers, these institutions operated under the aegis of the ministries of agriculture and water management and of the USSR and Kazakhstan Academies of Sciences. They were created to accompany the plan and propose alternatives to enhance breeding productivity. They held shared and specific competences, although their tasks often ended up overlapping because of continual changes. For experts, the most important issue was animal selection: they prioritised fat-tailed sheep, merinos, mixed breeds, and karakul sheep, who were raised for their lambskins. They also focused on the advancement of veterinary science (*e.g.* treatment for diseases, hormonal boosters to increase ewe fertility) and on the study of grazing lands and forage production. This collection of experts encompassed botanists, biologists, agronomists, veterinaries, animal-husbandry technicians, as well as economists. Research on the state of pasturelands was entrusted to two institutions: the Lenin All-Union Academy of Agricultural Sciences (VASKhNIL) and the “Forage and Pastures” Research and Production Institute of the Academy of Agricultural Sciences of Kazakhstan, created in 1949 and still active. These institutions provided their expertise not only to national agencies such as the Kazgiprozem, mentioned above, but also to regional and district organisations and sovkhozes, in accordance with the results of their field investigations. After the Second World War, when Kazakh pastoralism expanded, thanks to the evacuation of hundreds of thousands of animals from Moldavia and Ukraine in 1941–1942,^{xcix} agronomists and animal-husbandry technicians rolled out a new discourse about indigenous know-how. While in the 1920s and 1930s they had widely criticised vernacular skills in the name of modernity and rationalisation,^c agronomists started supporting a return to pastoral mobility based on “the study and use of the ancestral practices of former nomads”; such practices should be disseminated among “the best kolkhozes.”^{ci} They contended that the know-how of local herders was already orienting the recovery of pasture occupation. Yurts also acquired a new form of legitimacy in the eye of the

authorities and were introduced in the kolkhoz production plan. Here again, the idea was to use traditional know-how to produce the felt and wood beams required for the frame of the tent.^{cii}

Yet, the core of these scientists' research remained focused on livestock and pastures. Their objective was to supplement and, in the long run, replace traditional local knowledge. Little by little, as livestock numbers grew and the plan's goals evolved, their research became more complex and focused primarily on practical issues: winter breeding techniques, animal selection (based on the adaptability of each species or breed, their respective productivity, the fodder used, and the agro-climatic environment), water management, and, most important, the inventory of pastureland in order to identify under-grazed areas and periods of optimal use.^{ciii} As early as the 1960s, at the request of higher-ranking authorities (the republic's Communist Party and the ministry), but also local administrations and their sovkhozes,^{civ} these institutions focused on grazing land deterioration and potential solutions to the latter, so that seamless productivity could be preserved. These teams of botanists and agronomists ran studies based on methods similar to those used in the West. In both of these scientific traditions, researchers compared an ideal standard to the current state of affairs. In the USSR, the quality of the pastureland was evaluated according to two key indicators: the variety of species carried and the loss in productivity of the plant cover.

Numerous field studies were conducted in the regions most affected by overgrazing, such as the Moynkum area. Researchers realised that the blend of plant species increasingly included non-edible or even nefarious plants; biomass was also shrinking: grassland productivity decreased from 500 kg/ha to 100–200 kg/ha in the most severely hit regions of Karaganda and Kzyl-Orda.^{cv} They came up with various solutions: for instance, following a scientific expedition and some sampling at the request of the Tattyn sovkhoz in the Merke district of the Dzhambul region,^{cvi} scientists from the Forage and Pasture Institute suggested to treat the plots overtaken by weeds with herbicides or, for the areas that were the most damaged (close to wells, sheepfolds, and pens) to harrow and sow new plants following a specific calendar. At the same time, they reviewed the pasture rotation plan and recommended for planted and natural grazing lands to lay fallow, while maintaining their multi-year exploitation. They also requested a change in transit routes, avoiding the pasturelands most severely hit by overgrazing.

These technical recommendations, in addition to the occasional advice to use fertiliser, constituted the best scientific solutions at hand to meet the growing needs for pastures of farmers faced with an increasingly fragile environment. Allowing time for regeneration, though, was not enough to counter soil depletion in the arid and semi-arid areas of Kazakhstan. Unfortunately, the sources available do not clarify the constraints faced by local, political, and administrative authorities, and the nature of their debates around these issues.

