# Influence of Grazing Exclusion on Vegetation and Productivity of Kyrgyz Pastures

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# Influence of grazing exclusion on vegetation and productivity of Kyrgyz pastures

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## Introduction

The agricultural area of the Kyrgyz Republic consists of 10.6 million ha, of which 9.2 million ha (87%) are used as permanent grasslands (pastures and meadows for hay). Livestock breeding is a leading branch of agriculture in Kyrgyzstan, which is why a large emphasis is placed on the development and improvement of feed production.

At present, livestock mostly belong to small farmers. Most animals graze in or near villages, particularly in the spring and autumn, leading to over-grazing of these pastures, while pastures more remote from villages are only used for grazing in the summer and so tend to be under-grazed. Such a management system leads to destruction of pastures in the regions where a high density of human population is observed. A loss of floristic diversity can be observed near settlements and persistent vegetation types, dominated by good plant species, are replaced by undesirable and sometimes poisonous annual plants. This leads to a reduction of pasture productivity by up to 2-2.5 times and, in some cases, to its total loss.

The total area of degraded pastures in Kyrgyz (pastures covered with weeds, degraded or eroded to varying degrees) accounts for more than 4.5 million ha, or 49%, of the area of permanent pastures. Recently, 2.4 million ha of pastures were identified as having been damaged by soil erosion and 4.1 million ha were invaded by weed species, including *Rosa platyacantha, Caragana spp.* and *Carex spp*. Five million ha are invaded by plant species with a low nutritive value, including *Artemisia dracunculus*, *Veratrum lobelianum* and others. At the same time, remote summer pastures are not fully grazed. As a consequence, large areas of these pastures have become occupied by undesirable and inedible plant species.

The aim of this study was to assess the effect of grazing exclusion on the vegetation and productivity of: (1) pastures near villages that are grazed intensively throughout the year; and (2) pastures, which are used in summer and are less intensively grazed through the remainder of the year. The potential of degraded pastures to recover, when protected from overgrazing, was also evaluated. Six pastures (3 located in or near villages and 3 used for summer grazing) were selected with local community representatives in 3 pilot regions of Kyrgyzstan (the Lahol and Terek regions of Naryn oblast and the Orgochor region of Issyk-Kul oblast). This paper presents some preliminary results after 4 years of grazing exclusion from the Orgochor pilot region.

## Methods

The pilot region of Orgochor is situated on the south-east part of Issyk-Kul oblast, on the territory of Jety-Oguz rayon (42°22'16"N; 78°02'4"E), at an altitude of 1700 m above sea level (a.s.l.). Near-village pastures in Orgochor belong to wormwood-ephemeral dry steppes. The demonstration plot is located on the eastern part of Orgochor village, where the mean annual rainfall is 300 mm and the annual average temperature lies between 6.0 and 7.0 °C. The summer pasture study area of the Orgochor region is located 12-15 km to the south at an altitude of 2000 m a.s.l. on the northern mountainside of TerskeiAla-too, in an area called Kaindy. The vegetation type here is a grass-forb meadow-steppe. The mean annual rainfall is 400 mm and the annual average temperature is between 5.0 and 6.0 $^{o}$C.

The size of the protected area near Orgochor village was 900 m$^2$ and that of the Kaindy summer pasture was 300 m$^2$. Grazing was excluded using fences erected in 2008. The botanical composition was observed during summer of 2009 and 2012, according to the quick-start methodology of Herrick *et al.* (2005). Plants were identified according to Golovkova (1962) and Flora of Kyrgyz USSR (1959). In 2009 and 2011, 4 areas of 1 m$^2$ were cut monthly from May to September both inside the exclusion areas and outside them (next to the fenced areas) to a height of 2-3 cm (near-village pastures) or 4-5 cm (summer pastures) above the soil surface. The harvested plant material was air dried and weighed to determine the dry matter yield. Observations and measurements of dry matter and botanical composition were conducted according to the experimental methods for meadows and pastures described by Iglovikov (1971) and Imenov and Djoldoshev (2009).

## Results

In the near-village pasture of Orgochor, *Artemisia spp.* made up about 70% of the biomass. There were few grasses and *Carex turkestanica* was less prevalent inside, compared to outside, the fenced area. Vegetation reached its maximum at the end of July, with 520 kg DM/ha outside the fenced area and 640 kg DM/ha within the fenced area (Table 1). In the summer pastures of Kaindy, *Festuca valesiaca*, *Dactylis glomerata* and *Poa pratensis* were the dominant grasses. Legumes represented 10% of the biomass.

**Table 1. Dry matter yields produced from May to September outside (unfenced) and inside (fenced) in near-village and summer pasture areas in the Orgochor pilot region (mean of 2009 and 2012 values).**

| Pasture type | Plot type | Dry matter yield (kg DM/ha) | | | | |
|---|---|---|---|---|---|---|
| | | May | June | July | Aug | Sept |
| Near-village pasture | unfenced | 110 | 310 | 520 | 500 | 450 |
| | fenced | 120 | 310 | 640 | 580 | 530 |
| Summer pasture | unfenced | 190 | 760 | 1720 | 1430 | 1240 |
| | fenced | 200 | 920 | 2220 | 1440 | 1410 |

*Artemisia dracunculus* reached a higher proportion outside than inside the fenced plot. Plant vegetation commenced growing 8-10 days later than the near-village pastures (Orgochor). Maximum productivity of the vegetation was obtained at the end of July, with 1720 kg DM/ha outside the fenced area and 2220 kg DM/ha inside the fenced area (Table 1).

## Conclusion

To assess the effects of grazing exclusion, long term observations are required. Nevertheless, 4 years of observations reveal significant effects of grazing exclusion. On over-grazed near-village pastures, grazing exclusion favoured the emergence of plant species with a good nutritive value and reduced the proportion of some undesirable species. For this type of pasture, it is necessary to introduce rest periods to avoid pasture degradation. On less over-grazed summer pastures, the positive effects of grazing exclusion are less obvious and some undesirable plant species may be favoured. In such cases, long rest periods are not recommended

## References

Golovkova AG (1962) Geobotanical research of Central Tyan-Shan. Kyrgyz State University, Frunze.

Herrick JE, Van Zee JW, Haystad KM, Burkett LM, Whitford WG (2005) Monitoring Manual for Grassland, Shrubland and Savanna Ecosystems, Volume I: Quick Start. USDA-ARS Jornada Experimental Range, P.O. Box 30003, MSC 3JER, NMSU, Las Cruces, New Mexico 88003-8003, http://usda-ars.nmsu.edu, 36 p.

Iglovikov VG (1971) Experimental methods for meadows and pastures. (V. R. Vilyams Union Scientific Research Institute of Fodders: Moscow)

Imenov HI, Djoldoshev KD (2009) Mountainous Fodder production. Livestock and Pasture Research Institute, Bishkek, 164 p.

Flora of Kyrgyz USSR (1959) Published by Kyrgyz USSR Scientific Academy, Frunze, 28 volumes.