Experts also used the journal *Problemy osvoeniia pustyn'* ["Problems of desert development"] as a dedicated platform to exchange views on more general scientific questions. The journal was created in 1972 and edited by Agadzhan Babaev, a Turkmen physicist and geographer who attained the highest positions within the Soviet academic world. For a long time, he presided the Academy of Sciences of the Turkmenistan SSR. In 1976, he was also elected a corresponding member of the USSR Academy of Sciences and then of the Russian Academy of Sciences. As a specialist in arid environments and their development, he led innovative research on the deterioration of the arid and semi-arid regions of Central Asia. He was among the first to use satellite imaging to this end. He also stood out as a staunch supporter of modern irrigation technologies based on saline water treatment to curb desertification.^{cvi} His journal brought together many researchers in applied sciences from institutions across several Soviet republics, who turned it into an important platform for debates on the environmental crisis in Central Asian deserts and steppes. While the papers in this publication set forth analyses and experiments by experts in government agencies,^{cvi} they still contributed to the development of the discourse on the protection of ecosystems. Contrary to what ensued after the Perestroika, this discourse was devoid of vindictiveness.^{cix} The journal remained strictly utilitarian – a fact especially true of a section called "Production aid," which contained practical advice. It is either fortuitous or emblematic that this section disappeared in 1985, at the same time as the Soviet ecological boom.

Indeed, only then did warnings about the environmental emergency caused by overgrazing enter public scientific discourse. This happened with the release of *Beregite pastbishcha* ["Protect the Pastures"], a book by Kazakhstani geo-botanist and ecologist B.A. Bykov, and the ensuing debate

between him and A.G. Babaev. Bykov was a prominent figure in the field of pastoral ecosystem ecology and a member of the Academy of Sciences of Kazakhstan. He drafted the first botanical inventory of pastures in the Kazakh republic in 1969 and dedicated his career to observing their evolution. In his 1985 study, he classified as overgrazed the lands where productivity had fallen by more than 25% relative to their supposedly optimal state in the 1960s, and where plant cover had undergone a profound change in composition. His conclusions differed from Babaev's more optimistic assessment, even though Bykov's criteria were more restrictive. According to the latter's estimations, 30% of the arid zone had deteriorated in Kazakhstan over these decades.^{cx} Regardless of their differing methodology, both of these scientists, and more generally the academia, shared the same conclusion. The debate around the preservation of ecosystems spread to ministries and administrations. One can see in this the work of an epistemic community that engaged with several bodies and projected its diagnostics and warnings, even in the absence of an organised movement. This awareness entered public discourse through articles in the press and documentary films about Central Asia, which multiplied during Perestroika and covered desertification, the salinisation of Turkmenistan, air pollution in Alma-Ata, and the drying-out of the Aral Sea.^{cx} Scientists were then asked to testify on camera and share their expertise to bring legitimacy and help mobilise public opinion. For instance, in an interview with other colleagues, Babaev highlighted how water flowing from cotton-field drainages damaged the surrounding biosphere. They objected to prioritising cotton because it came at the expense of livestock-rearing and bore a heavy toll on the Turkmen desert environment.^{cxii} His perspective remained nonetheless firmly "Promethean": with more than a hint at self-promotion, he used his newly acquired freedom of speech to praise the new desalinisation techniques he was working on.

While it remains difficult to assess how much this rising awareness of environmental issues affected on policymaking, one can still surmise that, considering the imminent fall of the Soviet system, all this took place too late for tangible measures to be implemented to protect the pastoral milieu. Many actors were stuck in a setting dominated by stringent production goals. An example can be found in the analysis of Kazakh economist Gani Kaliev's analysis: his 1989 essay *Sheep-breeding: strategies for*

an accelerated development set forth a new model of pastoralism compatible with the introduction of land leasing and the economic liberalisation of the end of the Soviet era. While he acknowledged the deterioration and depletion of available pastures, he promoted the intensification of sheep-breeding in stables through more and more sophisticated inputs. On the basis of cost-effectiveness, he proposed to limit pastoral migration to selected breeds, adapted to the specificities of the zones where they would be put to graze.

Conclusion

The pastoral world was articulated around the links between various actors: decision-making institutions and executors, research agencies, and herders. All these links operated at different levels. It would be difficult to argue, thus, that scientific and practical information did not circulate between these spheres. Local executive bodies received scientific analyses from expert agencies, but also had their own inherent knowledge of production hurdles. The reports executive bodies drafted for agricultural administrations, the archives of which served as material for this research, report pastureland deterioration, salinisation problems, and, sometimes, the failure or success of measures adopted following experts' fieldwork and recommendations. Groups of experts, in turn, had the sovkhoses or kolkhoses they visited during their field research in mind, but wrote more general reports to the ministries or governmental agencies, such as Kazgizprozem. The diagnosis of overgrazing was certainly shared by all these sets of actors. This knowledge was fragmented, though: only the ministry of agriculture, the Kazgizprozem, and the Forage Institute benefitted from a global understanding of how this issue manifested itself across the country's territory, and even this knowledge would have been piecemeal, given the multiplicity of experts and viewpoints. If a form of environmental awareness had emerged, it would have been within these epistemic communities. Among these, only the scientific community, involved both in academia and in applied expertise, sought to alert the authorities: it was the likes of Bykov or Babaev who wrote articles intended for experts and, later, featured in documentary films for the general public. As for local actors, whether politicians or administrative personnel, or kolkhoz or sovkhos members involved in animal husbandry,

they had little access to general knowledge on overgrazing. There was in fact a hiatus between the producers of practical and theoretical knowledge and actors on the ground. Therefore, if there ever was an “environmentalism of the poor,” one must concede that sources have yet to provide substantiating evidence for it. No oral testimony or written source document mobilisation, however isolated, in defence of the pastoralists’ environment.

Indeed, awareness of overgrazing was highly dependent on the competing interests of each side, especially the economic authorities and the academic world. In many cases, productivity remained the main objective of all those involved, leaving environmental protection far behind. Herders, who laboured under a culture that firmly emphasised hierarchy, do not seem to have become a driving force for protest. They certainly did not advocate alternative pastoral methods. Were they even provided with the opportunity to do so, though? The sources at our disposal, oral and archival, offer no space where herders could have voiced their opinions on pasture quality. A reduced and deteriorated framework for pastoral migration did not allow kolkhozes and sovkhoses much wiggle room. Their only option would have been to diminish their flocks or turn cultivated fields into pastures, but both these solutions would have been in direct conflict with the spirit of Soviet productivity and would have been untenable in an annual production report. Moreover, the concern and response of livestock breeders to drought and lack of water, whether for livestock watering or for the uninterrupted growth of the plant cover, only point at a situation where water supplies were not secured by agricultural institutions. The latter catered to the bare minimum in forage, but experienced difficulties in exploiting water supplies, especially during drought years. As for the herders, even when they only let their flocks graze on the pastures assigned to them, they still believed that they had immense territories at their disposal and did not imagine that they could ever be confronted with a lack of land. Crucially, the many technical initiatives implemented to fill the cracks caused by environmental overexploitation contributed to rendering the deterioration of the plant cover invisible. This entailed the illusion, among kolkhoz and sovkhos members, that higher-level administrative bodies would always be able to respond adequately to crises. Finally, as mentioned by Jeanne Féaux de la Croix in relation to

Kyrgyzstan,^{cxiii} a sense of national pride probably delayed widespread awareness of pasture deterioration.

Beside these psychological processes, though, a very practical circumstance prevented the emergence of a form of migration more in tune with changes in pastureland quality: this was the lack of maintenance and completion of hydraulic infrastructure in the arid zone. This issue of water-point distribution over the territory appeared indirectly in scientific texts, when they described how the plant cover was trampled on around overused wells. But the logical conclusion – that wells should be put somewhere else – was never drawn. In this regard, it is clear that agronomists, botanists, and geographers followed the same general logic as economic planners and policymakers. While they were aware that pastoral systems are to re-modulate grazing areas and flock itineraries, they remained subservient to the economic decisions and technologies sanctioned by the ministries of water and agriculture. In this relation between herders, experts, and institutional economic actors, the latter occupied the top of the pyramid, while the others were constrained to tightly defined areas of intervention. It was because these three sets of actors operated in a compartmentalised and heavily hierarchical way that environmental awareness failed to develop.

Figure 2.1 Convoy of tractors carrying forage for the chaban brigades of the “Kraspanski” sovkhov, Chimkent oblast’, 9 November 1964.

Source: TsGA KFD RK 3-9519.

Figure 2.2 An avtolavka unpacking its goods, Sovkhov Shetyrgiz, Chelkar district, Aktiubinsk oblast’, 9 October 1979.

Source: TsGA KFD RK 3-21594.

Figure 2.3 The partorg and the Almaty oblast’ house representative Kozubekov inspecting the flock in the Toktogul sovkhov in the presence of a herder, 1976.

Source: Central State Archive of Film, Phonographic and Photographic Documents of the Republic of Kyrgyzstan, 1-22119.

Table 2.1 Types of desertification processes in the arid zone territories of the SSR of Kazakhstan, 1988 (in km² and % of the surface of the arid zone).^{cxiv}

	Km ²	%
Degradation of the plant cover due to intensive use	481,513	44.2
Degradation of the plant cover due to lack of grazing	—	—
Territories of partial desertification around wells	8,714	0.8
Wind erosion	—	4
Salinisation of irrigated lands	6,536	1.4
Salinisation due to the reduction of the sea level and the regulation of river flow	75,162	6.9
Technological desertification	61,006	5.6
Total	632,931	59.9
Surface unaffected by desertification	436,835	38.3

Table 2.2 Growth in livestock in Kazakhstan from 1916 to 1980 in thousands of head of livestock.^{cxv}

	Sheep and goats	Horses	Camels
1916	18,364	4,340	—

1928	19,169	3,545	–
1941	8,132	897	104
1951	18,038	1,454	126
1961	28,718	1,158	140
1971	31,777	1,245	129
1977	34,414	1,296	124
1980	35,067	1,258	122

ⁱ Research conducted for this chapter was funded by ANR-DFG, project EcoGlobReg, 2015–2018.

ⁱⁱ Rolando García et al., *Nature Pleads Not Guilty* (Oxford: Pergamon, 1981), Rolando García et al., *The Constant Catastrophe: Malnutrition, Famines and Drought* (Oxford: Pergamon, 1982); Rolando García and R. Pierre Spitz, *Drought and Man: The 1972 Case History: The Roots of Catastrophe* (Oxford: Pergamon, 1986); Kathleen A. Galvin et al., *Fragmentation in Semi-Arid and Arid Landscapes. Consequences for Human and Natural Systems* (Dordrecht: Springer, 2008); Monique Mainguet, *Desertification: Natural Background and Human Mismanagement* (Berlin: Springer Verlag, 1994); David Thomas and Nicholas Middleton, *World Atlas of Desertification* (London: Routledge, 1997); Brigitte Thébaud, *Foncier, dégradation des terres et désertification en Afrique: réflexions à partir de l'exemple du Sahel* (London: International Institute for Environment and Development, 1995).

ⁱⁱⁱ See Juan Martinez-Alier, *The Environmentalism of the Poor: A Study of Ecological Conflicts and Valuation* (Cheltenham: E. Elgar Publishers, 2002).

^{iv} Douglas R. Weiner, *A Little Corner of Freedom: Russian Nature Protection from Stalin to Gorbachëv* (Berkeley: University of California Press, 1999).

^v These interviews were conducted in Kazakh or in Russian by Aybek Samakov (Kzyl-Orda *oblast'*) and Xeniya Prilutskaia (Aktyubinsk *oblast'*, Akmola *oblast'*, Karaganda *oblast'*, Dzhambul *oblast'*, South Kazakhstan *oblast'*), whom I would especially like to thank. Oral history survey financed by Labex Tepsis (EHESS, Paris).

^{vi} Isabelle Ohayon, *La sédentarisation des Kazakhs dans l'URSS de Staline. Collectivisation et changement social (1928–1945)* (Paris: Maisonneuve et Larose, 2006).

^{vii} Ohayon, *La sédentarisation*, 363.

^{viii} Ohayon, *La sédentarisation*, 312–326.

^{ix} Tsentral'nyi Gosudarstvennyi Arkhiv Respubliki Kazakhstan [hereafter TsGA RK] 1000/1/32/35–38.

^x Veniamin V. Vostrov, “Kazakhi Dzhanybekskego raiona Zapadno-Kazakhstanskoï oblasti (istoriko-étnograficheskiï ocherk),” in *Kul'tura i byt kazakhskogo kolkhoznogo aula (Trudy Instituta istorii, arkheologii i étnografii*, vol. 3, ‘Etnografiia’), eds. Al'kei Kh. Margulan et al.. (Alma-Ata: Izdatel'stvo Akademii Nauk Kazakhskoi SSR, 1956): 5–104; O. A. Korbe, “Kul'tura i byt kazakhskogo kolkhoznogo aula,” *Sovetskaia etnografiia*, no. 4 (1950): 67–91.

^{xi} David George Anderson, *Identity and Ecology in Arctic Siberia: The Number One Reindeer Brigade* (Oxford, New York: Oxford University Press, 2000), 37ff.

^{xii} “Organizatsionnye sistemy zhivotnovodstva i sezonnogo otgona skota v Kazakhskoi SSR,” July 24, 1942, TsGA RK, 1137/7/367/72–88; A.B. Tursunbaev, *Kazakhskii aul v trëkh revoliutsiakh* (Alma-Ata: Kazakhstan, 1967).

^{xiii} Zauresh G. Saktaganova, *Ekonomicheskaiia modernizatsiia Kazakhstana* (Karaganda: Izd. KarGU, 2017), 188–190.

^{xiv} The first legal restrictions to annual migrations and nomadism date back to Paul I, in 1802, and increased with the peasant colonisation that substantially expanded from 1870. See *Istoriia Kazakhstana s drevneishikh vremën do nashikh dnei v v piati tomakh*, t. III (Almaty: Atamura, 2000), 424ff.

^{xv} Galvin et al., *Fragmentation*, 163.

^{xvi} Galvin et al., *Fragmentation*, 165; K.A. Asanov and I.I. Alimaev, “New Forms of Organisation and Management of Arid Pastures of Kazakhstan,” *Problems of Desert Development* 5 (1990): 42–49.

^{xvii} Arkhiv Prezidenta Respubliki Kazakhstan [Archives of the President of the Republic of Kazakhstan, hereafter AP RK] 708/56/326/30.

^{xviii} Galvin et al., *Fragmentation*, 166.

^{xix} See Table 2.2.

^{xx} Catherine Baroin, “L’hydraulique pastorale, un bienfait pour les éleveurs du Sahel?,” *Afrique contemporaine* 205 (2003): 205.

^{xxi} AP RK, 708/35/66. In 1980, the total size of the livestock was of 50 million head.

^{xxii} AP RK, 708/35/41.

^{xxiii} 600 million rubles, on average, would amount to about 1.2% of the annual GDP for the Soviet Republic of Kazakhstan in the 1970s – an amount that would have to be spread over ten-year increments.

^{xxiv} Tsentral’nyi Gosudarstvennyi Arkhiv Nauchno-Tekhnicheskoi Dokumentatsii Respubliki Kazakhstan [Central State Archives of technical and scientific documentation – hereafter TsGA NTD RK], 106/3–6/54/199–213; on water-drawn holes: “Vodopoi u shakhtnogo kolodtsa sovkhoza Piatimorskii dzhangalinskogo raiona,” *Uralsk oblast’*, 1962, TsGA KFD RK, 3–25043.

^{xxv} AP RK, 708/35/57.

^{xxvi} Klaus Gestwa, *Die Stalinschen Grossbauten des Kommunismus: sowjetische Technik- und Umweltgeschichte, 1948–1967* (München: R. Oldenbourg, 2010); Paul R. Josephson. “‘Projects of the Century’ in Soviet History: Large-Scale Technologies from Lenin to Gorbachev,” *Technology and Culture* 36, no. 3 (1995): 519–559.

^{xxvii} Josephson, “‘Projects of the Century’ in Soviet History,” 552.

^{xxviii} *Zhivotnovodstvo SSSR (Statisticheskii sbornik)* (Moskva: Gosudarstvennoe statisticheskoe izdatel'stvo, 1959), 382.

^{xxix} *Zhivotnovodstvo SSSR*, 552.

^{xxx} AP RK 708/37/267/68.

^{xxxi} Comments made at the occasion of the Republican Meeting of Young Herders: “Respublikanskoe soveshchanie molodykh chabanov ovtsevodov,” 1966, TsGA RK 1137/24/1802/24.

^{xxxii} *Kazakhskaiia sovetskaia socialisticheskaia respublika. Entsiklopedicheskii spravochnik*, 339.

^{xxxiii} TsGA NTD RK, 106/3–6/54/199–213.

^{xxxiv} TsGA RK 209/1/358/3–6.

^{xxxv} VASKhNIL analysis in a report to the Central Committee of the Communist Party, 1973, AP RK 708/56/326/30–37.

^{xxxvi} AP RK 708/51/2010/76–79; AP RK 708/58/2038/49–63.

^{xxxvii} See all the quoted interviews from Kazalinsk region in 2016.

^{xxxviii} AP RK 708/56/326/30–37.

^{xxxix} AP RK 708/51/2010/77 and AP RK 708/38/1303/79.

^{xl} Interview with Masaty Bolatovna (b.1 963), daughter and daughter-in-law of sovkhos directors in the Ėmba district.

^{xli} Galvin et al., *Fragmentation*, 166.

^{xlii} AP RK 708/56/326/31.

^{xliii} *Pravda*, no. 89, 19 April 1927, clipping in TsGA RK, 1000/1/32/24; TsGA RK, 1000/1/32/35–38; I.A. Zveriaikov, *Ot kochevaniia k sotsializmu* (Alma-Ata, Moskva: Kraevoe Izdatel'stvo Ogiza v Kazakhstane, 1932), 146.

^{xliv} V.F. Shakhmatov, "O proiskhozhdenii dvenadtsatiletnego zhivotnogo tsikla letoischisleniia u kochevnikov," *Vestnik Akademii Nauk Kazakhskoi SSR* no. 1 (1955), 43–53; Sarah Robinson, *Pastoralism and Land Degradation in Kazakhstan* (PhD dissertation, University of Warwick, 2000), 79.

^{xlv} AP RK 708/37/1309/114–115.

^{xlvi} AP RK 708/37/1309/116.

^{xlvii} "Sekretar' partorganizatsii kolkhoza "Bolshevik" dzhambul'skogo raiona privëz tëpluiu odezhdu chabanam na otgonnye pastbishcha," October 14, 1963, TsGA KFD RK 3–6488.

^{xlviii} AP RK 708/37/1309/119.

^{xlix} Interview with Edige (b. 1937), chief shepherd, Kazalinsk district, Kzyl-Orda *oblast'*, 17 August 2016.

¹ Interview with Masaty.

^{li} Minutes from the 12th Plenum of the Central Committee of the Communist Party of the SSR of Kazakhstan, 24–25 December 1969 AP RK 708/46/13/42–43.

^{lii} AP RK 708/38/1303/87.

^{liii} AP RK 708/38/1303/88.

^{liv} AP RK 708/38/1303/89.

^{lv} The anticipated deficit for 1971 was estimated to be 15% for the Republic as a whole, with significant variations depending on regions, AP RK 708/51/2009/2. The Dzhambul *obkom* warned as early as 5 July 1965, of a foreseeable lack of forage for the incoming winter and announced a potential deficit of 50%, APRK 708/38/1303/109. The chart recording the 1969 deficits shows an average of 9%; the variations were offset by a system of equalisation, but the average still reflected a shortfall, AP RK 708/48/551/15–16.

^{lvi} Interview with Nasyr (b. 1939), chief shepherd, Kazalinsk district, Kzyl-Orda *oblast'*, 19 August 2016.

^{lvii} Interview with Nurpaiyz (b. 1943), horse herder, Kazalinsk district, Kzyl-Orda *oblast'*, 16 August 2016.

^{lviii} Interview with Zhenis (b. 1944), Karkaralinsk, Nurken Sovkhoz, veterinary and then Party employee, 11 July 2017.

^{lix} AP RK 708/51/2009/3.

^{lx} AP RK 708/51/2009/7.

^{lxi} AP RK 708/51/2009/7.

^{lxii} Galvin et al., *Fragmentation*, 166.

^{lxiii} Interview with Kaiypkozha, born in 1959, assistant herder, Kazalinsk district, Kzyl-Orda *oblast'*, 17 August 2016.

^{lxiv} The same hierarchy can be observed in Kyrgyzstan: Svetlana Jacquesson, *Pastoréalismes: anthropologie historique des processus d'intégration chez les Kirghiz du Tian Shan intérieur* (Wiesbaden: Reichert Verlag, 2010), 159–161.

^{lxv} Viktor Dënningkhaus and Andrei Ivanovich Savin, “Smotrish', i Mane, i Tane kakoi-to “Znak Pochëta” popadaet. Brezhnevskaiia “industriia” nagrazhdenii i sovetskoe obshchestvo,” *Rossiiskaia Istoriia*, no. 2 (2014), 127–149.

^{lxvi} Interview with Aitzhan (b. 1940), *chaban*, Moiynkum village, Dzhambul *oblast'*, 8 July 2017.

^{lxvii} Interview with Nurgaliuly Toleutai (b. 1936), educator, inspector of popular education, in sovkhoses and kolkhoses and with Saulie, born in 1951, *raikom* employee, then library employee, Karkaralinsk, 8 May 2017.

^{lxviii} Visit of the museum on 8 July 2017.

^{lxix} Interview with Aitzhan.

^{lxx} Interview with Roza (b. 1952 in Ėmba city), daughter and sister of sovkhoses directors, Aktyubinsk *oblast'*, Kandyagash, 3 June 2017.

^{lxxi} Alun Thomas, *Nomads and Soviet Rule: Central Asia under Lenin and Stalin* (London: Bloomsbury, 2019), 142–145; Paula A. Michaels, *Curative Powers: Medicine and Empire in Stalin's Central Asia* (Pittsburgh: University of Pittsburgh Press, 2003), 155; Rebekah Ramsay, "Nomadic Hearths of Soviet Culture: 'Women's Red Yurt' Campaigns in Kazakhstan, 1925–1935," *Europe-Asia Studies* 73, no. 10 (2021): 1937–1961.

^{lxxii} "Delo èto nashe, obshchee. Pis'mo peredovykh zhivotnovodov Kazakhstana," *Pravda*, 7 September 1965, 2.

^{lxxiii} Interview with Gulmira (b. 1962). *chaban's* daughter, Aktyubinsk *oblast'*, 17 March 2017.

^{lxxiv} Interview with Sandybai (b. 1940), former sovkhos director, animal husbandry officer, Aktyubinsk *oblast'*, Kandyagash, 3 June 2017.

^{lxxv} Jacquesson, *Pastoréalismes*, 164–165.

^{lxxvi} Interview with Nurgaliuly Toleutai and Saulie.

^{lxxvii} Interview with Roza.

^{lxxviii} Interview with Nasyr. This situation was also observed by Jacquesson, *Pastoréalismes*, 162.

^{lxxxix} Interview with Amangeldy, born in 1927, chief shepherd, Moiynkum village, Dzhambul *oblast'*, 8 July 2017.

^{lxxx} Interview with Nurpaiyz.

^{lxxxi} TsGA RK 2029/1/898/2–3.

^{lxxxii} Interview with Nasyr.

^{lxxxiii} Interview with Masaty.

^{lxxxiv} Interview with Bakhytzhana (b. 1949), animal-husbandry officer, sovkhos "Arnasay", Kirov district, Southern Kazakhstan *oblast'*, 4 September 2016.

^{lxxxv} Robinson, *Pastoralism and Land Degradation in Kazakhstan*, 87–88.

^{lxxxvi} Ohayon, *La sédentarisation*, 332.

^{lxxxvii} "Resolution of the *Ispolkom* of the Soviet of the workers' deputies of the South Kazakhstan *oblast'* and of the *obkom* office of the KP(b)K on kolkhoz livestock transhumance on summer pasture in the high mountains of the Bostandyk district." TsGA RK, 1137/7/367/1–2.

^{lxxxviii} Robinson, *Pastoralism and Land Degradation in Kazakhstan*, 103.

^{lxxxix} Interview with Sholpan (b. 1960), niece of a herder, familiar with summer pasturelands, Agadyr region, Shet district, Karaganda *oblast'*, 24 October 2016.

^{xc} Interview with Abi (b. 1951), driver, sovkhos employee, Kazalinsk district, Kzyl-Orda *oblast'*, 15 August 2016; interview with Nasyr.

^{xci} AP RK 708/38/1280/310.

^{xcii} TSGA RK 2079/1/80/281–290.

^{xciii} TSGA RK 1711/1/102/47–50.

^{xciv} Raushan M. Mustafina, *Predstavleniia, kul'ty, obriady u kazakhov* (Alma-Ata: Qazaq Universiteti, 1992), 123–126.

^{xcv} D.Kh. Karmysheva, “Zemledel’cheskaia obriadnost’ u kazakhov,” in *Drevnie obriady, verovaniia i kul'ty narodov Srednei Azii*, ed. V.N. Basilov (Moskva: Nauka, 1986), 208.

^{xcvi} Mustafina, *Predstavleniia*, 124.

^{xcvii} Khalel A. Argynbaev, “Narodnye obychai i pover’ia kazakhov sviazannye s skotovodstvom,” *Khoziaistvenno-kul'turnye traditsii narodov Srednei Azii i Kazakhstana* (Moskva: Nauka, 1975), 194–206.

^{xcviii} Interview with Bibigul and Zaure (b. 1969), Almaty, reminiscing about the end of the 1970s, when they were children and took the train with their mother from Alma-Ata to the *aul* to buy meat, 16 July 2016.

^{xcix} TsGA RK, 1137/6/577/24.

^c TsGA RK, 1000/1/12/34–71, 1000/1/12/197, 1000/1/12/203–208, 1137/1/760/30–33, 1137/1/760/37–43.

^{ci} L.M. Zal’tsman and B.L. Blomkvist, *Opyt otgonno-pastbishchnogo sodержaniia skota v kolkhozakh* (Moskva: Sel’khozgiz, 1948); T.B. Balakaev, *Kolkhozhnoe krest'ianstvo Kazakhstana v gody velikoi otechestvennoi voiny, 1941–1945* (Alma-Ata: Nauka Kazakhskoi SSR, 1971), 160–166.

^{cii} Ohayon, *La sédentarisation*, 338.

^{ciii} Boris A. Bykov, *Pastbishcha i senokosy (klassifikatsiia)* (Alma-Ata: Nauka, 1969).

^{civ} TsGA NTD RK, 106/3–6/4/2.

^{cv} Asanov and Alimaev, “New Forms of Organization,” 42–49.

^{cvi} TsGA NTD RK, 106/3–6/4/1–10.

^{cvi} Agadzhan Babaev and Zakhar Freikin, *Pustyni SSSR vchera, segodnia i zavtra* (Moskva: Mysl', 1977), 248ff.

^{cvi} Marie-Hélène Mandrillon, "L'expertise d'État, creuset de l'environnement en URSS," *Vingtième Siècle*, no. 113 (2012): 107–116.

^{cix} Survey of the journal *Problemy osvoeniia pustyn'* from 1972 to 1988.

^{cx} Robinson, *Pastoralism and land degradation in Kazakhstan*, 87.

^{cx} See, for example, *Aralkum*, directed by B. Muzafarov (Lennauchfil'm, 1987), 28 min. Documentary film shot in Karakalpakstan (Uzbekistan).

^{cxii} *Spasite pustyniu*, directed by Sapar Mollaniiazov (Turkmenfil'm, 1988), 27 min.

^{cxiii} Jeanne Féaux de la Croix, *Iconic Places in Central Asia: The Moral Geography of Dams, Pastures and Holy Sites* (Bielefeld: Transcript Verlag, 2016).

^{cxiv} Source: N.G. Kharin and A.A. Kiril'tseva, "New Data on Areas of Desertified Lands in the Arid Zone of the USSR." *Problems of Desert Development* 4 (1988): 4. (The arid zone corresponds to the desert agro-climatic area that covers half of Kazakhstan.)

^{cxv} *Kazakhskaiia sovetskaia sotsialisticheskaia respublika. Ėntsiklopedicheskii spravocnik*, ed. Manash K. Kozybaev (Alma-Ata: Glavnaia redaktsiia Kazakhskoi Sovetskoi ėntsiklopedii, 1981), 339.